EXPLOSIVE GAS MONITORING PLAN

West Lake Landfill Remedial Design
Operable Unit 2 (OU-2)

Bridgeton, Missouri

Submitted to

Bridgeton Landfill LLC

Submitted by

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engineers | scientists | innovators

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SECTION 1

INTRODUCTION

The following Explosive Gas Monitoring Plan (EGMP) has been developed for the evaluation of subsurface landfill gas (LFG) migration at the West Lake Landfill Superfund Site (Site), Operable Unit 2 (OU-2), specifically the Inactive Sanitary Landfill (ISL) sub-unit. In addition, the general framework of this EGMP includes items recommended for evaluation of subsurface LFG migration established in published U.S. Environmental Protection Agency (USEPA) guidance.[1]

The ISL is subject to regulation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Record of Decision (ROD) for Operable Unit 2, including the ISL sub-unit, was issued in July 2008. The requirements for LFG migration monitoring and control in 10 CSR 80-3.010(14) (2008) are considered relevant and appropriate requirements as set forth in the ROD, and therefore serve as the primary regulatory basis for this EGMP. These regulations are provided in Appendix A, in addition to LFG sampling guidance published by the MDNR.

A general Site location map is illustrated on **Figure 1**. OU-2 is divided generally into three specific disposal sub-units. These include:

- Closed Demolition Landfill (CDL);
- Former Active Sanitary Landfill (a.k.a. Bridgeton Sanitary Landfill or Bridgeton Landfill); and,
- Inactive Sanitary Landfill (ISL).

ISL limits are illustrated on **Figures 1 and 2** and are the focus of the EGMP. A general diagram of the entire site and spatial relationship of each sub-unit is illustrated on **Figure 3**, which was obtained from remedial investigation reports associated with other portions of the Site[2].

The ISL is located in the western portion of the Site, southwest of the CDL and west of the Bridgeton Landfill. Previous records indicate that the wastes disposed of in the ISL consist primarily of municipal sanitary wastes, and therefore, have the capacity to generate LFG from decomposition.

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[1] Guidance for Evaluating Landfill Gas Emissions from Closed or Abandoned Facilities, EPA-600/R-05/123a, September 2005.

[2] Remedial Investigation Addendum, West Lake Landfill Operable Unit 1, Engineering Management Support, Inc., January 25, 2018.

Data collected during the OU-2 Remedial Investigation (RI) indicated that a Remedial Action (RA) was warranted for the ISL. Accordingly, a Feasibility Study (FS) was prepared to evaluate the appropriate RA for the ISL under CERCLA. This included requirements for evaluation of potential LFG migration. This EGMP has been prepared in response to this requirement.

SECTION 2

SITE ENVIRONS AND GAS MIGRATION MONITORING NETWORK

The entire West Lake Landfill Superfund Site consists of approximately 200-acres located within the City of Bridgeton, St. Louis County. The formal site address is 13570 St. Charles Rock Road. The Site is bounded on the north by St. Charles Rock Road and on the east by Taussig Road and agricultural land. Old St. Charles Rock Road borders the southern and western portions of the Site. Property north of the Site (across St. Charles Rock Road) is moderately developed with commercial retail and industrial operations. The property northeast of the Site is also developed for commercial uses. The property south of the Site is currently experiencing significant commercial development. The Earth City Industrial Park is adjacent to the Site on the west. The Site is now almost completely surrounded by commercial/industrial properties. As stated in Section 2.3 of the West Lake Landfill Superfund Site Operable Unit 2 Remedial Design Quality Assurance Project Plan (RD QAPP), dated May 2020, the perimeter landfill gas monitoring wells are intended to address current and future gas migration potential at the perimeter of the ISL.

2.1 Topographic Setting

The Site is located in the eastern edge of the Missouri River flood plain. The Missouri River is located less than two miles west of the Site. The Site area is transitional between the alluvial flood plain immediately to the west and the loessial bluffs 0.5 mile to the east. The edge of the alluvial valley is oriented northeast to southwest through the center of the Site. Topography in the area is gently rolling. However, the Site's topography has been significantly altered by quarry activities in the eastern portion (Bridgeton Landfill) and placement of mine spoils (unused quarry rock) and landfilled materials in the western portion in which the ISL is located.

2.2 History of Waste Placement

The ISL, CDL and Bridgeton Landfill operating history is complex and includes numerous and specific disposal authorizations. A detailed discussion of these initial and subsequent waste disposal activities is documented in prior Site investigation reports.[3] Disposal authorizations for the ISL were limited to municipal solid waste. Based on review of boring logs within the presumed limit of waste (**Appendix B**), materials encountered are consistent with operation as a sanitary landfill.

[3] Refer to Section 1.2.2, Remedial Investigation Report, West Lake Landfill Operable Unit 2, Bridgeton, Missouri, Revised September 2005 and prepared by Herst & Associates, Inc.

Estimated waste boundaries are depicted on **Figure 2**[4]. Additional documentation of waste limits will be completed during Remedial Design (RD) "Waste Separation Evaluation Report – Additional Field Investigation" and "Slope Stability Evaluation and Western Waste Limit Investigation Plan" investigations, expected to be completed during 2021[5]. Unless these limits are modified via this field investigation or other information gathered pursuant to the RD, the estimated limits identified in **Figure 2** will be used for development of this EGMP.

2.3 Radius of Evaluation

Consistent with conventional LFG migration assessments, and published USEPA guidance[6], a 1,000-foot radius from the presumed limit of waste is established within this EGMP for the purpose of evaluating off-site receptors. Off-site structures assumed to currently be occupied, or structures that can accommodate occupancy for periods of time exceeding one-hour or more, within 1,000 feet of the ISL boundary (currently assumed as the limit of waste) are illustrated on **Figure 2**. For the purpose of this EGMP, structures are defined as those having an enclosed occupancy space. Facilities that are considered "open" or not enclosed are also identified for reference. Those structures within the OU-2 Site boundary are not specifically identified as they are addressed in the Explosive Gas Management Plan previously submitted for the Bridgeton Landfill on July 12, 2006 (**Appendix E**).

2.4 Potential Explosive Gas Migration Pathways.

Within the western perimeter of the site, and within the 1,000-foot radius from the assumed limit of waste in the ISL, potential subsurface pathways include alluvial deposits, a fiber optic system and embedded fence posts associated with the facility perimeter fence. In addition, a sanitary sewer parallels Old St. Charles Rock Road which services leachate discharge from the Bridgeton Landfill. It is noted that the location of this infrastructure is being formally documented by the Remedial Design investigation (RD) via an "Existing Conditions investigation, which was submitted to the USEPA in November 2020. Both the fiber optic and sanitary sewer are categorized as linear infrastructure that may intercept and transmit landfill gas to occupied structures via service entrances.

However, within the 1,000-foot radius of the Site, no buildings that do not currently include gas alarms are known to have service entrances associated with these utilities. Existing Site conditions are illustrated on **Figure 4**.

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[4] For the purposes of this EGMP, estimated waste boundaries are assumed consistent with the site boundary established in the Remedial Design Work Plan previously issued for the facility.
[5] Slope Stability Evaluation and Western Waste Limit Investigation Plan work has been temporarily paused pending final results of the OU-1 Design Investigation Evaluation.
[6] Guidance for Evaluating Landfill Gas Emissions from Closed or Abandoned Facilities, EPA-600/R-05/123a, September 2005.

The primary explosive gas migration pathway identified in this EGMP consists of the alluvial deposits underlying and surrounding the ISL, principally those on the western perimeter of the site. The maximum vertical depth for this primary LFG pathway is either the depth to groundwater (i.e. unsaturated zone) or waste invert which are discussed in more detail in the following sections.

In addition to these alluvial deposits, two utility corridors, including fiber optic and a sanitary sewer, run parallel to Old St. Charles Rock Road on the western perimeter of the ISL. Each represents a potential migration pathway. However, as LFG must migrate through alluvial deposits prior to reaching these known utility corridors, the alluvial deposits are considered as the primary LFG migration pathway. If LFG is detected in any of the proposed perimeter LFG monitoring wells (located between the landfill and utility corridors), a series of bar punch monitoring wells (i.e. shallow direct push probes) will be installed within the utility backfill to monitor these potential migration pathways. A detail of a typical punch bar monitoring well is included in **Figure 5**. Unknown or abandoned utilities or landfill infrastructure not identified in the Existing Conditions Summary may exist and could also act as a primary migration pathway for landfill gas. If additional primary pathways are identified during future investigation activities, these will also be evaluated.

2.5 Other Potential Sources of Explosive Gas.

Other potential sources of explosive gas at the facility are primarily associated with the adjacent permitted Bridgeton Landfill. Geosyntec has reviewed various reports on the LFG corrective actions at the Bridgeton Landfill. The most recent, ongoing and proposed LFG migration control efforts at Bridgeton Landfill are detailed in sections 3.0 and 4.0 of the Landfill Gas Corrective Action Update dated July 15, 2020 (**Appendix F**) as discussed below.

The MoDNR's Waste Management Program (WMP) oversees the gas management activities at Bridgeton Landfill. Their regulatory role is to ensure that the current gas collection and control system (GCCS) is effectively controlling gas generation and migration at the Bridgeton Landfill. The Bridgeton Landfill GCCS is continuously evaluated and upgraded as necessary to ensure it is operating at peak performance. Potential gas migration pathways are routinely investigated, and measures taken to address any LFG migration.

Additionally, a below grade natural gas pipeline runs along Old St. Charles Rock Road and enters the site near the southwest gate. This pipeline is located between the ISL and Bridgeton Landfill and is another possible source of explosive gas.

2.6 Hydrogeologic and Geological Information.

The regional direction of groundwater flow is in a generally northern direction within the Missouri River alluvial valley, parallel or subparallel to the river alignment. The RI data indicate very flat gradients in the water table of the alluvial aquifer near the ISL. Groundwater characterization

specific to the ISL, including evaluation of groundwater gradients, will be completed following investigation of Operable Unit 3 (OU-3).

The western portion of the ISL is also bounded by a flood control canal operated by the Earth City Levee District. Groundwater elevations under the ISL are expected to vary in response to canal water elevation and to a lesser extent, groundwater and leachate withdrawal. The primary importance of this interaction is potential variation in groundwater elevations within probable gas migration zones. Such fluctuation may alter gas migration patterns temporally, and thus must be considered in the placement and specifically depth of gas monitoring wells. This groundwater fluctuation is accounted for in the design of the vertical screen interval for perimeter LFG monitoring wells in Section 2.15.

Based on review of stormwater application requirements set forth by the Earth City Levee District, stormwater canals are designed with a normal water surface elevation of 433.0 feet mean sea level (fmsl, Earth City Levee District datum). Additionally, the shallow/intermediate alluvial groundwater elevation contour maps generated by Trihydro and ERM (**Appendix H**) collected during quarter one of 2020 and 2021, confirm the water surface resides at similar elevation. Therefore, based on similar elevations between these units, it is assumed that there is communication between the canal and alluvial deposits underlying the ISL. Canal water surface elevations are assumed to impart significant influence on the depth of the unsaturated zone available for LFG migration along the western perimeter of the ISL.

2.6.1 Site Characteristics that May Act as Natural Impervious Boundaries to Gas Migration or Allow Natural Venting of Gas.

As previously indicated, groundwater elevations under and along the perimeter of the ISL are expected to vary in response to canal water elevation. The normal surface water elevation of the Earth City Levee District which is 433 fmsl and the shallow/intermediate alluvial groundwater elevations which range from 429 to 434 fmsl (Appendix H) are higher than the measured bottom of waste elevation shown in **Table 1** in Section 2.8. Therefore, as discussed in further detail in Section 2.14, the proposed perimeter LFG monitoring wells will be screened to a bottom elevation of 425 fmsl (below lowest waste invert elevation) to account for any fluctuations to the groundwater elevation and corresponding change in unsaturated zone available for LFG migration.

In addition to groundwater, the perimeter berm present along the western boundary of the ISL may also impact gas migration. At this time, the composition of this berm is not known, but will be investigated through the installation of six perimeter LFG monitoring wells within the berm or soil toe borings for the Slope Stability Evaluation. Geotechnical testing will be performed as part of either the installation of the perimeter LFG monitoring wells or the slope stability evaluation field investigation. The screen of the perimeter LFG monitoring wells will fully penetrate the berm thickness, regardless of whether the berm is comprised of permeable or impermeable soils. If this berm is comprised of low permeability soils, which is not anticipated based on the OU-2 RI/FS, it

will represent an additional redundant barrier to LFG migration. However, characterization of this berm will not change the proposed horizontal location or vertical screening of perimeter LFG monitoring wells identified in this EGMP.

2.6.2 Potential Explosive Gas Migration Pathways and Their Associated Explosive Gas Hazard.

This section has been consolidated with Section 2.4.

2.7 Identification of Other Sources of Explosive Gases

This section has been consolidated with Section 2.5.

2.8 Geologic Cross Sections and Potential Natural Pathways.

The RI previously completed for Operable Unit 1 (OU-1) at the Site included development of geologic cross-sections that traverse the ISL. These cross-sections provide considerable insight into the position of the ISL relative to regional geology and adjacent waste disposal units[7].

In general, the ISL is located over an alluvial plain, incised within a limestone bedrock formation. These alluvial deposits vary in thickness and exceed 100 feet at some locations. The current interpretation of the ISL relative to underlying and surrounding geology is that of a surface or "area" fill. Based on this interpretation, waste materials were placed directly on alluvial deposits (or mine spoil) with no significant excavation below prevailing ground surface.

Figure 5-14 presented in the OU-1 RI Addendum (Appendix C) indicates the base of ISL refuse rests in the range of 430 to 460 feet (site datum). As a means to further refine base grade, various borings advanced either within or adjacent to the ISL were also examined to determine ISL base grade. Borings noting waste content and relevant elevation data are summarized in **Table 1**. Borings associated with the ISL that were reviewed and associated well installation logs (as applicable) are provided in **Appendix B**.

Based on this boring data, an approximate base of waste may be established at elevation 425 feet fmsl. Correlating this boring data to normal water surface elevations recorded for the Levee District canal (433 fmsl per Earth City Levee District datum), and the shallow/intermediate alluvial groundwater elevation contour maps (groundwater elevations ranging from 425 to 434 fsml) provided in the draft OU-3 RI/FS Work Plan (**Appendix H**), the lower 8 to 10 feet of waste within the ISL could potentially be saturated. If this condition does occur, it may retard to some extent, both gas generation and migration within the lower portion of the waste column.

[7] Remedial Investigation Addendum, West Lake Landfill, Operable Unit 1, Engineering Management Support, Inc., January 25, 2018.

TABLE 1
Estimated Base of Waste at the ISL

Boring ID	Ground Surface Elevation (fmsl)	Depth to Base of Waste	Estimated Base of Waste	Comments
PZ-205AS	454.3	28	426.3	Waste
PZ-107SS	462.6	28	434.6	Waste
LR-105	484.2	36	448.2	Waste
LR-102	512.0	76	436.0	Waste
LR-101	500.2	54.7	445.5	Waste
LR-100	467.2	27	440.2	Waste

2.9 Discussion of Site Construction Details Including the Type and Characteristics of the Liner (if any), Type and Characteristics of Final Cover, and an Evaluation of Existing Cover Conditions.

No bottom or sidewall liners are known to have been placed at the base of the ISL. The cover system placed following cessation of waste receipt appears to be a general soil or clay cap and was not certified. Cap thickness and engineering properties are currently under evaluation in accordance with the Remedial Design Work Plan (RDWP) and this evaluation is anticipated to be completed in the third quarter of 2020. Should existing cap characteristics be altered during RD or RA activities, impacts to potential LFG migration will be reevaluated at that time.

2.10 Description of any Existing and Operating Gas Extraction or Gas Venting System.

The presence of a gas collection or venting system within the ISL is under investigation as part of the ongoing remedial design investigation activities. As previously indicated, an extensive active GCCS is operating at the adjacent Bridgeton Landfill. The impact of the adjacent GCCS on migration patterns within the ISL has not been defined. However, as the potential LFG migration monitoring zone is on the western perimeter of the ISL, minimal impact from the Bridgeton Landfill active GCCS is expected to occur.

2.11 Description of Any Existing Explosive Gas Monitoring System and an Evaluation of its Effectiveness.

No existing LFG monitoring system is in operation at the ISL. A comprehensive monitoring program is active at the neighboring Bridgeton Landfill, which consists of 39 perimeter LFG monitoring wells which are monitored on a weekly or quarterly basis. These include compliance wells, compliance nested wells, investigative nested wells, public safety wells, and sentry wells. Nine landfill gas extraction wells were installed in the south quarry in 2019 to increase landfill gas

extraction capacity. An additional 35 temporary LFG monitoring probes were installed in the second quarter of 2020 in 14 different locations in the southwest corner of the south quarry of Bridgeton Landfill to assess LFG migration. Compromised gas extraction wells are scheduled to be replaced in the third quarter of 2020 to improve LFG collection in this area of the Bridgeton Landfill.

To date, the Bridgeton Landfill EGMP has been deemed effective at detecting gas migration from the Bridgeton Landfill and mitigating off-site impacts to occupied structures or associated properties. More details regarding the Bridgeton Landfill LFG monitoring system can be found in the Landfill Gas Corrective Action Update dated July 15, 2020 (**Appendix F**).

2.12 Review of Explosive Gas Generation Potential.

In general, prior investigation of the ISL concluded that gas generation potential is "low" due to the relative age of refuse as well as "closed" conditions. As indicated in Section 5.3 of the ROD:

> *"Landfill gas characterization of the Inactive Sanitary Landfill was accomplished using various measurement techniques. Air monitoring of the breathing zone conducted during 49 borings did not show appreciable impacts from landfill gas. Active gas venting was not observed. Direct measurements of landfill gas were made along the crest of the landfill. Measurements along the western perimeter were also taken. Sporadic impacts from combustible gas emissions and volatile organic compounds (VOCs) were observed."*
>
> *"Landfill gas characterization of the Inactive Sanitary Landfill indicated the sporadic presence of decomposition gases and organic vapors. Typically, gas generation in municipal solid waste increases for the first five or six years after placement in the landfill and then declines thereafter. Because the landfill has been inactive for 30 years, decomposition gas generation is relatively low and expected to decline. However, even at low generation rates, placement of the landfill cover creates the potential for gases to be trapped and accumulate under the cover. To prevent pressure build up under the landfill cover and/or lateral migration, gas control systems may be required. Gas control measures may involve passive venting or active collection. The need for and nature of gas control measures will be evaluated and defined as part of the RD."*
>
> *(Refer to Sections 5.3 of the ROD for additional discussion on gas generation assessments conducted during prior Site investigations.)*

Based on the results of these prior investigations as well as ongoing investigations at the ISL and adjacent sites, data collected to date suggest that LFG generation potential remains "low".

2.13 Review and Summary of Historical Records Pertaining to Explosive Gas Investigations.

As indicated in the ROD, investigation of explosive gas was generally related to, or coordinated with, various intrusive investigations conducted for the purposes of initial site characterization. As indicated in Section 2.11, limited LFG generation (and therefore limited LFG migration) potential was inferred through observation of both surface and subsurface Site conditions. As summarized in Section 4.6 of the Revised Remedial Investigation Report dated September 2005:

> *"Landfill gas characterization was accomplished using various measurement techniques. Health and safety air monitoring was conducted during the drilling of each of the 49 borings completed as part of the OU-2 RI to determine potential landfill gas impacts in the breathing zone. Health and safety air monitoring equipment included a photoionization detector and a combustible gas indicator, which were used to verify that methane, hydrogen sulfide, and organic compound concentrations remained at or near background levels. Health and safety air monitoring results were consistently within acceptable background ranges throughout the OU-2 RI, indicating that appreciable landfill gas impacts were not occurring. Hydrogen cyanide was to be quantified during the OU-2 RI only if gas was observed actively venting from the boreholes. Active venting was not observed, and hydrogen cyanide measurements were made infrequently at the beginning of the OU-2 RI field program to confirm the lack of impacts. Hydrogen cyanide was not detected."*

This is consistent with the landfill gas characterization summary detailed in Section 5.3 of the ROD. Refer to Section 4.6 of the Revised Remedial Investigation for further information.

2.14 Discussion of the Latest Explosive Gas Investigation for this Site.

As indicated in the ROD, the OU-2 RI was conducted to characterize affected media associated with the CDL, Bridgeton Landfill and the ISL. The RI included studies of the physical and biological characteristics, hydrogeologic characteristics, sources of contamination, surface and sediment quality, and air quality. Source characterization activities conducted for the ISL included LFG and leachate characterization. The findings of this characterization related to ISL LFG are briefly summarized below.

The LFG characterization of the ISL was accomplished using various measurement techniques. Air monitoring of the worker breathing zones conducted during advancement of 49 borings did not show appreciable impacts from LFG. Active gas venting was not observed. Direct measurements of LFG were made along the crest of the landfill. Measurements along the western perimeter were also taken. Sporadic impacts from combustible gas emissions and VOCs were observed.

In addition to findings documented during the RI, a site reconnaissance was conducted in August 2020 by Geosyntec and Civil &Environmental Consultants, Inc. (CEC) personnel. This

reconnaissance included a walking tour of the landfill cap, site perimeter and various potential gas venting locations such as surface water ditches, cap transition areas and the entire western perimeter of the landfill. During this activity, no observed evidence of surficial LFG migration was observed as evidenced by distressed vegetation, LFG odors (i.e. rotten egg), soil staining, or bubbles in standing water.

2.15 Proposed Explosive Gas Monitoring System

2.15.1 Proposed Permanent Monitor and/or Punch Bar Station Locations, Depths, Screen Intervals, and Identification Designations.

The proposed permanent LFG monitoring system is illustrated on **Figure 2**. The system includes six perimeter gas monitoring wells, advanced to elevation 425 fmsl, which is equivalent to the maximum estimated depth of the base of waste within the ISL based on data from previous borings as shown on **Table 1** and Section 5.3 of the RD QAPP. Per the approved RDWP schedule, the perimeter LFG monitoring wells will be installed before the slope stability borings are complete[8]. If these borings result in a lower waste invert elevation, installation of supplemental LFG monitoring wells or screened intervals will be evaluated during the RD.

As the ISL is bounded by waste disposal facilities on the south, east and northern perimeters, only the western and southwestern perimeter is currently identified for permanent LFG monitoring well placement at this time. Based on monitoring results obtained in these locations, the need for additional on-site or off-site monitoring wells will be evaluated as a component of required corrective action monitoring plans (see Section 2.18).

The proposed perimeter LFG monitoring wells are spaced at a maximum distance of 500 feet apart and will be located on the eastern edge of Old St. Charles Rock Road or northern edge of Boenker Lane as shown on **Figure 2**. Well depth, based on the ground surface elevations (approximate elevation is 450 fmsl) adjacent to the western perimeter of the ISL is approximately 25 feet.

Due to the expected heterogeneity of alluvial deposits within the proposed monitoring zone, each well will be screened continuously from 5 feet below ground surface to elevation 425 fmsl. The upper 5 feet will consist of a well bore seal and concrete anchor for well protective casings.

In consideration of the importance of groundwater levels relative to potential gas migration, each well will be fitted with a slip cap. Each slip cap is also configured with a quick connect type fitting, thereby allowing measurement of well gas pressures and gas composition in a “sealed” configuration. The order of data collection will be of some level of importance given this well configuration and will be discussed in greater detail in Section 2.17.

[8] Slope Stability Evaluation and Western Waste Limit Investigation Plan work has been temporarily paused pending final results of the OU-1 Design Investigation Evaluation.

2.15.2 Proposed Punch Bar or Temporary Monitors.

At this time, no punch bar monitoring stations or similar "temporary" monitoring facilities are proposed. Should LFG migration be positively identified in the perimeter LFG monitoring well network, the addition of temporary monitoring stations will be evaluated at that time.

2.15.3 Proposed In-building Combustible Gas Alarms and Monitoring

At this time, only one occupied structure is located within 1,000 feet of the estimated limits of waste placement that does not currently utilize gas alarms. As this structure is located on the western side of the flood control canal operated by the Earth City Levee District, no in-building alarms are currently installed or proposed for installation at this location. Should any positive detections of LFG above applicable thresholds in the permanent perimeter LFG monitoring network be observed, evaluation of the need for in-building alarms will be conducted in accordance with corrective action monitoring protocol set forth in Section 2.18.

2.16 Methods of Construction or Specifications for the Monitoring System.

Specifications related to permanent perimeter LFG monitoring well installation are provided in **Appendix D**.

2.17 Explosive Gas Monitoring, Sampling and Reporting Procedures.

2.17.1 Monitoring Frequency.

In accordance with schedules associated with the OU-2 RDWP, the following monitoring schedule will be established for the permanent perimeter LFG monitoring well network after installation.

- Weekly for four consecutive sample events (Sample Events 1 – 4);
- Monthly for four consecutive sample events (Sample Events 5 – 8); and
- Quarterly through end of the established post closure monitoring period.

2.17.2 Parameters to be Monitored Including Detailed Step-by-Step Instructions of the Proper Procedures to be Utilized in Conducting Monitoring.

Parameters will be collected and recorded as part of the daily field report and will be maintained as part of the facility operating record as required by Section 7.3 of the RD QAPP. A Landtec® Model No. GEM500 or equivalent will be utilized for collection and measurement of LFG readings at the perimeter LFG monitoring wells. The following parameters shall be monitored at all permanent monitoring locations, as noted, in the following order:

- Gas pressure in the perimeter LFG monitoring well.

- Initial combustible gas concentration in percent methane by volume (the monitoring well should not be vented prior to measuring the concentration of combustible gas).
- Balance gas (percent).
- Oxygen (percent).
- Ambient barometric pressure.
- Ambient air temperature.
- Observed weather conditions (sunny, overcast, recent precipitation, snow cover, etc.).
- Observations related to potential gas generation (odors, distressed vegetation, etc.).

  Note: The monitoring equipment shall have a detection limit below twenty-five percent (25%) of the lower explosive limit (LEL). For the purposes of this EGMP "initial" means immediately after the gas pressure measurement so as not to inadvertently vent the monitor.

The proper monitoring procedure is detailed in Section 6.3 of the SWANA Landfill Gas Operation and Maintenance Manual of Practice provided in **Appendix G** and Sections 9.3 and 10.1 of the RD QAPP.

2.17.3 Data Reporting.

Results of this monitoring shall be transmitted to USEPA at least quarterly within the framework of CERCLA monthly status/progress reports. MDNR will be provided copies via electronic submission. Monitoring reports will be provided in a format and manner as prescribed by MDNR per current data reporting procedures.

2.18 <u>Corrective Action Procedures.</u>

2.18.1 Relevant Corrective Action Thresholds.

The established thresholds for implementation of corrective action procedures are established as follows. Note that thresholds apply to current conditions at the site, and also extend to future conditions including the installation of any buildings, enclosures or similar potentially occupied structures that may be required as a component of the RA activities:

- Twenty-five percent (25%) of the LEL or one and one quarter percent (1.25%) by volume for methane in buildings on the Bridgeton Landfill property (if located in the future); and
- Fifty percent (50%) of the LEL or two and one-half percent (2.5%) by volume for methane in the soil at the property boundary of the ISL.

Corrective action procedures will consist of the following:

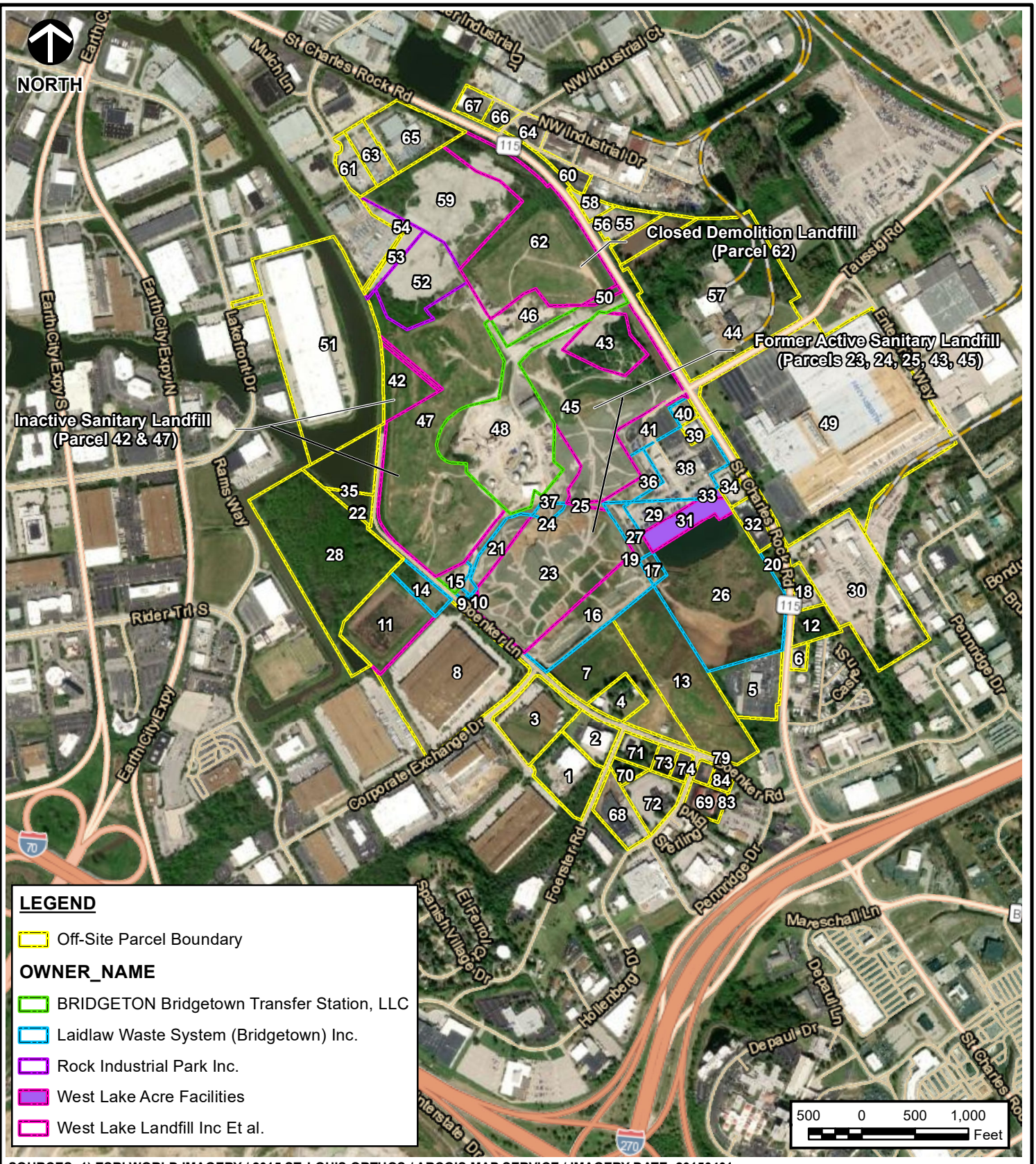
- If methane gas levels exceeding the limits specified in this EGMP, Bridgeton Landfill, LLC shall:

- Immediately evaluate the potential for methane accumulation in on-site and off-site buildings;
- Immediately evaluate measures to reduce methane concentrations at monitored property boundaries to below compliance levels;
- Notify USEPA and MDNR and immediately take all necessary steps to ensure protection of public health and safety including:
    - Within 7 days of detection, submit to USEPA and MDNR a report describing the steps taken to protect public health and safety;
    - Within 60 days of detection, submit to USEPA and MDNR for approval a corrective action plan designed by a professional engineer for the methane gas releases;
    - Corrective action plans shall describe the nature and extent of the problem and the proposed remedy. The plan shall be implemented upon departmental approval; and
    - USEPA or MDNR may establish alternative schedules reports and corrective action plans for demonstrating compliance per 10 CSR 80-3.010(14)(E).
- When results of monitoring in <u>on-site or off-site structures</u> indicate levels in excess of those specified, immediate and appropriate action shall be taken to mitigate the effects of landfill gas accumulation in those structures until a permanent corrective action is completed. Actions which must be undertaken include:
    - Notification of the fire department or other appropriate local public safety authorities. These include:
        - Bridgeton Fire and Police Department - 911
        - Missouri Emergency Response Unit - (573) 634-2436
        - MDNR Solid Waste Management Program - (573) 751-5401
        - St. Louis County Department of Public Health - (314) 615-4116
    - Notification of adjacent property owners and/or occupants;
    - Ventilation of any confined spaces that may trap decomposition gases or the installation of alarm systems in any confined spaces that may trap decomposition gases; and
    - Establishment of a temporary methane monitoring program in affected structures.

2.18.2 Corrective Action Monitoring

Once the permanent corrective action plan has been completed, corrective action monitoring shall continue at no less than a weekly frequency until observation of four consecutive quarterly monitoring events indicating compliance with applicable gas thresholds.

FIGURES



SOURCES: 1) ESRI WORLD IMAGERY / 2015 ST. LOUIS ORTHOS / ARCGIS MAP SERVICE / IMAGERY DATE: 20150401

Civil & Environmental Consultants, Inc.
5899 Montclair Boulevard - Cincinnati, OH 45150
513-985-0226 - 800-759-5614
www.cecinc.com

WESTLAKE LANDFILL OU-2
INACTIVE SANITARY LANDFILL EGMP

SITE VICINITY AND AERIAL MAP

DRAWN BY:	MHS	CHECKED BY:	RH	APPROVED BY:	RH	FIGURE NO:
DATE:	JULY 02, 2020	DWG SCALE:	1 " = 1,250 '	PROJECT NO:	191-750	1

Signature on File *

J:\gis_support\other office projects\PHX\191-750\-GIS\191750_WestlakeLF_OU2_WM01_Fig0_ParcelMap.mxd - 7/2/2020 - 8:56:46 AM (bkay)

LEGEND

- 1000-Foot Buffer
- Inactive Sanitary Landfill Assumed Limit of Waste
- Approximate Extent of Canal
- Proposed Gas Monitoring Locations (ISL)
- Leachate Pumping Well

Property Boundary

- Bridgeton Transfer Station
- Laidlaw Waste Systems Bridgeton Inc
- Rock Road Industries Inc
- West Lake Landfill Inc

SOURCE:
1) ESRI WORLD IMAGERY / ARCGIS MAP SERVICE / IMAGERY DATE: 2019.
2) OPERABLE UNIT 2 LANDFILL BOUNDARY AND LOCAL TOPOGRAPHY PROVIDED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC DRAWING "FIGURE A-4 - APPROXIMATE LOCATIONS OF PROPOSED TEMPORARY LANDFILL GAS PERIMETER MONITORING," DATED 2008.

Civil & Environmental Consultants, Inc.
5899 Montclair Boulevard - Cincinnati, OH 45150
513-985-0226 - 800-759-5614
www.cecinc.com

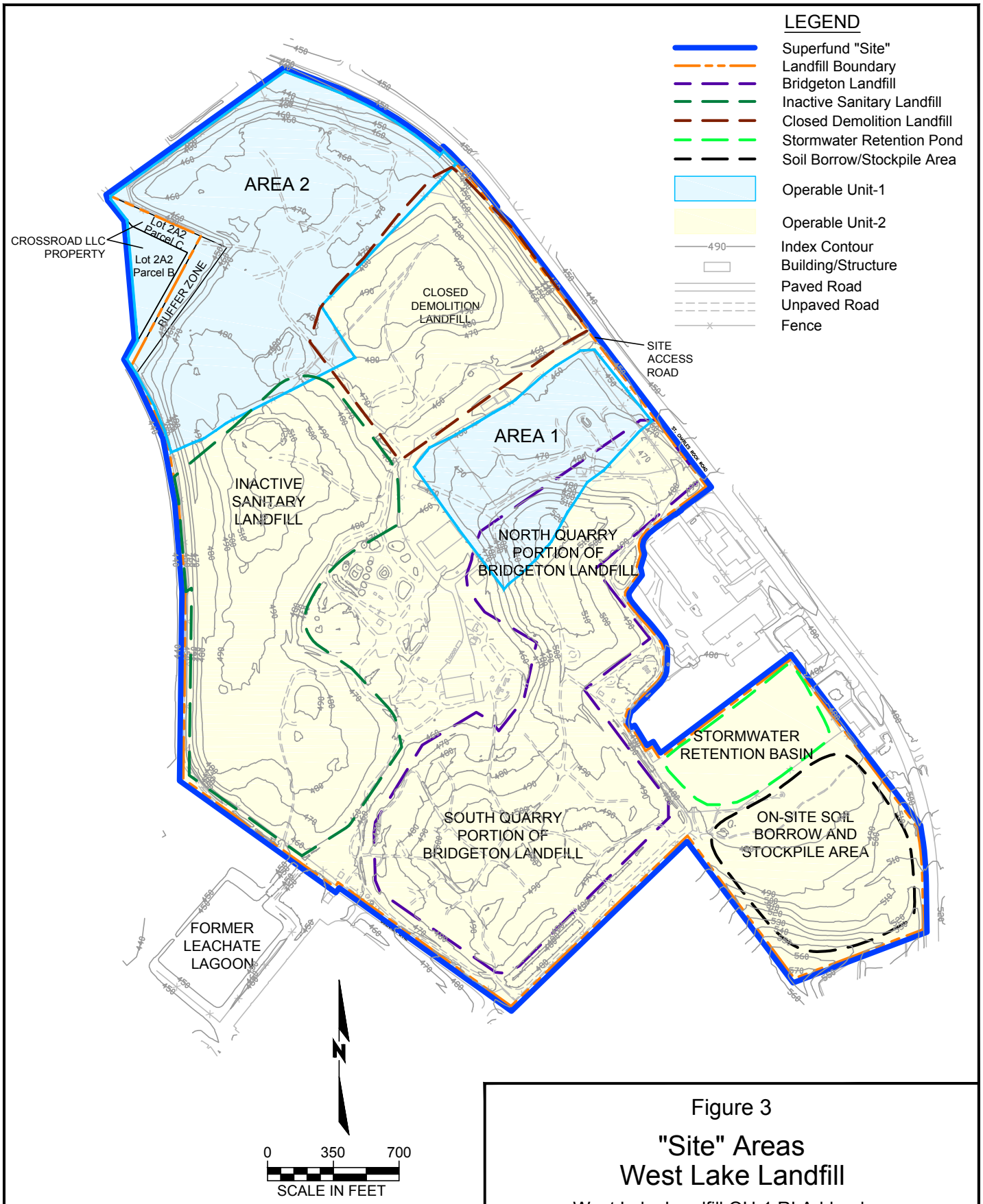
WESTLAKE LANDFILL OU-2
INACTIVE SANITARY LANDFILL EGMP

SITE BOUNDARY AND 1,000 FT RADIUS MAP

DRAWN BY:	MHS	CHECKED BY:	RH	APPROVED BY:	RH	FIGURE NO:	2
DATE:	JULY 07, 2020	DWG SCALE:	1 " = 400 '	PROJECT NO:	191-750		

Signature on File *

J:\gis_support\other office projects\PHX\191-750\-GIS\191750_WestlakeLF_OU2_WM02_Fig2_SiteMap.mxd - 7/7/2020 - 2:50:50 PM (bkay)



Notes:

- Aerial Topography Provided By Cooper Aerial Surveys Co. and is Dated December 2, 2016
- All Elevations Are Above Mean Sea Level (amsl)

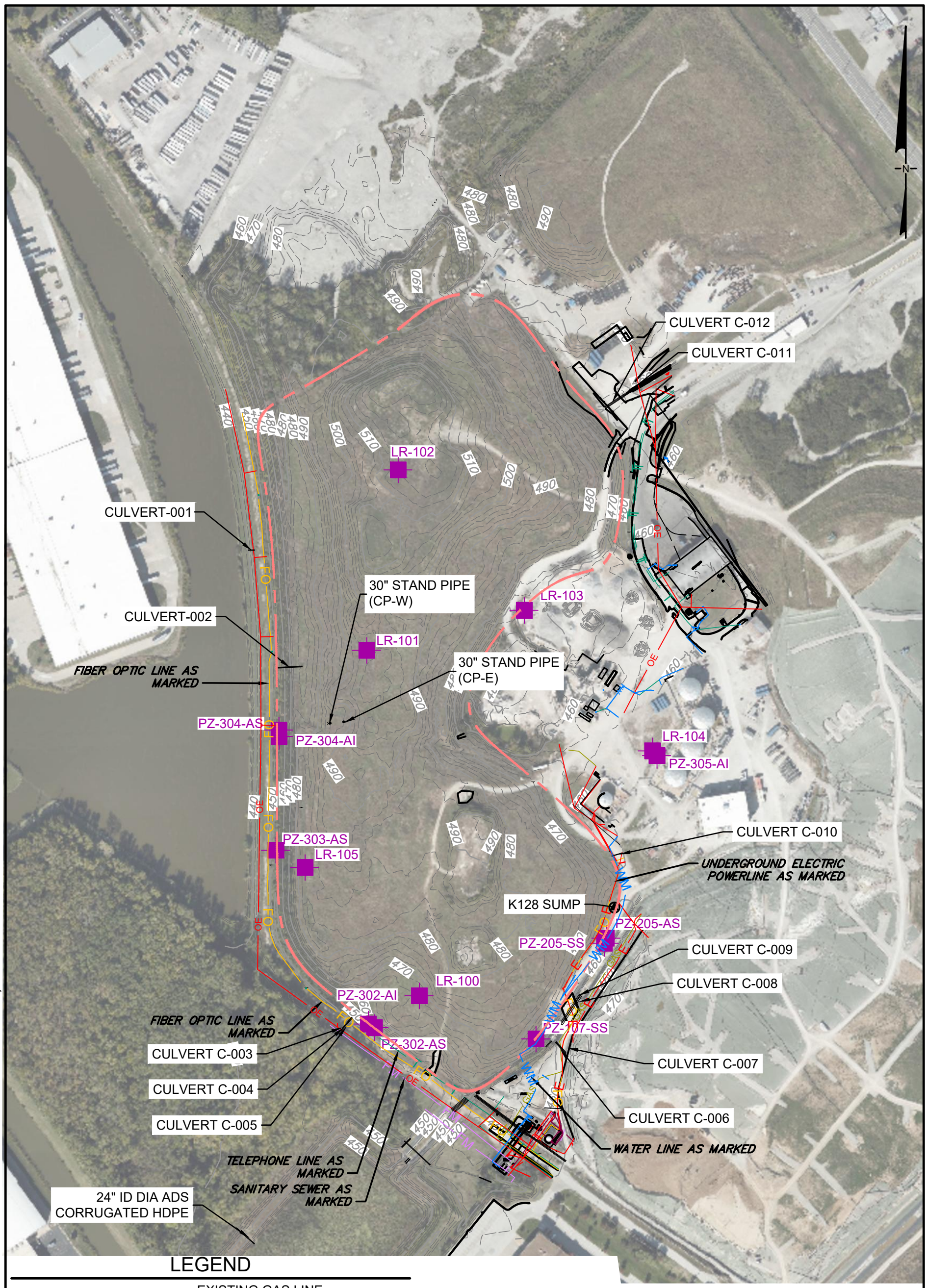
Figure 3

"Site" Areas
West Lake Landfill

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-3\FIG 3-5-Site-Areas.dwg 1/22/2018



LEGEND

GAS	EXISTING GAS LINE
WM	EXISTING WATER LINE
T T T	EXISTING TELEPHONE LINE
FO	EXISTING FIBER OPTIC LANE
FM	EXISTING SANITARY SEWER
OE	OVERHEAD ELECTRIC POWERLINE
E E	UNDERGROUND ELECTRIC LINE
LR-105	1995 BORINGS
	K128 SUMP
	EXISTING MONITORING WELL / PIEZOMETER

0 300' 600'

SCALE IN FEET

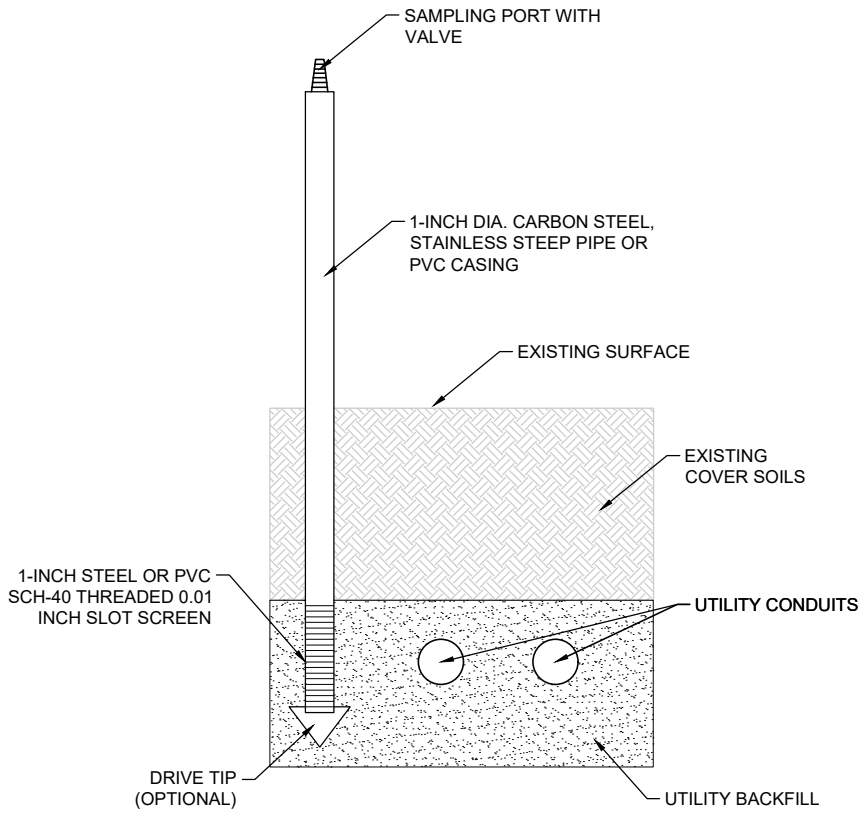
WESTLAKE LANDFILL OU-2 EXISTING CONDITIONS

Geosyntec consultants

FIGURE 4

PROJECT NO: CHE8424 | JUNE 2021

P:\RWEST LAKE\SLOPE STABILITY EVALUATION\WESTLAKE LANDFILL OU-2 EXISTING CONDITIONS - FIGURE 4 - Last Saved By: JVarsho on 6/11/21



NOTES:

1. DETAIL ADAPTED FROM SWANA LANDFILL GAS LANDFILL GAS OPERATION AND MAINTENANCE MANUAL OF PRACTICE, DATED JANUARY 2001.
2. IF NON INTRUSION METHODS ARE UTILIZED, AIR KNIFING OR HYDRAULIC EXCAVATION, THEN THE DRIVE TIP WILL NOT BE REQUIRED.
3. EQUIVALENT MATERIALS WILL BE UTILIZED UPON APPROVAL BY THE DESIGN ENGINEER.

WEST LAKE LANDFILL OU-2
EXPLOSIVE GAS MONITORING PLAN
PUNCH BAR MONITORING WELL DETAIL

Geosyntec consultants

FIGURE 5

PROJECT NO: CHE8424 | SEPTEMBER 2020

P:\DWG\R\WEST LAKE\EGMP\LFG DETAILS - Last Saved By: JVarsho on 9/15/20

APPENDIX A

Applicable Regulations and MDNR Guidance

obtained from the local pollution control agency. The operating procedures and location for burning practices shall be submitted to the department for review and written approval. Burning at the sanitary landfill shall be conducted in accordance with Chapter 643, RSMo, the corresponding rules, the terms conditions, or both, of the plans, permit, or both, and all local requirements.

(14) Gas Control.

(A) Requirement. Decomposition gases generated within the sanitary landfill shall be controlled on-site, as necessary, to avoid posing a hazard to the environment or to public health and the safety of occupants of adjacent property.

(B) Satisfactory Compliance—Design.

1. Plans shall contain a monitoring program capable of detecting decomposition gas migration.

A. The monitoring program must specify the type of monitoring and be based on—

(I) Soil conditions;

(II) The hydrogeologic and topographic conditions surrounding the facility; and

(III) The location of facility structures, property boundaries, and off-site features.

B. The monitoring program described in the plans must include:

(I) A written description of the monitoring system, including spacing of monitoring locations and frequency of monitoring;

(II) The results of any gas assessment that has been performed;

(III) The location of all gas monitoring wells shown on a plan sheet;

(IV) A drawing detailing the typical gas monitoring well design;

(V) The design depths and bottom elevations of the gas monitoring wells; and

(VI) Boring logs that support the design gas monitoring well depths.

C. The gas monitoring specified in the plans shall be performed at gas monitoring wells. The monitoring program shall specify how buildings on the landfill property are to be monitored. Gas monitoring wells shall be designed to monitor the unsaturated soil and rock down to an elevation equal to the bottom elevation of the landfill. Gas monitoring wells shall be placed between the landfill and off-site buildings and other features that may be harmed by landfill gas or may easily transmit gas from the landfill. Gas monitoring well locations at the property boundary shall not be more than five hundred feet (500') apart unless the permittee can show that the potential for gas migration is low.

2. Plans shall assess the need for gas control and indicate the location and design of any vents, barriers or other control measure to be provided.

A. The gas control system shall be constructed of materials that are chemically resistant to the solid wastes managed in the sanitary landfill and the gas expected to be generated. These materials shall be specified in the engineering report and the choice of materials justified.

B. The gas control system shall be constructed of materials that are of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying solid wastes, cover and by any equipment used at the sanitary landfill. Overburden pressure calculations, material specifications and system installation procedures shall be included in the engineering report.

C. Maintenance and repair options shall be considered in the design and specified in the engineering report.

D. All applicable permits and approvals necessary to comply with the requirements of the Air Conservation Law and rules promulgated shall be obtained from the department.

E. The plan shall estimate the maximum anticipated rate of gas generation at the disposal area and the length of time over which it is anticipated to be generated. The method by which these calculations are arrived at shall also be included.

(C) Satisfactory Compliance—Operations.

1. Decomposition gases shall not be allowed to migrate laterally from the sanitary landfill to endanger public health and safety or to pose a hazard to the environment. They shall be controlled on-site, flared or vented to the atmosphere directly through the cover, cut-off trenches or ventilation systems in a way that they do not accumulate in explosive or toxic concentrations, especially within structures. (Information on the limits of flammability of gases is available in such references as the *Handbook of Chemistry and Physics*, 68th ed. Cleveland, Chemical Rubber Publishing Co., 1987.)

2. Decomposition gases shall not be allowed to concentrate above the following levels:

A. Twenty-five percent (25%) of the lower explosive limit (LEL) or one and one-quarter percent (1.25%) by volume for methane in buildings on the sanitary landfill property; and

B. Fifty percent (50%) of the LEL or two and one-half percent (2.5%) by volume for methane in the soil at the property boundary of the sanitary landfill.

3. For purposes of this section, lower explosive limit (LEL) means the lowest percent by volume of a mixture of explosive gases in air that will propagate a flame at twenty-five degrees Celsius (25°C) and atmospheric pressure.

4. Owners/operators of all sanitary landfills shall implement a methane monitoring program capable of detecting decomposition gas migration in the most likely zone(s) of migration, to ensure that the standards of paragraph (14)(C)2. of this rule are met. Methane monitoring shall be conducted at least quarterly with equipment warranted by the manufacturer to detect explosive gases under the conditions the equipment is to be used. Facilities shall submit the results of this methane monitoring to the department at least quarterly. The electronic submission of methane monitoring data is required. This submission shall be in a format and manner as prescribed by the department.

5. If methane gas levels exceeding the limits specified in paragraph (14)(C)2. of this rule are detected, the owner/operator shall—

A. Notify the department and immediately take all necessary steps to ensure protection of public health and safety which include:

(I) When results of monitoring in on-site or off-site structures indicate levels in excess of those specified, the operator shall take appropriate action to mitigate the effects of landfill gas accumulation in those structures until a permanent remediation is completed. Actions which must be undertaken include:

(a) Notification of the fire department or other appropriate local public safety authorities;

(b) Notification of adjacent property owners and/or occupants;

(c) Ventilation of any confined spaces that may trap decomposition gases or the installation of alarm systems in any confined spaces that may trap decomposition gases; and

(d) Establishment of a temporary methane monitoring program in affected structures.

B. Within seven (7) days of detection, submit to the department a report describing the steps taken to protect public health and safety;

C. Within sixty (60) days of detection, submit to the department for approval a remediation plan designed by a professional engineer for the methane gas releases. A gas control system shall be designed to—

(I) Prevent methane accumulation in on-site and off-site buildings;

(II) Reduce methane concentrations at monitored property boundaries to below compliance levels; and

(III) Reduce methane concentrations off-site to below compliance levels;

D. Landfill gas corrective action plans shall describe the nature and extent of the problem and the proposed remedy. The plan shall be implemented upon departmental approval; and

E. The department may establish alternative schedules for demonstrating compliance with subparagraphs (14)(C)5.B. and C. of this rule.

6. The sanitary landfill shall operate in compliance with all applicable requirements of Chapter 643, RSMo and corresponding rules.

(15) Vectors.

(A) Requirements. Conditions shall be maintained that are unfavorable for the harboring, feeding and breeding of vectors.

(B) Satisfactory Compliance—Design. Plans shall include contingency programs for vector control and the operator shall be prepared at all times to implement those procedures.

(C) Satisfactory Compliance—Operations. Vector control contingency programs shall be implemented when necessary to prevent or rectify vector problems.

(16) Aesthetics.

(A) Requirement. The sanitary landfill shall be designed and operated at all times in an aesthetically acceptable manner.

(B) Satisfactory Compliance—Design. Plans shall include an effective litter control facility and operating program.

(C) Satisfactory Compliance—Operations.

1. Portable litter fences or other devices shall be used in the immediate vicinity of the working face and at other appropriate locations to control blowing litter. At the end of each operating day, or more often as required, litter shall be removed from the fences and the ground and incorporated into the cell being used. Alternatively, the litter may be containerized for disposal on the next operating day.

2. Solid wastes that are easily moved by wind shall be covered, as necessary, to prevent becoming airborne and scattered.

3. On-site vegetation should be cleared only as necessary. Natural windbreaks, such as green belts, should be maintained where they will improve the appearance and operation of the sanitary landfill.

4. Salvage operations shall be conducted in such a manner as to not detract from the appearance of the sanitary landfill. Salvaged materials shall be removed from the sanitary landfill daily or stored in aesthetically acceptable containers or enclosures.

(17) Cover.

(A) Requirement. Cover shall be applied to minimize fire hazards, infiltration of precipitation, odors and blowing litter; control gas venting and vectors; discourage scavenging; and provide a pleasing appearance.

(B) Satisfactory Compliance—Design. The owner/operator shall prepare a written closure plan that describes the steps necessary to close all sanitary landfill phases at any point during the active life of the sanitary landfill in accordance with the requirements of 10 CSR 80-2.030(4)(A). In addition, the final cover requirements specified in the closure and post-closure plans shall specify—

1. Cover sources, quantities and soil classification (Unified Soil Classification System or United States Department of Agriculture classification system);

2. The capability of the cover to perform the functions listed in subsection (17)(A) of this rule;

3. Surface grades and side slopes needed to promote maximum runoff, without excessive erosion, to minimize infiltration. Final side slopes shall not exceed twenty-five percent (25%) unless it has been demonstrated in a detailed slope stability analysis approved by the department that the slopes can be constructed and maintained throughout the entire operational life and post-closure period of the landfill.

4. Procedures to establish and maintain vegetative growth to combat erosion and improve appearance of idle and completed areas. Procedures shall include seeding rate, fertilizer rate, soil conditioning rate and provisions for mulching;

5. Procedures to maintain a cover integrity, for example, regrading and recovering;

6. Methods for borrow areas to be reclaimed so as to restore aesthetic qualities and prevent excessive erosion;

7. The final slope of the top of the sanitary landfill shall have a minimum slope of five percent (5%); and

8. Shear failure analyses shall be included where intermediate or final slopes exceed twenty-five percent (25%). However, the department will waive the analysis for slopes of twenty-five percent (25%) or less, except in seismic impact zones.

(C) Satisfactory Compliance—Operations.

1. Cover shall be applied by the end of each operating day regardless of weather; sources of cover, therefore, shall be accessible on all operating days. The thickness of the compacted cover shall not be less than six inches (6"). Sanitary landfills operating twenty-four (24) hours per day shall incorporate all solid waste into one (1) or more cells at least every twenty-four (24) hours. Where a liner and leachate collection system are in place, an alternative daily cover may be approved by the department on a site-specific basis, if the owner/operator demonstrates that the alternative material controls run-on, runoff, disease vectors, fires, odors, blowing litter and scavenging without presenting a threat to human health and the environment.

2. Cover shall be increased to a total thickness of at least one foot (1') of compacted cover on filled areas of the sanitary landfill which are idle for more than sixty (60) days.

3. No active, intermediate or final slope shall exceed thirty-three and one-third percent (33 1/3%).

4. As each phase of the sanitary landfill is completed, a final cover system shall be installed at portions of—

A. Existing sanitary landfills without composite liners. This final cover shall consist of at least two feet (2') of compacted clay with a coefficient of permeability of 1×10^{-5} cm/sec or less and overlaid by at least one foot (1') of soil capable of sustaining vegetative growth;

B. Sanitary landfills with composite liners. This final cover shall consist of component layers, in order from top to bottom, as follows:

(I) Two feet (2') of soil capable of sustaining vegetative growth;

(II) A drainage layer;

(III) A geomembrane liner at least as thick as the geomembrane liner described in subparagraph (10)(B)1.G.;

(IV) One foot (1') of compacted clay with a coefficient of permeability of 1×10^{-5} cm/sec or less; and

C. The geomembrane liner shall be in intimate contact with the underlying compacted clay.

5. The installation of the final cover systems shall include provisions for slope stability.

6. The department may approve the use of an alternative final cover system provided that the owner/operator can demonstrate to the department that the alternative design will be at least equivalent to the final cover system described in paragraph (17)(C)3. of this rule.

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Sampling of Landfill Gas Monitoring Wells

Technical Bulletin
9/1999

Division of Environmental Quality
Solid Waste Management Program

Overview

This document was prepared by the Missouri Department of Natural Resources' Solid Waste Management Program (SWMP) to provide guidance regarding the quarterly sampling of gas monitoring wells as required by 10 CSR 80-3.010(14) and 10 CSR 80-4.010(14). This guidance applies to all landfills that monitor for methane migration by means of gas monitoring wells. Sampling results must be submitted at least quarterly to SWMP in an electronic format.

Sampling Equipment

Proper selection of sampling equipment is critical in obtaining true soil gas concentrations. Explosimeter-type instruments are not appropriate for measuring methane in gas monitoring wells, because the amount of oxygen which is present in the well may not be sufficient for the sample to "burn." These instruments will typically give false low readings when high concentrations of methane are present.

It is recommended that instruments used to sample gas monitoring wells have an automatic pump that has the ability to withdraw enough volume to bring a fresh sample of soil gas into the well. It is also beneficial that the instrument reads both oxygen and methane concentrations. Some instruments have the ability to read barometric pressure, which is also desirable.

Sampling Procedures

Step 1 - Make sure the instrument is properly calibrated. Prepare the instrument for sampling by allowing it to properly warm up as directed by the manufacturer.

Step 2 - Connect the instrument to the well head and begin collecting a sample.

Step 3 - Continue collecting the sample until the reading stabilizes. A stable reading is one that does not vary more than 0.5 percent by volume on the instrument's scale.

Step 4 - A proper reading should have 2 percent oxygen by volume or less. If levels of oxygen are higher, it may indicate that air is being drawn into the system giving a false reading of the true soil gas concentrations. Possible explanations for this problem are:

A. The gas monitoring well seal has failed;
B. Well head connectors are leaking; or
C. A connection at the instrument is leaking.

When the problem is eliminated repeat Steps 1-3. If the problem cannot be corrected, record those values and make sure that the problem is well documented in the report sent to the department.

PUB002053

Recycled Paper

Step 5 - Record the stabilized reading including the oxygen concentration and barometric pressure, if available.

Obtaining true soil gas concentrations from gas monitoring wells is dependent upon using a consistent proven method. If you have problems using the sampling procedures described, you should contact the department as soon as possible.

Sampling Times

Sampling times are almost as important as the procedure used to collect the sample. Proper monitoring of the site should include sampling at those times when landfill gas is most likely to migrate. Scientific evidence indicates that weather and soil conditions influence when gas will migrate. For these reasons sampling should be considered when:

A. Barometric pressure is low and soils are saturated; or
B. When snow cover is just beginning to melt; or
C. The ground is frozen or ice covered.

Records

The Solid Waste Management Regulations require that reports on data collected from wells be submitted to SWMP at least quarterly. The SWMP recommends that gas monitoring be conducted during the months of February, May, August and November and that the results be submitted within 30 days of sampling. The data must be submitted in electronic form. The results submitted should contain:

1. The location of monitoring points.
2. Sample results obtained should include the date the sampling was performed and the barometric pressure, if available. Methane measurements may be given as a percentage of the total air volume or as a percentage of the Lower Explosive Limit (LEL). The following formula can be used to convert a percentage of LEL into a percentage methane by volume:
   % Methane (by volume) = LEL (%) ÷ 20
3. The amount of time a well is pumped before a stabilized methane reading is taken.
4. The percent volume of O_2 (if the instrument used is capable of measuring).

The form attached to the end of this bulletin may be used to record the information required by the department.

Conclusions

Missouri has stringent regulations governing landfill gas migration. The department prefers to address the issue of migrating gases before they present a threat to public safety or the environment.

Migrating gases detected above allowable limits at property boundaries do not necessarily mean that there is an immediate threat to public safety. It does mean that there is a potential problem that must be addressed. In order to address such a problem, a permit modification to install a gas collection system may be necessary.

References

Landtec Landfill Control Technologies, *Landfill Gas System Engineering Design: A Practical Approach*, course notes from Landfill Gas System Engineering Design Seminar, 1994.

Missouri Department of Natural Resources, Flood Grant Team, *Landfill Gas Monitoring Protocol*, available on the Solid Waste Management Program's web site.

For more information call or write:
Missouri Department of Natural Resources
Solid Waste Management Program
P.O. Box 176, Jefferson City, MO 65102-0176
1-800-361-4827 or (573) 751-5401 office
(573) 526-3902 fax
(http://www.dnr.state.mo.us/deq/swmp) Program Home Page

Solid Waste Management Program

Quarterly Gas Monitoring Report

Facility: _____ Permit Number: _____

Name of Sample Collector: _____

Date of Observations: _____

Type of Detection Instrument Used on Wells: _____

- in Buildings: _____

Pump Rate of Instrument Used to Monitor Wells:_____

Barometric Pressure: _____ Weather Conditions: _____

Instructions: Under "Location or Well Designation" identify the monitoring wells or describe the location for other tests (e.g., inside buildings). A drawing showing the location of test can be attached. Report methane readings in either % methane by volume, as % LEL (Lower Explosive Limit) or both. A reading in percent methane by volume can be converted to % LEL as follows:

% methane by volume = % LEL ÷ 20

Location or Well Designation	% LEL	% CH4 by volume	% O2	% CO2	Time pumped (for wells) in seconds	Comments

Location or Well Designation	% LEL	% CH4 by volume	% O2	% CO2	Time pumped (for wells) in seconds	Comments

If your facility has more gas monitoring locations than there is room on this form, please attach additional sheets listing the same information as contained on this form.

I hereby certify that the information on this form was collected by me and is correct to the best of my knowledge and belief.

_____
SIGNATURE

Submit to: *Missouri Department of Natural Resources*
Solid Waste Management Program
P.O. Box 176
Jefferson City, MO 65102-0176

Please submit electronic copies to the above address or via electronic mail at:

swmp@mail.dnr.state.mo.us

APPENDIX B

Site Boring Logs

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/HQ WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-100
	SAMPLING METHOD:	SHEET 1 OF 2
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START TIME	FINISH TIME
WATER LEVEL	19.0 FT.				7:30	11:00
TIME	11:55					
DATE	10/04/95				DATE 10/04/95	DATE 10/04/95
CASING DEPTH	26.0 FT.					

DATUM NORTHING: 1067293.73 EASTING: 514893.56 ELEVATION 467.2

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	0 6 7 4	1.7' 2.0' (85%)			(0.0-5.5 ft.) Compact, moderate yellowish brown (10YR 5/4), CLAYEY SILT, NR, damp, (CL), (FILL) @ 0.8 ft., dry	SP 1	Landfill cap 1.5 ft. thick
2 3	3 1 2 2	0.9' 2.0' (45%)			From 1.5-5.5 ft., Intermixed organic matter and trace waste	SP 2	
4 5	2 3 4 36	0.3' 2.0' (15%)			@ 5.0 ft., wet (461.7) 5.5	SP 3	0.0 ppm PID
					(5.5-22.0 ft.) WASTE, wet		
6 7	3 14 5 3	0.6' 2.0' (30%)				SP 4	
8 9	4 6 4 5	0.5' 2.0' (25%)				SP 5	0.1 ppm PID
10 11	4 2 3 8	0.5' 2.0' (25%)				SP 6	0.0 ppm PID
12 13	7 14 26 11	0.4' 2.0' (20%)				SP 7	
14	50/2	0.1' 2.0' (5%)				SP 8	1.1 ppm PID

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: LR100

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	BORING NO. LR-100	
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 2	
		DRILLING START	DRILLING FINISH
	WATER LEVEL: 19.0 FT.	TIME 7:30	TIME 11:00
	TIME: 11:55	DATE 10/04/95	DATE 10/04/95
	DATE: 10/04/95		
	CASING DEPTH: 26.0 FT.		
NORTHING: 1067293.73 DATUM EASTING: 514893.56 ELEVATION 467.2			
DRILL RIG CME 750	SURFACE CONDITIONS		
ANGLE 90° BEARING NA			
SAMPLE HAMMER			

DRILLING CONTR: LAYNE-WESTERN

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(5.5-22.0 ft.) WASTE, wet	SP 8	
16	8 11 21 11	0.2' / 2.0' (10%)					
17						SP 9	
18	8 13 7 8	0.4' / 2.0' (20%)				SP 10	0.0 ppm PID
19							
20	4 5 10 5	0.6' / 2.0' (30%)			@ 19.9 ft, increasing amount of olive gray SILT intermixed with waste	SP 11	
21							
22	4 7 6 6	0.1' / 2.0' (5%)				SP 12	0.0 ppm PID
23							
24	5 4 4 5	0.8' / 2.0' (40%)				SP 13	
25							
26	4 5 5 7	0.4' / 2.0' (20%)				SP 14	0.2 ppm PID
27					(440.2) 27.0 (27.0-28.0 Ft.) Compact, olive gray (5Y 4/1), SILT, NR, wet, (ML), (LOESS) (439.2) 28.0		
28					End of Soil Borehole Log at 28.0 ft.		
29							

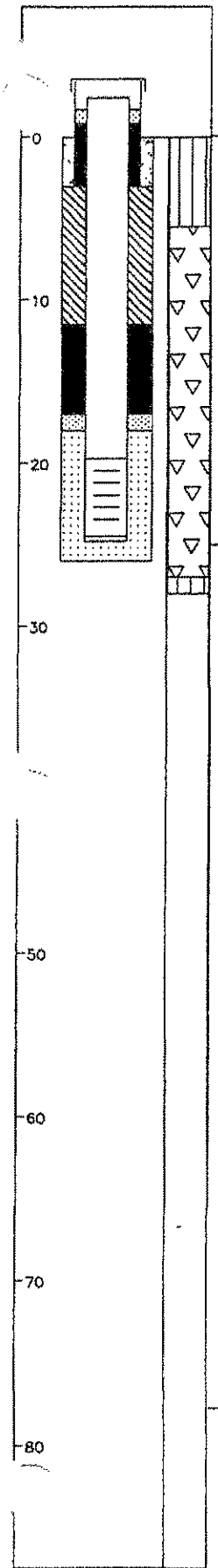
LOGGED BY: B. HARRINGTON
DATE: 10/9/95
CHK'D BY: B. TILTON

JOB NO.: 943-2848
FILENAME: LR100

Well No. LR-100

Boring No. X-Ref: LR-100

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1067294 ft. Easting: 514894 ft.

Elevation Ground Level 467.2 ft. NGVD

Top of PVC Casing 469.12 ft. NGVD

Drilling Summary:

Total Depth 26.0 ft.

Borehole Diameter 8 1/4" (0.0-26.0')

Casing Stickup Height 1.92 ft.

Driller Layne-Western St. Louis, MO

Rig CME 750

Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	10/4/95	7:30	10/4/95	11:00
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/4/95	12:00	10/4/95	12:10
Filter Placement:	10/4/95	12:10	10/4/95	13:05
Cementing:				
Development				
Bentonite Grout	10/4/95	14:45	10/4/95	14:55
Bentonite Seal	10/4/95	14:30	10/4/95	14:35

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.92	-	19.70	C1	469.12	-	447.50
19.70	-	24.50	S1	447.50	-	442.70
24.50	-	24.80	C2	442.70	-	442.40

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings

C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 18.0-26.0'

Filter Pack: 100 mesh Silica Sand 17.0-18.0'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-11.5'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 11.5-16.0'; Chips 16.0-17.0'

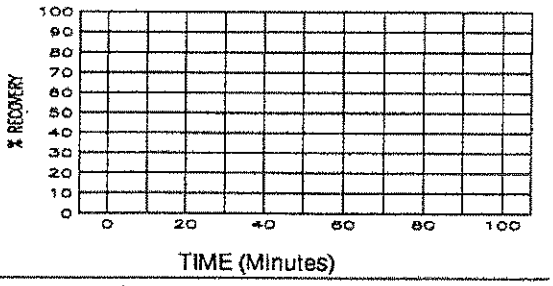
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: Drilled to 26.0 ft. then collected split spoon sample from 26.0-28.0 ft.

Supervised by B. Harrington

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name LR100

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145105	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: LR-100
SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044
OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710
OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
200' NORTHEAST OF SOUTH FENCE AND 380' NORTHWEST OF WESTERN MOST BUILDING AT SOUTH ENTRANCE OFF OLD ST CHARLES ROCK RD.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 467.2
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 E OR W
LAT. 38 ° 45 ' 53 " LONG. 90 ° 26 ' 52 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO, INC. PERMIT NUMBER: 001258 WPM
DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. DIAMETER OF CASING 8x8 IN. WEIGHT OR SDR # 0.188" DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 26 FT. JOINTS ☐ MECHANICAL ☐ OTHER ☐ THREADED ☐ WELDED MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____
DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER ☒ NO ☐ YES LOCATED AT ____ MATERIAL ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 22.9 FT. DIAMETER OF RISER PIPE 2 IN. WEIGHT OR SDR # SCH80 DIAMETER OF DRILL HOLE 8¼ IN. JOINTS ☒ THREADED ☐ MECHANICAL ☐ OTHER ____ ☐ WELDED MATERIAL ☐ STEEL ☒ THERMO PLASTIC ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☐ SLURRY ☒ CHIPS ☐ GRANULAR ☐ PELLETS LENGTH OF SEAL 1.0 BENTONITE SEAL INSTALLED IN ☒ UNSATURATED ZONE ☐ SATURATED ZONE

PRIMARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NATURAL GRAIN SIZE 16-35 LENGTH OF FILTER PACK 8.0 FT. METHOD OF INSTALLATION H.S.A. POUR

SECONDARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NONE GRAIN SIZE 100 LENGTH OF FILTER PACK 1.0 FT. METHOD OF INSTALLATION H.S.A. POUR

WELL SCREEN: LENGTH OF SCREEN 5 FT. DIAMETER 2 IN. SLOT SIZE 10 WEIGHT OR SDR # SCH80 MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER

SUMP DETAILS: LENGTH OF SUMP ____ DIAMETER OF SUMP ____ MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

BACK FILL: WAS THE WELL BACK FILLED? ☐ YES ☒ NO MATERIAL USED ____ LENGTH OF BACK FILLED BORE HOLE ____

STATIC WATER LEVEL ____ FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL ____
MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT 469.12

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

FEET FROM SURFACE	FORMATION DESCRIPTION
0-6	Clayey silt
6-25.5	Trash
25.5-28	clay

Depth to bottom of Protective Casing Seal: 3.0
Depth to Base of Annular Seal: 16.0
Depth to Base of Bentonite Seal: 17.0
Depth to Top of Primary Filter Pack: 18.0
Depth to Top of the Screen: 21.0
Depth to Bottom of the Screen: 26.0
Total Depth: 26.0
DATE WELL DRILLING WAS COMPLETED 10-04-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #: Lamar D. Mahurin M. DATE 11-15-95
SIGNATURE DRILLER/PERMIT #: Lamar D. Mahurin M. DATE 11-15-95

MO 780-1415 (7-95)
DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION
RECYCLED PAPER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-101
		SHEET 1 OF 4
	SAMPLING METHOD:	
	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	DRY	51.0 FT.			TIME	TIME
TIME	11:15	15:30			8:00	15:20
DATE	10/10/95	10/10/95			DATE	DATE
CASING DEPTH	35.0 FT.	55.0 FT.			10/10/95	10/10/95

DATUM NORTHING: 1068402.25 EASTING: 514718.41 ELEVATION 500.2

DRILL RIG CME 750 SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
		0.1'/1.0' (10%)			(0.0-1.0 ft.) Compact, moderate yellowish brown (10YR 5/4), SILT, NR, dry, (ML), (FILL) (499.2) 1.0	ST 1	
1	20 39 25 23	1.6'/2.0' (80%)			(1.0-2.6 ft.) Crushed, LIMESTONE Gravel, (GP), (FILL) (497.6) 2.6	SP 2	
3	4 8 10 6	1.1'/2.0' (55%)			(2.6-5.0 ft.) Compact, olive gray (5Y 4/1), SILT, NR, dry, (ML), (FILL) (495.5) 4.7	SP 3	
5	7 6 25 50/3	1.0'/2.0' (50%)			(4.7-12.4 ft.) WASTE, damp	SP 4	
7	6 7 11 5	0.9'/2.0' (45%)				SP 5	0.0 ppm PID
9	40 8 5 14	1.1'/2.0' (55%)			@ 10.0 ft., moist	SP 6	
11	12 15 5 7	1.3'/2.0' (65%)			(487.8) 12.4	SP 7	
13	8 16 10 15				(12.4-19.9 ft.) Compact, olive gray (5Y 4/1), SILT, with little waste, damp, (ML), (FILL)	SP 8	
14					@ 14.5 ft., wet		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/23/95

JOB NO.: 943-2848

FILENAME: LR101

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:				BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger				LR-101
					SHEET 2 OF 4
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD:				DRILLING
	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)				START / FINISH
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)				
	WATER LEVEL	DRY	51.0 FT.		TIME 8:00 / TIME 15:20
	TIME	11:15	15:30		
	DATE	10/10/95	10/10/95		DATE 10/10/95 / DATE 10/10/95
NORTHING: 1068402.25 DATUM EASTING: 514718.41 ELEVATION 500.2	CASING DEPTH	35.0 FT.	55.0 FT.		

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	6 13 20 50/5	1.7'/2.0' (85%)			(12.4-19.9 ft.) Compact, olive gray (5Y 4/1), SILT, with little waste, damp, (ML), (FILL)	SP 9	
17	22 18 18 16	0.6'/2.0' (30%)				SP 10	0.0 ppm PID
19	5 8 26 10	0.9'/2.0' (45%)			(480.3) 19.9	SP 11	
20					(19.9-51.5 ft.) WASTE, damp		
21	4 7 50 25	0.9'/2.0' (45%)			from 21.4-21.5 ft., layer of olive gray (5Y 4/1), SILT, with little waste, wet	SP 12	
23	29 18 25 50/4	1.4'/2.0' (70%)			from 23.5-24.0 ft., layer of olive gray (5Y 4/1), SILT, with little waste, wet, (ML)	SP 13	0.0 ppm PID
24					@ 24.0 ft., moist		
25	27 19 38 38	0.5'/2.0' (25%)				SP 14	
26					@ 26.0 ft., wet		
27	8 15 50/6	0.8'/2.0' (40%)				SP 15	0.0 ppm PID
28							
29	50/1	0.1'/2.0' (5%)				SP 16	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/23/95

JOB NO.: 943-2848

FILENAME: LR101

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-101
	SAMPLING METHOD:	SHEET 3 OF 4
	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	DRY	51.0 FT.			TIME	TIME
TIME	11:15	15:30			8:00	15:20
DATE	10/10/95	10/10/95			DATE	DATE
CASING DEPTH	35.0 FT.	55.0 FT.			10/10/95	10/10/95

DATUM NORTHING: 1068402.25 EASTING: 514718.41 ELEVATION 500.2

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(19.5-51.5 ft.) WASTE, damp	SP 18	Rods warm upon withdrawal from borehole.
31	50/5	0.2'/2.0' (10%)					
32						SP 17	
33	9 23 10 16	1.5'/2.0' (75%)					0.0 ppm PID
34						SP 18	
35	9 11 17 17	1.8'/2.0' (90%)			from 35.3-35.7 ft., layer of olive gray (5Y 4/1), SILT, moist, (ML)	SP 19	@ 11:00 Rain
36							
37	9 38 29 17				@ 37.0 ft., wet	SP 20	1.1 ppm PID 34% LEL, stop drilling temporarily
38							
39	42 45 36 17	1.3'/2.0' (65%)				SP 21	
40					@ 40.0 ft., moist		
41	11 11 18 20	1.1'/2.0' (55%)				SP 22	
42							
43	12 18 40 50/1	1.6'/2.0' (80%)				SP 23	6.1 ppm PID
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/23/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: LR101

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:				BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger				LR-101
					SHEET 4 OF 4
	SAMPLING METHOD:				
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)				DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)				START / FINISH
	WATER LEVEL	DRY	51.0 FT.		TIME / TIME
	TIME	11:15	15:30		8:00 / 15:20
	DATE	10/10/95	10/10/95		DATE / DATE
NORTHING: 1068402.25 DATUM EASTING: 514718.41 ELEVATION 500.2	CASING DEPTH	35.0 FT.	55.0 FT.		10/10/95 / 10/10/95

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DRILLING CONTR LAYNE-WESTERN

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
46	50/5	0.5'/2.0' (25%)			(19.5-51.5 ft.) WASTE, damp	SP 24	Drill rods very warm upon withdrawal from borehole.
47	34 15 25 33	1.8'/2.0' (90%)			from 47.0-48.0 ft., ammonia odor	SP 25	
48							
49	12 11 14 16	1.9'/2.0' (95%)				SP 26	Newsprint dated 1974-1976 0.3 ppm PID 34% LEL Temporarily stop drilling
50							
51	5 13 55 50/5	2.0'/2.0' (100%)			(448.7) 51.5 (51.5-52.1 ft.) Compact, olive gray (5Y 4/1), SILT, moist, (ML), (FILL) (448.1) 52.1	SP 27	
52					(52.1-54.7 ft.) Dense, black stained SILT and mixed WASTE, some Gravel (looks as if burned), damp to moist, (FILL)		
53	29 25 6 10	1.6'/2.0' (80%)				SP 28	0.0 ppm PID
54					(445.5) 54.7		
55	1 1 1 3	2.0'/2.0' (100%)			(54.7-57.0 ft.) Very loose, very light gray (N8), very fine SAND and thinly laminated lime, appears to be mine spoils, WR, wet, (FILL)	SP 29	Water level began to rise rapidly after penetrating mine spoils.
56							
57					(443.2) 57.0 End of Soil Borehole Log at 55.0 ft.		
58					At completion of drilling, borehole sealed to surface with cement/bentonite grout.		
59							

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/23/95

JOB NO.: 943-2848

FILENAME: LR101

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

REGISTRATION RECORD

OFFICE USE ONLY		DATE RECEIVED	
REF. NO. 131862			
ROUTE		P.W.S. NUMBER	CHECK NUMBER
STATE WELL NUMBER		TRANSMITTAL NO.	
CHECKED BY		CROSS REFERENCE NO.	
APPROVED BY	DATE	ENTERED Ph 1 Ph 2 Ph 3	

INFORMATION SUPPLIED BY OWNER

NAME: LADLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710
ADDRESS: 1 BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102
SITE NAME: LADLAW SANITARY LANDFILL
WELL NUMBER: LR-101
ADDRESS OF WELL SITE OR SITE NAME (IF DIFFERENT THAN ABOVE): ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044

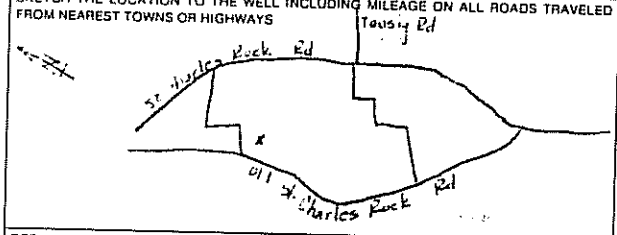
OWNER STATUS: ☐ BUILDER ☐ PRIVATE HOME OWNER ☐ DEVELOPER ☒ OTHER (SPECIFY) LANDFILL

PURPOSE OF REGISTRATION FORM: ☐ ABANDONED WELL ☐ MINERAL EXPLORATORY ☐ WELL RECONSTRUCTION TEST HOLE ☒ OTHER ABANDONED PIEZOMETER

VARIANCE ISSUED? ☐ YES ☒ NO
VARIANCE NUMBER:
WELL CERTIFICATION NUMBER:
DATE ORIGINALLY DRILLED: 10-10-95
SIGNATURE (WELL OWNER)
DATE

INFORMATION SUPPLIED BY CONTRACTOR

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



LOCATION OF WELL

SHOW LOCATION IN SECTION PLAT
QUAD ____ COUNTY ST. LOUIS
ELEV ____ AREA NO. ____
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N.RNG. 55 E OR W
LAT. 38 ° 46 ' 02 " LONG. 90 ° 26 ' 52 "

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL
775' NORTH OF SOUTHWEST FENCE CORNER AND 390' EAST OF FENCE
HOLE WAS DRILLED AND THEN ABANDONED BEFORE WELL WAS ACTUALLY SET

CONTRACTOR'S NAME: LANNE WESTERN CO, INC. PERMIT NUMBER 01258
DRILLERS NAME: DALE MAHURIN PERMIT NUMBER C-01258 WPM

ABANDONMENT OF WELLS

FORMER USE OF WELL: ☐ HAND DUG ☐ DOMESTIC (1 TO 3 CONNECTIONS) ☐ MULTI-FAMILY ☐ HEAT PUMP ☐ IRRIGATION ☐ SOIL BORING ☐ PUBLIC WATER SUPPLY ☐ MINERAL EXPLORATORY TEST HOLE ☒ MONITORING ☐ OTHER ____

ORIGINAL DRILLER (IF KNOWN): UNKNOWN
DATE ORIGINALLY DRILLED: 10-10-95
DATE PLUGGED: 10-10-15
STATIC WATER LEVEL: FT
PUMP REMOVED FROM WELL? ☐ YES N/A ☐ NO
DEPTH OF THE WELL: 35'
LENGTH OF CASING: N/A
~~CASING DIAMETER~~/WELL DIA: 8¼"
GROUT INSTALLATION METHOD: ☐ GRAVITY ☒ TREMIE
CASING CUT OFF THREE FEET BELOW SURFACE? ☒ YES ☐ NO N/A
TYPE OF CASING: ☐ STEEL ☐ PLASTIC ☐ OTHER N/A

GROUT MATERIAL USED: NEAT CEMENT ☐ HI-EARLY ☒ PORTLAND TYPE 1 ☐ OTHER ____ ☒ BENTONITE SLURRY ☐ OTHER ____ BENTONITE ☒ POWDER ☐ GRANULAR ☐ CHIPS ☐ PELLETS
NUMBER OF BAGS OF GROUT USED: 20.5
POUNDS OF GROUT PER BAG: 47
IF NEAT CEMENT USED, HOW MANY GALLONS OF WATER MIXED PER BAG OF CEMENT: 5
TYPE OF FILL MATERIAL USED: CEMENT / BENTONITE GROUT
AMOUNT OF FILL MATERIAL USED: 0.75 CU. YDS.
DEPTH TO TOP OF FILL MATERIAL: 3'
WELL DISINFECTED BEFORE PLUGGING? ☐ YES ☒ NO
NUMBER USED FOR DISINFECTION: GALLONS OF CHLORINE ____ POUNDS OF CHLORINE ____ TABLETS OF CHLORINE ____
WAS THE WELL ABANDONED BECAUSE OF HOOKING UP TO A PUBLIC OR RURAL WATER SUPPLY DISTRICT? ☐ YES ☒ NO
IF YES, WHAT IS THE NAME OF THE WATER DISTRICT:

WELL RECONSTRUCTION

TYPE OF REPAIR: ☐ RAISED CASING ☐ DEEPENING OF WELL ☐ LINING OF WELL ☐ OTHER ____
USE OF WELL: ☐ DOMESTIC (1 TO 3 CONNECTIONS) ☐ MULTI-FAMILY ☐ HEAT PUMP ☐ IRRIGATION ☐ PUBLIC WATER SUPPLY ☐ MONITORING ☐ OTHER ____
DIA. OF WELL CASING: IN.
WAS WELL DISINFECTED AFTER RECONSTRUCTION? ☐ YES ☐ NO
DATE RECONSTRUCTION COMPLETED

RAISED CASING INFORMATION: LENGTH OF CASING ADDED: FT.
MATERIAL: ☐ STEEL ☐ PLASTIC
METHOD OF ATTACHMENT: ☐ THREADED ☐ WELDED ☐ COUPLED ☐ FUSED ☐ GLUED

LINER DETAILS: PURPOSE OF LINER: ☐ USED ONLY TO HOLD BACK FORMATION ☐ USED TO SEAL OUT CONTAMINATION OR OTHER CONDITIONS
DIAMETER OF LINER: IN.
WEIGHT OR SDR #
DEPTH TO THE TOP OF LINER FROM SURFACE: FT.
MATERIAL: ☐ PLASTIC ☐ STEEL
AMOUNT OF LINER USED: FT.
JOINTS: ☐ GLUED ☐ WELDED ☐ OTHER ____

LINER PACKER DETAILS: TYPE USED ☐ NONE ☐ RUBBER BOOT
DEPTH(S) SET

LINER GROUT DETAILS: POSITION OF SEAL ☐ FULL LENGTH ☐ BETWEEN PACKERS
MATERIAL: CEMENT: ☐ PORTLAND TYPE 1 ☐ HI EARLY BENTONITE: ☐ CHIPS ☐ PELLETS ☐ SLURRY ☐ GRANULAR
DEPTH PUMP WAS SET ____ FT. GPM ____
DEPTH FROM SURFACE TO TOP OF THE GROUT SEAL: FT.
DEPTH FROM SURFACE TO BOTTOM OF THE GROUT SEAL: FT.

CHECK THE BOX WHICH APPLIES

☒ I HEREBY CERTIFY THAT THE WELL HEREIN DESCRIBED WAS ABANDONED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE ABANDONMENT OF WELLS.

☐ I HEREBY CERTIFY THAT THE WELL HEREIN DESCRIBED WAS REPAIRED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE REPAIR OF WELLS.

CONTRACTOR'S SIGNATURE: [signature]
DATE: 11-15-15

DEEPENING OF WELL INFORMATION

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION	YIELD

MO 780-1414 (1-95)
DISTRIBUTION: WHITE/CONTRACTOR CANARY/DIVISION PINK/OWNER
MAIL CANARY COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65401 RECORD MUST BE SUBMITTED WITHIN 60 DAYS OF COMPLETION DATE

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-102
		SHEET 1 OF 6
	SAMPLING METHOD:	
	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	54.0 FT.				TIME	TIME
TIME	10:15				11:55	14:30
DATE	10/8/95				DATE	DATE
CASING DEPTH	60.0 FT.				10/6/95	10/7/95

DATUM NORTHING: 1068937.21 EASTING: 514788.13 ELEVATION 512.0

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1		1.5'/2.0' (75%)			(0.0-1.5 ft.) Compact, moderate yellowish brown (10YR 5/4), SILT, NR, dry, (ML), (FILL)	ST 1	
					(510.5) 1.5		
2	50/3	0.3'/2.0' (15%)			(1.5-19.5 ft.) WASTE, consisting of wood, asphalt, carpet and other demolition wastes intermixed with olive black composite soil		Petroleum odor
3						SP 2	
4	15 17 5 6	1.1'/2.0' (55%)					0.0 ppm PID
5						SP 3	
6	9 22 22 4	0.5'/2.0' (25%)					
7						SP 4	
8	3 50/6	0.8'/2.0' (40%)					0.3 ppm PID
9					from 8.4-8.8 ft, layer of dark gray SILT with gravel sized stones	SP 5	
10	11 50/3	0.7'/2.0' (35%)					
11					@ 10.5 ft, asphalt	SP 6	
12	50/6	0.5'/2.0' (25%)			from 12.0-14.2 ft, carpet		0.9 ppm PID
13						SP 7	
14	15 50/6	0.7'/2.0' (35%)				SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: LR102

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	BORING NO. LR-102
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 6

					DRILLING START	DRILLING FINISH
WATER LEVEL	54.0 FT.				TIME 11:55	TIME 14:30
TIME	10:15					
DATE	10/8/95				DATE 10/6/95	DATE 10/7/95
CASING DEPTH	60.0 FT.					

DATUM NORTHING: 1068937.21 EASTING: 514788.13 ELEVATION 512.0

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	50/4	0.0' / 2.0' (0%)	(1.5-19.5 ft.) Compacted, WASTE, consisting of wood, asphalt, carpet and other demolition wastes intermixed with olive black composite soil	SP 8	0.1 ppm PID
17				SP 9	
18	16 20 24 11	0.3' / 2.0' (15%)		SP 10	
19			(492.5) 19.5		
20	10 8 8 5	0.8' / 2.0' (40%)	(19.5-20.5 ft.) Compact, greenish gray (5GY 6/1), SILT, damp, (ML), (FILL) (491.5) 20.5		0.1 ppm PID
21			(20.5-36.0 ft.) WASTE, municipal intermixed with medium gray SILT, moist, strong leachate odor	SP 11	
22	0 0 13 33	0.2' / 2.0' (10%)	@ 22.0 ft., wet	SP 12	
23					
24	28 50/4	0.0' / 2.0' (0%)			0.7 ppm PID
25			@ 25.0 ft., moist	SP 13	
26	0 0 8 6	0.4' / 2.0' (20%)		SP 14	
27					
28	50/3	0.3' / 2.0' (15%)			0.0 ppm PID
29				SP 15	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: LR102

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:				BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger				LR-102
					SHEET 3 OF 6
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD:				DRILLING
	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)				START / FINISH
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)				
	WATER LEVEL	54.0 FT.			TIME 11:55 / TIME 14:30
	TIME	10:15			
	DATE	10/8/95			DATE 10/6/95 / DATE 10/7/95
NORTHING: 1068937.21 DATUM EASTING: 514788.13 ELEVATION 512.0	CASING DEPTH	60.0 FT.			

DRILL RIG CME 750	SURFACE CONDITIONS
ANGLE 90° BEARING NA	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
	14 50/5	0.0'/2.0' (0%)			(20.5-36.0 ft.) Compacted WASTE, municipal intermixed with medium gray SILT, moist, strong leachate odor	SP 16	
31							
32	32 33 20 12	0.0'/2.0' (0%)				SP 17	1.2 ppm PID
33							
34	13 9 10 50/4	0.2'/2.0' (10%)				SP 18	
35							1.1 ppm PID
36	50/5	0.0'/2.0' (0%)			(36.0-48.4 ft.) WASTE, demolition and construction debris, aphalt, particle board, wood, corrugated cardboard, brick, etc, intermixed with black composite soil, moist	SP 19	
37							
38	41 50/3	0.4'/2.0' (20%)				SP 20	
39							
40	20 50/1	0.2'/2.0' (10%)				SP 21	0.2 ppm PID
41							
42	27 13 25 24	0.6'/2.0' (30%)				SP 22	
43							
44	50/5	0.0'/2.0' (0%)				SP 23	1.0 ppm PID

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: LR102

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-102
		SHEET 4 OF 6
	SAMPLING METHOD:	
	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	54.0 FT.				TIME	TIME
TIME	10:15				11:55	14:30
DATE	10/8/95				DATE	DATE
CASING DEPTH	60.0 FT.				10/6/95	10/7/95

DATUM NORTHING: 1068937.21 EASTING: 514788.13 ELEVATION 512.0

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
46	6 17 15 16	1.8'/2.0' (90%)			(36.0-48.4 ft.) Compacted WASTE, demolition and construction debris, asphalt, particle board, wood, corrugated cardboard, brick, etc., intermixed with black composite soil, moist from 45.0-45.5 ft., layer of compact, medium gray (N5), SILT, some Gravel, moist, (ML), (FILL)	SP 23 SP 24	
47							
48	7 18 27 17	2.0'/2.0' (100%)			(463.6) 48.4 (48.4-50.8 ft.) Dense, olive gray (5Y 4/1), SILT, with little waste and demolition debris, moist, (ML), (FILL)	SP 25	1.1 ppm PID
49							
50	7 9 10 12	1.6'/2.0' (80%)			(461.2) 50.8 (50.8-58.0 ft.) WASTE, demolition debris, bricks, wood, etc., with little olive gray Silt, moist	SP 26	
51							
52	8 11 50/5	1.5'/2.0' (75%)					
53					@ 53.0 ft., wet	SP 27	
54	10 14 50/4	1.1'/2.0' (55%)					
55						SP 28	
56	14 16 16 18	1.2'/2.0' (60%)					0.7 ppm PID
57						SP 29	
58	3 50/6	0.6'/2.0' (30%)			(454.0) 58.0 (58.0-62.8 ft.) Compact, olive gray (5Y 4/1), SILT and GRAVEL, wet, (ML/GP), (FILL)	SP 30	
59							0.2 ppm PID

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: LR102

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MD
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068937.21
DATUM EASTING: 514788.13 ELEVATION 512.0

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL	54.0 FT.			
TIME	10:15			
DATE	10/8/95			
CASING DEPTH	60.0 FT.			

BORING NO. LR-102

SHEET 5 OF 6

DRILLING	
START	FINISH
TIME 11:55	TIME 14:30
DATE 10/6/95	DATE 10/7/95

DRILL RIG CME 750
ANGLE 90° BEARING NA
SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
61	13 19 9 14	2.0'/2.0' (100%)			(58.0-62.8 ft.) Compact, olive gray (5Y 4/1), SILT and GRAVEL, wet, (ML/GP), (FILL)	SP 31	
62	13 33 32 35	1.4'/2.0' (70%)			(449.2) 62.8	SP 32	
63					(62.8-76.0 ft.) WASTE, demolition debris that appears to have been burned, wet to moist, with some olive gray Silt		
64	8 40 50/5	1.1'/2.0' (55%)			below 64.0 ft., waste becomes moist to damp	SP 33	0.1 ppm PID
65							
66	65 49 25 50/1	0.5'/2.0' (25%)				SP 34	
67							
68	8 29 21 12	0.4'/2.0' (20%)				SP 35	0.0 ppm PID
69							
70	4 9 12 27	0.6'/2.0' (30%)				SP 36	
71							
72	28 17 30 50/5	1.2'/2.0' (60%)				SP 37	0.1 ppm PID
73							
74	50/2	0.0'/2.0' (0%)				SP 38	0.7 ppm PID

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: LR102

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-102
		SHEET 6 OF 6
	SAMPLING METHOD:	
	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	54.0 FT.				TIME	TIME
TIME	10:15				11:55	14:30
DATE	10/8/95				DATE	DATE
CASING DEPTH	60.0 FT.				10/6/95	10/7/95

DATUM NORTHING: 1068937.21 EASTING: 514788.13 ELEVATION 512.0

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
					(62.8-76.0 ft.) Compacted WASTE, demolition debris, moist to damp, with some olive gray Silt (436.0) 76.0	SP 38		
76					End of Soil Borehole Log at 76.0 ft.			
77								
78								
79								
80								
81								
82								
83								
84								
85								
86								
87								
88								
89								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

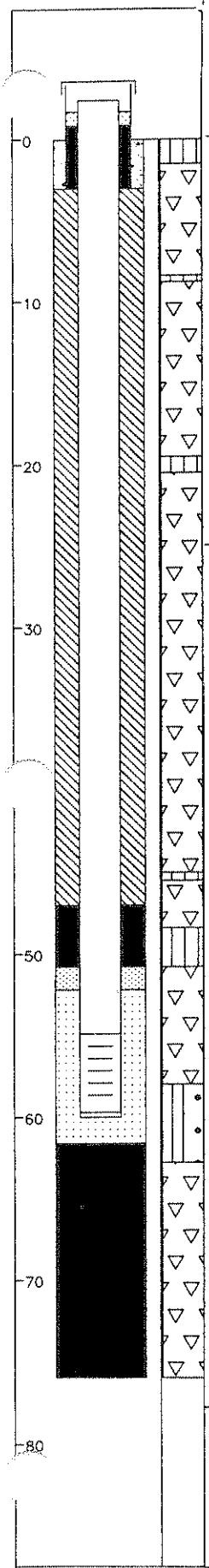
JOB NO.: 943-2848

FILENAME: LR102

Well No. LR-102

Boring No. X-Ref: LR-102

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1068937 ft. Easting: 514788 ft.

Elevation Ground Level 512.0 ft. NGVD

Top of PVC Casing 513.52 ft. NGVD

Drilling Summary:

Total Depth 76.0 ft.

Borehole Diameter 8 1/4" (0.0-76.0')

Casing Stickup Height 1.52 ft.

Driller Layne-Western St. Louis, MO

Rig CME 750

Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	10/6/95	11:55	10/7/95	14:30
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/8/95	14:30	10/8/95	15:05
Filter Placement:	10/8/95	12:50	10/8/95	15:45
Cementing:				
Development				
Bentonite Grout	10/8/95	16:20	10/8/95	
Bentonite Seal	10/8/95	15:45	10/8/95	15:55

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.52	-	54.90	C1	513.52	-	457.10
54.90	-	59.70	S1	457.10	-	452.30
59.70	-	60.00	C2	452.30	-	452.00

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings

C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 52.2-61.6'

Filter Pack: Less than 50 mesh Silica Sand 50.8-52.2'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-47.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 47.0-50.8', Chips 61.6-76.0'

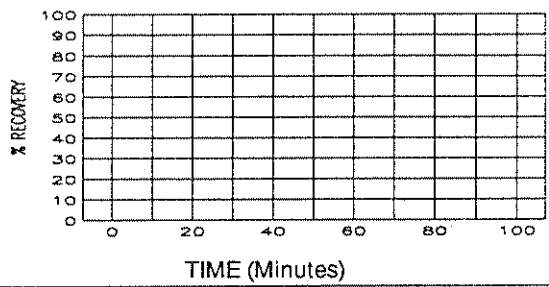
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Not to Scale

Supervised by B. Harrington

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name LR102

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145106	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: LR-102

SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044

OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710

OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
WEST SIDE OF SITE, 390' EAST OF FENCE LINE AND 1550' NORTH OF SOUTHWEST FENCE CORNER. (ON TOP OF HILL)

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 512.0
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 (E OR W)
LAT. 38 . 46 . 09 " LONG. 90 . 26 . 53 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO, INC.
PERMIT NUMBER: 001258 WPM

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO, INC.
PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ____ ☐ L.U.S.T.

MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8x8 IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 76 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED: ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO

CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____ | DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT.

TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____ | MATERIAL ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 56.5 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH 80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.

BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 3.8 | BENTONITE SEAL INSTALLED IN ☒ UNSATURATED ZONE ☐ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	9.4 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	1.4 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seal:	3.0	0-1.5 Clayey silt 1.5-76 Trash
WELL SCREEN	LENGTH OF SCREEN 5 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH 80	MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	47.0
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP		MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____	Depth to Base of Bentonite Seal:	50.8	
BACK FILL	WAS THE WELL BACK FILLED? ☒ YES ☐ NO	MATERIAL USED: MED. BENT. CHIPS		LENGTH OF BACK FILLED BORE HOLE 14.4'	Depth to Top of Primary Filter Pack:	52.2	
					Depth to Top of the Screen:	55.0	
					Depth to Bottom of the Screen:	60.0	
					Total Depth:	76.0	

STATIC WATER LEVEL ____ FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT 513.52

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

DATE WELL DRILLING WAS COMPLETED 10-08-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #: Leman H. Mahurin Jr. | DATE 11-15-95
SIGNATURE DRILLER/PERMIT #: Leman H. Mahurin Jr. | DATE 11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger				BORING NO. LR-103
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD:				SHEET 1 OF 3
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)				DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)				START / FINISH
	WATER LEVEL	26.74 FT			TIME 14:00 / TIME 9:00
	TIME	9:16			
	DATE	10/20/95			DATE 10/19/95 / DATE 10/20/95
NORTHING: 1068527.38 DATUM EASTING: 515217.07 ELEVATION 460.1	CASING DEPTH	38.0 FT.			
DRILL RIG CME 750	SURFACE CONDITIONS				
ANGLE 90° BEARING NA					
SAMPLE HAMMER					

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	2 4 6 8	1.0' / 2.0' (50%)			(0.0-2.5 Ft.) Stiff, moderate yellowish brown (10YR 5/4), CLAYEY SILT, trace fine Gravel, occasional cobbles, NR, dry, (CL-ML), (FILL)	SP 1	
2	17 12	1.3' / 2.0' (65%)			(457.6) 2.5		
3	13 16				(2.5-3.5 Ft.) Very stiff, medium gray (N5), SANDY SILT, little c-f Gravel, occasional cobbles, SR, damp, (ML), (FILL)	SP 2	
4	9 10 8 11	0.7' / 2.0' (35%)			(3.5-7.5 Ft.) Very stiff, medium bluish gray (5B 5/1), SILT, little c-f Sand, WR, damp, (ML), (FILL)	SP 3	
6	3 8 5 4	1.2' / 2.0' (60%)				SP 4	
8	3 5 4 4	1.1' / 2.0' (55%)			(7.5-10.0 Ft.) Stiff, medium light gray (N6), SANDY SILT, little c-f Gravel, SR, damp, (ML), (FILL)	SP 5	
10	2 2 3 2	1.6' / 2.0' (80%)			(10.0-19.3 Ft.) Firm, medium gray (N5), SILT, little fine Sand, trace iron staining, SR, damp, (ML), (LOESS)	SP 6	
12	1 2 3 3	1.4' / 2.0' (70%)				SP 7	@ 12.0 Ft. Hole began making gas at low levels
14	2 2 3 4	2.0' / 2.0' (100%)				SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. SANDFORT CHK'D BY B. TILTON

DATE 10/23/95

JOB NO.: 943-2848

FILENAME: LR103

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-103
	SAMPLING METHOD:	SHEET 2 OF 3
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	26.74 FT				TIME	TIME
TIME	9:16				14:00	9:00
DATE	10/20/95				DATE	DATE
CASING DEPTH	38.0 FT.				10/19/95	10/20/95

NORTHING: 1068527.38
DATUM EASTING: 515217.07 ELEVATION 460.1

DRILL RIG CME 750 | SURFACE CONDITIONS
ANGLE 90° BEARING NA
SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(10.0-19.3 ft.) Firm, medium gray (N5), SILT, little fine Sand, trace iron staining, SR, damp, (ML), (LOESS)	SP 8	
16	3 3 4 5	2.0'/2.0' (100%)					
17						SP 9	
18	1 2 2 4	2.0'/2.0' (100%)			From 18.0-19.0 ft, wet zone		
19					(440.8) 19.3	SP 10	
					(19.3-24.2 ft.) Firm, grayish black (N2), SILTY CLAY, NR, damp, (CL), (ALLUVIUM)		
20	2 4 6 7	2.0'/2.0' (100%)					
21						SH 11	
22	2 4 5 8	2.0'/2.0' (100%)			@ 22.3 ft, color changes to medium dark gray (N4)		
23						SP 12	
24					(435.9) 24.2		
	6 12 17 15	2.0'/2.0' (100%)			(24.2-38.0 ft.) Compact, medium gray to medium dark gray (N5 to N4), fine SAND, trace Silt, NR, damp, (SP), (ALLUVIUM)		
25						SP 13	
26	4 4 6 15	1.2'/2.0' (60%)					@ 26.0 ft, encountered water
27					From 27.2-27.5 ft, CLAYEY SILT layer	SP 14	
28	8 8 15 15	2.0'/2.0' (100%)					
29						SP 15	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. SANDFORT CHK'D BY B. TILTON

DATE 10/23/95

JOB NO.: 943-2848

FILENAME: LR103

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	BORING NO. LR-103
		SHEET 3 OF 3
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING

					START	FINISH
WATER LEVEL	26.74 FT				TIME	TIME
TIME	9:16				14:00	9:00
DATE	10/20/95				DATE	DATE
CASING DEPTH	38.0 FT.				10/19/95	10/20/95

DATUM NORTHING: 1068527.38 EASTING: 515217.07 ELEVATION 460.1

DRILL RIG CME 750

SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
31	4 4 7 10	1.5'/2.0' (75%)			(24.2-38.0 ft.) Compact, medium gray to medium dark gray (N5 to N4), fine SAND, trace Silt, NR, damp, (SP), (ALLUVIUM)	SP (16)		
32 33	5 11 14 27	1.3'/2.0' (65%)			from 32.3-32.5 ft., layers of decayed vegetation	SP (17)		
34 35	6 12 15 15					SP (18)		
36 37	5 6 12 14				@ 37.0 ft., SAND becomes medium to fine grained (422.1) 38.0	SP (19)		
38					End of Soil Borehole Log at 38.0 ft.			
39								
40								
41								
42								
43								
44								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. SANDFORT

DATE 10/23/95 CHK'D BY B. TILTON

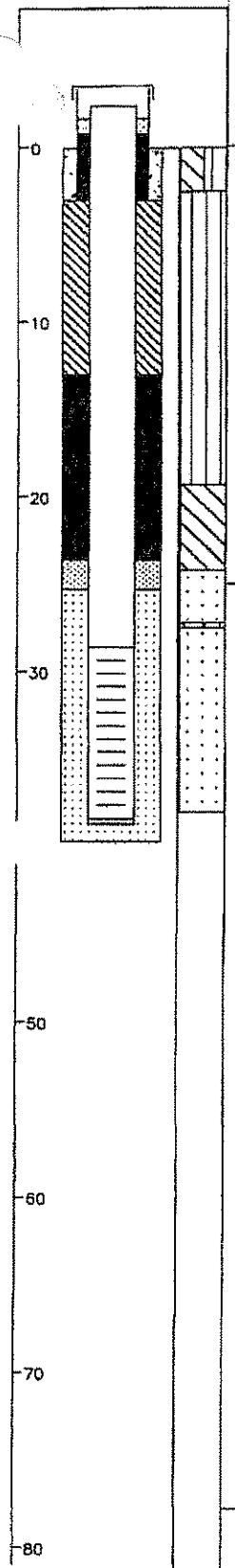
JOB NO.: 943-2848

FILENAME: LR103

Well No. LR-103

Boring No. X-Ref: LR-103

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1068527 ft. Easting: 515217 ft.

Elevation Ground Level 460.1 ft. NGVD

Top of PVC Casing 461.28 ft. NGVD

Drilling Summary:

Total Depth 40.0 ft.

Borehole Diameter 8 1/4" (0.0-40.0')

Casing Stickup Height 1.10 ft.

Driller Layne-Western St. Louis, MO

Rig CME 750

Bit(s) 4 1/4" ID/8 1/4" O.D. Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	10/19/95	14:00	10/20/95	9:00
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/20/95	8:55	10/20/95	8:59
Filter Placement:	10/20/95	9:10	10/20/95	10:25
Cementing:				
Development				
Bentonite Grout	10/20/95	10:35	10/20/95	10:50
Bentonite Seal	10/20/95	10:28	10/20/95	10:35

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.10	-	28.60	C1	461.28	-	431.50
28.60	-	38.40	S1	431.50	-	421.70
38.40	-	38.70	C2	421.70	-	421.40

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings

C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 25.3-39.7'

Filter Pack: 100 mesh Silica Sand 23.6-25.3'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-13.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 13.0-23.6'

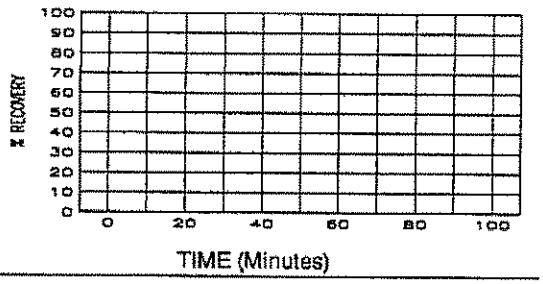
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by M. Sandfort

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name LR103

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145107	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: LR-103

SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044

OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710

OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
AT WEST BASE OF GRAVEL PILE FOR ASPHALT PLANT.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 460.1
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 (E OR W)
LAT. 38 ° 46 ' 05 " LONG. 90 ° 26 ' 48 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ L.U.S.T. ☐ OTHER ____
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8x8 IN. | WEIGHT OR SDR # 0.188 | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 40 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED: ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____
DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____
MATERIAL: ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 31.2 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 10.6 | BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	14.7 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	1.7 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seal:	3.0	0-7 Gravelly clay
WELL SCREEN	LENGTH OF SCREEN 10 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH 80	MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal: 13.0	7-26 Silty clay
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP		MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____	Depth to Base of Bentonite Seal:	23.6	
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED		LENGTH OF BACK FILLED BORE HOLE	Depth to Top of Primary Filter Pack:	25.3	
					Depth to Top of the Screen:	30.0	26-40 Silty sand
					Depth to Bottom of the Screen:	40.0	
					Total Depth:	40.0	

STATIC WATER LEVEL: FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT: 461.28

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

DATE WELL DRILLING WAS COMPLETED: 10-20-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
[signature]	11-15-95	[signature]	11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-105
	SAMPLING METHOD:	SHEET 1 OF 3
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	21.3 FT.	32.0 FT.			TIME	TIME
TIME	13:50	11:00			9:45	14:45
DATE	10/03/95	10/04/95			DATE	DATE
CASING DEPTH	28.0 FT.	36.0 FT.			10/03/95	10/03/95

NORTHING: 1067709.56
DATUM EASTING: 514524.56 ELEVATION 484.2

DRILL RIG CME 750
ANGLE 90° BEARING NA
SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	6 8 6 8	1.8' / 2.0' (90%)			(0.0-2.2 ft.) Compact, moderate yellowish brown (10YR 5/4), SILTY CLAY, NR, dry, (CL), (FILL) @ 1.3 ft., damp	SP 1	
2	4 3 7 43	1.3' / 2.0' (65%)			(482.0) 2.2 (2.2-3.2 ft.) Loose, light olive gray (5Y 5/2), SILT, NR, damp, (ML), (FILL) (481.0) 3.2 (3.2-29.2 ft.) WASTE, damp	SP 2	
4	4 3 2 4	0.4' / 2.0' (20%)				SP 3	0.0 ppm PID
6	8 6 10 5	0.7' / 2.0' (35%)			@ 7.5 ft., moist	SP 4	
8	1 2 2 4	0.4' / 2.0' (20%)			@ 9.6 ft., wet	SP 5	
10	2 3 4 6	0.5' / 2.0' (25%)				SP 6	Faint petroleum odor
12	6 3 4 4	0.5' / 2.0' (25%)				SP 7	
14	22 5 50/4	0.4' / 2.0' (20%)				SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON
DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848
FILENAME: LR105

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-105
	SAMPLING METHOD:	SHEET 2 OF 3
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	21.3 FT.	32.0 FT.			TIME	TIME
TIME	13:50	11:00			9:45	14:45
DATE	10/03/95	10/04/95			DATE	DATE
CASING DEPTH	28.0 FT.	36.0 FT.			10/03/95	10/03/95

NORTHING: 1067709.56
DATUM EASTING: 514524.56 ELEVATION 484.2

DRILL RIG CME 750
ANGLE 90° BEARING NA
SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(3.2-29.2 ft.) WASTE, damp	SP 8	
16	9 3 5 6	0.9'/2.0' (45%)					0.0 ppm PID
17						SP 9	
18	3 5 7 50/3	0.9'/2.0' (45%)				SP 10	
19							
20	50/5	0.4'/2.0' (20%)			From 19.9-23.8 ft, some Limestone and granular soil intermixed with waste		0.0 ppm PID
21						SP 11	
22	7 13 20 12	1.0'/2.0' (50%)				SP 12	
23							
24	7 8 19 17	1.4'/2.0' (70%)				SP 13	Landfill gas odor 0.0 ppm PID Lost shoe on Spoon
25							
26	13 21 17 25	1.5'/2.0' (75%)				SP 14	
27							
28	9 37 15 11						0.0 ppm PID
29					(29.2-30.0 ft.) Compact, medium gray (N5), SILTY CLAY, NR, wet, (CL), (FILL) From 29.2-29.8 ft, layer of LIMESTONE GRAVEL	SP 15	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: LR105

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger				BORING NO. LR-105
					SHEET 3 OF 3
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)				DRILLING START / FINISH
	WATER LEVEL	21.3 FT.	32.0 FT.		TIME 9:45 / TIME 14:45
	TIME	13:50	11:00		
	DATE	10/03/95	10/04/95		DATE 10/03/95 / DATE 10/03/95
NORTHING: 1067709.56 DATUM EASTING: 514524.56 ELEVATION 484.2	CASING DEPTH	28.0 FT.	36.0 FT.		
DRILL RIG CME 750	SURFACE CONDITIONS				
ANGLE 90° BEARING NA					
SAMPLE HAMMER					

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31		0.9'/2.0' (45%)			(30.0-36.0 ft.) WASTE, wet	ST 16	@ 31.2 ft., chunk of limestone crushed end of Shelby Tube 0.0 ppm PID
32	10 11 50/3	0.4'/2.0' (20%)				SP 17	
33							
34	37 29 24 30	0.2'/2.0' (10%)				SP 18	
35							
36	1 2 3 4	1.8'/2.0' (90%)			(448.2) 36.0 (36.0-38.0 ft.) Loose, olive gray (5Y 4/1), SILT, little fine Sand, NR, moist, (ML), (LOESS)	SP 19	0.0 ppm PID
37							
38					(446.2) 38.0 End of Soil Borehole Log at 38.0 ft.		
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

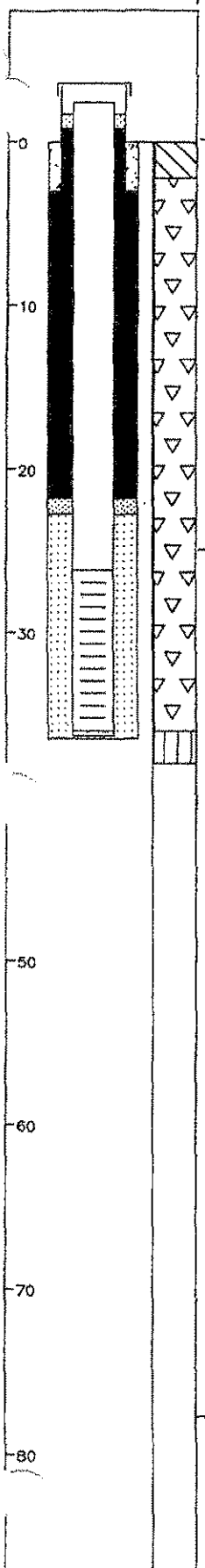
JOB NO.: 943-2848

FILENAME: LR105

Well No. LR-105

Boring No. X-Ref: LR-105

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords:	Northing:	1067710 ft.	Elevation Ground Level	484.2 ft. NGVD
	Easting:	514525 ft.	Top of PVC Casing	486.79 ft. NGVD

Drilling Summary:

Total Depth 38.0 ft.
Borehole Diameter 8 1/4" (0.0-38.0')
Casing Stickup Height 2.59 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	10/3/95	9:45	10/3/95	14:45
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/3/95	15:00	10/3/95	15:05
Filter Placement:	10/3/95	15:10	10/3/95	16:00
Cementing:				
Development				
Bentonite Grout				
Bentonite Seal	10/3/95	16:00	10/3/95	16:40

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.59	-	26.20	C1	486.79	-	458.00
26.20	-	36.00	S1	458.00	-	448.20
36.00	-	36.30	C2	448.20	-	447.90
	-				-	
	-				-	
	-				-	

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 22.8-36.5'

Filter Pack: Less than 50 mesh Silica Sand 21.8-22.8'

Grout Seal:

Bentonite Seal: Extra high yield Wyo-Ben (100%) Chips 3.0-21.8'

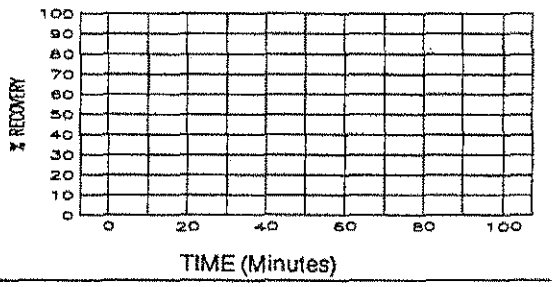
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Drilled to 36.0' and collected split spoon sample from 36.0-38.0'

Supervised by	B. Harrington	Site	LAIDLAW/OU2 RI-FS/MO
Job Number	943-2848	File Name	LR105

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145109	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: LR-105
SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044
OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710
OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT:
90' EAST OF WEST FENCE LINE AND 320' NORTH OF SOUTHWEST FENCE CORNER

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 424.2
SMALLEST ¼ ___ ¼ ___ ¼ ___ ¼ LARGEST ¼
SEC. ___ TWN. 47 N, RNG. 5 E OR W
LAT. 38 ° 45 ' 57 " LONG. 90 ° 26 ' 57 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. PERMIT NUMBER: 001258 WPM
DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ___
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ___ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. DIAMETER OF CASING 8x8 IN. WEIGHT OR SDR # 0.188" DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 38 FT. JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ___ MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ___ LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ___
DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ___
MATERIAL: ☐ STAINLESS STEEL ☐ OTHER ___

RISER PIPE DETAILS: LENGTH 28.9 FT. DIAMETER OF RISER PIPE 2 IN. WEIGHT OR SDR # SCH 80 DIAMETER OF DRILL HOLE 8¼ IN. JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ___ MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ___

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ___ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ___ % BENTONITE USED ___ WATER USED/BAG ___ GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS
LENGTH OF SEAL: 18.8
BENTONITE SEAL INSTALLED IN: ☒ UNSATURATED ZONE ☐ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	15.2 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	1.0 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seal:	3.0	0-2 Clay
WELL SCREEN	LENGTH OF SCREEN 10 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH 80 / MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	21.8	2-36 Trash
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP	MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ___		Depth to Base of Bentonite Seal:	21.8	
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED	LENGTH OF BACK FILLED BORE HOLE		Depth to Top of Primary Filter Pack:	22.8	
					Depth to Top of the Screen:	26.3	
					Depth to Bottom of the Screen:	36.3	36-38 Silt
					Total Depth:	38.0	

STATIC WATER LEVEL FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS ☒ TOP OF RISER PIPE ☐ OTHER ___
ELEVATION OF MEASURING POINT 426.74
MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.
DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ___
DATE WELL DRILLING WAS COMPLETED 10-03-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #: Lorman H. Mahurin Jr. DATE: 11-15-95
SIGNATURE DRILLER/PERMIT #: Lorman H. Mahurin Jr. DATE: 11-15-95

MO 780-1415 (7-95)
DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION
RECYCLED PAPER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger	PZ-107-SS
		SHEET 1 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	TIME 13:00 / TIME 16:25
	TIME	
	DATE	DATE 3/26/95 / DATE 3/26/95
NORTHING: 1067163.45 DATUM EASTING: 515254.52 ELEVATION 462.6	CASING DEPTH	

DRILL RIG CME 75	SURFACE CONDITIONS
ANGLE -90° BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	3 5 5 5	0.9' / 2.0' (45%)			(0.0-2.0 ft.) Stiff, moderate yellowish brown (10YR 5/4), SILTY CLAY, trace of very fine Sand, WR, damp, (CL), (FILL)	SP 1	
2 3	2 2 4 18	1.0' / 2.0' (50%)			(2.0-4.0 ft.) Firm, yellowish brown (10YR 5/4), SILTY CLAY, little Gravel, trace amount of trash at bottom, WR, damp, (CL), (FILL)	SP 2	
4 5	3 8 11 10	1.1' / 2.0' (55%)			(4.0-6.0 ft.) Very stiff, medium light gray (N5) to dark greenish gray (5GY 4/1), SILTY CLAY, some Gravel, SR, moist, (CL), (FILL)	SP 3	
					(456.6) 6.0		
6 7	4 8 23 5	1.1' / 2.0' (55%)			(6.0-8.0 ft.) Mixed damp waste and silty clay	SP 4	
8 9	7 2 4 1	0.3' / 2.0' (15%)			(8.0-10.0 ft.) Trash	SP 5	
10 11	3 3 4 4	0.0' / 2.0' (0%)			(10.0-12.0 ft.) Waste becomes wet	SP 6	
					(450.6) 12.0		
12 13	8 32 15 9	0.0' / 2.0' (0%)	NO RECOVERY		(12.0-14.0 ft.) No Recovery	SP 7	From 12.0-28.0 ft. no samples recovered, but drilling indicated mixed waste and silty clay layers
14	6 12 8 5	0.0' / 2.0' (0%)			(14.0-15.0 ft.) No Recovery	SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO CHK'D BY W. HERST

DATE 6/1/95

JOB NO.: 943-2848

FILENAME: PZ107SS

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger	PZ-107-SS
	SAMPLING METHOD:	SHEET 2 OF 3
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

WATER LEVEL					TIME	TIME
TIME					13:00	16:25
DATE					DATE	DATE
CASING DEPTH					3/26/95	3/26/95

DATUM NORTHING: 1067163.45 EASTING: 515254.52 ELEVATION 462.6

DRILL RIG CME 75

ANGLE -90° BEARING

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
					(15.0-16.0 ft.) No Recovery	SP 8		
16	5 8 13 6	0.0' 2.0' (0%)			(16.0-18.0 ft.) No Recovery	SP 9		
17								
18	5 7 35 41	0.0' 2.0' (0%)			(18.0-20.0 ft.) No Recovery	SP 10		
19								
20	5 5 5 3	0.0' 2.0' (0%)	NO RECOVERY		(20.0-22.0 ft.) No Recovery	SP 11		
21								
22	5 4 7 9	0.0' 2.0' (0%)			(22.0-24.0 ft.) No Recovery	SP 12		
23								
24	6 7 7 10	0.0' 2.0' (0%)			(24.0-26.0 ft.) No Recovery	SP 13		
25								
26	5 5 9 12	0.4' 2.0' (20%)			(26.0-28.0 ft.) Waste	SP 14		
27								
28					(434.6) 28.0 (28.0-32.0 ft.) Stiff, dark greenish gray (5GY 4/1), SILTY CLAY, NR, wet, (CL), (LOESS)			
29								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO

DATE 6/1/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ107SS

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger	PZ-107-SS
		SHEET 3 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	TIME / TIME
	TIME	13:00 / 16:25
	DATE	DATE / DATE
NORTHING: 1067163.45 DATUM EASTING: 515254.52 ELEVATION 462.6	CASING DEPTH	3/26/95 / 3/26/95

DRILL RIG CME 75 | SURFACE CONDITIONS

ANGLE -90° BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
31					(28.0-32.0 ft.) Stiff, dark greenish gray (5GY 4/1), SILTY CLAY, NR, wet, (CL), (LOESS)			
32					(430.6) 32.0 End of Soil Borehole Log at 32.0 ft. See PZ-107-SS Record of Drillhole for rock descriptions below 55.0 ft.			
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO

DATE 6/1/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ107SS

RECORD OF DRILLHOLE PZ-107-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/21/95 - 5/22/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067163.45
AZIMUTH: 0

COLLAR ELEV: 482.6
E: 515254.52
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	0.0-32.0 ft. See Soil Borehole Log PZ-107-SS 32.0-54.0 ft. No samples collected												5/18/95 - 5/19/95 A 9 7/8 in. borehole (air rotary) was advanced through 10 1/4 in. ID hollow stem augers from 30.0-55.0 ft., and 6 in. steel was sealed in borehole from surface to 55.0 ft. with neat cement. Bedrock was encountered at 51.0 ft. BGS during drilling
50													
52													
54	408.60 / 54.00 54.0-59.0 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)	408.60 / 54.00											5/21/95 @ 15:30 Began coring
56			1	92%				J,PL,SM,CL					
58								J,PL,SM					5/21/95 @ 15:50 End of Run 1
	59.0-63.5 ft. Slightly weathered, medium bedded, light olive gray (5Y 5/2), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)	403.60 / 59.00											
60	60.0 ft. Fossiliferous							J,PL,R B,PL,SM					
			2	98%				J,PL,SM,CL J,PL,R					
62	63.5-82.3 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), m-c grained, medium strong LIMESTONE, (ST. LOUIS FORMATION)							B,PL,SM					
64													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

RECORD OF DRILLHOLE PZ-107-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2646
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/21/95 - 5/22/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067183.45
AZIMUTH: 0

COLLAR ELEV: 462.6
E: 515254.52
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
64	63.5-62.3 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), m-c grained, medium strong LIMESTONE, (ST. LOUIS FORMATION)				B,PL,SM	
	64.3 ft. Argillaceous layers common, stylolites common				B,PL,SM,CL	
66			2	98%		
					J,PL,SM	
					J,PL,SM,CL	
68					J,PL,SM,CL	5/21/95 @ 16:15 End of Run 2
		383.60 / 69.00				
					J,PL,R	
70					B,PL,SM,CL (5)	
72	72.1-72.6 ft. Argillaceous layer				B,PL,SM,CL	
					J,I,R	
74			3	100 %	B,PL,SM,CL	
76	76.7-77.2 ft. Argillaceous layer					
78	78.4-79.9 ft. Argillaceous layer				J,PL,SM (2)	5/21/95 @ 17:40 End of Run 3
		383.60 / 79.00				
			4	100 %	J,PL,SM	
80						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

RECORD OF DRILLHOLE PZ-107-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/21/95 - 5/22/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1087163.45
AZIMUTH: 0

COLLAR ELEV: 482.6
E: 515254.52
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRP-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	63.5-82.3 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), m-c grained, medium strong LIMESTONE, (ST. LOUIS FORMATION)								J,PL,SM (3)						
									J,PL,SM (2)						
82	82.3-84.6 ft. Slightly weathered, medium bedded, light olive gray (5Y 5/2), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)														
84	84.6-88.5 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Thinly laminated Clay layers abundant			4	100 %										
86									J,PL,SM,CL (2)						
									J,C,SM						
88	88.5-94.1 ft. Fresh, medium bedded, light olive gray (5Y 5/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Stylolites abundant		373.60 / 89.00												5/21/95 @ 18:40 End of Run 4 Quit drilling for the day 5/22/95 @ 7:30 Began drilling
90															
92				5	100 %										
94	94.1-97.2 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Abundant thinly laminated Clay layers								B,PL,SM,CL (3)						
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

RECORD OF DRILLHOLE PZ-107-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/21/95 - 5/22/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1087163.45
AZIMUTH: 0

COLLAR ELEV: 462.6
E: 515254.52
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE / DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	94.1-97.2 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE,(ST. LOUIS FORMATION) Abundant thinly laminated Clay layers								B,PL,SM						
				5	100 %										
98	97.2-100.7 ft. Slightly weathered, medium bedded, light olive gray (5Y 5/2), fine to medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Calcite filled healed fractures common		363.60 / 99.00												5/22/95 @ 8:10 End of Run 5
100									J,PL,R,CL						
	100.7-104.0 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Abundant thinly laminated clay layers			6	100 %				J,PL,R						
102									J,PL,R						
									J,PL,R						5/22/95 @ 8:30 Finished coring
104	358.60 End of Record of Borehole at 104.0 ft.		358.60 / 104.00												
106															
108															
110															
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

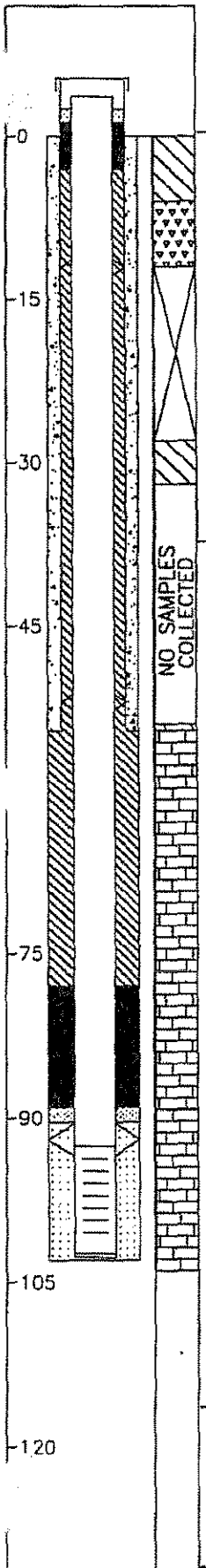
LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

Well No. PZ-107-SS

Boring No. X-Ref: PZ-107-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords:	Northing: 1067163 ft.	Elevation Ground Level	462.6 ft. NGVD
	Easting: 515255 ft.	Top of PVC Casing	464.66 ft. NGVD

Drilling Summary:

Total Depth 103.0 ft.

Borehole Diameter 14 1/4 in. (0.0-32.0 ft.) 5 7/8 in. (32.0-103.0 ft.)

Casing Stickup Height 2.03 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger-None, NX Core Water, Air and Mud Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75 (augers)	3/28/95	13:00	3/28/95	16:25
CME 75 (core)	5/21/95	15:30	5/22/95	8:30
Schramm Rotary	5/22/95	11:00	5/22/95	11:30
Geophys.Logging:				
Casing:				
2" PVC	5/22/95	11:30	5/22/95	11:35
6" Steel	5/18/95	9:00	5/18/95	14:00
Filter Placement:	5/22/95	11:40	5/22/95	11:55
Cementing:				
Development				
Bentonite Grout	5/22/95	12:10	5/22/95	12:45
Bentonite Seal	5/22/95	11:55	5/22/95	12:10

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.03	-	92.60	C1	464.86	-	370.03
92.60	-	102.40	S1	370.03	-	360.23
102.40	-	102.73	C2	360.23	-	359.90
+ 1.00	-	55.00	C3	463.60	-	407.63
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 90.4-103.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 89.0-90.4 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-78.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 78.0-89.0 ft.

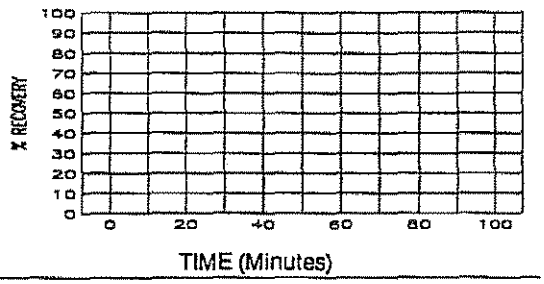
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Surface Casing C3: 6 1/8 ID / 6 5/8 in. OD Steel Casing

Supervised by	B. Tilton	Site	LAIDLAW/OU2 RI-FS/MO
Job Number	943-2848	File Name	PZ107SS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122508	CHECK NO.
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LAIDLAW BRIDGETON SANITARY LANDFILL	PZ - 107SS

SITE ADDRESS	CITY	STATE	ZIP CODE
ST CHARLES ROCK RD	BRIDGETON	MO	63044

NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-241-3710

ADDRESS	CITY	STATE	ZIP CODE
1838 N. BROADWAY	ST. LOUIS	MO	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

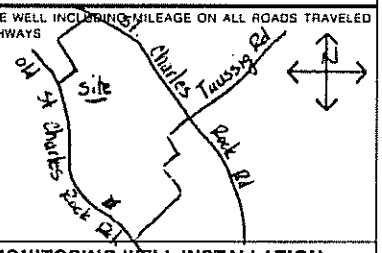
COUNTY ST. LOUIS
ELEVATION 450.6
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 E OR W

LAT. 38° 45' 52" LONG. 90° 26' 48"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
464.7

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ HSA
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 4 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
5-22-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Veit
PERMIT NUMBER 001256WM DATE 6-02-95
SIGNATURE (DRILLING CONTRACTOR) Michael P. Veit
PERMIT NUMBER 001256WM DATE 6-02-95

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation: 464.7

Ground Surface Elevation: 462.4

Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column	0-5 Clay
Depth to bottom of Protective Casing Seal: 3.0	5-38 Trash
	38-54 Not sampled
	54-103 Limestone
Depth to Base of Annular Seal: 18.0	
Depth to Base of Bentonite Seal: 89.0	
Depth to Base of Secondary Filter Pack: 90.4	
Depth to Top of the Screen: 92.6	
Depth to Bottom of the Screen: 102.6	
Plug Back Total Depth	
Original Total Depth: 103.0	

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x8'
Bore Hole Diameter: 9 7/8"
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 94.10
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: ☒ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 11 FT.

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: 4-50
Length: 1.4'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16-35
Length: 12.6'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH. 80 PVC

SUMP DETAILS
Length: 0.5 FT.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SLAID

MO 780-1415 (2-94) DISTRIBUTION: WHITE DIVISION CANARY MONITORING WELL CONTRACTOR PINK/OWNER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-205-AS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 1 OF 4
	WATER LEVEL / TIME / DATE / CASING DEPTH	DRILLING START TIME 16:35 DATE 3/25/95; FINISH TIME 11:00 DATE 3/25/95
DATUM NORTHING: 1067463.60 EASTING: 515463.34 ELEVATION 459.3		
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE -90° BEARING		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	4 7 7 10	1.5' / 2.0' (75%)			(0.0-2.2 ft.) Stiff, dark greenish gray (5GY 4/1) to olive gray (5Y 6/1), SILTY CLAY, trace fine Sand, SR, damp, (CL), (FILL)	SP 1	
2					(457.1) 2.2		
3	1 2 2 4	0.5' / 2.0' (25%)			(2.2-6.0 ft.) Soft, black (N1), CLAYEY SILT, trace fine Sand, WR, moist to wet, (CL-ML), (FILL)	SP 2	
4 5	2 2 2 3	1.5' / 2.0' (75%)				SP 3	Soil becomes wet @ 4.0 ft.
6					(453.3) 6.0		
7	1 4 4 3	0.1' / 2.0' (5%)			(6.0-12.0 ft.) Mixed wet waste and clayey silt	SP 4	
8 9	6 5 6 4	0.1' / 2.0' (5%)			(8.0-10.0 ft.) Mixed wet waste and clayey silt	SP 5	
10 11	2 2 3 3	0.6' / 2.0' (30%)				SP 6	
12					(447.3) 12.0		
13	2 9 3 2	0.0' / 2.0' (0%)	NO RECOVERY		(12.0-14.0 ft.) No Recovery	SP 7	From 12.0-28.0 ft., no samples recovered, but drilling indicated mixed waste and silty clay layers
14	6 8 8 7	0.0' / 2.0' (0%)			(14.0-15.0 ft.) No Recovery	SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO

DATE 6/1/95

CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ205AS

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-205-AS
		SHEET 2 OF 4
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING

WATER LEVEL					START	FINISH
TIME					TIME 16:35	TIME 11:00
DATE					DATE 3/25/95	DATE 3/25/95
CASING DEPTH						

DATUM NORTHING: 1067463.60 EASTING: 515463.34 ELEVATION 459.3

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS

ANGLE -90° BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(15.0-16.0 ft.) No Recovery	SP (8)	
16	5 5 5 4	0.0' 2.0' (0%)			(16.0-18.0 ft.) No Recovery	SP (9)	
17							
18	5 2 1 5	0.0' 2.0' (0%)			(18.0-20.0 ft.) No Recovery	SP (10)	
19							
20	1 2 3 3	0.0' 2.0' (0%)			(20.0-22.0 ft.) No Recovery	SP (11)	
21			NO RECOVERY				
22	3 2 1 4	0.0' 2.0' (0%)			(22.0-24.0 ft.) No Recovery	SP (12)	
23							
24	3 3 23 50/1"	0.0' 2.0' (0%)			(24.0-26.0 ft.) No Recovery	SP (13)	
25							
26	8 6 8 10	0.0' 2.0' (0%)			(26.0-28.0 ft.) No Recovery	SP (14)	
27					(431.3) 28.0		
28	1 2 4 5	0.0' 2.0' (0%)			(28.0-30.0 ft.) Loose, dark greenish gray (5GY 4/1), SANDY SILT, NR, wet, (ML)	SP (15)	
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO

DATE 6/1/95 CHK'D BY W. HERSI

JOB NO.: 943-2848

FILENAME: PZ205AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	BORING NO. PZ-205-AS SHEET 3 OF 4

WATER LEVEL					DRILLING START	DRILLING FINISH
TIME					TIME 16:35	TIME 11:00
DATE					DATE 3/25/95	DATE 3/25/95
CASING DEPTH						

DATUM NORTHING: 1067463.60 EASTING: 515463.34 ELEVATION 459.3

DRILL RIG CME 75 - TRUCK MOUNT

ANGLE -90° BEARING

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(30.0-31.0 ft.) No samples collected (428.3) 31.0		5/21/95, 10.0 in. ID steel casing installed through 10.25 in. ID augers to 29.0 ft. Casing sealed in borehole with neat cement grout to surface.
31	6 5 5 8	1.2' / 2.0' (60%)			(31.0-36.5 ft.) Stiff, medium dark gray (N4), SILTY CLAY, with thin fine sand layers (1" thick), moist, NR, (CL), (ALLUVIUM)	SP (16)	
32							
33	9 3 5 12	1.3' / 2.0' (65%)				SP (17)	
34							
35	7 7 9 9	1.0' / 2.0' (50%)				SP (18)	
36					(422.8) 36.5		
37	7 14 21 17	1.1' / 2.0' (55%)			(36.5-39.0 ft.) Dense, olive gray (5Y 4/1), SILTY fine SAND, wet, NR, (SM), (ALLUVIUM)	SP (19)	
38					(420.3) 39.0		
39	4 3 3 4	1.4' / 2.0' (70%)			(39.0-44.2 ft.) Firm, olive gray (5Y 4/1), SILTY CLAY, moist to wet, NR, (CL) from 40.2-40.4 ft., wet, fine, sandy clay layer	SP (20)	
40							
41	3 4 4 5	1.7' / 2.0' (85%)			from 41.8-42.0 ft., wet, fine, sandy clay layer	SP (21)	
42							
43	2 7 11 18	1.3' / 2.0' (65%)				SP (22)	
44					(415.1) 44.2 (44.2-49.0 ft.) Compact, olive gray (5Y 4/1), fine SAND, trace silt, wet, NR, (SM), (ALLUVIUM)		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO

CHK'D BY W. HERST

DATE 6/1/95

JOB NO.: 943-2848

FILENAME: PZ205AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-205-AS
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 4 OF 4
		DRILLING START / FINISH
	WATER LEVEL	TIME 16:35 / TIME 11:00
	TIME	
	DATE	DATE 3/25/95 / DATE 3/25/95
	CASING DEPTH	
DATUM NORTHING: 1067463.60 EASTING: 515463.34	ELEVATION 459.3	
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE -90° BEARING		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
46	6 8 12 16	1.6'/2.0' (80%)			(44.2-49.0 ft.) Compact, olive gray (5Y 4/1), fine SAND, trace silt, wet, NR, (SM), (ALLUVIUM)	SP (23)	
47	3 5 50/4"	1.1'/2.0' (55%)				SP (24)	
48							
49					(410.3) 49.0 End of Soil Borehole Log at 49.0 ft.		Top of weathered bedrock encountered @ 48.5 Ft.
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. CDSID

DATE 6/1/95

CHK'D BY W. HERST

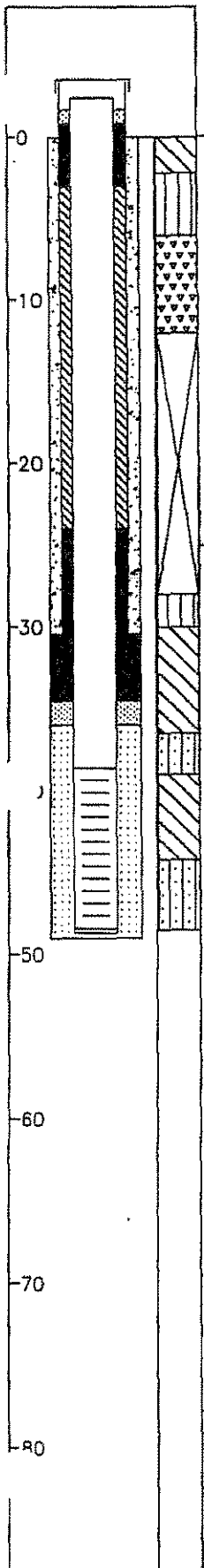
JOB NO.: 243-2849

FILENAME: PZ205AS

Well No. PZ-205-AS

Boring No. X-Ref: PZ-205-AS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1087464 ft. Easting: 515463 ft.

Elevation Ground Level 459.3 ft. NGVD

Top of PVC Casing 460.99 ft. NGVD

Drilling Summary:

Total Depth 49.0 ft.

Borehole Diameter 14 1/4 in. (0.0–29.0 ft.) 8 1/4 in. (29.0–49.0 ft.)

Casing Stickup Height 1.66 ft.

Driller Layne-Western St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. and 10 1/4 in. ID Hollow Stem Auger Bits

Drilling Fluid Auger-None

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	3/25/95	16:35	3/25/95	11:00
CME 75	4/21/95	14:10	4/21/95	15:30
CME 75	5/5/95	13:30	5/5/95	15:30
Geophys.Logging:				
Casing:				
2" PVC	5/5/95	16:00	5/5/95	16:05
10" Steel	4/21/95	15:29	4/21/95	16:30
Filter Placement:	5/5/95	16:05	5/5/95	16:45
Cementing:				
Development				
Bentonite Grout	5/5/95	17:00	5/5/95	17:30
Bentonite Seal	5/5/95	16:45	5/5/95	17:00

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.66	-	38.55	C1	460.99	-	420.78
38.55	-	48.35	S1	420.78	-	410.98
48.35	-	48.68	C2	410.98	-	410.65
+ 0.70	-	29.00	C3	460.00	-	430.33
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 36.0-49.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 34.5-36.0 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-24.0 ft., Neat cement, 3.0-29.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 24.0-34.5 ft.

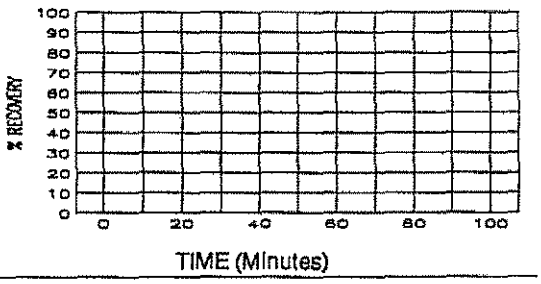
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: Surface Casing C3: 10 in. ID / 10 7/8 in. OD Steel Casing

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ205AS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122496	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LAIDLAW BRIDGETON SANITARY LANDFILL	PZ-205AS

SITE ADDRESS	CITY	STATE	ZIP CODE
ST. CHARLES ROCK RD.	BRIDGETON	MO.	63044

NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-241-3710

ADDRESS	CITY	STATE	ZIP CODE
1838 N. BROADWAY	ST. LOUIS	MO	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

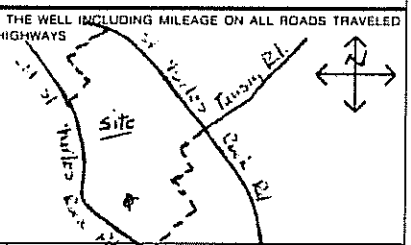
COUNTY ST. LOUIS
ELEVATION 454.3
AREA NO.

SMALLEST ¼ LARGEST

SEC. TWN. 47 N.RNG. 5 (E OR W)

LAT. 38 ° 45 ' 55 " LONG. 90 ° 36 ' 45 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation: 461.0

LOCKING CAP - (Y) N (Circle one)
CAP VENT (Y) N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x5'
Bore Hole Diameter: 14"
WEEP HOLE - Y / (N) (Circle one)

Ground Surface Elevation: 454.3 Ft

Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column	0-2 Clay
	2-6 Silt
Depth to bottom of Protective Casing Seal: 4.0	
	6-27 Trash
Depth to Base of Annular Seal: 34.0	
	27-31 Silt
Depth to Base of Bentonite Seal: 34.5	
Depth to Base of Secondary Filter Pack: 36.0	31-38 Clay
Depth to Top of the Screen: 38.4	
	38-47 Silt w/ sand
Depth to Bottom of the Screen: 48.4	
Plug Back Total Depth	
Original Total Depth: 47.0	

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 40.1'
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 8 In.

ANNULAR SEAL
Type: [X] Bentonite Slurry [X] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 10.5 Ft.

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: 2 50
Length: 1.5'

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16-35
Length: 13'

WELL SCREEN
Length: 10
Slot Size: 0.010"
Type: SCH. 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

TYPE OF INSTALLATION
[X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
461.0

MEASURING POINT IS
[X] TOP OF RISER PIPE
[ ] OTHER

DRILLING EQUIPMENT
[ ] AIR ROTARY [X] AUGER TYPE 4¼ H.S.A.
[ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED
[X] YES, AT 2 TOTAL
[X] STAINLESS STEEL
[ ] OTHER
[ ] NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
5-06-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR)
[signature]

PERMIT NUMBER	DATE
001258 WMA	6-02-95

SIGNATURE (DRILLING CONTRACTOR)
[signature]

PERMIT NUMBER	DATE
001258 WMA-1	6-02-95

DISTRIBUTION: WHITE DIVISION CANARY MONITORING WELL CONTRACTOR PINK/OWNER

Drilling Log

Project Name: WESTLAKE			Boring No.: D-81
Project No.: 84-075-4-002			Page 1 of 4
Ground Elevation: 447.8	Location: N. 1196.2728, E. 922.0145		Total Footage: 61.5'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. Core Boxes	Depth To Water	Date Measured
SEE REMARKS	SEE REMARKS	61.5	0	11	0	SEE REMARKS	—

Drilling Co.	WABASH DRILLING CO.	Driller (s)	DORL THORNTON
Drilling Rig.	ACKER MP-5, TRUCK	Type of Penetration Test	STANDARD
Date	8-13-84 To 8-15-84	Field Observer (s)	GLEN ERNSTMANN

Depth	Description	Class.	Blow Count	Recov.		Sample or Box No.	Remarks
1	BROWN FINE SANDY SILT, LOW PLASTICITY, DAMP (FILL)						5" SOLID AUGERS 0' TO 15'
2							
3	GRAY-BROWN COARSE GRAVEL (MAX. 2" DIA.), SOME FINE GRAVEL AND SAND, DAMP (FILL)						
4							
5							
6							
7	BROWN CLAYEY SILT, LOW PLASTICITY, DAMP TO MOIST (FILL)						
8							
9							
10	BROWN FINE TO MEDIUM SAND, MEDIUM DENSE TO LOOSE, DAMP (FILL)				10.0		
11			5/5/4	16"/18"		SS-1	
	BROWN CLAYEY SILT, LOW PLASTICITY MOIST (FILL)				11.5		STOPPED 8-13-84
12							RESUMED 8-14-84
13	BROWN SILTY FINE TO MEDIUM SAND, MEDIUM DENSITY, SATURATED BELOW APPROX. 13'. (FILL?)						SATURATED MATERIAL FIRST ENCOUNTERED @ APPROX. 13'

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

	Boring No. D-81
Project Name WESTLAKE	Page 2 of 4
Project No. 84-075-4-002	Date 8-13-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
15	BROWN SILTY FINE TO MEDIUM SAND, MEDIUM DENSE SATURATED BELOW APPROX. 13' (FILL(?)		3/5/7	19"/18"	15.0	SS-2	BEGAN 4½" DIA. TRI-CONE, WASH BORING @ 15'. CONTINUED TO 61.5'.
16					16.5		
17							
18	BROWN FINE TO MEDIUM SAND, WELL SORTED, SUBROUNDED GRAINS, MEDIUM DENSITY, SATURATED						
19							
20			6/10/16	10"/18"	20.0	SS-3	
21					21.5		
22							
23							
24							
25			9/14/15	10"/18"	25.0	SS-4	
26					26.5		
27							
28	GRAY FINE SAND, TRACE SILT, SAND IS HIGHLY QUARTZOSE, MEDIUM DENSE, SATURATED						
29							
30			10/12/5	11"/18"	30.0	SS-5a	

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-81
Page 3 of 4
Project Name WESTLAKE
Project No. 84-075-4-002
Date 8-13-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
	GRAY SILTY CLAY MEDIUM TO HIGH PLASTICITY, STIFF TO MEDIUM STIFF, MOIST TO SATURATED				31.5	SS-5	
32							
33							
34	GRAY SILT AND SAND INTERBEDS, SILT IS LOW PLASTICITY, VERY LOOSE, SATURATED				35.0		
35			*0/1/4	*0"/18"		SS-6	*NOTE: RODS SUNK 6" WHEN SAMPLE SS-6 WAS FIRST ATTEMPTED. NO RECOVERY ON FIRST ATTEMPT SO RODS WERE DROPPED BACK DOWN THE HOLE AND A SAMPLE OBTAINED.
36					36.5		
37							
38							
39							
40					40.0		
				18"/18"		ST-7	Q_p = N.A.
41					41.5		
42	GRAY FINE TO COARSE SD, SUBANGULAR TO SUBROUND GRAINS, HIGHLY QUARTZ, SATURATED						
43							
44	GRAY SAND AND GRAVEL MIX, SATURATED				45.0		
45	GRAY COARSE SAND, SOME MEDIUM AND FINE, SUBRND TO SUBANGULAR, DENSE		15/20/18	7"/18"		SS-8	
46					46.5		
47							
	(SEE DESCRIPTION BELOW)						

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Project Name	WESTLAKE
Project No.	84-075-4-002
Boring No.	D-81
Page	4 of 4
Date	8-13-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
49	GRAY SAND AND FINE GRAVEL INTERBEDS, SAND IS FINE TO COARSE, SUBROUNDED, QUARTZOSE						
50	GRAVEL IS SUBANGULAR TO SUBROUNDED, QUARTZ, FELDSPAR AND SOME MAFIC MINERALS,		15/18/22	10"/18"	50.0	SS-9	← GRAVEL
51	DENSE TO VERY DENSE, SATURATED				51.0	SS-9b	← SAND
52							
53							
54							
55			13/21/37	9"/18"	55.0	SS-10	A 2" dia. PVC piezometer was installed to 60'.
56					56.5		PVC is flush-joint, threaded couplings.
57							Bottom 15' is .010" machine slotted screen.
58							Bottom 17.5' is gravel packed with a 3' thick bentonite pellet seal above.
59	GRAY-BROWN FINE TO MEDIUM SAND, VERY DENSE, SATURATED						
60			14/20/44	8"/18"	60.0	SS-11	Annulus is grouted from seal to ground surface.
61					61.5		T.O.P. is 3' above ground surface.
62	TOTAL DEPTH 61.5'						
63							WATER LEVEL IS @ 16.43' BELOW T.O.P. 3:05pm 8-15-83 (24 hrs. after installation)
64							

Drilling Log

Project Name	WESTLAKE	Boring No.	D - 87
Project No.	84-075-4-002	Page	1 of 7
Ground Elevation	460.0	Location	N 114.45, E. 903.6487
Total Footage	111.7

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. Core Boxes	Depth To Water	Date Measured
SEE REMARKS	5" @ THE SURFACE	111.0	0.7	22	0	SEE REMARKS	—

Drilling Co.	WABASH DRILLING CO.	Driller (s)	DORL THORNTON
Drilling Rig.	ACKER MP-5, TRUCK	Type of Penetration Test	STANDARD
Date	8-9-84 To 8-10-84	Field Observer (s)	GLEN ERNSTMANN

Depth	Description	Class.	Blow Count	Recov.		Sample or Box No.	Remarks
1	LIGHT BROWN FINE TO COARSE SAND, SOME SILT AND GRAVEL, DAMP (FILL)						5" SOLID AUGERS 0' TO 30.0'
2	LIGHT GRAY GRAVEL (2" MAX. DIA.) SOME SAND, VERY DENSE, DAMP (FILL)						
3							
4							
5		-	50/3"	2"/3"	5.0 / 5.3	SS-1	
6	MOTTLED LIGHT GRAY TO DARK GRAY TO BROWN SANDY SILTY CLAY, MEDIUM PLASTICITY, STIFF, MOIST (FILL						
7	TRACE GRAVEL (2" MAX. DIA.)						
8							
9							
10			2/3/4	12"/12"	10.0	SS-2	
11					11.5		
12							
13							

Drilling Log, continued

	Boring No. D-87
Project Name WESTLAKE	Page 2 of 7
Project No. 84-075-4-002	Date 8-9-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
15	MOTTLED LIGHT GRAY TO DARK GRAY TO BROWN SANDY, SILTY CLAY, MEDIUM PLASTICITY, STIFF MOIST (FILL				15.0		
16	TRACE GRAVEL (2" MAX. DIA.)			23"/24"		ST-3	Q_p = 1.5 TSF
17					17.0		
18							
19							
20	DARK GRAY SILTY CLAY, MEDIUM TO HIGH PLASTICITY, VERY STIFF, MOIST				20.0		
21				21"/24"		ST-4	Q_p = 2.75 TSF
22					22.0		
23							
24	DARK GRAY SANDY SILT AND SILTY SAND INTERBEDS, SAND IS FINE TO MEDIUM, LOW TO NON-PLASTIC, WET TO SATURATED						
25					25.0		
26				4"/24"		ST-5	Q_p = N.A.
27					27.0		SATURATED MATERIAL FIRST ENCOUNTERED @ APPROXIMATELY 27.0' BELOW G.S.
28							
29							
30	BROWN TO GRAY-BROWN SILTY FINE SAND, MEDIUM DENSE SATURATED, SLIGHTLY MICACEOUS		3/7/8	10"/18"	30.0	SS-6	

Drilling Log, continued

Project Name	WEST LAKE
Project No.	84-075-4-002
Boring No.	D-87
Page	3 of 7
Date	8-9-84

Depth	Description	Log or Class	Blow Counts	Core Recov. & Loss		Back or Sample No.	Remarks
	BROWN TO GRAY-BROWN SILTY FINE SAND, MEDIUM DENSE SATURATED				31.5	SS-6	NOTE: HOLE COLLAPSED TO 26.7' AFTER SAMPLE SS-6 WAS OBTAINED. NO FREE WATER OCCURS ABOVE THIS DEPTH.
32	SLIGHTLY MICACEOUS						
33							
34							
	BROWN FINE TO MEDIUM SAND, TRACE SILT, HIGHLY QUARTZOSE, DENSE, SATURATED				35.0		BEGAN ROTARY WASH BORING W/ 4½" DIA. TRI-CONE BIT @ 30.0'
35			12/14/20	4"/18"		SS-7	
36					36.5		
37							
	LIGHT BROWN FINE TO COARSE SAND INTERBEDDED WITH THIN (3" TO 10" THICK) GRAVEL SEAMS, TRACE SILT, DENSE TO VERY DENSE, SATURATED						
38							
39							
40					40.0		
41			15/25/25	8"/18"		SS-8	
					41.5		
42							
43							
44							
45					45.0		
46			17/23/14	8"/18"		SS-9	
					46.5		
47							

Drilling Log, continued

		Boring No.	B-87
Project Name	WEST LAKE	Page	4 of 7
Project No.	84-075-4-002	Date	8-9-84

Depth	Description	Log or Class	Blows Content	Core Recov. & Loss		Box or Sample No.	Remarks
49	LIGHT BROWN FINE TO COARSE SAND INTERBEDDED WITH THIN (3" TO 10" THICK) GRAVEL SEAMS, TRACE SILT, DENSE TO VERY DENSE, SATURATED						
50			19/29/50	10"/18"	50.0		
51						SS-10	
					51.5		
52	GREENISH DARK GRAY FINE TO MEDIUM SAND, TRACE SILT, DENSE TO VERY DENSE, SATURATED						
53							
54							
55					55.0		
56			12/17/23	7"/18"		SS-11	
					56.5		
57							
58							
59							
60					60.0		
61			33/35/50/4"	12"/18"		SS-12	
					61.5		
62							
63							
64							

Drilling Log, continued

Project Name	WESTLAKE
Project No.	84-075-4-002
Boring No.	D-87
Page	5 of 7
Date	8-9-84

Depth	Description	Log or Class	Blows Cover	Core Recov. & Loss		Box or Sample No.	Remarks
	GREENISH DARK GRAY FINE TO MEDIUM SAND, TRACE SILT, DENSE TO VERY DENSE, SATURATED		24/25/34	13"/18"	65.0	SS-13	
66					66.5		STOPPED 8-9-84 RESUMED 8-10-84
67							
68							
69							
70			30/23/24	14"/18"	70.0	SS-14	
71					71.5		
72							
73							
74							
75	GRAY TO DARK GREENISH GRAY FINE TO COARSE SAND, HIGHLY QUARTZOSE, SUBROUNDED GRAINS, VERY DENSE TO MEDIUM DENSE, SATURATED FEW THIN (3" TO 6") GRAVEL SEAMS		22/29/34	14"/18"	75.0	SS-15	
76					76.5		
77							
78							
79							
80					80.0		
81			27/37/26	11"/18"	81.5	SS-16	

Drilling Log, continued

Project Name	WESTLAKE
Project No.	84-075-4-002
Boring No.	D-87
Page	6 of 7
Date	8-9-84

Depth	Description	Log or Class	Blows Content	Core Recov. & Loss		Box or Sample No.	Remarks
83	GRAY TO DARK GREENISH GRAY FINE TO COARSE SAND, HIGHLY QUARTZOSE, SUBROUNDED GRAINS, VERY DENSE TO MEDIUM DENSE, SATURATED						
84							
85	FEW THIN (3" TO 6" THICK) GRAVEL SEAMS AT INTERVALS OF 1' TO 5'.		15/16/14	9"/18"	RCD		
86						SS-17	
					86.5		
87							
88							
89	NOTE: SAND IS PREDOMINANTLY COARSE WITH TRACE FINE GRAVEL THROUGHOUT BELOW APPROXIMATELY 88'.						
90					90.5		
91			15/17/22	8"/18"		SS-18	
					91.5		
92							
93							
94							
95					95.0		
96			14/15/18	7"/18"		SS-19	
					96.5		
97							
98							

LOG OF TEST BORING NO.: F-2

CLIENT: LAIDLAW/BRIDGETON
PROJECT: AUG 90 WELL INSTALL
PROJECT NUMBER: 89L46
LOCATION:

SURFACE ELEVATION:
BORING DEPTH: 25.0
DATE: 9-3-90

MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	FIELD INSTRUMENTS	DRILLING AND SAMPLING NOTES
0.0	--0	0-5	SB	1	-	2.8	Top is Brown (10YR 5/3) silt with some sand & clay; turns to Brown lean CLAY w/ silt later dk. brown (10YR 3/3); Grey v.f. SAND layer (lift ?) at 2.0'. See some crushed white limestone gravel at 4.5'	FILL		Underground utility running nearby approx. 15' (?).
-5.0	--5							-----	TIP = 9.4 ppm maximum	Organics/sewer like odor noticed.
		5-10	SB	2	-	4.8	Brown (10YR 4/3) lean CLAY with little silt & trace of gravel; Bottom 1' is mottled brown, yell-brown(10YR 5/6) & grey (2.5YR 4/0) lean CLAY.	cl	TIP = 2.3 ppm max.	
-10.0	--10	10-15	SB	3	-	0.0	No recovery.	--?--	EXP = 28% LEL	First notice strong petroleum & lighter fluid like odors @ approx 13'
-15.0	--15							ml	TIP = 220 ppm from cuttings RAD = 0 mR/hr	
		15-20	SB	4	-	2.8	Dark Grey (2.5YR 4/0) SILT w/ some v.fine sand and some stratified CLAY layers (<2") 2" clay layer at 17.8'. Silt gradually coarsening to a v.f. SAND w/ little silt.	----- cl -----	TIP = 471 ppm max.	Water added to lower EXP. level.
-20.0	--20	20-25	SB	5	-	2.7	Dark Grey (2.5YR 4/0), f. to v.f. clean SAND; very stiff.	sp	TIP = 930 ppm max.	Strong gasoline like odor.
-25.0	--25						E.O.B. = 25.0'	-----		
-30.0	--30									
-35.0	--35									
-40.0	--40									
-45.0	--45									
-50.0	--50									

DRILLING DATA
START DATE: 8/9/90
COMPLETION DATE: 8/9/90
LOGGED BY: LDA
DRILLING METHOD: 4-1/4" I.D. HSA's
DRILLING CONTRACTOR: BROTCKE ENGR.

WATER LEVEL INFORMATION
DEPTH AT COMPLETION: 13.5'
LATER TIME/DEPTH: 15 hrs / 14.9'
LATER TIME/DEPTH:
CAVE IN DEPTH:
DRILLING LOSSES:

Foth & Van Dyke

DTW = 16.73 from PVC Top

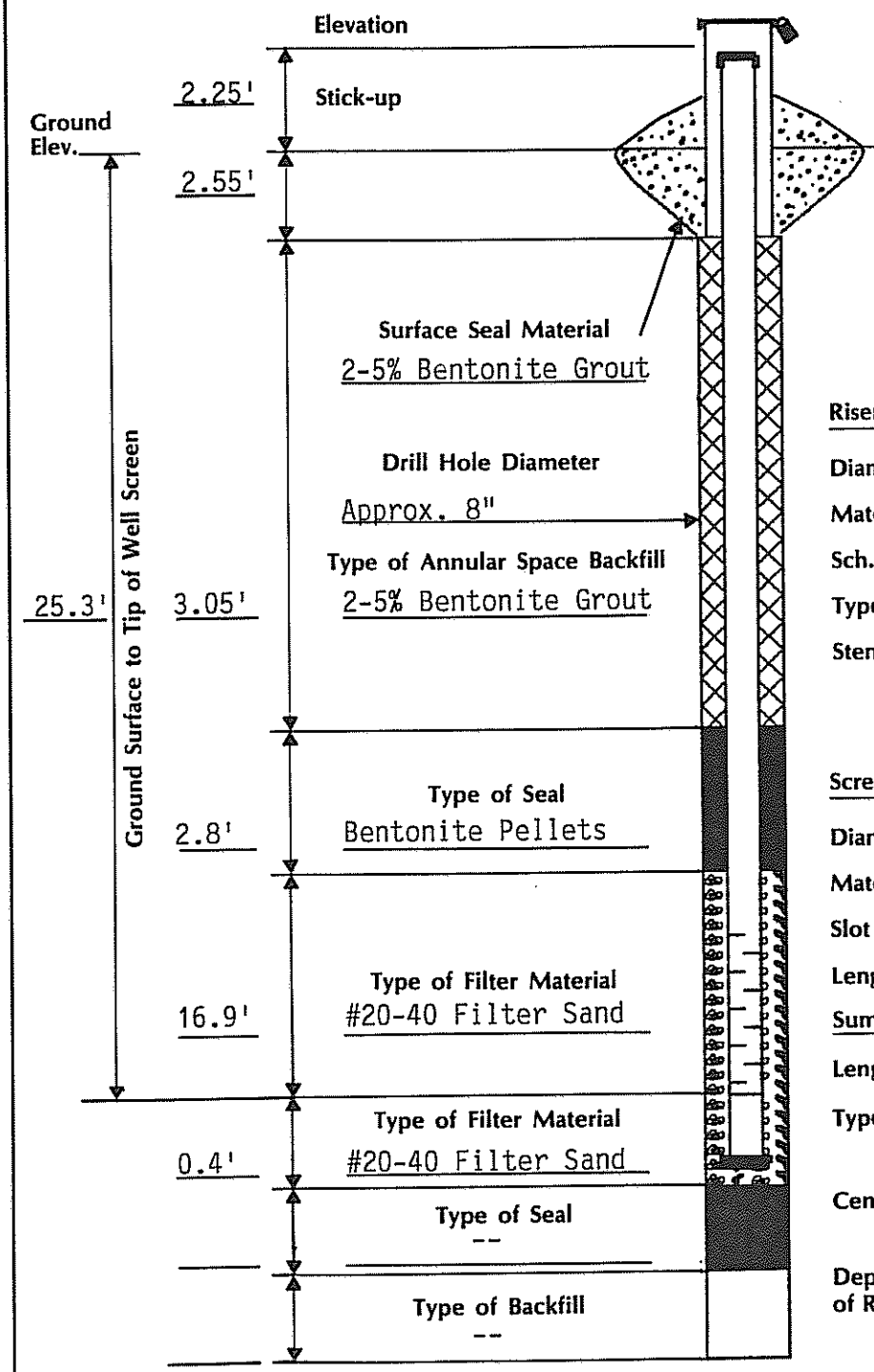
Client: Laidlaw/Bridgeton — Scope I.D.: 89L46-21
Project: 8/90 Well Installation — Page: 1
Prepared by: L.D. Aughenbaugh — Date: 8/10/90
Checked by: R.T. Bloese — Date: 9/6/90

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Mike Foppe of Brotcke Engineering — Well No.: F-2
Drilling Method: 4 1/4" I.D. HSA's — Date Installed: 8/10/90

Coordinates: --

Protector Pipe:
Size: 6" x 6" x 5'
Material: Steel
Lock No.: --



Riser:
Diameter: 2"
Material: PVC
Sch.: 40
Type of Joints: Flush threaded
Stenciled? NO

Screen:
Diameter: 2"
Material: PVC
Slot Size: 10 slot
Length: 15 feet

Sump:
Length: 5"
Type of Cap: Point sump

Centralizer: Used ☐ Not Used ☒

Depth to Water From Top of Riser at Completion: 14'

NOTE: Not to Scale

FORM #309 GEM (Rev. 1 89)

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
1-9 WL-229	07.0803035.003.002	1 of 2

Start/Finish Date 9/18/95	**Site Name and Location** West Lake Landfill; Bridgeton, Missouri
Drilling Contractor Hart Environmental Drilling	**Boring Location:** Area 2
	Ground Surface Elevation: 448.5
Driller Max Tinnin	**Northing:** 1069329.26
	Easting: 514268.59
Drilling Equipment CME-55 Drill Rig, Hollow Stem Augers	**McLaren/Hart Geologist/Office** Tim Biggs / St. Louis

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/4" ID; 8 1/4" Hole	5' Continuous Sampler	55.6'	I-9

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
5	WL-229 5	Background (0.01-0.04)	0.0-5.0' Landfill Debris: soil consisting of brown silt, and asphalt; no trashy debris encountered; dry.
10	None Taken	Background (0.01-0.04)	5.0-56.0' Native Alluvium: dark gray, silty, fine-grained sand grading to coarse-grained sand with gravel; moist to wet.
15	None Taken	Background (0.01-0.04)	
20	WL-229 20'	Background (0.01-0.04)	@ 16' wet
25	WL-229 25'	Background (0.01-0.04)	
30	WL-229 30'	Background (0.01-0.04)	
35	None Taken	None Taken	
40	None Taken	None Taken	
45	None Taken	None Taken	
50	None Taken	None Taken	

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
I-9 WL-229	07.0803035.003.002	2 of 2

Start/Finish Date 9/18/95	**Site Name and Location** West Lake Landfill; Bridgeton, Missouri
Drilling Contractor Hart Environmental Drilling	**Boring Location:** Area 2
	Ground Surface Elevation: 448.5
Driller Max Tinnin	**Northing:** 1069329.26
	Easting: 514268.59
Drilling Equipment CME-55 Drill Rig, Hollow Stem Augers	**McLaren/Hart Geologist/Office** Tim Biggs / St. Louis

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/4" ID; 8 1/4" Hole	5' Continuous Sampler	55.6'	I-9

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (uR/hr)	Description
55	None Taken	None Taken	50.0-55.6' Native Alluvium: dark gray, silty, fine-grained sand grading to coarse-grained sand with gravel; moist to wet.
60	None Taken	None Taken	Boring terminated @ 55.6'

Notes:

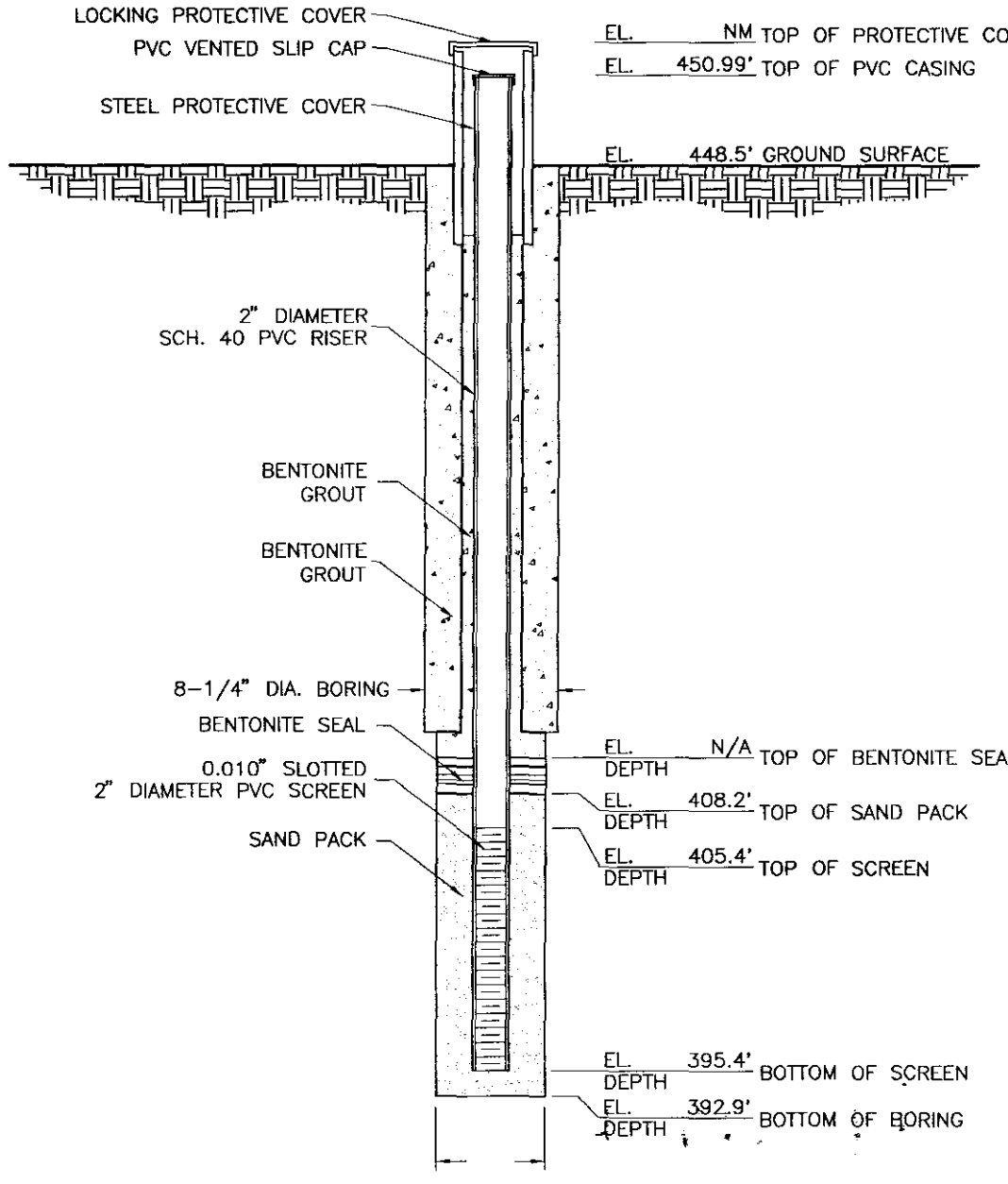
Radiological samples collected at 5 and 20 feet below ground surface.
Non-radiological samples not collected during boring activities.
Perched water not encountered during boring activities.
Groundwater encountered at 16 feet below ground surface.

McLaren Hart
ENVIRONMENTAL ENGINEERING CORPORATION

MONITORING WELL DETAILS

PROJECT NO. 070803035
WELL NO. I-9

PROJECT NAME WEST LAKE LANDFILL
WELL LOCATION BRIDGETON, MISSOURI DATE 9/18/95 BY HART ENVIRONMENTAL DRILLING



NOTES:

1. REFER TO SOIL BORING WL-229 FOR SOIL DESCRIPTION.
2. DETAIL NOT TO SCALE.
3. NM = NOT MEASURED.
4. N/A = NOT APPLICABLE; BENTONITE GROUT USED TO SEAL WELL UP TO SURFACE.

(W9)

SUBSURFACE EXPLORATION DA
by
WABASH DRILLING COMPANY

110 Angelica St. - St. Louis, Mo. 63147 - 421-2460

Date of Drilling:
Started 6-22-78
Finished 6-23-78

Boring No. 38
Coordinates Sheet 1 of 2
Surf. Elev.
Gr. Water Elev. --

Client Westlake Quarry & Material Co.
Job Name Westlake Landfill Client's Job No.
Job Location St. Charles Rock Road City Bridgeton State Mo.
Casing O.D. I.D. Sampler O.D. 2" I.D. 1-3/8"
Casing Hammer lbs. fall Sampler Hammer 140 lbs. 30" fall
W. D. Co. Foreman Gary Johanning Client's Inspector

Depth Below Ground Surface	Blows On Casing	Sample Number	Blows On Sampler	Penetration (ft Sampler (inches)	FIELD IDENTIFICATION OF SOIL (Include relative firmness, relative moisture, color, mention all soil constituents, etc.)	REMARKS
1'6"					Trash & white chat	Used 6" H.S. auger
7'0"					White chat 1" minus	
13'0"					Moist, yellowish-tan, medium stiff clay	
19'0"					Moist, brown, firm, silty-clay with traces of fine sand	
26'6"					Moist, gray, medium stiff, plastic clay with traces of rust stains	
32'0"					Moist to wet, brown, loose, fine sand with traces of gravel	
					Wet, gray, medium dense, fine sand	(Cont'd.)

SUBSURFACE EXPLORATION D A

by

WABASH DRILLING COMPANY

110 Angelica St. • St. Louis, Mo. 63147 • 421-2460

Date of Drilling:
Started 6-22-78
Finished 6-23-78

Boring No. 38
Coordinates Sheet 2 of 2
Surf. Elev.
Gr. Water Elev. --

Client Westlake Quarry & Material Co.

Job Name Westlake Landfill Client's Job No.

Job Location St.Charles Rock Road City Bridgeton State Mo.

Casing O.D. I.D. Sampler O.D. 2" I.D. 1-3/8

Casing Hammer lbs. fall Sampler Hammer 140 lbs. 30" fall

W. D. Co. Foreman Gary Johanning Client's Inspector

Depth Below Ground Surface	Blows On Casing	Sample Number	Blows On Sampler	Penetration Of Sampler (inches)	FIELD IDENTIFICATION OF SOIL (Include relative firmness, relative moisture, color, mention all soil constituents, etc.)	REMARKS
					Wet, gray, medium dense, fine sand	Set bottom of well point @ 50'0" and back filled with ½" minus rock.
50'0"					Total depth of boring 50'0"	

AUG 04 '93 08:38AM FVD STL

DRILLING LOG

McLaren Hart

SB/MW #: I-73
Log #:
Page 1 of 2
Geoscientist:

PROJECT: Westlake
PROJECT #: 11.0800556
LOCATION: Bridgeton, Missouri
TOC ELEVATION: 462.6
SAMPLING DATE(S): 6/22/78 6/23/78
START:
FINISH:
SAMPLING METHOD:
MONITORING DEVICE:
SUBCONTRACTOR/EQUIPMENT: /
DRILLING METHOD:
NOTES:

Depth Below Surface (ft.)	Sampler Interval/ Recovery	Sample ID #	PID reading (ppm)	Soil Description Color, Texture, Moisture, Etc.	Unified Classification	Graphic Log	Well Construction Details
				TRASH & white CHAT (FILL)			
2, 4, 6				CHAT; white, 1" minus			
8, 10, 12				CLAY; yellowish tan, med stiff, moist			
14, 16, 18				Silty CLAY; tr fine Sand, brown, firm, moist	CL ML		
20, 22, 24, 26				CLAY; gray, med stiff, tr rust stains, moist			
28, 30, 32, 34				SAND; brown, loose, fine, tr Gravel	SM GM		
36, 38, 40, 42, 44, 46, 48, 50				SAND; gray, med dense, fine, wet			
				See Following Page...			

SIGNATURE OF FIELD SUPERVISOR

Assistant Geoscientist
TITLE

SIGNATURE OF REVIEWER

Project Manager
TITLE

DRILLING LOG

McLaren Hart

SB/MW #: I-73
Log #:
Page 2 of 2
Geoscientist:

PROJECT: Westlake PROJECT #: 11.0800556

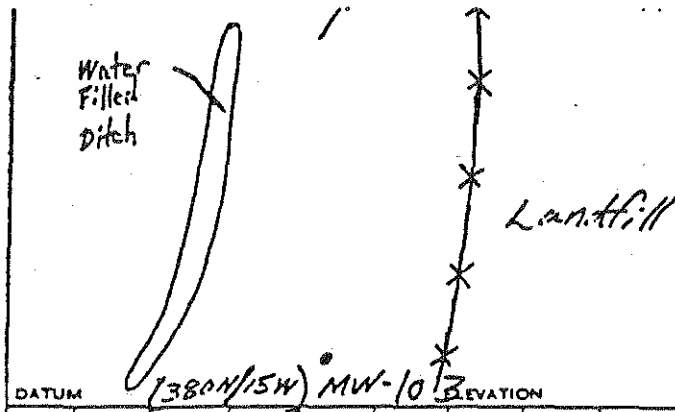
Depth Below Surface (ft.)	Sampler Interval/ Recovery	Sample ID #	PID reading (ppm)	Soil Description Color, Texture, Moisture, Etc.	Unified Classification	Graphic Log	Well Construction Details
50.0				Total depth = 50.0'			

SIGNATURE OF FIELD SUPERVISOR

Assistant Geoscientist
TITLE

SIGNATURE OF REVIEWER

Project Manager
TITLE



DRILLING METHOD: 3 3/4" Hollow Stem Augers	BORING NO. MW-103
	SHEET 1 of 2
SAMPLING METHOD: 3" I.D. Continuous Sampler	DRILLING START / FINISH
WATER LEVEL: 7'	TIME: 11:30
TIME	
DATE	DATE: 04/09 / DATE: 04/09
CASING DEPTH	

DATUM (380N/15W) MW-103 ELEVATION

SURFACE CONDITIONS: Grassy Topsoil

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	HNU (PPM)	DEPTH IN FEET	SOIL GRAPH	
CS	60"/48"		1/0'			0	ML	Dark brown, med stiff, slightly moist clay silt, high organic content
					0	1		
						2		
						3		
						4		Gray, med stiff, fine silt with traces of clay
						5		
CS	60"/20"		2/5'			6		
					0	7		Moist, gray, med stiff to stiff, fine silt w/ traces of sand
						8		
						9		
						10	SM	Very moist, gray, fine sand with silt, very soft and runny
CS	60"/42"		3/10'			1		
					0	2		
						3		
						4		
						5		
CS	36"/36"		4/15'			6		
					0	7		
						8		
						9		
						20		

Steel Prot. Casing 0

2' Dia. Pad. 2.7'

2.5'

Sand: WB-35
Well: 2" Dia PVC
Screen: #10 Slot Size PVC

4.5'

Bentonite Pellets

Sand

EOB-18'

10006354

(From top of PVC) 18.7'

LIFE 35

DATE 8/1/2 CHK'D BY

EOB 1 1/1 (REV 11-80)

MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION _____

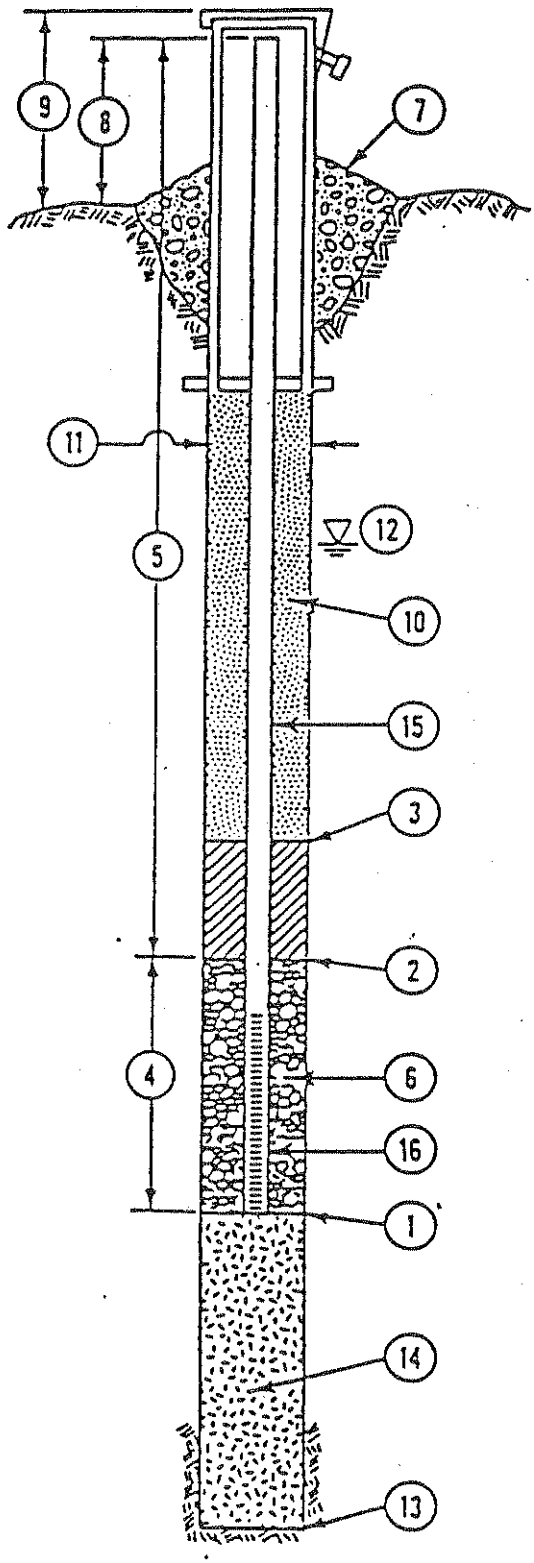
TOP OF WELL CASING ELEVATION 441.16

JOB NUMBER 19943-002

BORING NUMBER MW-103

DATE 04/09/90

LOCATION Earth City, MO



1. DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 15.7 FEET.*
2. DEPTH TO BOTTOM OF SEAL (IF INSTALLED) 4.5 FEET.* Bentonite Pellets
3. DEPTH TO TOP OF SEAL (IF INSTALLED) 2.5 FEET.*
4. LENGTH OF WELL SCREEN 10 FEET. SLOT SIZE 0.010.
5. TOTAL LENGTH OF PIPE 8.4 FEET AT 2 INCH DIAMETER.
6. TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE sand.
7. CONCRETE CAP. YES NO (CIRCLE ONE)
8. HEIGHT OF WELL CASING ABOVE GROUND 2.7 FEET.
9. PROTECTIVE CASING? YES NO (CIRCLE ONE) HEIGHT ABOVE GROUND 2.8 FEET. LOCKING CAP? YES NO (CIRCLE ONE)
10. TYPE OF UPPER BACKFILL cement slurry
11. BOREHOLE DIAMETER 8 INCHES.
12. DEPTH TO GROUND WATER 7 FEET.*
13. TOTAL DEPTH OF BOREHOLE 18 FEET.*
14. TYPE OF LOWER BACKFILL Natural sand + silt
15. PIPE MATERIAL PVC.
16. SCREEN MATERIAL PVC.

*(DEPTH FROM GROUND SURFACE)

10006362

MONITOR WELL INSTALLATION DETAILS

Dames & Moore

Landfill

Old St. Charles Rock Rd

culvert

MW104

ditch

(40N/15E)

DRILLING METHOD:	BORING NO.
3 3/4" ID Hollow Stem Auger	MW-104
	SHEET 1 of 1
SAMPLING METHOD: 3" ID Continuous Sampler 5' length	DRILLING START TIME 8:20 DATE 4-11-90 / FINISH TIME 9:00 DATE

WATER LEVEL	7'			
TIME				
DATE				
CASING DEPTH				

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS: Grassy Topsoil
CS	60/48		1/0-5			00		moist dark brown topsoil silt
						1		sandy silt
						2		Medium to light brown stiff fine silt
						3		
						4		Medium brown to grey silt w/ black and rust particles
CS	60/48		2/5-10			05		
						6		Medium brown stiff silty clay
						7		
						8		Medium brown fine silt w/ rust stains
						9		stiff medium brown stiff silt
CS	60/12		3/10-15			10		dark grey fine sand
						1		
						2		
						3		
						4		
CS	24/30		4/15-17			15		
						6		
						17	EOB 17'	
						8		
						9		
						0		

1CC06353

MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION _____

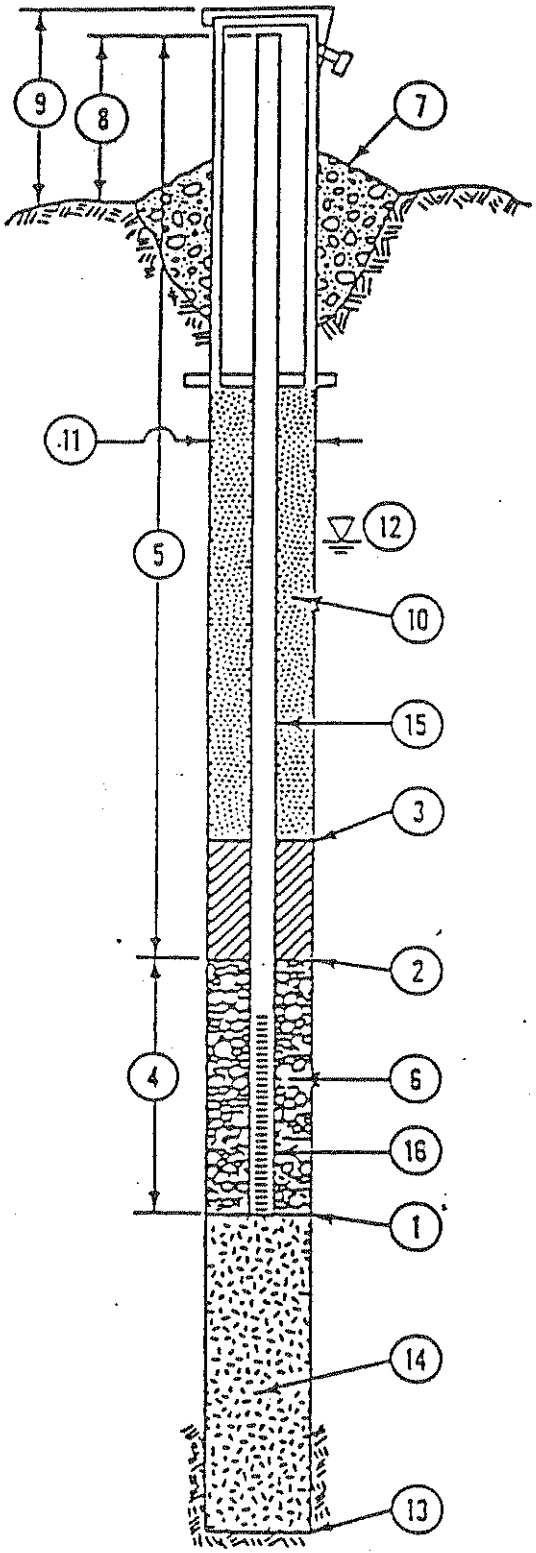
TOP OF WELL CASING ELEVATION 441.88

JOB NUMBER 19943-002

BORING NUMBER MW-104

DATE 4-11-90

LOCATION Earth City MO



1. DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 17 FEET.*
2. DEPTH TO BOTTOM OF SEAL (IF INSTALLED) 5 FEET.* Bentonite Pellets
3. DEPTH TO TOP OF SEAL (IF INSTALLED) 2.3 FEET.*
4. LENGTH OF WELL SCREEN 10 FEET. SLOT SIZE 0.010.
5. TOTAL LENGTH OF PIPE 9.9 FEET AT 2 INCH DIAMETER.
6. TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE SAND.
7. CONCRETE CAP. (YES) NO (CIRCLE ONE)
8. HEIGHT OF WELL CASING ABOVE GROUND 2.9 FEET.
9. PROTECTIVE CASING? (YES) NO (CIRCLE ONE) HEIGHT ABOVE GROUND _____ FEET. LOCKING CAP? (YES) NO (CIRCLE ONE)
10. TYPE OF UPPER BACKFILL Cement.
11. BOREHOLE DIAMETER 8 INCHES.
12. DEPTH TO GROUND WATER 7 FEET.*
13. TOTAL DEPTH OF BOREHOLE 17 FEET.*
14. TYPE OF LOWER BACKFILL N/A.
15. PIPE MATERIAL PVC.
16. SCREEN MATERIAL PVC.

*(DEPTH FROM GROUND SURFACE)

10006361

MONITOR WELL INSTALLATION DETAILS

Dames & Moore

RECORD OF DRILLHOLE PZ-205-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/17/95 - 5/19/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067483.54
AZIMUTH: 0

COLLAR ELEV: 459.5
E: 515477.78
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	0.0-49.0 ft. See Soil Borehole Log PZ-205-AS 49.0-54.0 ft. No samples collected														0.0-49.0 ft. Borehole advanced with 10.25 in. ID hollow stem augers 49.0-54.0 ft. Borehole advanced with 9 7/8 in. bit using mud rotary then 6 in. steel casing grouted into annulas with neat cement Bedrock encountered @ 48.5 ft.
50															
52															
54	405.50 54.00 54.0-67.5 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)		405.50 54.00												5/18/95 @ 8:15 Began coring
56				1	93%			56	J,PL,SM,Fe						
									J,PL,SM						
									J,ST,SM						
58								58	J,C,SM,Fe						
	400.50 59.00		400.10 59.40												5/18/95 @ 8:40 End of Run 1
									B,PL,SM						
60															
62	62.3-69.5 ft. Grain size is medium grained			2	89%				J,PL,SM (2)						
									J,PL,SM						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

RECORD OF DRILLHOLE PZ-205-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/17/95 - 5/19/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N. 1067483.54
AZIMUTH: 0

COLLAR ELEV: 459.5
E: 515477.78
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular; P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DISCONTINUITY DATA

DEPTH SCALE (Feet)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
64	54.0-67.5 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)				J,PL,R	
	65.0-75.9 ft. Scattered chert nodules				B,PL,SM (2)	
66	65.8-66.0 ft. Claystone layer				J,PL,SM,Fe	
			2	99%		
68	67.5-99.5 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained, weak, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic					5/18/95 @ 10:40 End of Run 2
		390.10			J,PL,R,Fe	
		69.40			J,PL,R	
70	69.8-75.9 ft. Very fine to microcrystalline zones of thinly laminated layers of clay within the limestone, color is medium light gray (N6)				J,PL,R (2)	
					J,I,R	
72			3	100 %		
					J,PL,R	
					J,I,R	
74						5/18/95 @ 11:45 End of Run 3 Ended drilling for the day due to bad weather. 5/19/95 @ 7:40 Began drilling
		385.00			J,I,R (3)	
		74.50			J,PL,R	
					J,PL,R,Fe	
76					J,PL,R	
	76.6-77.4 ft. Argillaceous layer					
			4	100 %	J,PL,R	
78					J,I,R	
	78.7-80.0 ft. Argillaceous zone, unfilled vugs (1-3 mm. in diameter)				J,PL,R	
					J,PL,R (2)	
80						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

RECORD OF DRILLHOLE PZ-205-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/17/95 - 5/19/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1087483.54
AZIMUTH: 0

COLLAR ELEV: 459.5
E: 515477.78
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	67.5-99.5 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained, weak, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic								J,PL,R (2)						
									J,PL,R						
82	81.8-86.4 ft. Argillaceous zone, unfilled vugs, (1-3 mm. in diameter)			4	100 %										
									J,PL,R						
84									J,PL,R						5/19/95 @ 9:15 End of Run 4
	84.5-86.4 ft. Color grades to light olive gray (5GY 6/1)		375.00 / 84.50						J,PL,R						
86									B,PL,SM						
									J,PL,SM						
									J,PL,SM						
									J,C,SM						
									J,PL,R						
88	88.6-93.8 ft. Argillaceous, vuggy, color is light olive gray (5GY 6/1)			5	100 %										
90															
92									B,PL,SM						
94															5/19/95 @ 10:40 End of Run 5
	94.5-97.5 ft. Argillaceous, color is light olive gray (5GY 6/1)		365.00 / 94.50	6	100 %				J,PL,SM						
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

RECORD OF DRILLHOLE PZ-205-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/17/95 - 5/19/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1087483.54
AZIMUTH: 0

COLLAR ELEV: 459.5
E: 515477.78
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD 80 60 40 20	FRACTURES PER FOOT 2 4 6 8 10	DISCONTINUITY DATA: DIP wrt CORE AXIS 0 30 60 90	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: FR SW MW HW CW	STRENGTH INDEX: R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 30 R2 150 R3 300 R4 600 R5 1500 R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	67.5-99.5 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained, weak, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic														
	97.5-99.5 ft. Thin clay laminae			6	100 %				J,I,R,Fe						
98									J,PL,SM,CL						
			360.00						J,I,R						5/19/95 @ 11:30 Finished drilling
	End of Record of Drillhole at 99.5 ft. 99.50		99.50												
100															
102															
104															
106															
108															
110															
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

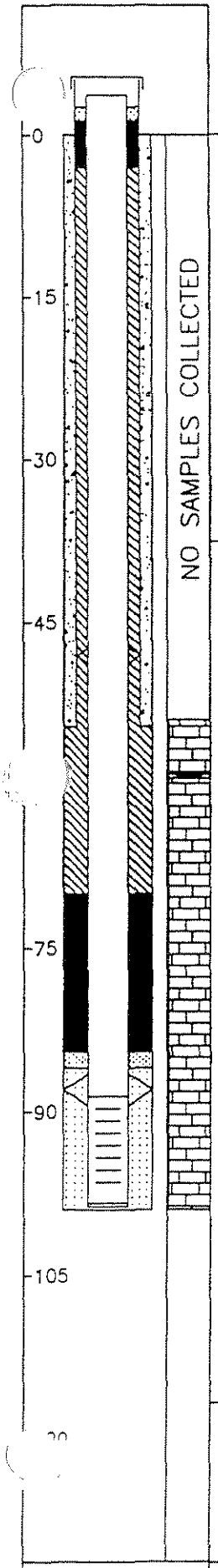
LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

Well No. PZ-205-SS

Boring No. X-Ref: PZ-205-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1067484 ft. Easting: 515478 ft.

Elevation Ground Level 459.5 ft. NGVD

Top of PVC Casing 461.78 ft. NGVD

Drilling Summary:

Total Depth 99.0 ft.

Borehole Diameter 9 3/4 in. (0.0-54.0 ft.) 5 7/8 in. (54.0-99.0 ft.)

Casing Stickup Height 1.66 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit and 9 3/4 in. Tricone Bit

Drilling Fluid Auger-None, NX Core Water, Air and Mud Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	5/18/95	8:15	5/19/95	11:30
Schramm Rotary	5/21/95	13:30	5/21/95	14:30
Geophys.Logging:				
Casing:				
2" PVC	5/21/95	14:25	5/21/95	14:30
6" Steel	5/11/95	7:30	5/11/95	11:00
Filter Placement:	5/21/95	14:40	5/21/95	15:15
Cementing:				
Development				
Bentonite Grout	5/21/95	15:20	5/21/95	15:35
Bentonite Seal	5/21/95	15:15	5/21/95	15:20

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.66	-	88.57	C1	461.78	-	370.96
88.57	-	98.37	S1	370.96	-	361.16
98.37	-	98.70	C2	361.16	-	360.83
+ 1.00	-	54.00	C3	460.50	-	405.53
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 86.0-99.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 84.5-86.0 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-70.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 70.0-84.5 ft.

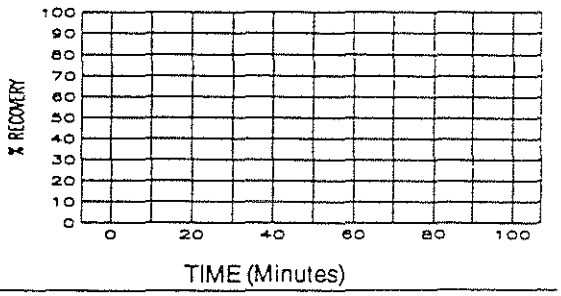
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Supervised by W. Herst

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ205SS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122506	CHECK NO.
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LAIDLAW BRIDGETON SANITARY LANDFILL	PZ-20555

SITE ADDRESS	CITY	STATE	ZIP CODE
ST. CHARLES ROCK RD.	BRIDGETON	MO	63044

NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-241-3710

ADDRESS	CITY	STATE	ZIP CODE
1838 N. BROADWAY	ST. LOUIS	MO	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

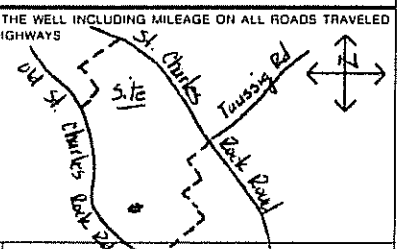
COUNTY ST. LOUIS
ELEVATION 454.5
AREA NO

SMALLEST ¼ LARGEST ¼

SEC. TWN. 47 N.RNG. 5 E OR W

LAT. 38 ° 45 ' 35 " LONG. 90 ° 36 ' 45 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
461.8

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☐ AIR ROTARY ☐ AUGER TYPE
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 4 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
5-21-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogt

PERMIT NUMBER	DATE
001256 VIM	6-02-95

SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogt

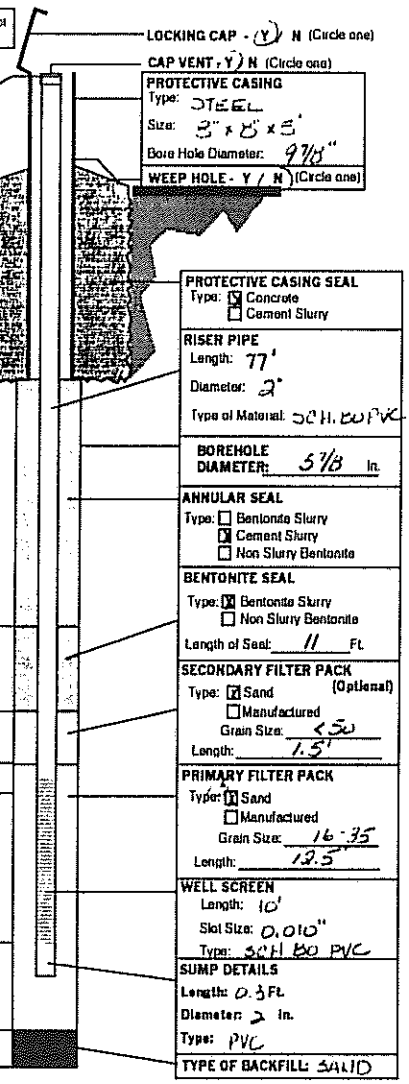
PERMIT NUMBER	DATE
001256 VIM	6-02-95

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation: 461.8

Ground Surface Elevation: 454.5

	Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column		
Depth to bottom of Protective Casing Seal:	3.0	
		50-85 Limestone
Depth to Base of Annular Seal:	60.0	
Depth to Base of Bentonite Seal:	71.0	
Depth to Base of Secondary Filter Pack:	72.5	
Depth to Top of the Screen:	74.7	
Depth to Bottom of the Screen:	84.7	
Plug Back Total Depth:		
Original Total Depth:	85.0	



LOCKING CAP - (Y) N (Circle one)
CAP VENT - (Y) N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 3" x 8' x 5'
Bore Hole Diameter: 9 7/8"
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 77'
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 5 7/8 in.

ANNULAR SEAL
Type: ☐ Bentonite Slurry ☒ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 11 Ft.

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: <50
Length: 1.5'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16-35
Length: 12.5'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH. 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 in.
Type: PVC

TYPE OF BACKFILL: SOLID

MO 780-1415 (2-94) DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2
DRILLING METHOD:	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger 3.625 inch Mud Rotary
SAMPLING METHOD:	CALIFORNIA SAMPLER: 2.0" I.D. (CA) SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)
BORING NO.	PZ-302-AI
SHEET	1 OF 2
DRILLING START TIME	8:15
DRILLING FINISH TIME	11:30
DRILLING START DATE	9/26/95
DRILLING FINISH DATE	9/26/95
WATER LEVEL / TIME / DATE / CASING DEPTH	
DATUM	NORTHING: 1067210.24 EASTING: 514720.49
ELEVATION	450.0
DRILL RIG	CME 750
ANGLE	90°
BEARING	NA
SAMPLE HAMMER	
SURFACE CONDITIONS	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16, 17, 18, 19, 20, 21					(0.0-22.0 ft.) No samples collected, see Soil Borehole Log PZ-302-AS for descriptions		
(428.0) 22.0							
22, 23	4 2 7 6	0.1' / 2.0' (5%)			(22.0-25.4 ft.) Loose, pale yellowish brown (10YR 6/2), f-m SAND with trace iron staining, NR, wet, (SP), (ALLUVIUM)	SP 1	
24, 25	3 2 3 10	1.2' / 2.0' (60%)				SP 2	0.0 ppm PID
26					(25.4-26.1 ft.) Compact, olive gray (5Y 4/1), f-m SAND, trace Silt, iron staining, NR, wet, (SP), (ALLUVIUM)		
27	10 7 9 14	1.6' / 2.0' (80%)			(26.1-37.4 ft.) Compact to dense, light olive gray (5Y 4/1), f-m SAND, NR, wet, (SP), (ALLUVIUM)	SP 3	
28, 29	8 8 12 10	1.0' / 2.0' (50%)				SP 4	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95

CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ302AI

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger; 3.625 inch Mud Rotary	BORING NO. PZ-302-AI
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: CALIFORNIA SAMPLER: 2.0" I.D. (CA) SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 2
		DRILLING START / FINISH
	WATER LEVEL / TIME / DATE / CASING DEPTH	TIME 8:15 / TIME 11:30
		DATE 9/26/95 / DATE 9/26/95
NORTHING: 1067210.24 DATUM EASTING: 514720.49 ELEVATION 450.0		
DRILL RIG CME 750	SURFACE CONDITIONS	
ANGLE 90° BEARING NA		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	8, 9, 10, 13	1.4'/2.0' (70%)			(26.1-37.4 Ft.) Compact to dense, light olive gray (5Y 4/1), f-m SAND, NR, wet, (SP), (ALLUVIUM)	SP 5	
32–33	11, 9, 10, 14	1.6'/2.0' (80%)				SP 6	
34–35	16, 18, 20, 24	1.1'/2.0' (55%)				CA 7	
36–37	7, 7, 10, 14	1.2'/2.0' (60%)				SP 8	
					(412.6) 37.4		
38–39	6, 11, 11, 12	1.3'/2.0' (65%)			(37.4-42.0 Ft.) Compact, olive gray (5Y 4/1), well graded SAND, NR, wet, (SW), (ALLUVIUM)	SP 9	
40–41	10, 14, 14, 12	1.3'/2.0' (65%)				SP 10	
					(408.0) 42.0		
42					End of Soil Borehole Log at 42.0 ft.		0.0 ppm PID
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

CHK'D BY B. TILTON

DATE 10/9/95

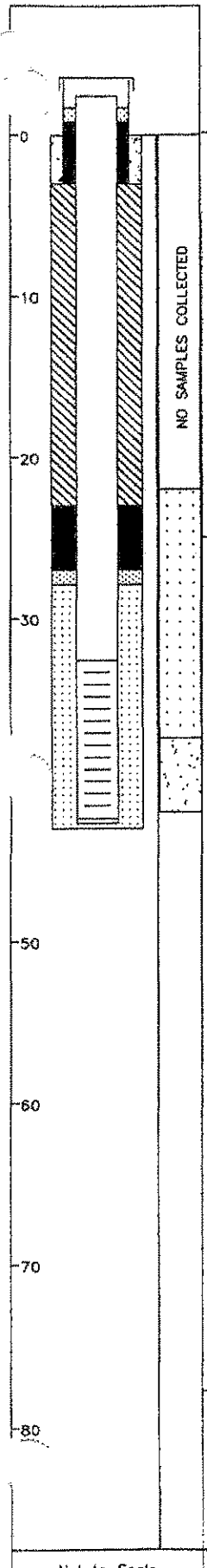
JOB NO.: 943-2848

FILENAME: PZ302AI

Well No. PZ-302-AI

Boring No. X-Ref: PZ-302-AI

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1067210 ft. Easting: 514720 ft.

Elevation Ground Level 450.0 ft. NGVD

Top of PVC Casing 451.15 ft. NGVD

Drilling Summary:

Total Depth 43.0 ft.

Borehole Diameter 8 1/4" (0.0-43.0')

Casing Stickup Height 1.15 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 750

Bit(s) 4 1/4" ID Hollow Stem Auger Bit, 3 5/8" Tricone Bit

Drilling Fluid Bentonite Drilling Mud (20.0-42.0')

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling CME 750	9/26/95	8:15	9/26/95	11:30
Geophys.Logging:				
Casing: 2" I.D. PVC	9/26/95	12:50	9/26/95	12:55
Filter Placement:	9/26/95	13:05	9/26/95	13:40
Cementing:				
Development				
Bentonite Grout	9/26/95	14:00	9/26/95	14:15
Bentonite Seal	9/26/95	13:40	9/26/95	13:50

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.15	-	32.60	C1	451.15	-	417.40
32.60	-	42.40	S1	417.40	-	407.60
42.40	-	42.70	C2	407.60	-	407.30

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings

C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 27.9-43.0'

Filter Pack: 100 mesh Silica Sand 27.0-27.9'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-23.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 23.0-27.0'

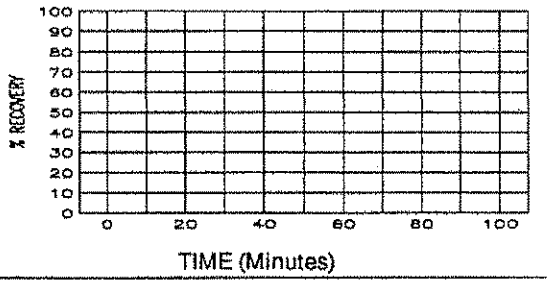
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Not to Scale

Supervised by B. Harrington

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ302AI

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145100	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-302AI

SITE ADDRESS: ST. CHARLES ROCK RD.
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044

OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710

OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT:
15' INSIDE FENCE LINE, 720' NORTHWEST OF SOUTH ENTRANCE OFF OLD ST. CHARLES ROCK RD.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 450.0
SMALLEST ¼ ___ ¼ ___ ¼ ___ ¼ LARGEST ¼
SEC. ___ TWN. 47 N, RNG. 5 (E) OR W
LAT. 38 · 45 · 52 · LONG. 90 · 26 · 54 ·

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO, INC.
PERMIT NUMBER: 001258 WPM

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO, INC.
PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ___

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T.

MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ___ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8 x 8 IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 43 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ___ | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ___ | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED: ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO

CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ___
DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED:

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ___
MATERIAL: ☐ STAINLESS STEEL ☐ OTHER ___

RISER PIPE DETAILS: LENGTH 34.2 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH 80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ___ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ___

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ___ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ___ % BENTONITE USED ___ WATER USED/BAG ___ GAL.

BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 4.0 | BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

PRIMARY FILTER PACK	TYPE ☒ SAND ☐ MANUFACTURED ☐ NATURAL	GRAIN SIZE 16-35	LENGTH OF FILTER PACK 15.1 FT.	METHOD OF INSTALLATION HSA POUR	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
SECONDARY FILTER PACK	TYPE ☒ SAND ☐ MANUFACTURED ☐ NONE	GRAIN SIZE 100	LENGTH OF FILTER PACK 0.9 FT.	METHOD OF INSTALLATION HSA POUR	Depth to bottom of Protective Casing Seal:	3.0	0-15 Silty clay
WELL SCREEN	LENGTH OF SCREEN 10 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH 80	MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal: 23.0	15-43 Silty sand
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP			MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ___	Depth to Base of Bentonite Seal: 27.0	
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED			LENGTH OF BACK FILLED BORE HOLE	Depth to Top of Primary Filter Pack: 27.4	
						Depth to Top of the Screen: 33.0	
						Depth to Bottom of the Screen: 43.0	
						Total Depth: 43.0	

STATIC WATER LEVEL: FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ___
ELEVATION OF MEASURING POINT: 451.15

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ___

DATE WELL DRILLING WAS COMPLETED: 9-26-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Lorman H. Mahurin Jr.	11-15-95	Lorman H. Mahurin Jr.	11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	PZ-302-AS
		SHEET 1 OF 2
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: CALIFORNIA SAMPLER: 2.0" I.D. (CA)	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

						START	FINISH
WATER LEVEL	18 FT.					TIME	TIME
TIME	14:00					11:45	14:35
DATE	9/25/95					DATE	DATE
CASING DEPTH	20 FT.					9/25/95	9/25/95

NORTHING: 1067197.73
DATUM EASTING: 514737.29 ELEVATION 449.5

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	5 7 5 5	1.6' / 2.0' (80%)			(0.0-1.5 ft.) Compact, dark yellowish orange (5YR 6/6), CLAYEY SILT, fine Gravel sized pebbles, (FILL)	SP ①	
					(1.5-15.0 ft.) Loose, olive gray (5Y 4/1), SILT, NR, dry to wet, some inter-mixed fill to 2.5 ft., (SM), (LOESS)		
2	4 5 5 6	1.5' / 2.0' (75%)				SP ②	
3					@ 3.5 ft., damp		
4		1.7' / 2.0' (85%)					0.0 ppm PID
5						ST ③	
6	1 1 1 2	1.9' / 2.0' (95%)			@ 6.7 ft, moist	SP ④	
7							
8	0 0 0 1	1.9' / 2.0' (95%)				SP ⑤	
9							
10	1 2 2 2	1.4' / 2.0' (70%)					0.0 ppm PID
11						SP ⑥	
					From 11.5-11.7 ft, wet From 11.7-13.1 ft, moist		
12	1 2 1 4	2.0' / 2.0' (100%)				SP ⑦	
13					From 13.1-13.6 ft, wet From 13.6-15.0 ft., moist		
14	4 5 6 3	1.2' / 2.0' (60%)				SP ⑧	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ302AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	PZ-302-AS
		SHEET 2 OF 2
	SAMPLING METHOD: CALIFORNIA SAMPLER: 2.0" I.D. (CA)	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	18 FT.				TIME	TIME
TIME	14:00				11:45	14:35
DATE	9/25/95				DATE	DATE
CASING DEPTH	20 FT.				9/25/95	9/25/95

NORTHING: 1067197.73
DATUM EASTING: 514737.29 ELEVATION 449.5

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(15.0-21.9 ft.) Loose, olive gray (5Y 4/1), medium SAND, NR, wet, (SP),(ALLUVIUM)	SP 8	
16	1 9 8 6	1.5' 2.0' (75%)				CA 9	
17							
18	1 3 5 9	2.0' 2.0' (100%)				SP 10	0.0 ppm PID
19					From 19.2-21.0 ft, trace to little Silt in Sand		
20	3 5 5 4	1.6' 2.0' (80%)				SP 11	
21					(21.9-24.0 ft.) Loose, dark yellowish brown (10YR 6/2), f-m SAND, little iron staining, NR, wet, (ALLUVIUM)		
22	0 0 1 2	2.0' 2.0' (100%)				SP 12	0.0 ppm PID
23					(-24.0) 24.0		
24					End of Soil Borehole Log at 24.0 ft.		
25							
26							
27							
28							
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

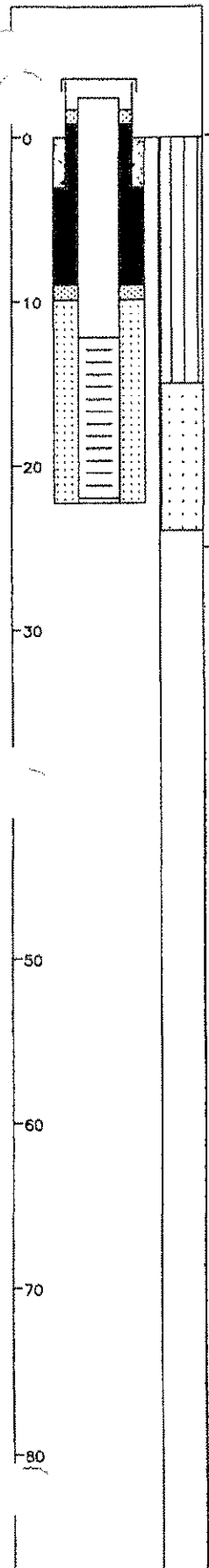
JOB NO.: 943-2848

FILENAME: PZ302AS

Well No. PZ-302-AS

Boring No. X-Ref: PZ-302-AS

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1067198 ft. Easting: 514737 ft.

Elevation Ground Level 449.5 ft. NGVD

Top of PVC Casing 451.42 ft. NGVD

Drilling Summary:

Total Depth 22.3 ft.

Borehole Diameter 8 1/4" (0.0-22.3')

Casing Stickup Height 1.92 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 750

Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	9/25/95	11:45	9/25/95	14:35
Geophys.Logging:				
Casing:				
2" I.D. PVC	9/25/95	14:55	9/25/95	15:00
Filter Placement:	9/25/95	15:00	9/25/95	15:40
Cementing:				
Development				
Bentonite Grout Bentonite Seal	9/25/95	15:40	9/25/95	15:60

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.92	-	12.20	C1	451.42	-	437.30
12.20	-	22.00	S1	437.30	-	427.50
22.00	-	22.30	C2	427.50	-	427.20

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings

C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 9.9-22.3'

Filter Pack: 100 mesh Silica Sand 9.0-9.9'

Grout Seal:

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 3.0-9.0'

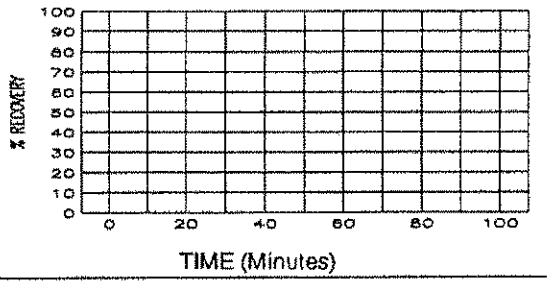
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Not to Scale

Supervised by B. Harrington

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ302AS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145099	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-302AS

SITE ADDRESS: ST. CHARLES ROCK RD.
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044

OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710

OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
20' INSIDE FENCE LINE, 700' NORTHWEST OF SOUTH ENTRANCE OFF OLD ST CHARLES ROCK RD.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 449.2
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 (E) OR W
LAT. 38 ° 45 ' 52 " LONG. 90 ° 26 ' 54 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO, INC.
PERMIT NUMBER: 001258 WPM

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ____ ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ONLY ☐ OTHER ____

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8x8 IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8 1/4 IN. 22.3 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____
DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____
MATERIAL: ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 14.2 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH 80 | DIAMETER OF DRILL HOLE 8 1/4 IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS
LENGTH OF SEAL 6.0
BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	12.4 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	0.9 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seal:	3.0	0-15 Silty clay
WELL SCREEN	LENGTH OF SCREEN 10 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH 80	MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal: 9.0	
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP		MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____	Depth to Base of Bentonite Seal: 9.0		
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED		LENGTH OF BACK FILLED BORE HOLE	Depth to Top of Primary Filter Pack: 9.9		
					Depth to Top of the Screen: 12.3		
					Depth to Bottom of the Screen: 22.3		15-22.3 Silty sand

STATIC WATER LEVEL ____ FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL ____
MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT 451.42
MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.
DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4 1/4 H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____
Total Depth: 22.3
DATE WELL DRILLING WAS COMPLETED 9-25-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Loman J. Mahurin Jr.	11-15-95	Loman J. Mahurin Jr.	11-15-95

MO 780-1415 (7-95)
DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION
RECYCLED PAPER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	BORING NO. PZ-303-AS
	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 1 OF 2
	WATER LEVEL / TIME / DATE / CASING DEPTH	DRILLING START TIME 16:45 DATE 10/4/95; FINISH TIME 8:45 DATE 10/5/95
DATUM NORTHING: 1067763.32 EASTING: 514425.53 ELEVATION 450.8		
DRILL RIG CME 750	SURFACE CONDITIONS	
ANGLE 90° BEARING NA		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	3 5 7 9	1.9' / 2.0' (95%)			(0.0-3.1 ft.) Compact, moderate yellowish brown (10YR 5/4), SILT, NR, dry, (ML), (FILL) (3.1-4.6 ft.) Compact, olive gray (5Y 4/1), SANDY SILT, NR, dry, (ML), (LOESS)	SP 1	
2 3	7 7 6 8	1.8' / 2.0' (90%)				SP 2	
4	2 3 5 5	1.8' / 2.0' (90%)			(446.2) 4.6 (4.6-7.4 ft.) Loose, olive gray (5Y 4/1), fine SAND, trace Silt, NR, damp, (SP), (ALLUVIUM)	SP 3	0.0 ppm PID
6 7	1 3 2 3	1.9' / 2.0' (95%)			(7.4-12.2 ft.) Loose, olive black, fine SAND, NR, moist, (SP), (ALLUVIUM)	SP 4	
8 9	1 1 6 6	1.7' / 2.0' (85%)				SP 5	Faint petroleum odor @ 7.4 ft.
10 11	2 2 2 2	1.2' / 2.0' (60%)				SP 6	0.1 ppm PID
12 13	3 6 7 8	1.8' / 2.0' (90%)			(12.2-26.0 ft.) Compact to dense, medium dark gray (N4), f-m SAND, NR, damp, (SP), (ALLUVIUM)	SP 7	Strong petroleum odor
14	6 5 9 10	1.8' / 2.0' (90%)				SP 8	0.9 ppm PID

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ303AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	PZ-303-AS
		SHEET 2 OF 2
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL / TIME / DATE / CASING DEPTH	TIME 16:45 / TIME 8:45
		DATE 10/4/95 / DATE 10/5/95

DATUM NORTHING: 1067763.32 EASTING: 514425.53 ELEVATION 450.8

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(12.2-26.0 ft.) Compact to dense, medium dark gray (N4), f-m SAND, NR, damp to wet, (SP), (ALLUVIUM)	SP 8	
16	5 3 4 12	1.8'/2.0' (90%)			from 15.3-15.6 ft., seam of olive black sandy SILT		
17					@ 17.0 ft., wet	SP 9	
					From 17.5-17.8 ft., seam of olive black SILT		
18	6 17 28 49	1.8'/2.0' (90%)					
19						SP 10	
20	11 19 13 10	2.0'/2.0' (100%)					6.6 ppm PID
21						SP 11	
22	3 5 10 11	1.9'/2.0' (95%)					Petroleum sheen in Split Spoon
23						SP 12	
24	3 16 26 39	2.0'/2.0' (100%)					3.7 ppm PID
25						SP 13	
26					(424.8) 26.0		
					End of Soil Borehole Log at 26.0 ft.		
27							
28							
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

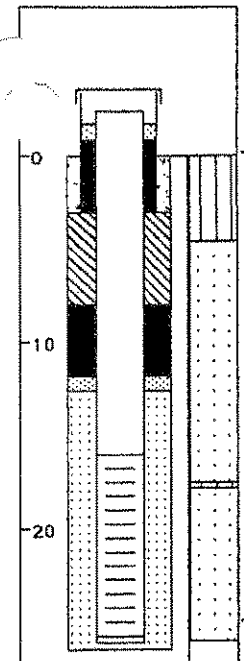
JOB NO.: 943-2848

FILENAME: PZ303AS

Well No. PZ-303-AS

Boring No. X-Ref: PZ-303-AS

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1067763 ft. Easting: 514426 ft.

Elevation Ground Level 450.8 ft. NGVD

Top of PVC Casing 453.18 ft. NGVD

Drilling Summary:

Total Depth 26.5 ft.

Borehole Diameter 8 1/4" (0.0-26.5')

Casing Stickup Height 2.38 ft.

Driller Layne-Western St. Louis, MO

Rig CME 750

Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	10/4/95	16:45	10/5/95	8:45
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/5/95	9:00	10/5/95	9:05
Filter Placement:	10/5/95	9:05	10/5/95	9:55
Cementing:				
Development				
Bentonite Grout	10/5/95	10:15	10/5/95	10:20
Bentonite Seal	10/5/95	9:55	10/5/95	10:05

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.38	-	16.00	C1	453.18	-	434.80
16.00	-	25.80	S1	434.80	-	425.00
25.80	-	26.10	C2	425.00	-	424.70
	-				-	
	-				-	
	-				-	

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings

C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 12.6-26.5'

Filter Pack: Less than 50 mesh Silica Sand 11.8-12.6'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-8.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 8.0-11.8'

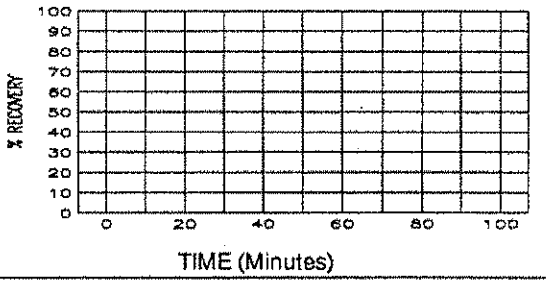
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Not to Scale

Supervised by B. Harrington

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ303AS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145101	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-303AS

SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: Mo
ZIP CODE: 63044

OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710

OWNER ADDRESS: 1839 N. BROADWAY
CITY: ST. LOUIS
STATE: Mo
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
AT FENCE LINE, 360' NORTH OF SOUTHWEST FENCE CORNER

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY:
SURFACE ELEVATION: 450.8
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N.RNG. 5 (E OR W)
LAT. 38 ° 45 ' 58 " LONG. 90 ° 26 ' 58 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO, INC.
PERMIT NUMBER: 00125B WPM

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 00125B WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T.

MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5.0 FT. | DIAMETER OF CASING 8x8 IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 26.5 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO

CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER
DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3.0 FT.

TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT
MATERIAL: ☐ STAINLESS STEEL ☐ OTHER

RISER PIPE DETAILS: LENGTH 18.9 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH 80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.

BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 3.8 | BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

PRIMARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NATURAL | GRAIN SIZE 16-35 | LENGTH OF FILTER PACK 13.9 FT. | METHOD OF INSTALLATION H.S.A. POUR

SECONDARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NONE | GRAIN SIZE <50 | LENGTH OF FILTER PACK 0.8 FT. | METHOD OF INSTALLATION H.S.A. POUR

WELL SCREEN: LENGTH OF SCREEN 10 FT. | DIAMETER 2 IN. | SLOT SIZE 10 | WEIGHT OR SDR # SCH 80 | MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER

SUMP DETAILS: LENGTH OF SUMP | DIAMETER OF SUMP | MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER

BACK FILL: WAS THE WELL BACK FILLED? ☐ YES ☒ NO | MATERIAL USED | LENGTH OF BACK FILLED BORE HOLE

Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
		0-4.5 Silty clay
Depth to bottom of Protective Casing Seal:	3.0	
		4.5-26.5 Silty sand
Depth to Base of Annular Seal:	8.0	
Depth to Base of Bentonite Seal:	11.8	
Depth to Top of Primary Filter Pack:	12.6	
Depth to Top of the Screen:	16.5	
Depth to Bottom of the Screen:	26.5	
Total Depth:	26.5	
DATE WELL DRILLING WAS COMPLETED	10-05-95	

STATIC WATER LEVEL FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS ☒ TOP OF RISER PIPE ☐ OTHER
ELEVATION OF MEASURING POINT 453.18

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Tomas J. Mahurin M.	11-15-95	Tomas J. Mahurin M.	11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger 3.625 inch Mud Rotary	PZ-304-AI
	SAMPLING METHOD:	SHEET 1 OF 3
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING START / FINISH

					START TIME	FINISH TIME
WATER LEVEL	18.5 FT.				8:00	14:15
TIME	16:00					
DATE	10/2/95				DATE 10/2/95	DATE 10/2/95
CASING DEPTH	40.0 FT.					

DATUM NORTHING: 1068125.91 EASTING: 514434.70 ELEVATION 451.6

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16					(0.0-28.0 ft.) No samples collected, see Soil Borehole Log PZ-304-AS for descriptions		
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28 (423.6)					28.0		
29	12 15 14 12	1.6' 2.0' (80%)			(28.0-39.3 ft.) Compact, light olive gray (5Y 5/2), well graded, SAND, NR, wet, (SW), (ALLUVIUM)	SP 1	0.0 ppm PID

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ304AI

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	PZ-304-AI
	3.625 inch Mud Rotary	SHEET 2 OF 3
	SAMPLING METHOD:	
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL: 18.5 FT.	TIME: 8:00 / TIME: 14:15
	TIME: 16:00	
	DATE: 10/2/95	DATE: 10/2/95 / DATE: 10/2/95
	CASING DEPTH: 40.0 FT.	

DATUM NORTHING: 1068125.91 EASTING: 514434.70 ELEVATION 451.6

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	8 11 12 13	1.0'/2.0' (50%)			(28.0-39.3 ft.) Compact, light olive gray (5Y 5/2), well graded, SAND, NR, wet, (SW), (ALLUVIUM)	SP 2	
32–33	8 15 15 12	1.1'/2.0' (55%)				SP 3	
34–35	5 8 4 3	1.2'/2.0' (60%)				SP 4	0.0 ppm PID
36–37	11 6 6 7 8	2.0'/2.0' (100%)			from 35.6-35.8 ft., Lignite coal partical	SP 5	
38–39	9 9 17 16	1.3'/2.0' (65%)			(412.3) 39.3	SP 6	
40–41	10 18 28 27	1.8'/2.0' (90%)			(39.3-46.0 ft.) Compact to dense, olive gray (5Y 4/1), f-m SAND, NR, wet, (SP), (ALLUVIUM)	SP 7	0.0 ppm PID
42–43	7 11 12 14	1.4'/2.0' (70%)			from 43.0-43.5 ft., seam of compact, olive gray (5Y 4/1), well graded SAND	SP 8	
44	15 17 10 14	0.7'/2.0' (35%)				SP 9	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ304AI

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger 3.625 inch Mud Rotary	PZ-304-AJ
	SAMPLING METHOD:	SHEET 3 OF 3
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING START / FINISH

					START TIME	FINISH TIME
WATER LEVEL	18.5 FT.				8:00	14:15
TIME	16:00					
DATE	10/2/95				DATE 10/2/95	DATE 10/2/95
CASING DEPTH	40.0 FT.					

DATUM NORTHING: 1068125.91 EASTING: 514434.70 ELEVATION 451.6

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(39.3-46.0 ft.) Compact to dense, olive gray (5Y 4/1), f-m SAND, NR, wet, (SP), (ALLUVIUM) (405.6) 46.0	SP 9	0.0 ppm PID
46	3 3 6 6	1.2'/2.0' (60%)			(46.0-48.4 ft.) Loose, olive gray (5Y 4/1), well graded SAND, some fine Gravel, NR, wet, (SW), (ALLUVIUM)	SP 10	
47							
48	9 12 17 15	1.3'/2.0' (65%)			(403.2) 48.4		
49					(48.4-50.0 ft.) Compact, olive gray (5Y 4/1), f-m SAND, trace coarse Sand and fine Gravel, NR, wet, (SP), (ALLUVIUM) (401.6) 50.0	SP 11	
50					End of Soil Borehole Log at 50.0 ft.		0.0 ppm PID
51							
52							
53							
54							
55							
56							
57							
58							
59							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

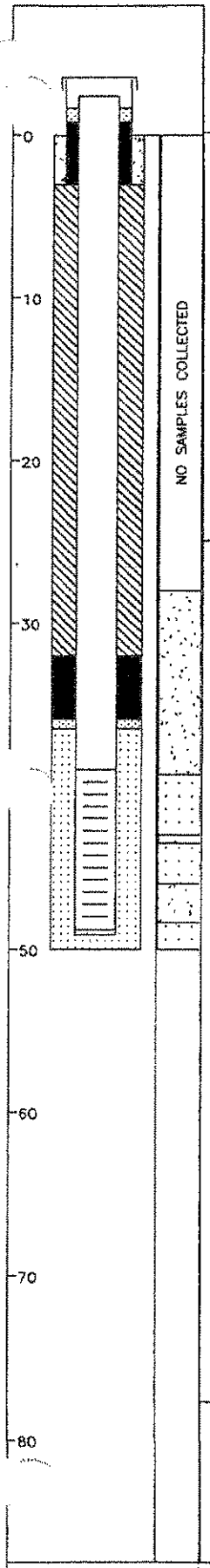
JOB NO.: 943-2848

FILENAME: PZ304AJ

Well No. PZ-304-AI

Boring No. X-Ref: PZ-304-AI

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1068126 ft. Easting: 514435 ft.

Elevation Ground Level 451.6 ft. NGVD

Top of PVC Casing 454.02 ft. NGVD

Drilling Summary:

Total Depth 50.0 ft.

Borehole Diameter 8 1/4" (0.0-50.0')

Casing Stickup Height 2.42 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 4 1/4" ID Hollow Stem Auger Bit; 3/8" Tricone Bit

Drilling Fluid Bentonite Drilling Mud (23.0-50.0')

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	10/2/95	8:00	10/2/95	14:15
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/2/95	14:20	10/2/95	14:25
Filter Placement:	10/2/95	14:25	10/2/95	15:10
Cementing:				
Development				
Bentonite Grout	10/2/95	15:45	10/2/95	16:45
Bentonite Seal	10/2/95	15:15	10/2/95	15:20

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.42	-	39.00	C1	454.02	-	412.60
39.00	-	48.80	S1	412.60	-	402.80
48.80	-	49.10	C2	402.80	-	402.50

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings

C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 36.5-50.0'

Filter Pack: 100 mesh Silica Sand 35.9-36.5'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-32.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 32.0-35.9'

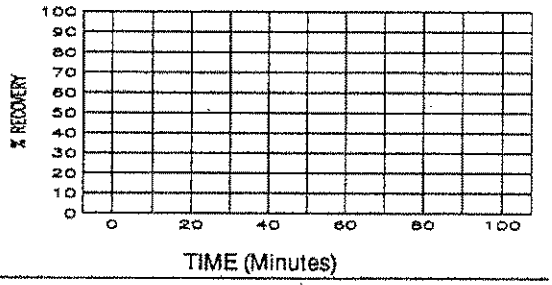
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Not to Scale

Supervised by B. Harrington

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ304AI

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145103	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-304AI

SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044

OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710

OWNER ADDRESS: 1538 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT:
AT WEST FENCE LINE, 720' NORTH OF SOUTHWEST FENCE CORNER.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 451.6
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 (E OR W)
LAT. 38. 46. 01. LONG. 40. 26. 58.

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ____ ☐ L.U.S.T.

MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 3x8 IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 50 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED: ☒ YES ☐ NO
WEEP HOLE?: ☒ YES ☐ NO

CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____ | DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT. | TYPE OF SURFACE COMPLETION ☒ ABOVE GROUND ☐ FLUSH MOUNT

DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED:

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____ | MATERIAL ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 42.4 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH 80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ | ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.

BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 3.9 | BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

PRIMARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NATURAL | GRAIN SIZE 16-35 | LENGTH OF FILTER PACK 13.5 FT. | METHOD OF INSTALLATION H.S.A. POUR

SECONDARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NONE | GRAIN SIZE 100 | LENGTH OF FILTER PACK 0.6 FT. | METHOD OF INSTALLATION H.S.A. POUR

WELL SCREEN: LENGTH OF SCREEN 10 FT. | DIAMETER 2 IN. | SLOT SIZE 10 | WEIGHT OR SDR # SCH 80 | MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER

SUMP DETAILS: LENGTH OF SUMP | DIAMETER OF SUMP | MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

BACK FILL: WAS THE WELL BACK FILLED? ☐ YES ☒ NO | MATERIAL USED | LENGTH OF BACK FILLED BORE HOLE

Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
Depth to bottom of Protective Casing Seal:	3.0	0-15 Gray silty clay
Depth to Base of Annular Seal:	32.0	15-18 Silty sand 18-28 Sand & gravel
Depth to Base of Bentonite Seal:	35.9	28-50 Sand
Depth to Top of Primary Filter Pack:	36.5	
Depth to Top of the Screen:	40.0	
Depth to Bottom of the Screen:	50.0	
Total Depth:	50.0	

STATIC WATER LEVEL FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT: 454.02

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

DATE WELL DRILLING WAS COMPLETED: 10-02-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #: Lorman D. Malurich Jr. | DATE 11-15-95
SIGNATURE DRILLER/PERMIT #: Lorman D. Malurich Jr. | DATE 11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	LAIDLAW/OU2 RI-FS/MQ WEST LAKE LANDFILL OPERABLE UNIT 2
DRILLING METHOD:	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger
SAMPLING METHOD:	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)
BORING NO.	PZ-304-AS
SHEET	1 OF 2
DRILLING START TIME	10:10
DRILLING FINISH TIME	12:10
DRILLING START DATE	9/27/95
DRILLING FINISH DATE	9/27/95
WATER LEVEL / TIME / DATE / CASING DEPTH	
DATUM	NORTHING: 1068146.47 EASTING: 514434.57
ELEVATION	451.4
DRILL RIG	CME 750
ANGLE	90°
BEARING	NA
SAMPLE HAMMER	
SURFACE CONDITIONS	

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	4 4 4 7	1.8' 2.0' (90%)	(0.0-3.7 ft.) Loose, moderate yellowish brown (10YR 5/4), SILT, NR, dry, (ML), (FILL) @ 0.6 ft, damp	SP 1	
2	6 8 7 8	1.5' 2.0' (75%)	(3.7-6.8 ft.) Compact, olive gray (5Y 4/1), SILT, NR, damp, (ML), (LOESS) @ 6.0 ft, trace organic material	SP 2	
4	3 4 5 6	1.7' 2.0' (85%)		SP 3	
6	2 3 4 4	1.6' 2.0' (80%)	(6.8-10.4 ft.) Loose, olive gray (5Y 4/1), fine SANDY SILT, NR, damp, (ML), (LOESS)	SP 4	0.0 ppm PID
8	2 1 2 2	1.2' 2.0' (60%)	@ 8.4 ft, moist	SP 5	
10	1 3 5 5	1.7' 2.0' (85%)	(10.4-13.0 ft.) Loose, olive gray (5Y 4/1), SILT, NR, damp, (ML), (LOESS)	SP 6	
12	1 2 4 11	1.6' 2.0' (80%)	(438.4) 13.0	SP 7	0.0 ppm PID
13			(13.0-14.2 ft.) Loose, olive gray (5Y 4/1), SILTY fine SAND, NR, moist, (SM), (ALLUVIUM) (437.2) 14.2		
14	5 7 10 20	1.7' 2.0' (85%)	(14.2-27.1 ft.) Compact to dense, light olive gray (5Y 6/1), fine SAND, NR, damp, (SP), (ALLUVIUM)	SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ304AS

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	PZ-304-AS
		SHEET 2 OF 2
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					10:10	12:10
DATE					DATE	DATE
CASING DEPTH					9/27/95	9/27/95

DATUM NORTHING: 1068146.47 EASTING: 514434.57 ELEVATION 451.4

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(14.2-27.1 ft.) Compact to dense, light olive gray (5Y 6/1), fine SAND, NR, damp, (SP), (ALLUVIUM)		
16	9 15 17 11	1.4'/2.0' (70%)				SP 8	
17						SP 9	
18	5 6 14 24	1.8'/2.0' (90%)			@ 17.7 ft, moist @ 18.0 ft, wet	SP 10	0.0 ppm PID Slight organic odor
19							
20	2 15 18 14	1.7'/2.0' (85%)				SP 11	
21							
22	3 5 8 14	0.7'/2.0' (35%)				SP 12	0.1 ppm PID
23							
24	3 5 14 15	1.6'/2.0' (80%)				SP 13	
25							
26	5 11 12 13	1.2'/2.0' (60%)				SP 14	0.0 ppm PID
27					(27.1-28.0 ft.) Compact, olive gray (5Y 4/1), f-m SAND, NR, wet, (SP), (ALLUVIUM) (423.4) 28.0		
28					End of Soil Borehole Log at 28.0 ft.		
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

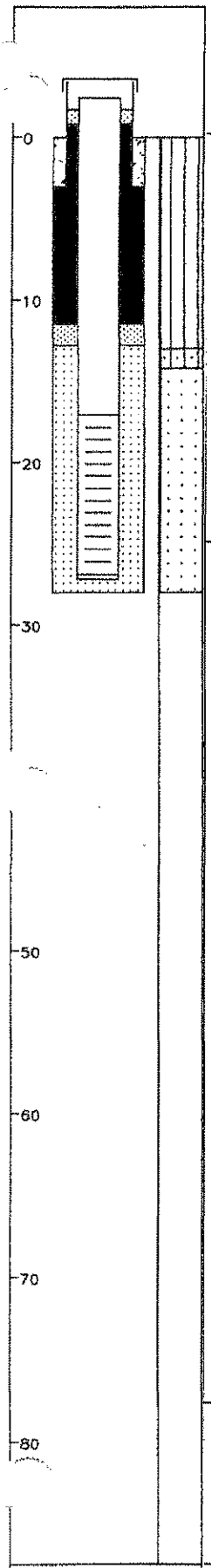
JOB NO.: 943-2848

FILENAME: PZ304AS

Well No. PZ-304-AS

Boring No. X-Ref: PZ-304-AS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1068146 ft. Easting: 514435 ft.

Elevation Ground Level 451.4 ft. NGVD

Top of PVC Casing 453.71 ft. NGVD

Drilling Summary:

Total Depth 28.0 ft.

Borehole Diameter 8 1/4" (0.0-28.0')

Casing Stickup Height 2.31 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 750

Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	9/27/95	10:10	9/27/95	12:10
Geophys.Logging:				
Casing:				
2" I.D. PVC	9/27/95	13:40	9/27/95	13:45
Filter Placement:	9/27/95	13:45	9/27/95	14:30
Cementing:				
Development				
Bentonite Grout				
Bentonite Seal	9/27/95	14:30	9/27/95	14:45

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.31	-	17.10	C1	453.71	-	434.30
17.10	-	26.90	S1	434.30	-	424.50
26.90	-	27.20	C2	424.50	-	424.20

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings

C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 12.8-28.0'

Filter Pack: 100 mesh Silica Sand 11.5-12.8'

Grout Seal:

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 3.0-11.5'

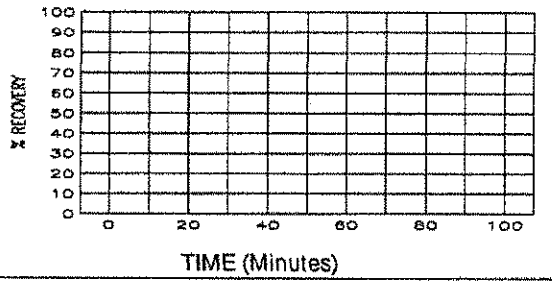
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by B. Harrington

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ304AS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145102	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-304AS

SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044

OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710

OWNER ADDRESS: 1936 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
AT WEST FENCE LINE, 740' NORTH OF SOUTHWEST FENCE CORNER

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 451.4
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 E OR W
LAT. 38° 46' 01" LONG. 90° 26' 58"

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T. ____

MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8x8 IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 28 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO

CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____
DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3.0 FT.

TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____
MATERIAL: ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 20.3 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH 80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.

BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☒ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 8.5 | BENTONITE SEAL INSTALLED IN ☒ UNSATURATED ZONE ☐ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	15.2 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	1.3 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seal:	3.0	0-13 Silt
WELL SCREEN	LENGTH OF SCREEN 10 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH80	MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	11.5
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP		MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____	Depth to Base of Bentonite Seal:	11.5	
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED	LENGTH OF BACK FILLED BORE HOLE		Depth to Top of Primary Filter Pack:	12.8	
					Depth to Top of the Screen:	18.0	13-28 Sand
					Depth to Bottom of the Screen:	28.0	
					Total Depth:	28.0	

STATIC WATER LEVEL: ____ FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL: ____
MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT: 453.71

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

DATE WELL DRILLING WAS COMPLETED: 9-27-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Lonnie H. Mahurin Jr.	11-15-95	Lonnie H. Mahurin Jr.	11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

Drilling Log

Project Name: WESTLAKE			Boring No. S-82
Project No. 84-075-4-002			Page 1 of 2
Ground Elevation 447.7	Location: NW Central Section of Site; Fig I-2		Total Footage 26.5'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. Core Boxes	Depth To Water	Date Measured
SEE REMARKS	SEE REMARKS	26.5'	0	5	0	SEE REMARKS	–

Drilling Co.	WABASH DRILLING CO.	Driller (s)	DORL THORNTON
Drilling Rig.	ACKER MP-5, TRUCK	Type of Penetration Test	STANDARD
Date	8-24-84 To 8-27-84	Field Observer (s)	GLEN ERNSTMANN

Depth	Description	Class.	Blow Count	Recov.		Sample or Box No.	Remarks
1	BROWN SANDY CLAY, SOME GRAVEL, MEDIUM PLASTICITY, STIFF TO VERY STIFF, DAMP TO MOIST (FILL)						5" SOLID AUGERS 0' TO 20'.
2							
3							
4							
5					5.0		
			5/4/8	14"/18"		SS-1	
6					6.5		
7							
8							
9	BROWN FINE SANDY SILT, LOW TO NON-PLASTIC, STIFF, MOIST TO SATURATED						SATURATED MATERIAL ENCOUNTERED @ 11' TO 13'. UNSATURATED 13' TO 17'.
10					10.5		
			2/3/3	17"/18"		SS-2	
11					11.5		
12							
13	LIGHT BROWN FINE TO MEDIUM SAND, DAMP						

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. S-82
Project Name WESTLAKE
Page 2 of 2
Project No. 84-075-4-002
Date 8-27-84

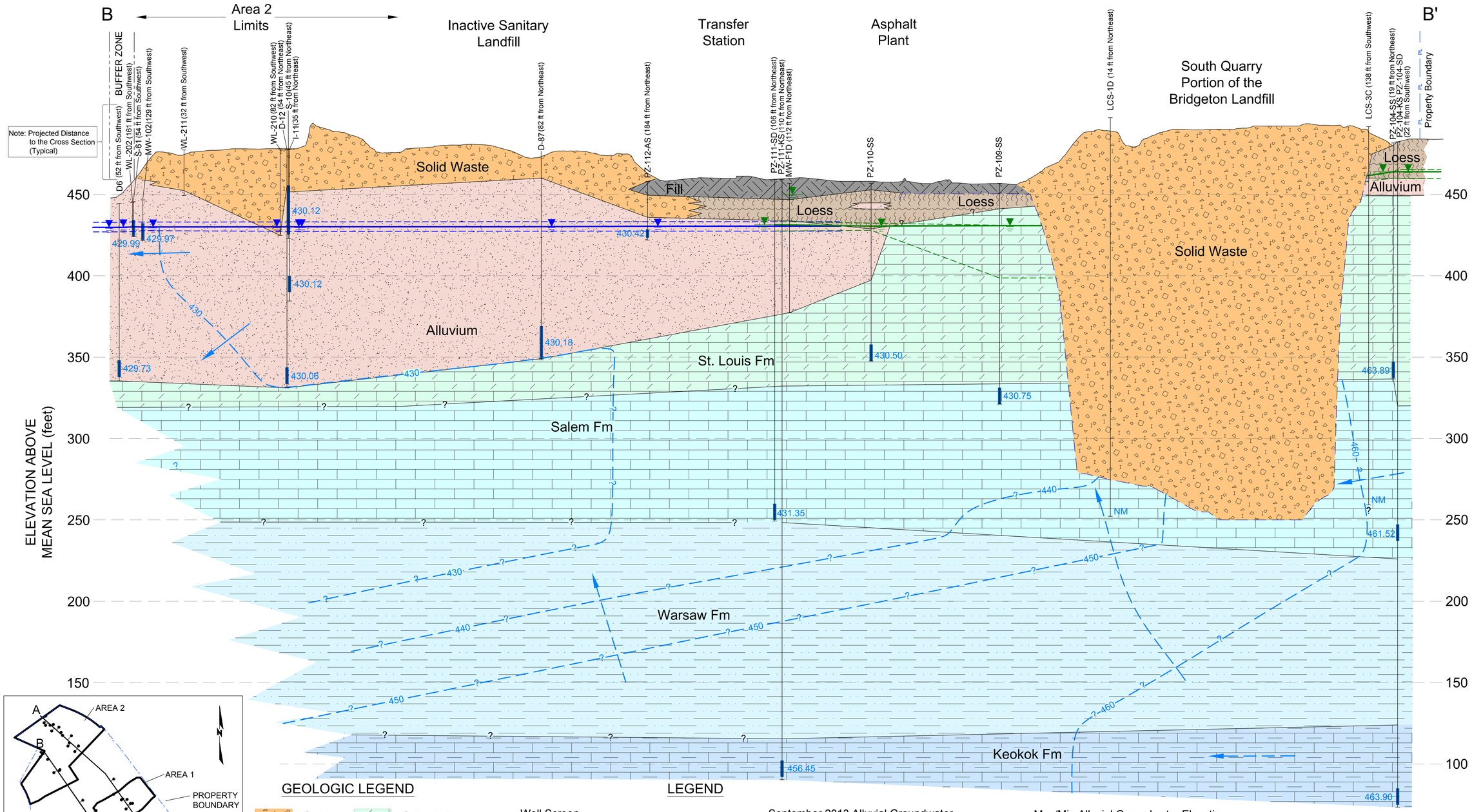
Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
	LIGHT BROWN FINE TO MEDIUM SAND, DAMP						
15					15.0		
	BROWN SILTY CLAY, MEDIUM PLASTICITY, VERY STIFF, MOIST		3/7/13	16"/18"		SS-3	
16					16.5		
17							SATURATED MATERIAL BELOW APPROX. 17' TO 18'.
	BROWN-GRAY SILTY FINE TO MEDIUM SAND, MEDIUM DENSITY, SATURATED						
18							
19							CASING WAS DRIVEN TO 20' & HOLE WAS WASH-BORED FROM 20' TO 25'.
20					20.0		
			4/7/12	15"/18"		SS-4	
21							
					21.5		STOPPED 8-24-84
22							RESUMED 8-27-84
							NOTE: HOLE HAS COLLAPSED TO 13.3' BELOW G.S. OVER THE WEEKEND.
23							
	GRAY-BROWN COARSE SAND, SOME FINE TO MEDIUM SAND, MEDIUM DENSITY, SATURATED						
24	PRIMARILY QUARTZ, SOME CHERT FRAGMENTS AND MAFIC MINERALS						
25					25.0		A 2" dia. PVC piezometer was installed to 25.5' PVC is flush-jointed, threaded couplings.
			7/14/29	17"/18"		SS-5a	
26							
	GRAY, SILTY FINE TO MED. SAND, SATURATED				26.5	SS-5b	Bottom 10' is .010" machine slotted screen.
27	TOTAL DEPTH 26.5'						Bottom 12.5' is gravel packed with a 2' thick bentonite pellet seal above.
28							Anulus is grouted from seal to surface.
29							T.O.P. is 3.0' above ground surface.
30							WATER LEVEL IS 18.2' BELOW T.O.P. IMMEDIATELY AFTER PIEZOMETER INSTALLATION 1:45 pm 8-27-84.

Burns & McDonnell
Engineers-Architects-Consultants

Form TS-GT-2-2

APPENDIX C

Geologic Cross Sections



Notes: These cross-sections were developed to display groundwater conditions beneath the site.
Please see the cross-sections in Appendix M for detailed portrayals of the RIM occurrences in Areas 1 and 2.
Ground surface from Aerial Topography provided by Cooper Aerial Surveys Co. and is dated December 2, 2016

Figure 5-14

Cross Section B-B'

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-5\Fig-5-13_5-14-Xsections.dwg 1/22/18

APPENDIX D

PERMANENT PERIMETER LFG MONITORING WELL SPECIFICATIONS

1.0 DRILLING

1.1 Nominal Boring Diameter

In all cases where the diameter of the well pipe will be 2.0 inches, the minimum nominal borehole diameter of borings advanced through soil materials will be 8.0 inches in order to help ensure that the minimum width of the annulus around the well pipe will be 2 inches.

1.2 Drilling Methods

Borings should be advanced with either hollow stem auger or sonic drilling methodologies. If a different drilling method is proposed, an amendment will be submitted prior to mobilization. Drilling methods shall facilitate extraction of drill cores (ASTM D1586, Standard Method for Standard Penetration Test (SPT) and Split-Barrel Sampling Soils or Sonic drilling continuous soil cores) for physical examination and classification of soils relative to gas transmission potential.

1.3 Cuttings

Drilling will be performed in a manner that minimizes the spreading of soil cuttings. Disposition of cuttings upon project completion will be the responsibility of Bridgeton Landfill, LLC or the Bridgeton Landfill LLC's designated representative. Any waste materials will be collected and disposed of at permitted solid waste landfill that has approved acceptance of this waste in conformance with its permit. Currently, Bridgeton Landfill, LLC has a special waste certification to disposal of drill cuttings at the permitted Roxana Landfill.

2.0 SOIL SAMPLING

2.1 Drill Cores

During borehole drilling, the driller will attempt to retrieve continuous drill cores for physical observation. If any drilling interval is interrupted and a continuous core not retrieved, such intervals shall be noted in drilling logs including interpretation of probable stratigraphy based on core samples above and below the interrupted interval in accordance with Section 6.3 of the RD QAPP.

Soil will be classified are based on ASTM D2487 (Unified Soil Classification System [USCS]) and ASTM D2488 (visual-manual procedure). The apparent color of soil will vary with changes in lighting conditions (e.g., overcast skies versus clear skies). The color chart should be used to calibrate one's eyes to changing light conditions.

The depth to water, with respect to the ground surface, and time of measurement should be recorded in the borehole logs. At a minimum, water level measurements should be taken at the beginning (before drilling resumes) and end of each drilling shift. Borehole logs should note instances where groundwater level measurements were attempted but no groundwater was detected. Water level measurements should also be taken when water or drilling fluid has been added to the borehole, and these readings should be identified as such in the borehole logs.

2.2 Sample Disposition

Disposition of sample material upon completion of the project will be the responsibility of the Owner/Operator or the Owner/Operator's designated representative.

3.0 GAS WELL CONSTRUCTION

Per Section 11.3 of the RD QAPP, the perimeter landfill gas monitoring wells will consist of the following materials, supplies and consumables as shown on Figure 1.

3.1 Gas Well Pipe and Screen

Each monitoring well will be constructed of pre-cleaned Schedule 40 PVC pipe having an inner diameter of 2.0 inch (minimum). The use of threaded joints is recommended for all installation. The base of each well will terminate with a screen approximately 20 feet in length unless otherwise required by boring location. Screens will be factory slotted. Slots will be 0.01 inch in width (maximum).

All personnel handling well materials will wear clean nitrile gloves and shall utilize appropriate decontamination procedures between drilling locations. All drilling equipment and materials shall be maintained in a clean manner.

Use of PVC pipe cutters is recommended whenever necessary to shorten sections of the PVC well pipe. Use of hacksaws or similar cutting implements is not recommended.

3.3 Sand Pack

Filter sand will be a clean sand of proper size in relation to the screen slots to prevent its passage into the well, with no fraction coarser than 0.25-inch nominal diameter.

Filter sand will be placed in the annulus around the well riser and to a point approximately 2 feet above the top of the screen. A tremie pipe shall be used whenever feasible for sand placement in excess of 10 feet.

3.4 Bentonite Seal

The annulus around the well pipe will be sealed with a layer of bentonite pellets, to be placed directly above the sand filter pack. The minimum thickness of the bentonite layer will be approximately 2 feet. The bentonite pellets should ideally be allowed 24 hours for hydration prior to continuing with well construction.

3.5 Surface Completion

All wells shall be completed as stick-up installation including use of a locking protective casing and concrete apron. The PVC riser will be provided with a slip type end cap. The end cap shall be fitted with a threaded stainless steel ¼ inch quick connect type fitting. The PVC riser (well pipe) will extend to an approximate height of 1.75 feet above the top of the concrete pad.

An outer locking protective casing shall be mounted within the concrete apron leaving approximately 2 inches of clearance to the top if the PVC riser. The driller will provide a lock for each protective casing. All locks will be keyed identically, and all keys relinquished to the owner.

The apron will be constructed in such a manner that surface water will not return to it. The concrete apron will have the following minimum dimensions: 3 feet x 3 feet x 3.5 inches or 18 to 24-inches circular and will be centered with respects to the riser and protective casing. A form will be used in constructing the apron. The upper surface of the apron will be graded to provide drainage away from the PVC riser. A spike will be set into the pad for surveying purposes.

The outer protective casing will be constructed of steel pipe having a diameter, or diagonal, of not less than 4 inches. A drain hole having a diameter of 0.5-inch will be drilled through the outer protective casing near the top of the concrete apron. Shavings generated by drilling the steel casing will be prevented from falling into the well. The casing will be marked for surveying purposes.

4.0 SURVEYING

A licensed surveyor will survey each gas well elevation. Survey point(s) will include:

- concrete pad (marked with a spike) within ± 0.01 foot;
- outer protective steel casing, when open (engraved mark);
- inner PVC well pipe (engraved mark) within ± 0.01 foot;
- well location to within ± 0.5 foot in horizontal plane; and,
- ground surface elevation to within ± 0.1 foot.

5.0 WELL DEVELOPMENT AND INSPECTION

Not required unless dictated by specific site conditions.

6.0 ANCILLARY REQUIREMENTS

6.1 Extraneous Material

The driller will take all reasonable care to ensure that each boring is free from all materials other than those required for well construction. Materials required for well construction is here defined to include polyvinyl chloride (PVC), sand, bentonite, and Portland cement. All other materials accidentally or purposely placed in the hole will be removed by driller prior to well completion.

6.2 Decontamination

If impacted soils are visually observed, all drilling equipment (drill steel, bits, casing materials) and any additional equipment, that contacts subsurface formations shall be decontaminated prior to on site use, between consecutive on site uses, and/or between consecutive well installations, as directed by Owner/Operator or Owner/Operator's designated representative.

Appropriate decontamination procedure will consist of steam cleaning with potable water and biodegradable detergent (e.g., Alconox) approved by Owner/Operator or Owner/Operator's designated representative. Steam cleaning will be conducted in a manner that minimizes over-spray and runoff.

6.3 Disposition of Waste Water

If drilling fluids are used or monitoring wells constructed in an area of suspected contamination, these fluids will be placed in 55-gallon drums at the well site and subsequently disposed by the Owner/Operator.

6.4 Site Safety Plan

The driller is responsible for maintaining the personal safety of his employees while on site. The driller shall provide a copy of the project safety plan for review by the Owner/Operator no less than 7 days prior to commencement of field work.

6.5 Cleanup

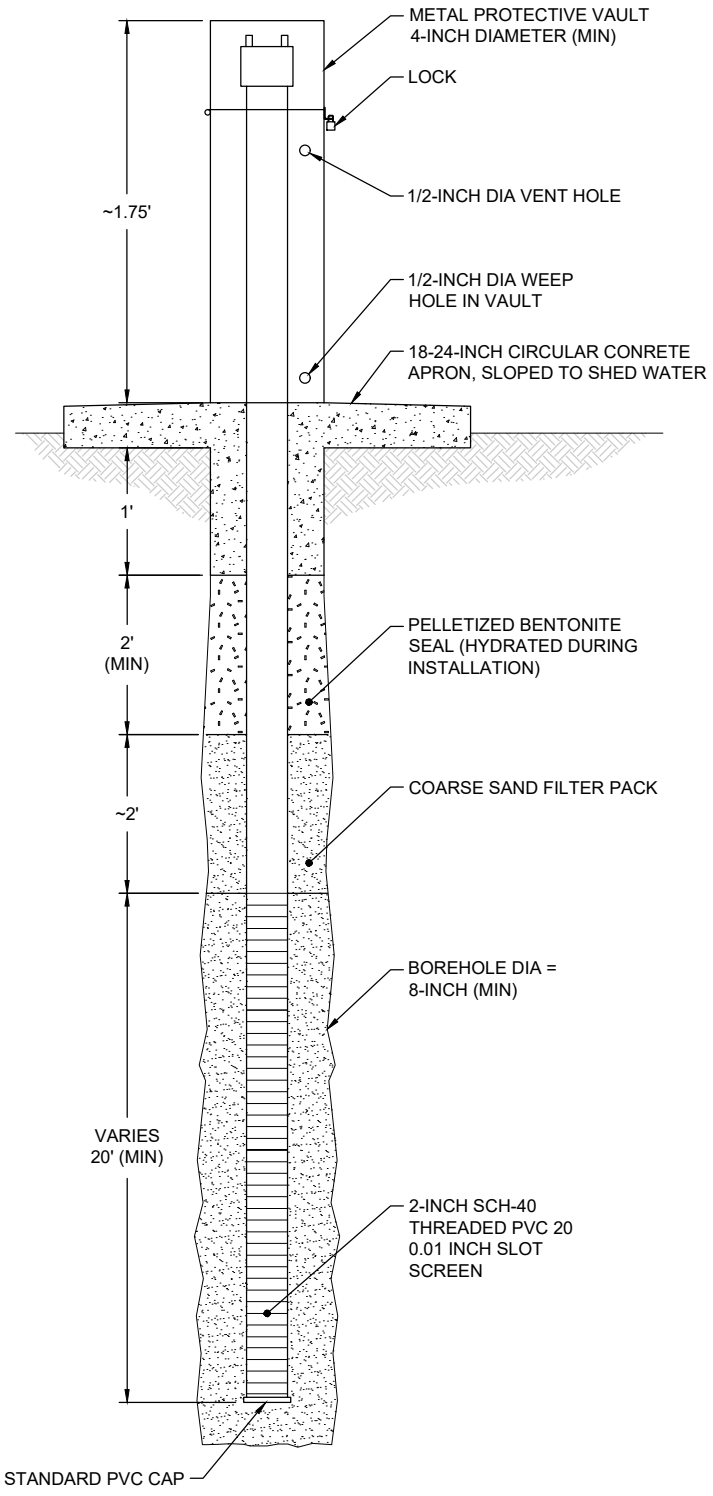
The driller will be responsible for removing all refuse from each well site. Such refuse typically includes, but is not limited to, PVC pipe wrappers, sand bags, bentonite bags, cement bags, beverage containers, food wrappers and other forms of litter. Smoking on site will not be permitted.

The driller will be responsible for providing the following information to the Owner/Operator's designated representative after well installation has been performed:

- date and time of construction;
- drilling method and fluid used (if applicable);
- boring diameter;
- well pipe (inner casing) specifications;
- well depth (+/-0.01 ft.);
- drilling/lithologic logs;
- specifications for other casing materials (if applicable);
- screen specifications;
- well pipe/screen joint type;
- filter pack specifications (material, size);
- filter pack volume and calculations;
- filter pack placement methods;
- bentonite seal specifications;
- bentonite seal volume;
- bentonite seal placement method;
- grout specifications;
- grout volume;
- grout placement method;
- surface completion specifications; and,
- well development procedure.

7.0 WELL CONSTRUCTION AND SOIL BORING LOGS

Certified copies of well construction and soil boring logs will be forwarded to the MDNR by the driller in accordance will applicable requirements following completion of well construction activities.



DETAIL

GAS MONITORING WELL

SCALE: NTS

XREF: C-GAS-066

WEST LAKE LANDFILL OU-2
EXPLOSIVE GAS MONITORING PLAN
TYPICAL GAS MONITORING WELL

Geosyntec consultants

FIGURE

1

PROJECT NO: CHE8424 | AUGUST 2021

P:\R\WEST LAKE\EGMP\C-GAS-066 - Last Saved By: DKein on 8/4/21

ATTACHMENT E

Bridgeton Landfill Explosive Gas Management Plan

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.

128

July 12, 2006

Ms. Laurie Bobbit
Missouri Department of Natural Resources
1738 East Elm Street
Jefferson City, Missouri 65101

Re: Revised Explosive Gas Management Plan
Bridgeton Landfill, LLC – Permit #118912

Dear Ms. Bobbit:

Aquaterra Environmental Solutions, Inc. (Aquaterra) on behalf of our client, Bridgeton Landfill LLC, has enclosed an original and one copy of the revised *Explosive Gas Management Plan, Bridgeton Landfill, LLC, Bridgeton, Missouri* dated July 2006. Please feel free to contact me at (618) 394-9622 or Michele Boussad at (573) 442-6391 with any questions or comments regarding this report.

Sincerely,
Aquaterra Environmental Solutions, Inc.

Nathan Higgerson
Project Engineer

Cc: Cecilia Campbell – Missouri Department of Natural Resources
Sue Taylor – St. Louis County Department of Health
JP Boessen – Missouri Department of Natural Resources
Allen Steinkamp – Bridgeton Landfill, LLC
Rick Walker – Bridgeton Landfill, LLC
Mike Hockley – Spencer, Fane, Britt, and Brown, LLP
Michele Boussad - Aquaterra

EXPLOSIVE GAS MANAGEMENT PLAN
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Aquaterra Project Number 1649.10
Revised July 2006

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.

Prepared For:

Bridgeton Landfill, LLC
13570 St. Charles Rock Road
Bridgeton, Missouri

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.

TABLE OF CONTENTS

1.0 INTRODUCTION **1**
2.0 LANDFILL GAS GENERATION AND CONTROL **3**
3.0 ACTION PLAN PROCEDURES **4**
3.1 Action Conditions 4
3.2 Response Action 4
3.3 Emergency Contacts 7
4.0 LANDFILL GAS MIGRATION ACTION PLAN DISTRIBUTION **8**

LIST OF APPENDICES

Appendix A

Explosive Gas Management Plan Drawing

Appendix B

Semiannual Inspection Form and Incident Form

Appendix C

Explosive Gas Alarm Procedures

Appendix D

Nighthawk Carbon Monoxide and Explosive Gas Alarm Manual

Appendix E

List of Businesses with Explosive Gas Monitors

Explosive Gas Management Plan
Bridgeton Landfill, LLC
Bridgeton, Missouri
Revised July 2006

1.0 PROJECT INTRODUCTION

The Bridgeton Landfill is located in Bridgeton, Missouri and is owned and operated by Bridgeton Landfill, LLC. The purpose of this plan is to provide information regarding the response actions to be implemented to address possible landfill gas (LFG) migration from the Bridgeton Landfill to the surrounding properties.

The Bridgeton Landfill no longer accepts waste and will be closed. In order to prevent LFG migration the Bridgeton Landfill operates a LFG collection and control system and flares to destruct the LFG. The Bridgeton Landfill monitors the potential LFG migration by collecting monthly readings from the perimeter LFG monitoring probes at the landfill and the off-site LFG monitoring probes. As compliance is achieved in the monitoring probes, Allied Waste, with Missouri Department of Natural Resources Solid Waste Management Program's (MDNR SWMP) approval, will re-evaluate monitoring requirements. The locations of these monitoring probes are shown on Figure 1 included in Appendix A.

Due to the concern for off-site LFG migration, this action plan has been prepared to identify actions to be implemented in the event that elevated LFG levels are detected above regulatory levels on adjacent property. The explosive gas detectors were provided to adjacent businesses by Bridgeton Landfill. However, it is the responsibility of each business to install the monitors. Bridgeton Landfill continues to expand the gas collection system to control off-site migration. This action plan provides procedures to be implemented in the event an alarm sounds as well as if elevated LFG concentrations are detected in the monitoring probes.

The purpose of this plan is to develop procedures for maintaining the explosive monitors and to develop an action plan for neighboring facilities' employees to follow in the event of an alarm condition or other incident related to the detection of LFG in the area near the Bridgeton Landfill. This plan identifies the following:

- When the plan will be implemented.
- Who will implement the plan.
- Points of contact.
- Procedures for electrical power outages.
- Procedures for monitoring equipment malfunctions or breakdowns.

- Emergency procedures during alarm conditions.
- Procedures during and following incidents, when LFG concentrations are detected above acceptable limits.

This action plan establishes and assigns actions and responsibilities to Bridgeton Landfill and to facilities surrounding the landfill. Its implementation should minimize the occurrence of fires or explosions caused by LFG migrating beyond the landfill property. It is intended to be protective of the public health and safety concerning the control of LFG migration. The Bridgeton Landfill has installed and will continue to provide maintenance to the explosive gas monitors. When an incident is reported, this action plan shall trigger a follow up investigation in accordance with the procedures of this plan until the matter is satisfactorily resolved. An incident evaluation form is included in Appendix B.

2.0 LANDFILL GAS GENERATION AND CONTROL

The decomposition of encapsulated solid waste within a landfill is known to produce LFG typically consisting of approximately 50 percent methane (CH_4) and 50 percent carbon dioxide (CO_2). Trace amounts of nonmethane organic compounds (NMOCs), oxygen, hydrogen sulfide and reactive organic gases are also present (*Engineering and Design Landfill Off-Gas Collection and Treatment Systems, U.S. Army Corps of Engineers, 1995*). Methane and carbon dioxide are both major greenhouse gases. Reported collection efficiencies of LFG collection systems range from 60 percent to 85 percent, with 75 percent being most commonly assumed (*AP-42, Compilation of Air Pollutant Emission Factors*).

The LFG collection and control system at Bridgeton Landfill collects the LFG from a network of extraction wells and piping within the limits of the landfill. The collected LFG is routed through piping to the control devices (LFG flares) for destruction.

A typical LFG composition (by volume) and the LFG composition that have been assumed at the Bridgeton Landfill are provided in the following table.

Compound	Typical Range	Assumed
Methane	40% to 55%	50%
Carbon Dioxide	40% to 50%	40%
Nitrogen	0 to 10%	9%
Oxygen	0 to 5%	1%
Trace Compounds	<1%	<1%

Although the LFG produced in the landfill waste mass will be primarily methane and carbon dioxide, the presence of nitrogen and oxygen has also been assumed to account for minor infiltration of air through the landfill surface during operation of the LFG collection and control system.

3.0 ACTION PLAN PROCEDURES

3.1 Action Conditions

This action plan identifies the following conditions, which will trigger a plan response.

1. An explosive gas monitor sounds an alarm.
2. A neighboring facility detects air bubbles or gas flow from cracks in the ground or foundation.
3. A neighboring facility experiences an electrical power service outage for at least 24 hours.
4. An explosive gas monitor malfunctions or breaks down.
5. Landfill gas monitoring levels exceed the regulatory level of 50 percent of the lower explosive level (LEL) (2.5 percent methane gas by volume) in a perimeter gas monitoring probe.
6. Landfill gas is detected at levels above 50 percent of the LEL (2.5% by volume) in off-site gas monitoring probes.
7. Landfill gas is detected at levels above 25 percent of the LEL (1.25% by volume) in neighboring buildings.

Emergency responses to the above conditions are described in Section 3.2 below. Emergency contacts are included in Section 3.3. The gas alarm procedures are include in Appendix C

3.2 Response Action

When one of the action conditions listed above has occurred, implementation of the following response actions will be initiated. The response actions are numbered to correspond to the conditions.

1. Personnel at the neighboring facilities that have explosive gas monitors have been trained to operate and maintain the explosive gas monitoring equipment installed. Each facility was provided the manufacturer's literature and information included with each unit. A copy of the owner's manual for the explosive gas monitor (Nighthawk Carbon Dioxide and Explosive Gas Alarm, Model No. KN-COEG-3) is included in Appendix D. The Bridgeton Landfill will check each gas monitor semiannually to determine proper operation and to update the facility contact(s) regarding each monitor's operation and procedures to be followed, should the alarm sound. Appendix B includes an inspection form that will be completed during each

inspection. Any defect or problems with the unit shall be reported immediately to Rick Walker at Bridgeton Landfill at (314) 739-1919 or (314) 568-4537 (cell phone).

If an explosive gas monitor sounds an alarm, the individual who hears the alarm shall notify all parties within the building and evacuate the building immediately. Contact Bridgeton Fire Department at 911 and Rick Walker at Bridgeton Landfill at (314) 739-1919 Ext.4462, Allen Steinkamp Ext. 4464, or Randy Meibaum Ext. 4465 immediately after the occupants have exited the building. You should identify yourself and business location and advise the person that the explosive gas monitor has sounded an alarm that requires immediate assistance. A Bridgeton Landfill representative will use an explosive gas detector to check and verify the presence of explosive gases in the building. Until the representative arrives, you should remain out of the building and at least 200 feet away from the building. Alternate phone numbers to call, if there is no answer at Bridgeton Landfill are: Rick Walker's cell phone at (314) 568-4537, or Allen Steinkamp's cell phone at (636) 357-3555.

If investigation of the alarm condition determines that explosive gas is present, the building should remain evacuated and ventilated as well as possible until the source of the explosive gas is determined and controlled. If the alarm is determined to be a valid LFG migration event, the MDNR Emergency Response Unit will be notified at (573) 634-2436 by Bridgeton Landfill, LLC personnel along with the Bridgeton Fire Department at 911 as soon as possible during the incident. The status of the current conditions and control actions underway should be described during the call. After the investigation and the area is determined safe by the Bridgeton Fire Department, the Bridgeton Landfill staff with check and reset the monitors.

A written incident report for each valid explosive gas monitor alarm condition event caused by LFG migration will be prepared and recorded in the Bridgeton Landfill record. The checking and resetting of these monitors will then be documented in the written incident report Bridgeton Landfill, LLC will submit a report to the MDNR detailing the steps implemented to protect public health and safety within seven (7) days of LFG migration detection. Reports must be submitted to the MDNR Enforcement Section, Solid Waste Management Program, P. O. Box 176, Jefferson City, MO 65102-0176. A copy of the incident report can be found in Appendix B.

2. If a neighboring facility observes evidence of LFG escaping from below ground surface anywhere on the property or in any structures on the property, the Bridgeton Fire Department at 911 and Rick Walker should be contacted immediately at (314) 739-1919 Ext. 4462 or (314) 568-4537 (cell phone). If the event involves a fire, the

Bridgeton Fire Department should be contacted at 911. Bridgeton Landfill, LLC will investigate the reported problem and call the MDNR Response Unit, if a valid LFG migration event has occurred.

If the event occurs in an occupied building, Rick Walker shall be contacted immediately to monitor the building with an explosive gas meter. If explosive gases are determined to be present, the building shall be evacuated immediately and properly vented. During the evacuation it is recommended that all doors and windows be opened without prolonging the exposure to the LFG.

If a confined space enclosure or structure that has not been previously monitored is identified during the response investigation, an explosive gas monitor will be provided to the facility for the facility to install the device in the area identified. Substantiated events will be documented in writing, and the written report will be placed in the Bridgeton Landfill record.

3. All explosive gas monitors shall be equipped with a battery backup for continuous monitoring of explosive gases. Bridgeton Landfill, LLC shall provide batteries and install batteries on a semiannual basis during routine inspections of the monitoring equipment.

4. If the neighboring facility suspects or determines through testing that the explosive gas monitor in a building is malfunctioning or defective, the Bridgeton Landfill, should be contacted immediately at (314) 739-1919. All defective monitors will be replaced by Bridgeton Landfill within 24 hours of inspection.

5. The Bridgeton Landfill representative performing the LFG monitoring probe testing shall record LFG levels in each monitoring probe. If the LFG levels measured in the perimeter probes exceed the regulatory level, Bridgeton Landfill, LLC will begin monitoring of the off-site gas monitoring probes, as well as the perimeter probes, at a frequency determined by MDNR's SWMP. Bridgeton Landfill, LLC will continue probe monitoring at the frequency determined by MDNR's SWMP on a case-by-case basis, until the LFG concentrations in the off-site and perimeter probes return to compliance for one month.

   Adjustments will be made in the operation of the active LFG collection system at Bridgeton Landfill in an effort to control LFG migration. If the elevated concentrations of LFG continue to be observed in the perimeter probes, the Bridgeton Landfill will re-evaluate the LFG collection and control system and propose modification(s) to

MDNR for approval to return to compliance levels for the LFG concentrations within the regulatory thresholds.

6. If LFG levels in the off-site probes are detected above regulatory levels, Bridgeton Landfill, LLC will notify the facilities in close proximity to the LFG monitoring probes where elevated LFG concentrations were detected above regulatory levels. The LFG monitors within close proximity to the non-compliant LFG monitoring probes will be inspected to verify no explosive level of LFG is monitored within the buildings. Bridgeton Landfill, LLC will continue monitoring the LFG monitoring probes at a frequency determined by MDNR's SWMP on a case-by-case basis, until the LFG levels in the monitoring probes have decreased below regulatory levels.

7. If LFG levels are detected above regulatory levels in buildings, the building occupants and Bridgeton Landfill, LLC should implement the emergency response actions provided under item 1 of this section.

The response actions identified above will be implemented when the conditions in Section 3.1 are discovered. The MDNR will be notified as soon as possible, when incidents regarding gas migration occur. If other environmental reporting requirements are applicable to an incident, the appropriate notice will be made by the first responder to the event. Emergency contacts are listed in Section 3.3 below.

3.3 Emergency Contacts

The following local and state contacts are listed for implementation of this action plan.

1. Rick Walker at Bridgeton Landfill - (314) 739-1919 Ext. 4462, (314) 568-4537 (cell phone)
2. Allen Steinkamp at Bridgeton Landfill - (314) 739-1919 Ext. 4464, (636) 357-3555 (cell phone)
3. Bridgeton Fire and Police Department - 911
4. Missouri Emergency Response Unit - (573) 634-2436
5. MDNR Solid Waste Management Program - (573) 751-5401
6. St. Louis County Department of Health – (314) 615-4116

When making an emergency contact, it is important to provide specific information about the incident including the location, what has occurred, name and contact information for the reporting individual, and how that individual can be contacted.

4.0 LANDFILL GAS MIGRATION ACTION PLAN DISTRIBUTION

This emergency plan will be distributed to neighboring facilities to the Bridgeton Landfill that have explosive gas monitors, the Bridgeton Fire Department, the Local Emergency Planning Commission Office, the MDNR, and to others upon request. A meeting will be scheduled with the Bridgeton Fire Department to discuss this plan and the action procedures for the surrounding businesses. A list of the businesses that currently have explosive gas monitors is included in Appendix E.

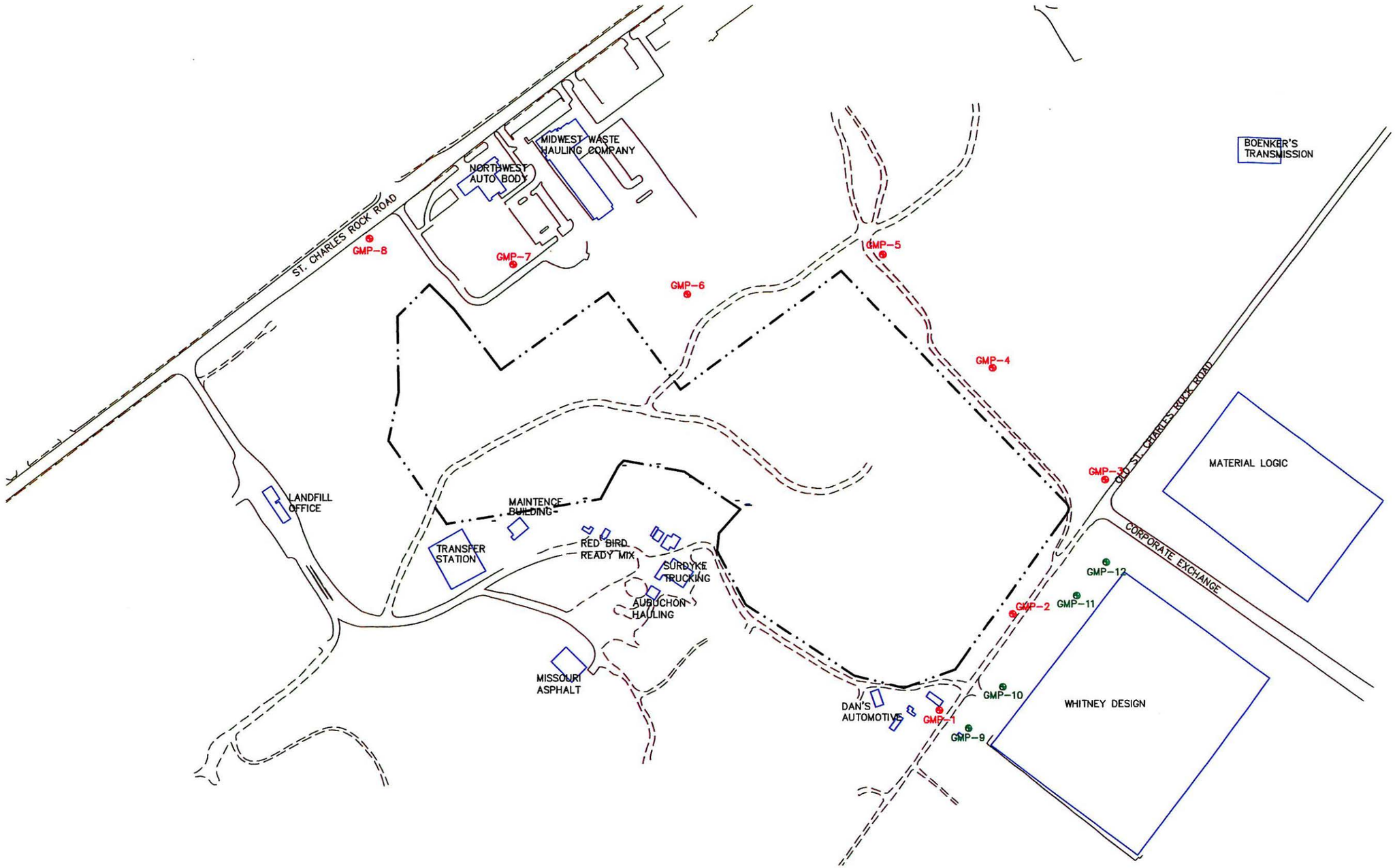
Copies of the action plan should be requested from:

Bridgeton Landfill
13570 St Charles Rock Rd
Bridgeton, MO 63044
Phone (314) 739-1919

APPENDIX A

Explosive Gas Management Plan Drawing

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.



LEGEND

- EXISTING BUILDING
- GMP-3 PERIMETER LANDFILL GAS MONITORING PROBES
- GMP-11 OFF-SITE LANDFILL GAS MONITORING PROBES
- LIMITS OF WASTE PLACEMENT
- EXISTING ROAD

NOTE:

1. ALL LOCATIONS ARE APPROXIMATE.

400' 0 400' 800'

SCALE FEET

AQUATERRA

ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairveiw Heights, Illinois 62208

FIGURE 1
EXPLOSIVE GAS MANAGEMENT PLAN DRAWING
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr. MSB	Drawn By NLH	Designed By MSB	Project No. 1649.10
Scale AS SHOWN	Date 6/22/05	File Name 1649.10-PLAN LOC.dwg	Figure No.

K:\Allied Waste\Bridgeton\1649.10 - Settlement Agreement - Task 1\1649 10-Building Location Drawings.dwg July 6, 2006 9:29:00 am (Nat)

APPENDIX B

Semiannual Inspection Form and Incident Form

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.

INCIDENT EVALUATION

Facility Name: _____
Contact Person: _____
Address: _____
Phone Number: _____
Emergency Contact: _____
Emergency Number: _____
Allied Personnel: _____

Date Contacted: _____
Time: _____
Date Investigated: _____
Date Monitors Checked and Reset: _____
Time: _____

Incident:

Action Taken:

Follow Up Action Needed:

Additional Comments:

Signature - Bridgeton Landfill Inspector

Signature - Environmental Manager

Bridgeton Landfill Inspector Name and Title

Environmental Manager Name

SEMIANNUAL INSPECTION CHECKLIST

Facility Name: _____ **Date:** _____
Contact Person: _____ **Start Time:** _____
Address: _____ **Stop Time:** _____
Emergency Contact: _____

Gas Monitor Locations _____

Date Monitors Checked and Reset: _____

		yes	no
1	Are the explosive gas monitors located at the proper locations?		
2	Re-test each unit to confirm proper operation of the monitors. Are the gas monitors operating properly? If not, replace malfunctioning monitors immediately. Document any action taken below.		
3	Replace batteries in each unit and provide the site with additional batteries, if needed. Document below any action taken.		
4	Has the monitor sounded since the last inspection? If yes, was the action plan followed? If not, document all incidents that alarm sounded below.		
5	Have any problems with the monitoring system occurred since the last inspection?		
6	Any questions? Document all questions and responses below.		

Additional Comments

_____

Signature - Bridgeton Landfill Inspector _____ **Signature - Business Representative** _____

Bridgeton Landfill Inspector Name and Title _____ **Business Representative Name and Title** _____

APPENDIX C

Explosive Gas Alarm Procedures

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.

Procedures in the Event the Explosive Gas Alarm Sounds

In the event the explosive gas alarms sound within this structure, the following steps should be implemented:

1. Evacuate the building and leave doors ajar to ventilate building.

2. Do not turn on or off any lights or other electrical devices located in the building before exiting the building.

3. After evacuating the building, contact the Bridgeton Fire Department at 911 and Rick Walker (Bridgeton Landfill, Operations Manager at (314) 739-1919 Ext. 4462. If there is no answer, call his cell phone at (314) 568-4537. If contact to Rick Walker is not made, contact Allen Steinkamp, at (314) 739-1919 Ext. 4464 . If there is no answer, call his cell phone at (636) 357-3555. If Allen can not be reached contact randy Meibaum at (314) 393-2610. Notify the person contacted that your Explosive Gas Monitor Alarm has sounded and you need someone to come and check the building for possible explosive levels of LFG.

4. The alarms will continue sounding until the explosive gas has dissipated through the open doors and vents. Until such time, stay out of the building. Wait until Rick Walker or the Bridgeton Fire Department has checked the building for the presence of explosive levels of gas.

July 12, 2006

Name
Address
City, State, Zip

Re: Explosive Gas Management Plan
Bridgeton Landfill, LLC – Permit #118912

To Whom It May Concern:

The Bridgeton Landfill LLC, has enclosed a copy of the *Explosive Gas Management Plan, for the Bridgeton Landfill, LLC, Bridgeton, Missouri* dated November 2005, revised July 2006. The Missouri Department of Natural Resources (MDNR) has approved the plan and requested that a copy be provided to the businesses that have an explosive gas meter. MDNR also requests that copies of the one page document, "Procedures in the Event the Explosive Gas Alarm Sounds" from Appendix C of the explosive gas management plan, will be posted near monitors and outside doors (in lieu of the complete plan being posted by the monitors and doors..

In addition, a landfill gas fact sheet is attached to this letter. The landfill gas fact sheet describes landfill gas and the threats associated with it, as well as ways to minimize the associated risks.

Please feel free to contact me at (314) 739-1919 or Allen Steinkamp at (314) 739-5099 Ext. 4464 with any questions or comments regarding the plan.

Sincerely,
Bridgeton Landfill, LLC

Rick Walker
Landfill Operations Manager

Missouri Department of Natural Resources
Landfill Gas Facts

What is Landfill Gas?

Landfill gas is generated during the decomposition of trash. The major gases generated in a landfill are methane and carbon dioxide. Nitrogen is produced, initially at high levels, then drops rapidly until it stabilizes at low levels.

Additional gases, called trace gases, are produced in much smaller amounts. Hydrogen sulfide is a trace gas that gives landfill gas its characteristic odor. Other trace gases may also be produced, depending on the composition of the waste.

Does Landfill Gas Pose an Immediate Threat?

Methane gas is the constituent of concern in landfill gas. It is a by-product of landfill decomposition and is colorless and odorless. Methane is highly explosive at certain concentrations in air (between 5% and 15% of the total air volume). Methane can become dangerous when it migrates into confined spaces in these concentrations. Confined spaces can range from trenches or holes in the soil to buildings and structures. Additionally, higher concentrations of methane in confined spaces can displace the oxygen and may lead to suffocation.

How Do I Protect Myself From Methane Gas?

An individual can take a number of steps in order to minimize the risk associated with gases migrating from a landfill.

Step 1: Properly ventilate all confined spaces. Some examples are removing some of the skirting from around a mobile home or opening basement and garage windows.

Step 2: Remove all potential ignition sources (portable heaters, open flames, etc.) in confined spaces which cannot be properly ventilated.

Step 3: Install a methane gas detector with an alarm set at or close to 1% methane gas by volume [20% of the Lower Explosive Limit (LEL)] in buildings or structures.

Information Sources

For more information contact these agencies:

Missouri Department of Natural Resources
Solid Waste Management Program
P.O. Box 176
Jefferson City, Missouri 65102
Phone: (573) 751-5401

Missouri Department of Natural Resources
Environmental Services Program/
Environmental Emergency Response
P.O. Box 176
Jefferson City, Missouri 65102
Phone: (573) 526-3315
Emergency: (573) 634-2436

U.S. Environmental Protection Agency
Region VII Office
726 Minnesota Avenue
Kansas City, Kansas 66101
Phone: (913) 236-3884

You can also contact your local fire department or Emergency Planning Commission.
D:\HARLAN\GASPRO\GASFACTS.WPD

APPENDIX D

Nighthawk Carbon Monoxide and Explosive Gas Alarm Manual

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.

NIGHTHAWK™

By KIDDE Safety

AC Powered with Battery Backup

Carbon Monoxide and Explosive Gas Alarm

User's Guide

See pages 4-1 and 4-2 for "What to do When the Alarm Sounds"

c UL us LISTED SINGLE STATION CARBON MONOXIDE ALARM

UL LISTED RESIDENTIAL GAS DETECTOR

Nighthawk CO and Gas Alarm with Digital Display, Peak Level Memory and 9V Battery Backup

Model: KN-COEG-3

For questions concerning your Carbon Monoxide and Explosive Gas Alarm, please call our Consumer Hotline at 1-800-880-6788.

Please have the following information ready when calling:
CO and Gas Alarm Model number (located on back of alarm):
CO and Gas Alarm Assembly number (located on back of alarm):
Date of Manufacture (located on the back of the alarm):
Date of Purchase:
Where Purchased:

810-1571 REV. C
03/01

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IMPORTANT

THIS CARBON MONOXIDE AND EXPLOSIVE GAS ALARM IS DESIGNED TO DETECT CARBON MONOXIDE, NATURAL GAS OR PROPANE. IT IS NOT DESIGNED TO DETECT SMOKE, FIRE, OR ANY OTHER GAS. THIS DETECTOR WILL ONLY DETECT THE PRESENCE OF CO, NATURAL GAS OR PROPANE PRESENT AT THE SENSOR. CO, NATURAL GAS OR PROPANE MAY BE PRESENT IN OTHER AREAS.

NOT SUITABLE FOR INSTALLATION IN HAZARDOUS LOCATIONS AS DEFINED IN THE NATIONAL ELECTRIC CODE. THIS DETECTOR WILL DETECT CARBON MONOXIDE PRIMARILY AND EXPLOSIVE GAS SECONDARILY. CO EVENTS WILL ALWAYS TAKE PRESIDENCE OVER EXPLOSIVE GAS EVENTS. THROUGHOUT THIS MANUAL, THE WORD GAS WILL BE USED TO SPECIFICALLY REFER TO NATURAL GAS OR PROPANE.

KIDDE Safety

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©KIDDE Safety, 1998

1394 South Third Street, Mebane, NC 27302
Consumer Hotline: 1-800-880-6788
www.kiddesafety.com

About this User's Guide

Notice we call this booklet a "User's Guide" and not an "Owner's Manual." This is because our intention is you *use* this guide just as you will be using your Nighthawk CO and Gas alarm. Keep the guide in a handy location and refer to it when you have questions about your CO and Gas alarm, its functions and features.

Part One

Your Nighthawk Carbon Monoxide and Explosive Gas Alarm, covers the unique features of your Nighthawk carbon monoxide and explosive Gas alarm, how and where to install it, as well as information on testing and maintaining your unit.

Part Two

Carbon Monoxide and Gas contains valuable information about carbon monoxide (CO) and gas. From discovering the most common sources of CO in your home to recognizing the symptoms of CO poisoning, this section provides tips and information that could help protect your family.

Part Three

What You Should Know Before the Alarm Sounds, provides a common sense approach to understanding the difference between low level CO readings, high levels and emergency situations. This section also describes the effects of exposure to CO levels over time and when your Nighthawk CO and Gas unit will alarm.

Part Four

What to do When the Unit Alarms, gives you step-by step information on how to respond to the different alarm situations. Also covered is whom to call for help if you think you have CO or Gas in your home.

Part Five

Technical Information, covers the technical specifications of your Nighthawk CO and Gas alarm.

Part Six

Frequently Asked Questions, contains the most commonly asked questions about our alarms. Part six was written by KIDDE Safety customer service representatives who handle thousands of calls per month, year-round. This section provides you with answers and tips that will most likely answer any questions you might have after reading this user's guide.

Introduction

This Nighthawk carbon monoxide (CO) alarm is an important part of your family's home safety plan. As a new owner of a CO and Gas alarm, there are some basic facts you should know for your protection *and* convenience.

Carbon monoxide (CO) is invisible, odorless, tasteless and non-irritating–completely undetectable to your five senses. That's why it's so important to your safety that you have a carbon monoxide and explosive Gas alarm.

Natural Gas is typically supplied through a main utility line connected to your home. If you do not live in a rural area you are likely to be a user of natural Gas. It is the dominant energy used for home heating with about 55 percent of American homes using Gas. Natural Gas is a fossil fuel comprised almost entirely of Methane. Methane is much lighter than air and will rise rapidly in air. If you are a user of natural Gas, we recommend you mount your Nighthawk unit 12 inches away from the ceiling (using retractable cord feature) to ensure the earliest opportunity to detect a leak.

Propane is typically supplied to homes via delivery truck in liquid form and stored near the home in propane tanks. Propane is used by homes in rural areas that do not have natural Gas service. Since propane is the most commonly used *liquefied petroleum Gas (LPG),* "propane" and LP-Gas are often used synonymously. Unlike natural Gas, propane is much heavier than air and will collect at lower levels. If you are a user of propane, we recommend you mount your Nighthawk near the floor (using the direct plug-in feature) to ensure the earliest opportunity to detect a leak.

Both Propane and Natural Gas are colorless and odorless. For safety reasons, an ordorant (Mercaptan) is added so that any leak can be detected by smell. The common detection threshold for smelling the Gases is around 20% of the **lower explosion limit (LEL).** This can vary greatly depending on the individuals sense of smell and how long they have been exposed to it. The LEL of each of these gases defines the bottom range of flammability for the Gas. Your Nighthawk is calibrated to alarm before 25% of the LEL of either Gas detected. **Therefore, it is possible that you may smell Gas before the alarm is activated.**

If you are not sure which Gas your home uses, contact your utility company.

Please take the time to read this guide from cover to cover, to familiarize yourself with the facts about carbon monoxide, natural Gas and propane. Know how your new unit works, and what to do if it alarms. Then, find a handy place to keep the guide so it will be readily available in the future when you have a question. You might want to write down KIDDE Safety's toll-free customer service number and keep it with your other important phone numbers for the same reason.

Thank you for making Nighthawk a part of your complete home safety program. With proper installation and use, your new Nighthawk CO and Gas alarm should provide you with years of dependable service.

Quick Set-Up Guide

We urge you to read this entire manual in the sequence it is presented. But, if you only read one part of this guide initially, read this page!

Listed below are seven easy steps for setting up your Nighthawk CO and Gas alarm. Please read the entire guide for complete information.

Setting up your CO and Gas alarm for first time operation

Step 1

Determine the best location for your CO and Gas alarm(s). Refer to page 1-3 for complete information.

Step 2

Your CO and Gas alarm is equipped to be mounted as a corded unit (recommended for natural gas detection), a direct plug unit (recommended for propane gas detection) or a table top unit. In the "as shipped" configuration, the unit can be plugged directly into a wall socket. (If your outlets are mounted horizontally, please refer to page 1-4). If the transformer/adapter is taken out of the unit, the unit can be mounted high on the wall, while the transformer is plugged into a wall socket. The explosive Gas you use will determine if the unit should be mounted high on the wall (cord option) or low on the wall (direct plug option). Refer to page 1-4 for further information on installing your alarm.

Step 3

A 9V battery is needed for backup in the event of a power outage. When installing the battery, use an Energizer 522, Duracell MX 1604 or, for extended life, use an Ultralife lithium power cell model U9VL. Any of these batteries can be purchased where you bought the alarm or at your local hardware store. To install the battery, open the back door and snap battery connector onto battery. You will hear the alarm sound briefly to indicate the unit is receiving power. Place battery into battery compartment and replace back door (refer to page 1-1).

Step 4

First install the 9V battery then plug the alarm into a standard, unswitched 120 volt AC electric outlet in one of the configurations listed in step 2.

Step 5

At power up, you will see a flashing red dot and three eights 888 in the digital display indicating the alarm is warming up. After approximately 20 seconds the unit will start sampling for CO. After approximately 2 minutes the unit will start sampling for gas. During this period a number will appear on the digital display. The number on the digital display should be zero (0). If not, see page 1-5 for complete information on normal operating characteristics.

Step 6

Wait 2 to 3 minutes after power up and make sure the red dot in the digital display is blinking. Then test the unit's operation by pressing and releasing the Test/Reset button. Within 15 seconds you hear 3 slow beeps with "GAS" appearing in the digital display. Then, you will hear 4 quick beeps followed by 5 seconds of silence then 4 quick beeps repeating while a number (usually around 200) is displayed. In normal operation, the repeating slow beeps with "GAS" showing in the display is the alarm condition notifying you that either natural Gas or propane is being detected. The 4 quick beeps 5 seconds of silence -repeating while a number is shown in the digital display indicates that the alarm is in a condition notifying you that carbon monoxide is being detected. For complete testing information, refer to page 1-5.

Step 7

While testing the alarm, have someone else check that the alarm can be heard easily from the sleeping areas. The unit should be located where it can wake you if it alarms at night. See page 1-3 for complete information on the best locations for your alarm.

Caution: Continuous exposure to the loud 85 decibel alarm at close range over an extended period of time may cause hearing loss. We recommend that you cover the sound holes while testing.

That's it. Your Nighthawk CO and Gas alarm is now monitoring for the presence of carbon monoxide and explosive Gas.

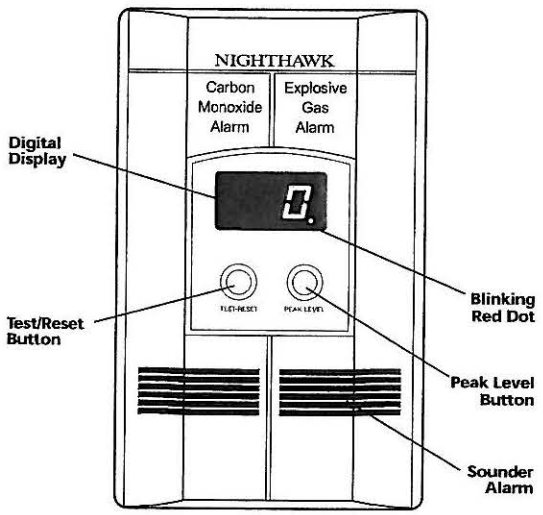
Part One – Your Nighthawk CO and Gas Alarm

About Your CO and Gas Alarm

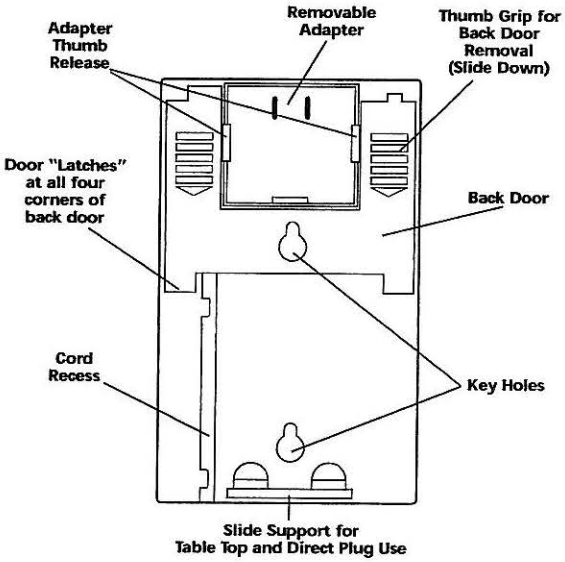
The number one feature that sets Nighthawk apart from other alarms is its unique digital display that gives you a continuos read-out of CO levels from 30-999 parts per million and an easy method for determining if Gas is being detected. The digital display serves as an early warning of CO or Gas presence.

Nighthawk is the only CO and Gas alarm that gives you the choice of a direct-plug, a 6' power cord or table top unit all in one. Depending on how or where you wish to mount your unit, you can get exactly what you need for a perfect application. These are just a few reasons over 4.5 million families have chosen Nighthawk over every other brand for this kind of life-saving protection.

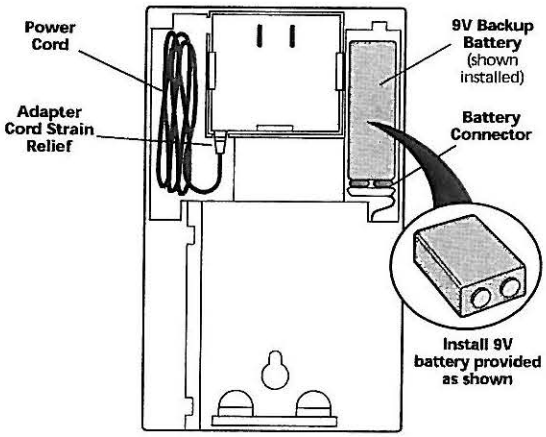
Nighthawk CO and Gas Alarm** (KN-COEG-3) **- front view



Nighthawk CO and Gas Alarm - rear view



Rear view with back door removed



Part One – Your Nighthawk CO and Gas Alarm

Nighthawk's Unique Features

Digital Display

The continuous digital display shows you the level of carbon monoxide (if any) the unit is sensing as well as if Gas is present. The unit updates this reading every 15 seconds so you can watch levels rise or fall.

Note: If the unit does not sense any CO or gas, the reading is zero (0). In most homes, the unit reads "0" all the time. A reading of "0" is expected under normal conditions, and is good. The blinking dot after the number shows you the unit is operating.

Test/Reset Button

This button has three functions. First, this is the button you press when you test the unit monthly (see page 1-5 for further details). Secondly, you press this button if the unit alarms and you want to silence the alarm. This will *reset* the unit and it will then again start monitoring for CO or Gas, if CO concentration is above 70 ppm the alarm will again sound within 6 minutes. It's also used when resetting the peak level memory. (See page 1-7).

Peak Level Button

By pressing this button, you can see the peak CO level recorded by the alarm since it was last cleared or unplugged. This Nighthawk feature allows you (or heating contractor or fireman) to see exactly how big a CO problem you have so you can react accordingly. (More on the peak level memory feature on page 1-7).

Sensors

The CO sensor is a highly sensitive, electrochemical sensor that is CO-specific to help avoid false alarms. Turn to page 1-7 for more information on how to care for and protect the alarm.

The Gas sensor is a metal oxide sensor designed to detect natural gas (methane) or propane.

Sounder Alarm

This is the loud 85 decibel pulsing alarm that will sound to alert you to a potential problem. Alarm condition for CO is 4 quick beeps – followed by 5 seconds of silence – followed by 4 quick beeps. Repeat with a number showing in the display (CO concentration in PPM). The alarm pattern for Gas is a 1/2 second alarm on, 1/2 second of silence - repeating with "GAS" shown in the display.

Caution: Continuous exposure to this sound level at close range over an extended period of time may cause hearing loss. We recommend you cover the sounder with your finger while testing. More on testing on page 1-5,6.

Keyholes

When the alarm is mounted to the wall, these keyholes slide onto the screws in the wall. (See "How to install your alarm on page 1-4).

Pull-Out Transformer/Adapter

This unique Nighthawk feature enables the alarm to be used as a direct plug unit, a wall mounted unit or a table top unit. More on how this unique feature is used for different application, page 1-4.

9V Backup Battery

This CO and Gas alarm is not battery operated. The 9V battery is to supply a short-term backup during a power outage. In the event of a power outage, a fully charged 9V battery will continue operating the CO alarm for at least 20 hours, unless Gas is detected during battery backup conditions. This will significantly shorten the battery life.

What Carbon Monoxide and Explosive Gas Alarms Can and Cannot Do

This unit is designed to sense unacceptable levels of CO or Gas from malfunctioning furnaces, appliances, Gas engines or other sources.

This unit will provide early warning of the presence of carbon monoxide, usually before a healthy adult would experience symptoms. It will provide warning of a Gas condition before 25% of the LEL for methane or propane is detected.

This early warning is possible, however, only if your Nighthawk CO and Gas alarm is located, installed and maintained as described in this user's guide.

When on AC power, this unit is designed to act as a continuous monitor, it is not designed for use as a short-term testing device to perform a quick check for the presence of CO or Gas.

Alarms have limitations. Like any other electronic device, CO and Gas alarms are not fool-proof.

CO and Gas alarms have a limited operational life. You must test your CO and Gas alarm monthly, because it could fail to operate at any time. If your CO and Gas alarm fails to test properly, or if its self-diagnostic test reveals a malfunction, immediately have the unit replaced. See back page for warranty information.

CO and Gas alarms can only sense CO that reaches the unit's sensor. Carbon monoxide may be present in other areas without reaching the alarm. The rate at which CO reaches the unit may be affected by doors or other obstructions. In addition, fresh air from a vent or open window or any other source may prevent CO from reaching the sensor. Please observe cautions on page 1-3 "Where to install your alarm."

CO or Gas could be present on one level of the home and not reach the alarm installed on a different level. For example, CO or Gas in the basement may not reach an alarm on the second level, near the bedrooms. For this reason, we recommend you provide complete coverage by placing a CO and Gas alarm on every level of the home.

This unit is not a smoke alarm. It will not sense smoke or fire. For early warning of fire you must install smoke alarms, even though carbon monoxide can be generated by a fire.

CO and Gas alarms are not a substitute for property, disability, life or other insurance of any kind. Appropriate insurance coverage is your responsibility. Consult your insurance agent.

Your CO/Gas alarm is not designed to continually detect explosive gas while on battery only operation. The CO/Gas alarm is provided with a 9 volt battery backup for short term protection against the presence of carbon monoxide or explosive gas. For the first four minutes after the unit goes into battery backup operation, the explosive gas sensor will operate as if on AC power. However, after four minutes, to extened battery life, the unit will go into battery conserve mode and will only sample for explosive gas once every eight minutes. Explosive gas could be present during this 8-minute period without the unit going into alarm.

Part One – Your Nighthawk CO and Gas Alarm

Where to Install Your CO and Gas Alarm

WHEN CHOOSING YOUR INSTALLATION LOCATIONS, MAKE SURE YOU CAN HEAR THE ALARM FROM ALL SLEEPING AREAS.

Mounting Configuration
Since CO generally mixes well with air, mounting the Nighthawk CO and Gas alarm should depend on the type of explosive Gas you intend to detect. If you are not certain which type of Gas you are using in your home, please read about natural Gas and propane in the introduction on page i.

If you are a user of natural Gas, we recommend you mount your Nighthawk unit high on the wall (no closer than 6 inches from the ceiling) using the extendable cord feature to ensure the earliest opportunity to detect a Natural Gas leak.

If you are a user of propane, we recommend you mount your Nighthawk near the floor (using the direct plug-in feature) to ensure the earliest opportunity to detect a propane leak.

LOCATION
Your Nighthawk CO and Gas alarm should be mounted in or near bedrooms and living areas or wherever you suspect a CO or Gas exposure is likely. It is recommended that you install a Nighthawk CO and Gas alarm on each level of a multi-level home.

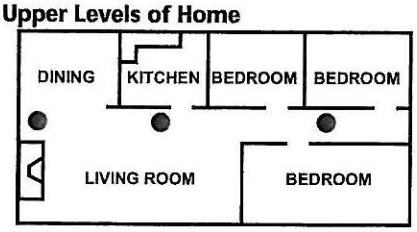
In the event of a CO alarm, two self-adhesive labels are included with the CO and Gas alarm. Add the phone number of your emergency service provider in the space provided. Place one label next to the alarm and one label near a fresh air source such as a door or window.

CAUTION: This alarm will only indicate the presence of carbon monoxide or Gas at the sensor. Carbon monoxide or Gas may be present in other areas.

IMPORTANT: Improper location can affect the sensitive electronic components in this alarm. Please see the next section describing where NOT to install this alarm.

Recommended Locations

Upper Levels of Home



Where Not to Install Your CO and Gas Alarm

To avoid causing damage to the unit, to provide optimum protection, and to prevent unnecessary alarms, follow the directions below where NOT to install this alarm:

It is not recommended that you install this CO and Gas alarm in garages or kitchens. Installation in these areas could lead to nuisance alarms, may expose the sensor to substances that could damage or contaminate it, or the alarm may not be heard by persons in other areas of the home, especially if they are sleeping.

In the garage, vehicle exhaust can contain some carbon monoxide. These levels are higher when the engine is first started. Within hours of starting a vehicle and backing it out of the garage, the levels present over time can activate the alarm and become a nuisance.

In the kitchen, some Gas appliances can emit a short burst of CO or Gas upon start-up. This is normal. If your CO and Gas alarm is mounted too close to these appliances, it may alarm often and become a nuisance.

If you must install a Nighthawk CO and Gas alarm near a cooking or heating appliance, **install AT LEAST 5 feet away from appliance.**

Do not install in excessively dusty, dirty or greasy areas such as kitchens, garages and furnace rooms. Dust grease or household chemicals can contaminate or coat the alarm's sensors, causing the alarm not to operate properly.

Do not obstruct the vents located at the top and bottom of the alarm. Place the alarm where drapes, furniture or other objects do not block the flow of air to the vents.

Do not install in dead air spaces, such as peaks of vaulted ceilings or gabled roofs, where carbon monoxide or Gas may not reach the sensor in time to provide early warning.

Do not install in turbulent air from ceiling fans. Do not install near doors and windows that open to the outside, near fresh air vents, or anywhere that is drafty. Rapid air circulation from fans or fresh air from outside may cause the sensors to display an inaccurate readings.

Do not install this alarm in a switch- or dimmer-controlled outlet.

Do not install in areas where the temperature is colder than 40°F (4.4°C) or hotter than 100°F (37.8°C). These areas include unconditioned crawl spaces, attics, porches and garages. Extreme temperatures will affect the sensitivity of the alarm.

Do not install this unit near deep cell large batteries. Large batteries have emissions that can cause the alarm to perform at less than optimum performance.

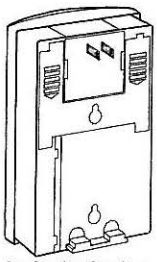
Avoid the following:

- Excessive spillage or reverse venting of fuel burning appliances caused by outdoor ambient conditions, such as: 1) Wind direction and/or velocity, including high gusts of wind. Heavy air in the vent pipes (cold/humid air with extended periods between cycles). 2) Negative pressure differential resulting from the use of exhaust fans. 3) Simultaneous operation of several fuel burning appliances competing for limited internal air. 4) Vent pipe connections vibrating loose from clothes dryers, furnaces or water heaters. 5) Obstructions in or unconventional vent pipe designs which can amplify the above situations.
- Extended operation of unvented fuel burning devices (range, oven, fireplace, etc.).
- Temperature inversions which can trap exhaust Gasses near the ground.
- Car idling in an open or closed attached garage, or near a home.

How to Install Your Alarm

Your Nighthawk CO and Gas alarm with its removable adapter allows you to install the alarm as a wall mounted unit (for natural Gas detection and CO), a direct plug unit (for propane and CO), or as a table top unit.

To install the battery, open the back door and snap battery connector onto battery. You will hear the alarm sound briefly to indicate the unit is receiving power. Place battery into battery compartment and replace back door.



Back of unit when used as direct plug for CO and propane detection.

Direct Plug Alarm

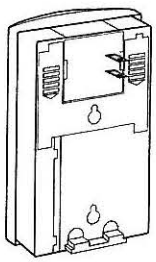
First, refer to "Where to Install Your CO and Gas alarm" on page 1-3 for general guidelines as to where to locate your CO and Gas alarm. In its "as shipped" configuration, your Nighthawk CO and Gas alarm is ready to be plugged directly into a close to the floor wall socket. This is the recommended configuration for detecting CO and propane.

To install:

1. Choose a standard 120V outlet to plug alarm into.
2. Pull slide support out approximately .25" until slide snaps in place (this will help support unit in wall outlet).
3. Simply plug in.

If outlet is mounted horizontally (sideways):

If you are going to use your alarm as a direct plug and you are going to plug in to an outlet that is mounted horizontally (sideways), you will need to rotate the adapter 90°. This simple process is outlined below.



Back of unit when used as direct plug for sideways outlet

To rotate adapter:

1. With back of unit facing you (with adapter at top), place your thumbs on thumb grips.
2. With your thumbs, push down in the direction of the arrows on the thumb grips and slide back door off.
3. Next, place your thumbs on the adapter thumb releases.
4. Spread adapter thumb releases out and carefully turn alarm over. This will allow adapter to slide out.
5. Rotate the adapter 90° to the right (clockwise), and snap firmly back into place.
6. Carefully replace back door by making sure "latches" on all four corners of door are lined up, then firmly press into place.
7. Now simply plug in to outlet.

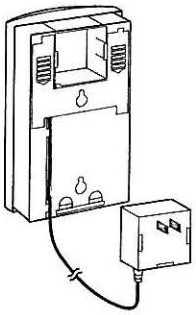
Part One – Your Nighthawk CO and Gas Alarm

Wall Mounted Alarm

First, refer to "Where to Install Your CO and Gas alarm" on page 1-3 for general guidelines as to where to locate your CO and Gas alarm.

Installation tips for power cord models: The power cord option provides more flexibility in mounting locations and allows the alarm to be easily installed at eye level.

Note: If you mount the alarm high on a wall, make sure it is **at least 6" from the ceiling**. Any higher than this, it will be in "dead air space" and carbon monoxide or natural Gas may not reach the sensors.



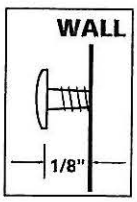
Back of unit when used as a wall mount for natural gas and CO detection

Note: Do not cover the alarm with a curtain.

For a wall-mount, you will need to pull out the removable adapter and power cord. This simple process as outlined below.

To install:

1. Follow steps 1 - 4 in the previous column under "To Rotate Adapter."
2. With adapter out, pull out power cord and unwrap it.
3. With cord extended, press last few inches into cord recess. Gently pull cord at bottom of cord recess until cord becomes taught and lays flat in cord recess.
4. Carefully replace back door by making sure "latches" on all four corners of door are lined up, then firmly press into place.
5. Insert the screws provided until head is approx. 1/8" from wall (If mounting in plaster board or drywall, drill 3/16 hole and use plastic anchor provided). Use mounting guide template in back of user's guide to locate holes.



6. Hook the Nighthawk CO and Gas alarm unit over the screw onto keyhole in back of unit.
7. Plug cord into electrical outlet.

Table Top Alarm

You can also use your Nighthawk CO and Gas alarm as a table top unit. Simply follow the above steps for removing adapter, then instead of mounting to a wall, simply pull out slide support and stand on table, bedside stand, chest of drawers, etc. (refer to diagram on page 1-1).

Normal Operating Characteristics

When you first power up the unit, the alarm will sound briefly to let you know the unit is receiving power and that the alarm circuit is functioning.

You should see three eights 888 on the digital display, indicating the alarm is in the start-up mode. The three eights will remain for approximately 20 seconds. You should see a blinking red dot to the lower right of the digital display. The blinking dot shows that the alarm is operating.

Blinking Dot

Within 20 seconds, your CO alarm will start monitoring for CO. Within 2 minutes your alarm will start monitoring for Gas. **Note:** The number will probably be zero (0). This is a normal condition for most households and shows that no measurable amount of CO or Gas is being detected.

The alarm has begun monitoring the air for carbon monoxide and Gas and will continue to do so as long as it receives power.

When the alarm is unplugged or loses power <u>and you have a good 9V battery installed,</u> the alarm will automatically switch to its battery backup mode and you will notice the following:

- After 4 minutes the digital display will show a blinking dot only – this helps conserve the battery's power.
- The digital display will show a number for CO or show "GAS" only if it senses carbon monoxide or Gas while in backup mode.
- If CO is detected while on battery backup, alarm pattern is 4 quick beeps – followed by 5 seconds of silence – followed by 4 quick beeps. After 4 minutes, this alarm pattern occurs only every 60 seconds.
- If Gas is detected while on battery backup, the unit will display Gas and alarm continuously. The alarm pattern for Gas is a 1/2 second alarm on, 1/2 second of silence -repeating. For the first four minutes after the unit goes into battery backup operation, the explosive gas sensor will operate as if on AC power. However, after four minutes, to extened battery life, the unit will go into battery conserve mode and will only sample for explosive gas once every eight minutes. Explosive gas could be present during this 8-minute period without the unit going into alarm. If the alarm is on battery backup for an extended period of time, replace the battery to ensure maximum protection is provided. The battery will last only a couple hours in a Gas alarm condition.

Note: When AC power is restored, the alarm will automatically switch back to normal operating mode.

When the alarm is unplugged or loses power <u>and you have a low battery installed,</u> you will notice the following:

- A fading alarm will sound alerting you the unit has switched to its backup mode, but the 9V battery is low.

- A blinking dot will be displayed and the sounder will chirp every 15 seconds.
- The display will alternate between "Lb." (low battery) and CO reading while chirping.

When battery is depleted:

- A blinking dot will be displayed and the sounder will chirp approximately every 30 seconds.
- Pressing the test button will result in a chirp approximately every one second. The alarm **will not** detect CO or gas if battery is depleted. Replace battery.

Constant exposures to high or low humidity may reduce battery life.

We recommend you replace your 9V battery at least every six months.

How to Test Your Alarm

There are two aspects of the alarm's operation that can be tested: the electronics and the sensors response. Instructions on testing each are outlined below and on the next page.

Testing the Electronics

You should test the alarm once a month, following the directions listed below. If at any time you test the alarm and it does not perform as described below, have it replaced immediately. Turn to page 1-6 "How to know if your alarm is malfunctioning" for a description of the characteristics of a malfunctioning alarm and what you should do if a malfunction occurs.

Observe the alarm weekly to make sure the red dot is blinking, indicating normal operation.

If the dot is not blinking, unplug the alarm for three minutes, then plug in again. This will clear the alarm for restart. If the dot does not resume blinking, your alarm may be malfunctioning.

To test the alarm, press the Test/Reset button. If the unit is operating properly, you should notice the following:

- The display shows three eights 888, then shows the word "GAS" in the display while the unit is sounding 3 half second beeps. Then, the display shows a number (usu ally around 200). You should then hear 4 quick beeps – followed by 5 seconds of silence – followed by 4 quick beeps repeating until reset stops. The unit will then show the three eights for several seconds. It will then return to monitoring for carbon monoxide and Gas.

Familiarize yourself and household members with the alarm pattern described above for a Gas event and a CO event. While on AC power, in the event of a CO or Gas incident, the appropriate pattern will continue to repeat as long as CO or Gas is present.

How to Test Your Alarm (continued)

NOTE: Pressing the Test/Reset button tests the functions of the alarm's internal components, circuitry and micro-computer. **YOU DO NOT NEED TO PRESS THE TEST BUTTON TO TAKE A CO OR GAS READING.** CO readings or the presence of Gas are automatically shown on the alarm's digital display. If the alarm shows zero (0), then no measurable amount of CO or Gas has been sensed by the alarm within the past 15 seconds.

Testing the sensor response

While it is not required, on occasion you may wish to observe and become familiar with your alarm's response in the actual presence of carbon monoxide or Gas. The best and safest way to do this is with either a cigarette or an incense stick. To perform this test you will need: your alarm, a butane lighter, an ashtray, and either a cigarette or an incense stick.

CAUTION: Please refer to the "Frequently Asked Questions" section for warnings on how NOT to test the sensor response.

WARNING: This test should be done by adults only. Children should be warned never to light matches or butane lighters. Please use caution when performing the test described below. Avoid burns from flame or hot materials. Avoid inhaling excessive smoke from the cigarette or incense stick. Extinguish all flames and properly discard all hot materials.

CARBON MONOXIDE TESTING

Step 1. With a match or a lighter, light a single cigarette or incense stick. Extinguish the match or lighter. Make sure an ashtray is available to discard ashes, matches and the burned cigarette or incense stick.

Step 2. Hold the smoldering cigarette or incense stick 2-3 inches directly *below* the bottom air vents of the CO and Gas alarm, making sure the stream of smoke rises into the vents.

Step 3. Continue holding the cigarette or incense stick directly below the alarm for 3 - 5 minutes or until you see a reading on the display. Note: Do not hold the cigarette or incense stick closer than one inch to the alarm as smoke *will* cause a yellow stain to develop on the alarm's outer case.

Step 4. Your unit will probably not alarm during this test. If it does, you can silence it by pressing Test/Reset button and removing the source of CO.

Step 5. Extinguish the cigarette or incense stick by pressing the smoldering tip into the ashtray.

Part One – Your Nighthawk CO and Gas Alarm

GAS TESTING

Step 1. With a butane lighter, press the button of the lighter without activating the flint. Ensure no heat source or spark is present near you when performing this test.

Step 2. While holding the button of the lighter down, insert the orafice of the lighter into the vents on the front of the unit. Hold for 30-60 seconds or until alarm activates.

Step 3. After the alarm condition is achieved, remove the lighter and gently blow in the same area to remove the gas.

How to Know If Your Alarm is Malfunctioning

Your alarm performs an internal self-diagnosis every 15 seconds to make sure that it is functioning properly. The alarm is designed to alert you in the unusual event of a malfunction.

If the alarm malfunctions.

In the rare event that your alarm malfunctions, it will alert you with one of these signal groups (depending upon the type of malfunction that occurs):

Malfunction Signal Group 1 - Component Failure

- An intermittent "chirping" alarm will sound every 30 secs., and
- An "Err" message will appear on the digital display

OR,

Malfunction Signal Group 2 - Microprocessor Failure

- The alarm will sound continuously, and
- The digital display will be blank, and
- The alarm cannot be shut off by pushing "Test/Reset" button

Unplug the alarm immediately and return for warranty exchange (see "Warranty" on back page).

Low Battery Warning

If the 9V battery is missing, or if the battery's power is low, an "Lb" message will display which blink's alternately with the current CO reading or "GAS" every second. If this happens, you need to replace the battery. Refer to page 1-5 for more on low battery warnings.

What to do if you're not sure...

PLEASE familiarize yourself with the malfunction alert, and do not confuse these signals with an alarm. After reading the information above, if you are still unsure whether your alarm is operating properly, call the KIDDE Safety toll-free consumer hotline at 800-880-6788 to do a quick diagnostic check of the alarm over the phone. The customer service representative will be able to assist you and answer your questions.

If your alarm sounder is beeping, and you are not sure if it is a CO and Gas alarm or a malfunction alert, reset the alarm, open windows for ventilation, extinguish all open flames, do not activate any electrical switch and evacuate the premises immediately. Then call the KIDDE Safety toll-free consumer hotline at 800-880-6788 for assistance.

Part One – Your Nighthawk CO and Gas Alarm

How to Know If Your Alarm is Malfunctioning (continued)

Never ignore an alarm. A true alarm is an indication of potentially dangerous levels of carbon monoxide or Gas.

How to Care for Your Alarm

To keep your alarm in good working order, you must follow these simple steps:

WHAT YOU SHOULD DO

- Test the alarm once a month by pressing the Test/Reset button (see page 1-5,6).
- Vacuum the alarm cover once a month to remove accumulated dust. Use the soft brush attachment of your vacuum cleaner, and unplug the alarm from the electrical outlet before vacuuming.
- Instruct children never to touch, unplug or otherwise interfere with the alarm.

WHAT YOU SHOULD NOT DO

- Never use detergents or solvents to clean the alarm. Chemicals can permanently damage or temporarily contaminate the sensor.
- Avoid spraying air fresheners, hair spray, paint or other aerosols near the alarm.
- Do not paint the alarm. Paint will seal the vents and interfere with proper sensor operation.
- Do not mount the alarm directly above or near a diaper pail, as high amounts of methane Gas can cause a Gas alarm.

Note: If you will be staining or stripping wood floors or furniture, painting, wall-papering, or using aerosols or adhesives for a do-it-yourself project or hobby, **before you begin: Remove the alarm to a remote location to prevent possible damage to or contamination of the sensor.** You may wish to unplug the alarm and store in a plastic bag during the project.

The following is a list of substances that at high levels can affect the sensor and cause an alarm.
Methane, propane, iso-butane, ethylene, ethanol, alcohol, carbon monoxide, iso-propanol, benzene, toluene, ethyl acetate, hydrogen, hydrogen sulfide, sulfur dioxides.

Also most **aerosol sprays, alcohol based products, paints, thinners, solvents, adhesives, hair sprays, aftershaves, perfumes, auto exhaust** (cold start) and some cleaning agents.

The Peak Level Memory Button

Although the peak level feature will display levels below 30 PPM of CO, these levels will not result in an alarm no matter how long the device is exposed to these levels.

The peak level feature is helpful in identifying low level CO occurrences below 30 PPM. Although the unit will not automatically display levels below 30 PPM, it will detect and store these readings in memory. By pressing the peak level button, concentration levels as low as 11 and up to 999 PPM will be displayed. Gas events will not be displayed when pressing the peak level memory button.

Concentrations of CO between 0 and 30 PPM can often occur in normal, everyday conditions. Concentrations of CO below 30 PPM may be an indication of a transient condition that may appear today and never reappear. Just a few examples of conditions and/or sources that may cause low level readings are heavy automobile traffic, a running vehicle in an attached garage, an appliance that emits CO when starting up, a fire in a fireplace or charcoal in a nearby barbecue. A temperature inversion can trap CO generated by traffic and other fuel burning appliances causing low level readings of CO.

Normally, the digital display will read "0" and under certain conditions you may notice levels of 30 or more for short periods of time, by using the Peak level memory feature on the Nighthawk alarm you can view concentrations of CO between 11 and 30 PPM. Use the low-level concentrations shown in memory as a tool in identifying the source of the CO. It may be helpful to purchase additional Nighthawk alarms to place in different locations throughout your house to isolate the CO source. Monitor the CO concentrations shown in the peak level memory to see if readings occur in certain areas at certain times of the day, or near a particular appliance.

Once the source is located, correcting the problem may be as easy as opening a window, venting an appliance, backing a car out of the garage a safe distance from living quarters, closing the garage door, and letting the car warm up outside. It could be possible that a weather condition caused the low-level reading and the condition may or may not happen again.

Some CO conditions may start out as low level leaks but could develop into CO concentrations that could become harmful. If this happens, the CO and Gas alarm will detect the dangerous level and alarm, notifying you and others of the conditions. DO NOT ignore high concentration readings above 30 PPM or a CO and Gas alarming device that is in alarm. Refer to page 4-1 for more details.

CO concentrations displayed below 30 PPM in memory are for reference only and the accuracy of the concentration shown may not be as accurate as noted on page 5-1.

To Reset the Peak Level Memory...

Step 1. Press the peak level button.

Step 2. With the peak level button still pressed, press the test/reset button for two seconds and release.

The number on the display will turn to "0". The memory has now been cleared and the alarm will begin monitoring for CO and Gas within a few minutes.

Part Two – Carbon Monoxide and Gas

What is Carbon Monoxide?

Carbon monoxide (CO) is an odorless, colorless, poisonous Gas created when any fuel is burned – Gasoline, propane, natural Gas, oil, wood, coal, and even tobacco. When combustion air is limited, more CO is produced. Serious problems can develop when combustion by-products are not properly vented outside the house.

You've probably heard about carbon monoxide poisoning in the news recently. It's a problem receiving more attention because groups like the American Lung Association and the Consumer Product Safety Commission have made it a priority to warn the public about the dangers of this deadly household poison.

What is Natural Gas?

Natural Gas is typically supplied through a main utility line connected to your home. If you do not live in a rural area you are likely to be a user of natural Gas. It is the dominant energy used for home heating with about 55 percent of American homes using Gas. Natural Gas is a fossil fuel comprised almost entirely of Methane. Methane is much lighter than air and will rise rapidly in air. If you are a user of natural Gas, we recommend you mount your Nighthawk unit 12 inches away from the ceiling (using retractable cord feature) to ensure the earliest opportunity to detect a leak.

What is Propane?

Propane is typically supplied to homes via delivery truck in liquid form and stored near the home in propane tanks. Propane is used by homes in rural areas that do not have natural Gas service. Since propane is the most commonly used *liquefied petroleum Gas (LPG)*, "propane" and LP-Gas are often used synonymously. Unlike natural Gas, propane is much heavier than air and will collect at lower levels. If you are a user of propane, we recommend you mount your Nighthawk near the floor (using the direct plug-in feature) to ensure the earliest opportunity to detect a leak.

What are the Effects of CO Exposure?

When you breathe carbon monoxide, it enters your bloodstream through your lungs and attaches to red blood cells. These red blood cells, called hemoglobin, carry oxygen throughout your body. Carbon monoxide molecules attach to the red blood cells 200 times faster than oxygen, preventing the flow of oxygen to your heart, brain and vital organs. As carbon monoxide accumulates in your bloodstream, your body becomes starved for oxygen. The amount of carbon monoxide in a person's body can be measured by a simple blood test, called a "carboxyhemoglobin level" test .

The early symptoms of carbon monoxide poisoning are often mistaken for the flu – headache, dizziness, weakness, nausea, vomiting, sleepiness, and confusion.
Breathing very high concentrations of carbon monoxide can be lethal in minutes. Breathing low concentrations over time is dangerous, too. Long term exposure to low levels could cause permanent heart and brain damage.

Could Your Family be at Risk for CO Poisoning?

Carbon monoxide is the number one cause of poisoning deaths in the United States. According to the Mayo Clinic, at least 10,000 Americans are affected by CO poisoning each year.

While anyone is susceptible, experts agree that unborn babies, small children, senior citizens and people with heart or respiratory problems are especially vulnerable to CO and are at the greatest risk for death or serious injury.

Where Does CO Come From?

Inside your home, appliances used for heating and cooking are the most likely sources of carbon monoxide. Vehicles running in attached garages can also produce dangerous levels of carbon monoxide.

A by-product of combustion, carbon monoxide can be a potential problem from a number of common sources – automobiles, furnaces, water heaters, fireplaces, wood stoves, charcoal grills, Gas ranges, space heaters and portable generators.

When these appliances are in good working condition with proper ventilation, lethal carbon monoxide Gas is vented outdoors where it quickly disperses. But even the slightest malfunction or misuse of any of these sources can lead to a build-up of carbon monoxide in your home that can become deadly before you'd even know it's there.

And you don't have to have ancient appliances to have a problem. Today's more energy-efficient, airtight home designs can trap CO-polluted air inside where it can quickly build to lethal levels.

What Can You do to Protect Your Family?

To be safe, know the possible sources of CO in your home. Keep fuel-burning appliances and their chimneys and vents in good working condition. Learn the early symptoms of exposure, and if you suspect carbon monoxide poisoning, move outside to fresh air and get emergency help. A blood test can confirm that CO caused the problem.

Your first line of defense is an annual inspection and regular maintenance of your appliances. Contact a licensed contractor or call your local utility company for assistance.

But remember, problems can begin after an inspection is over, like a crack in a furnace heat exchanger, or a leak in a water heater vent or a bird's nest blocking a flue. Other sources are nearly impossible to detect: even a change in the air pressure outside can turn a normally safe situation deadly. That's why you need the 24-hour protection provided by a CO and Gas alarm.

Part Two – Carbon Monoxide and Gas

Home Safety Tips

What You Can Do...

- Buy only appliances approved by a nationally recognized testing laboratory.
- Choose fuel-burning appliances that can be vented to the outdoors, whenever possible.
- Make sure appliances are installed according to manufacturer's instructions and local building codes. Most appliances should be installed by professionals and should be inspected by the proper authority after installation.
- Have the heating system, vents, chimney and flue inspected and cleaned by a qualified technician every year.
- Follow manufacturer's directions for safe operation of all fuel-burning appliances.
- Examine vents and chimneys regularly for improper connections, visible rust or stains.
- Open a window when a fireplace or wood-burning stove is in use, and provide adequate outdoor air for furnace and water heater.
- Notice problems that could indicate improper appliance operation:
  - Decreasing hot water supply
  - Furnace unable to heat house or runs constantly
  - Sooting, especially on appliances
  - Unfamiliar or burning odor
  - Yellow or orange flame
- Be aware of the symptoms of carbon monoxide poisoning:
  - headaches, dizziness, weakness, sleepiness, nausea, vomiting, confusion and disorientation.
- Recognize that CO poisoning may be the cause when family members suffer from flu-like symptoms that don't disappear but improve when they leave home for extended periods of time.

What You Should Not Do...

- Never burn charcoal inside a home, garage, cabin, RV or camper.
- Never install, service, or convert fuel-burning appliances from one type to another without proper knowledge, skills and tools.
- Never use a Gas range, oven, or clothes dryer for heating.
- Never operate unvented Gas-burning appliances, such as kerosene or natural Gas space heaters, in a closed room.
- Never operate Gasoline-powered engines (like vehicles, motorcycles, lawn mowers, yard equipment or power tools) in confined areas such as garages or basements, **even if** an outside door or window is open.
- Never ignore a safety device when it shuts off an appliance.
- Never ignore a CO alarm or Gas alarm.

Be Aware of the Warning Signs of Carbon Monoxide: Clues You Can See...

- Streaks of carbon or soot around the service door of your fuel-burning appliances.
- A yellow or orange flame may indicate a problem with natural Gas appliances.
- Excessive rusting on flue pipes or appliance jackets.
- Loose or missing furnace panel.
- Moisture collecting on the windows and walls of furnace rooms.
- Loose or disconnected vent/chimney, fireplace or appliance.
- Small amounts of water leaking from the base of the chimney, vent or flue pipe.
- Rust on the portion of the vent pipe visible from outside your home.
- The absence of a draft in your chimney (indicating blockage).
- Fallen soot from the fireplace chimney.
- Loose, damaged or discolored bricks on your chimney.

Clues You Cannot See...

- Internal appliance damage or malfunctioning components
- Improper burner adjustment
- Hidden blockage or damage in chimneys

Part Three – What You Should Know Before the Alarm Sounds

Learn the difference between dangerous levels, high levels, mid levels and low levels for an average healthy adult

Dangerous levels, when someone is experiencing symptoms of CO poisoning and CO readings are *generally* above 100 ppm. Anytime someone is experiencing the symptoms of carbon monoxide poisoning this should be treated as an EMERGENCY. Follow the instructions on page 4-1.

High levels, generally above 100 ppm, with no one experiencing symptoms. This should be treated as an URGENT situation. Follow the instructions on page 4-1.

Mid levels, generally between 50 ppm to 100 ppm. This should be cause for CONCERN and should not be ignored or dismissed. Follow the instructions on page 4-1.

Low levels, generally below 50 ppm. This indicates a need to watch the situation closely to see if it resolves itself or worsens. Follow the instructions on page 4-2.

Determine if anyone in the household is at high risk for CO poisoning

Many cases of reported carbon monoxide poisoning indicate that while victims are aware they are not well, they become so disoriented they are unable to save themselves by either exiting the building or calling for assistance.

You should **take extra precautions to protect high risk persons** from CO exposure because they may experience ill effects from carbon monoxide at levels that would not ordinarily affect a healthy adult. Are there any infants or small children in the home? Be sure to check them for signs of possible CO poisoning because they might have trouble explaining their symptoms. Infants and children are more susceptible to CO poisoning than a healthy adult.

Pregnant women should be aware that their unborn fetus could be harmed by exposure to carbon monoxide, even when the mother suffers no ill effect herself. Any pregnant woman who suspects she may have been exposed to carbon monoxide should immediately contact her physician.

Is there anyone in the household who is elderly, or who has anemia, heart disease or respiratory problems, emphysema or chronic bronchitis? These individuals are at higher risk for CO poisoning and for health problems from exposure to low levels of carbon monoxide.

If anyone in the household is at high risk for CO poisoning, we urge you to take extra precaution to prevent possible poisoning. You should consider a more sensitive alarm for your home safety. If the unit alarms or if CO readings are shown on the digital display, remove the at-risk person from the premises, if possible. Ventilate the area. The high-risk person(s) should not re-enter the residence until the source of the CO problem has been identified and corrected.

Understand the Effects of Carbon Monoxide Exposure

Low Levels:
Generally 50 ppm and below.

Mid Levels:
Generally 50 ppm to 100 ppm.

High Levels:
Generally 100 ppm and above if no one is experiencing symptoms.

Dangerous Levels:
Generally 100 ppm and above if someone is experiencing symptoms.

Concentration of CO in Air *(ppm = parts per million)*	Approximate Inhalation Time and Symptoms Developed
50 ppm	The maximum allowable concentration for continuous exposure for healthy adults in any 8-hour period, according to OSHA*.
200 ppm	Slight headache, fatigue, dizziness, nausea after 2-3 hours.
400 ppm	Frontal headaches within 1-2 hours, life threatening after 3 hours.
800 ppm	Dizziness, nausea and convulsions within 45 minutes. Unconsciousness within 2 hours. Death within 2-3 hours.
1,600 ppm	Headache, dizziness and nausea within 20 minutes. Death within 1 hour.
3,200 ppm	Headache, dizziness and nausea within 5-10 minutes. Death within 25-30 minutes.
6,400 ppm	Headache, dizziness and nausea within 1-2 minutes. Death within 10-15 minutes.
12,800 ppm	Death within 1-3 minutes.

* Occupational Safety and Health Administration

Reminder: This chart relates to the exposure of healthy adults. Read the info above for descriptions of those who are at higher risk.

Part Four – What to Do When the Alarm Sounds for Carbon Monoxide

Determine if anyone in the household is experiencing symptoms of CO poisoning. Many cases of reported CO poisoning indicate that while victims are aware they are not well, they become so disoriented they are unable to save themselves by either exiting the building or calling for assistance. Also young children and household pets may be the first affected. The following symptoms are related to CARBON MONOXIDE POISONING and should be discussed with ALL members of the household:

Become familiar with these common symptoms from CO poisoning.

Common Mild Exposure Symptoms:
Slight headache, nausea, vomiting, fatigue ("flu-like" symptoms).

Common Medium Exposure Symptoms:
Throbbing headache, drowsiness, confusion, fast heart rate.

Common Extreme Exposure Symptoms:
Convulsions, unconsciousness, heart and lung failure. It can cause brain damage and death.

If you experience even mild symptoms of CO poisoning, consult your doctor immediately!

WARNING:
Actuation of your CO and Gas alarm indicates the presence of Carbon Monoxide (CO) or explosive Gas which can KILL YOU.

When the CO and Gas alarm senses a dangerous level of CO, the unit will emit a loud alarm pattern and display the concentration of CO in parts per million (PPM). The alarm pattern is 4 short beeps – followed by 5 seconds of silence – followed by 4 short beeps repeating. (Note: When the unit is disconnected from the 120V power supply and is on battery backup, the alarm pattern will continue for the first 4 minutes after detecting CO and then the cycle will repeat every one minute). Know how to respond to a CO or Gas emergency. Periodically review this user's guide and discuss with all members of your family.

If the alarm sounds for carbon monoxide:

1) Operate test/reset button;

2) Call your emergency services PHONE NUMBER (fire dept. or 911);

3) Immediately move to fresh air - outdoors or by an open door/window. Do a head count to check that all persons are accounted for. Do not reenter the premises nor move away from the open door/window until the emergency services responders have arrived, the premises have been aired out, and your CO and Gas alarm remains in its normal condition.

4) After following steps 1-3, if your alarm reactivates within a 24 hour period, repeat steps 1-3 and call a qualified technician to investigate for sources of CO from fuel burning equipment and appliances, and inspect for proper operation of this equipment. If problems are identified during this inspection have the equipment serviced immediately. PHONE NUMBER
Note any combustion equipment not inspected by the technician and consult the manufacturer's instructions, or contact the manufacturer's directly, for more information about CO safety and this equipment. Make sure that motor vehicles are not, and have not been, operating in an attached garage or adjacent to the residence.

Part Four – What to Do if the Alarm Sounds for Gas

Treatment for CO Poisoning

Any person who is suspected to have carbon monoxide poisoning should leave the potentially dangerous environment, get fresh air immediately and seek care from a physician. CO poisoning can be determined by a simple blood test, called a "carboxyhemoglobin" test. This test measures the amount of carbon monoxide in the bloodstream. For this test to be accurate, it must be done immediately after CO exposure. Acute CO poisoning is usually treated by breathing in oxygen. When CO poisoning is severe, (for example, when there is an altered state of consciousness), high pressure oxygen therapy in a special "hyperbaric chamber" may be used. A physician will make this determination and administer treatment if necessary.

What to DO if the Alarm Sounds for Gas

Activation of the Gas alarm indicates the presence of an explosive Gas, which can cause an explosion and/or fire. When the unit senses either natural Gas or propane, the display will show "GAS" and emit a loud alarm pattern. The alarm pattern for Gas is a 1/2 second beep followed by a 1/2 second of silence then repeating. Know how to respond to a CO or Gas emergency. If the unit alarms for Gas:

1) Evacuate the premises.

2) Do not activate any electrical switch or telephone.

3) Contact your fire department

Calling a Qualified Technician to Find and Repair the Problem

If you call a qualified service technician (such as a licensed heating contractor, utility service technician or fuel provider) to inspect your home for possible sources of CO or Gas leak. Do not restart these appliances until the problem is corrected. Request service for as soon as possible, like **TODAY**.

Please be aware that some service technicians may charge a fee to inspect your home, even if the source of CO or Gas is not found. You may wish to find out if you will be charged for the service and the amount of the fee before you request service. Some public utilities do not charge for inspection. Some service technicians do not charge if you purchased your appliance from them. To know for sure, you need to ask before the technician comes to your home. Repair work or replacement of appliances may be necessary to fix the problem that is creating the CO or Gas in your home. Remember, a CO and Gas alarm can only warn you of the presence of CO or Gas, it does not prevent CO or Gas from occurring, nor can it solve an existing CO or Gas problem.

Because you've provided ventilation by leaving your windows and doors open, the CO or Gas buildup may have dissipated by the time help responds. Although your problem may appear to be temporarily solved, it's crucial that the source of the problem is determined and appropriate repairs are made.

Sometimes it's Difficult to Find the Source of CO in a Home

It can be difficult for responders to locate the source(s) of CO if:

- The house was ventilated before they arrived and the fresh air caused the CO to dissipate. The peak level function on your Nighthawk CO and Gas alarm helps the responders know how severe the problem was before they arrived.
- The CO problem was caused by a source that fluctuates on and off, sometimes creating CO and sometimes not. Such a situation makes it nearly impossible to pinpoint the source of CO in a short period of time.
- The cause of CO problem was backdrafting – when air in a chimney or flue is sucked into the home instead of venting outside. The exact situation that created a negative air pressure inside the home (the cause of backdrafting) is difficult to recreate during an investigation for CO. Sometimes the CO problem disappears when a door or window is opened. Backdrafting may or may not happen again.

Part Five – Technical Information

Product Specifications

Power: 120V AC units: 60 Hz, Current 120 mA max.

Sensor: CO sensor calibrated at 150 ppm (±25 ppm).

Gas sensor calibrated to alarm before 25% of the LEL.

Temperature:
Operating range: 40°F (4.4°C) to 100°F (37.8°C).

Mounting: Accessories supplied for wall mount or direct plug applications.

Alarm: 85+ dB at 10' @ 3.4 ± 0.5 KHz pulsing alarm.

LED Operation:
Blinking dot on display denotes normal operation.
Digital readout 30-999.
In alarm condition for CO you will hear 4 quick beeps, 5 seconds off, repeating for CO.
In alarm condition for GAS you will hear a 1/2 second beep, 1/2 second silence, repeating for GAS.

Battery Backup:
A 9V battery is needed. If battery is low or missing while the unit is plugged into a 120V outlet, an "Lb" message will display which will blink alternately with a the CO reading every second and the sounder will chirp every 15 seconds.

Unit Malfunction:
"Err" error message will display. Intermittent alarm will sound every 30 seconds.
Refer to pages 1-6, 6-3 and 6-4 for other error conditions.

Test/Reset Button:
Test button verifies proper unit operation and resets the unit in the event of a CO and Gas alarm.

Peak Level Memory Button:
When pressed, LED will display the highest CO ppm level detected since unit was powered up or since unit was reset with test button. Reading will be stored in memory as long as unit is not reset or unplugged. Any CO concentration detected from 11-999 will be displayed

Size: 6"L x 3.75"W x 1.8"H. Wt. 1 lb.

Warranty: Five-year warranty from date of purchase against defects in material and workmanship.

How the Unit Determines When to Alarm

Your Nighthawk alarm uses advanced technology to monitor the environment in your home and warn you of unacceptable levels of carbon monoxide or Gas. An internal microcomputer works together with the sensors inside the alarm to determine the levels of carbon monoxide or Gas in the air. The microcomputer is calibrated to trigger the unit's alarm before most people would experience any symptoms of carbon monoxide poisoning or in the case of natural Gas or propane, the alarm will trigger before 25% of the lower explosion limit (LEL). Because carbon monoxide is a cumulative poison, long-term exposures to low levels can cause symptoms, as well as short-term exposures to high levels. Your Nighthawk unit has a **time weighted alarm**, so the higher the level of carbon monoxide present, the sooner the alarm will be triggered.

This Nighthawk alarm meets the alarm response time requirements of UL Standard 2034 which are as follows for CO:

At 70 ppm, the unit must alarm within 60-240 minutes.
At 150 ppm, the unit must alarm within 10-50 minutes.
At 400 ppm, the unit must alarm within 4-15 minutes.

This Nighthawk alarm meets the alarm response time requirements of UL Standard 1484 which are as follows for Gas:

This unit shall alarm before 25% of the LEL of either natural Gas or propane is detected. In all cases, the unit will detect carbon monoxide as a priority over Gas. If the device is detecting Gas, then detects an amount of CO to cause an alarm, the device will stop alarming for Gas and alarm for CO.

WARNING: This product is intended for use in ordinary indoor locations of family living units. It is not designed to measure compliance with Occupational Safety and Health Administration (OSHA) commercial or industrial standards. Individuals with medical problems may consider using warning devices which provide audible and visual signals for carbon monoxide concentrations under 30 ppm.

Accuracy of the Digital Display

Each Nighthawk CO and Gas alarm is calibrated at a CO concentration of 150 ppm in air, at 80° F (+/- 10° F) and 40% (+/- 3%) relative humidity. Depending on the ambient condition (temperature, humidity) and the condition of the sensor, the alarm readings may vary. Under the same ambient conditions the device will alarm for Gas before 25% of the LEL is reached.

The digital reading tolerances are:
Ambient: 80° F (+/- 10° F), atmospheric pressure +/- 10%, 40% +/- 3% relative humidity.

Reading	Tolerance (of displayed reading)
0-999 ppm	+/-20% +15 ppm

Part Six – Frequently Asked Questions

Q. How many alarms do I need in my house? How much square footage will one alarm cover?
A. We recommend you place alarms near the sleeping area(s). If you have a multi-level home, you should place an alarm on each level of the home. A good rule of thumb for the number and placement of CO and Gas alarms for your particular home is to place CO and Gas alarms near smoke alarms that have been installed to meet current building code requirements.

Generally, one alarm can be adequate for 1,200 to 1,500 square feet of living space. The most important determination for the number of units needed is whether an alarm can be heard in all sleeping areas.

Q. Can you explain what "time-weighted alarm" means?
A. Because carbon monoxide is a cumulative poison, two factors determine how the body is affected by CO: the level of exposure and the length of exposure. For example, being continuously exposed to low levels of carbon monoxide for many hours can be as dangerous as being exposed to higher levels of CO for a short period of time.

The microchip inside your Nighthawk CO and Gas alarm monitors the air for the presence of carbon monoxide and computes the levels and length of exposure, alarming when you should be concerned about CO exposure.

For more information about the alarm, see page 5-1.

Q. Do I have to press the test button to get a CO or Gas reading?
A. No. Your Nighthawk CO and Gas alarm continuously monitors the air for carbon monoxide and gas. An updated reading is shown on the digital display every 15 seconds. If there is no CO or Gas present, the digital display will show a zero. The alarm will alert you to the presence of CO or Gas automatically.
To test the internal components and circuitry of your alarm, press the Test/Reset button. For complete instructions on testing your alarm, see page 1-5,6.

Q. What happens if the power goes out?
A. If a good battery is in the unit, the alarm will display a blinking dot for at least 20 hours while still providing protection against CO or Gas exposure. Please note however, that the alarm will sample for the presence of gas once every eight minutes while on battery backup. Gas could be present during this eight minute period without alarming. Please see page 1-5.

Q. How do I get the alarm to show something besides "0." OR, How can I determine if the sensors are operating correctly?
A. Please refer to "Testing Sensor Response" on page 1-6 for complete instructions on how to test your alarm's electronics and sensor functions.

Q. You warranty the alarm for five years. How will I know when it doesn't work anymore and I need to buy a new one?
A. In any event of malfunction, your alarm will alert you with malfunction signals. These signals are described in detail on page 1-6.

Q. What do the numbers mean on the digital display when I press the "Test/Reset" button?
A. The numbers you see when you press the Test/Reset button are NOT a CO reading or a Gas alarm. This is a *simulated* reading the alarm displays as it tests its electronics. The numbers displayed when the Test/Reset button is pushed should be between 100 to 400 (usually around 200). These numbers are shown after the "Gas" test is complete.

Q. I called in someone to inspect my home for CO after my unit alarmed, and he couldn't find anything wrong. Why? Does that mean this unit "false alarmed"?
A. No. Please read the information explaining why a CO problem can be difficult to diagnose on page 4-2. Also, please read the information on page 1-6 to make sure you experienced an alarm and not a malfunction alert.

Q. I tried to test the alarm (see below) and it still reads "0." Why?
- ***by running the car in the garage***
- ***by holding it to the tailpipe of the car***
- ***by putting it next to the furnace vent***

A. DO NOT try to test your alarm by doing any of the above! Testing the alarm using any of the methods listed above usually does not yield satisfactory results and *could in fact be dangerous.* To accurately test the alarm, please follow the guidelines given on page 1-5,6.

Never operate a vehicle in a closed garage, as high levels of CO can be built up in a short time. With an attached garage, dangerous CO levels develop inside the home as well as within the garage.

Attempting to test the sensor function by holding the alarm next to a tailpipe or furnace vent may not cause a reading on the display because today's vehicles emit very little CO once the engine reaches operating temperature. Likewise, many of today's high efficiency furnaces emit very low levels of CO.

Q. When I tried to test the unit I got a high number on the digital display, but the alarm didn't sound immediately. Why?

A. Please refer to "How the unit determines when to alarm" on page 5-1 for an explanation of the "time weighted alarm."

Q. Will the alarm last longer if I unplug it during the summer months and only use it during the winter?

A. No. Some components of the alarm can deteriorate over time if not used regularly. We recommend the alarm be plugged in continuously for maximum alarm life.

Q. I use the alarm in a vacation home that isn't always occupied and can have temperature extremes when no one is there (no heat or no air conditioning). Will that hurt the alarm? Should I leave it plugged in all the time?

A. We recommend that your alarm not be installed in areas where temperatures fall below 40°F (4.4°C) or rise above 100°F (37.8°C). Your alarm was designed to be constantly plugged in for maximum performance.

Q. I plugged in the alarm at my house (my parents', my neighbors', etc.) and it read "0." Does that mean everything is OK? (I'm thinking I can return the alarm since everything checks out OK.)

A. This alarm is designed to act as a continuous monitor, it is not designed for use as a short-term testing device to perform a quick check for the presence of CO or Gas.

Remember, a problem can occur at any time, even after a professional inspection has determined that everything is in proper working order. Examples of problems that can develop are a crack in a furnace heat exchanger, a leak in a water heater vent, a bird's nest blocking a flue, or a Gas line fitting becomes loose.

Part Six – Display Reading and What They Mean

Page 6-3 and 6-4 contain vital information about the various readings you may see on your display. We suggest you keep this User's Guide handy for reference.

Your new Nighthawk carbon monoxide and explosive Gas alarm is a sophisticated electronic device – yet very simple to understand. Basically, the unit will display a "0" if it does not sense carbon monoxide or Gas and if you have a good 9V backup battery installed.

If it senses carbon monoxide, it will display a reading in parts per million of carbon monoxide or "GAS" if either natural Gas or propane has been detected..

However, if the backup battery is low or missing, or if the unit malfunctions it will display other readings (and alarm differently) to alert you that something is wrong with the alarm.

Please familiarize yourself and other family members to the difference between a CO reading, a Gas reading and a reading signifying a problem with the alarm itself.

Start-up and Normal Operation Readings

	Display Shows	Alarm Sound	Unit Status	Recommended Action
888.	Brief "888"	One short "chirp"	Self checking when AC powered (Test button was pressed or unit was first powered).	None – Unit should return to zero within a minute..
Lb. ↕ (flashes alternately) 0.	"Lb" flashes alternately with "0".	One short "chirp" every 15 seconds.	Start-up or reset phase when AC powered and ***low battery*** or missing battery.	Install or Replace 9V battery Refer to page 1-4.
0.	Steady "0" and flashing dot	None	Normal AC operation (sensing no CO or Gas) and with good battery	None
238.	Steady display of high number (in the hundreds of ppm) and flashing dot	4 quick beeps, 5 seconds off, repeating.	High level of CO detected	Refer to page 4-1
GAS.	GAS	1/2 second beep, 1/2 second silence repeating	Unit has detected Gas.	Refer to page 4-2.

If at any time the alarm does not perform as described, have it replaced immediately.

Part Six – Display Reading and What They Mean

Readings You May See When Unit is AC Powered

	Display Shows	Alarm Sound	Unit Status	Recommended Action
Err.	Steady "Err" and flashing dot	"Chirp" every 30 seconds	Unit malfunctioning when AC powered	Call KIDDE Safety customer service at 1-800-880-6788

Readings You May See When Unit is on Temporary Battery Backup

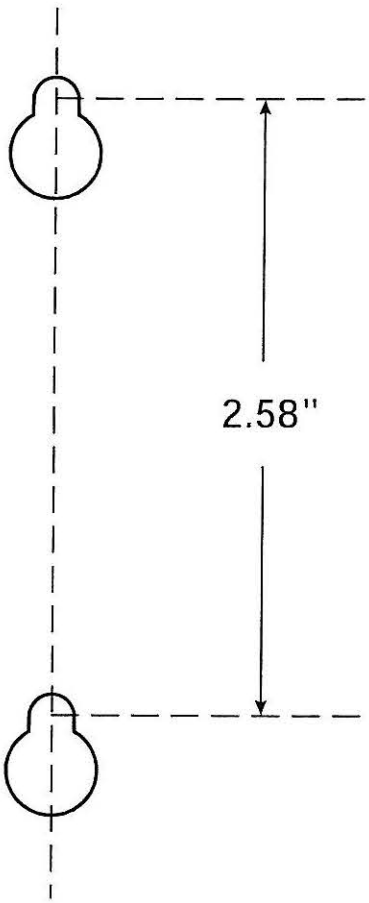
	Display Shows	Alarm Sound	Unit Status	Recommended Action
.	Flashing dot	None	Normal battery-only operation – unit will show reading only if it senses CO or gas	Plug in to AC as soon as possible to conserve battery
Err.	Steady "Err" and flashing dot	"Chirp" every 30 seconds	Unit malfunctioning when battery powered	Call KIDDE Safety customer service at 1-800-880-6788
.	Flashing dot	"Chirp" every 30 seconds	Very low battery – unit will not respond to CO or gas	Replace battery Refer to Step 3 on page ii.
	No display	Constant Alarm	Near dead battery or unit malfunction	Replace battery – If this does not fix condition, Call KIDDE Safety customer service at 1-800-880-6788

If at any time you test the alarm and it does not perform as described, have it replaced immediately.

Notes:

Wall Mount Diagram

If you are going to mount your Nighthawk CO and Gas alarm to the wall, you may use this guide for exact placement of the two wall mount screws provided. For more information about mounting to the wall, please refer to page 1-4.



Limited Warranty

WARRANTY COVERAGE: THE MANUFACTURER WARRANTS TO THE ORIGINAL CONSUMER PURCHASER, THAT THIS PRODUCT WILL BE FREE OF DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF FIVE (5) YEARS FROM DATE OF PURCHASE. THE MANUFACTURER'S LIABILITY HEREUNDER IS LIMITED TO REPLACEMENT OF THE PRODUCT, REPAIR OF THE PRODUCT OR REPLACEMENT OF THE PRODUCT WITH REPAIRED PRODUCT AT THE DISCRETION OF THE MANUFACTURER. THIS WARRANTY IS VOID IF THE PRODUCT HAS BEEN DAMAGED BY ACCIDENT, UNREASONABLE USE, NEGLECT, TAMPERING OR OTHER CAUSES NOT ARISING FROM DEFECTS IN MATERIAL OR WORKMANSHIP. THIS WARRANTY EXTENDS TO THE ORIGINAL CONSUMER PURCHASER OF THE PRODUCT ONLY.

Warranty Disclaimers: Any implied warranties arising out of this sale, including but not limited to the implied warranties of description, merchantability and fitness for a particular purpose, are limited in duration to the above warranty period. In no event shall the Manufacturer be liable for loss of use of this product or for any indirect, special, incidental or consequential damages, or costs, or expenses incurred by the consumer or any other user of this product, whether due to a breach of contract, negligence, strict liability in tort or otherwise. The Manufacturer shall have no liability for any personal injury, property damage or any special, incidental, contingent or consequential damage of any kind resulting from gas leakage, fire or explosion.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

Some states do not allow the exclusion or limitation of consequential or incidental damages, so the above limitations or exclusions may not apply to you.

Legal Remedies: This warranty gives you specific legal rights and you may also have other rights that vary from state to state.

Warranty Performance: During the above warranty period, your product will be replaced with a comparable product if the defective product is returned, postage prepaid, to KIDDE Safety, Customer Service Department, 1-800-880-6788, together with proof of purchase date. Please include a note describing the problem when you return the unit. The replacement product will be in warranty for the remainder of the original warranty period or for six months, whichever is longer. Other than the cost of postage, no charge will be made for replacement of the defective product.

Important: Do not remove back cover. Back cover removal will void warranty.

Your *Nighthawk Carbon Monoxide and Explosive Gas Alarm* is not a substitute for property, disability, life or other insurance of any kind. Appropriate insurance coverage is your responsibility. Consult your insurance agent.

Warranty Registration

To register for your five year factory warranty, please fill out the enclosed warranty card completely, apply necessary postage and place in the mail. You may place the warranty card in a separate envelope if you wish.

Please use the following address for warranty registration ONLY:
KIDDE Safety
Product Registration Department
PO Box 8748
Denver, CO 80201-8748

Please send products and all other correspondence to:
KIDDE Safety
Attn.: Customer Service Department
1394 South Third Street
Mebane, NC 27302

Warranty information is located on the label on the back of the alarm. For your convenience, please complete the warranty information before installing the alarm.

The model number and assembly number can be found on the label on the back of the alarm.

For Warranty Service:
In many cases the quickest way to exchange your alarm is to return it to the original place of purchase. If you have questions, call the KIDDE Safety customer service department at 1-800-880-6788 for assistance.

KIDDE SAFETY

1394 South Third Street, Mebane, NC 27302
Consumer Hotline: 1-800-880-6788
www.kiddesafety.com

member gama

Custom Assembled in China with U.S. and Foreign Components.

APPENDIX E

List of Businesses with Explosive Gas Monitors

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.

BUSINESSES WITH EXPLOSIVE GAS MONITORS

Business	Contact person
Whitney Design 13213 Corporate Exchange Drive Bridgeton, MO 63044	Russell Lacoste 314-428-5657, ext. 246
Material Logic 13209 Corporate Exchange Drive Bridgeton, MO 63044	Mike Cook 314-770-9224
Boenker's Transmission 12855 Boenkers Lane Bridgeton, MO 63044	Luke Boenker 314-739-7158
Dan's Automotive 13901 Boenkers Lane Bridgeton, MO 63044	Dan Rose 314-291-4330
Red Bird Ready Mix 13570 St. Charles Rock Road Bridgeton, MO 63044	Tom Green 314-739-1700
Aubuchon Hauling 13570 St. Charles Rock Road Bridgeton, MO 63044	Doug Aubuchon 314-344-9924
Surdyke Trucking 13570 St. Charles Rock Road Bridgeton, MO 63044	Bob Surdyke 314-581-6101
Northwest Auto Body 12990 St. Charles Rock Road Bridgeton, M0 63044	Pam Fair 314-770-2700
Missouri Asphalt 13570 St. Charles Rock Road Bridgeton, MO 63044	Chris Simpson 314-291-1870

ATTACHMENT F

Bridgeton Landfill Gas Corrective Action Update

ENGINEERING FOR A BETTER WORLD

FEEZOR

ENGINEERING, INC.

LANDFILL GAS CORRECTIVE ACTION UPDATE

BRIDGETON LANDFILL

BRIDGETON, ST. LOUIS COUNTY, MISSOURI

Submitted Pursuant to Section 23 of Agreed Order
Case No. 13SL-CC01088, Effective May 13, 2013

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1.0 INTRODUCTION

On May 13, 2013, Bridgeton Landfill (BL), LLC entered into an Agreed Order with the State of Missouri which required actions to address a subsurface reaction (SSR) occurring in the South Quarry area of the Bridgeton Landfill (BL). Section 23 of the Agreed Order required the preparation of an updated "Landfill Gas Corrective Action Plan" (CAP) and requested that the update consider SSR control measures. Bridgeton Landfill, LLC subsequently submitted an updated CAP on July 26, 2013. On June 29, 2018, Bridgeton Landfill LLC entered into the Final Consent Judgment (Case No. 13SL-CC01088-01) between Bridgeton Landfill, LLC and the State of Missouri). Paragraph 39 of the Final Consent Judgement requires the continuation of the quarterly CAP updates.

Section 5.0 of the July 2013 CAP proposed that weekly monitoring data would be summarized and reviewed in a quarterly report to be submitted on the 15th day of the month following each quarter. The Missouri Department of Natural Resources (MDNR) accepted this proposal in a letter dated October 18, 2013. Bridgeton Landfill, LLC has subsequently submitted updated Quarterly Corrective Action Plan Updates each quarter. The purpose of this document is to provide monitoring data for the second quarter of 2020 (April 01, 2020 – June 30, 2020) and to review the current status of gas migration control measures.

The text of the July 2013 CAP is presented in **Appendix A** for reference.

2.0 REVIEW OF CURRENT GAS MIGRATION CONTROL STATUS

The BL continues an aggressive monitoring program and significant infrastructure investment with respect to landfill gas migration control at the facility.

Detailed graphs showing approximately one year of methane concentrations as measured in the probes June 30, 2019 to June 30, 2020 are included in this document as **Appendix B**.

Table 1 lists the gas monitoring probes and their corresponding abbreviations, as presented in the July 2013 CAP, to clarify the historical graphs and the tabulated data for April 1, 2020 through June 30, 2020.

Tables 2 through **5** present tabulated gas monitoring probe data for the monitoring period. Weekly water level readings were proposed by the July 2013 CAP and approved by the October 18, 2013 MDNR letter. These readings are presented as depth to water (from top of well). Results of weekly water level measurements for the monitoring period are presented in **Table 6**. Please note the "Quadrant" designation on **Tables 2-6** is based upon the March 2019 Operation, Maintenance, and Monitoring (OM&M) Plan. This plan was modified in June 2020. Therefore, this CAP Update includes the latest quadrant designations for the probes.

The following discussion highlights observations regarding methane data observed during this monitoring period. A site plan that depicts locations of the gas monitoring probes is presented in **Appendix C**.

<u>Newly Elevated Compliance Probes</u>

There were no newly elevated compliance probes during this quarterly review.

<u>Probes with Greater Than or Equal to 2.5% Methane: Quarterly Review</u>

The following probes exhibited methane concentrations above 2.5% for at least a portion of the current monitoring quarter: TMP-1S and TMP-3S.

<u>Probes Below 2.5% Methane</u>

The following probes exhibited methane concentrations less than 2.5% during the current quarterly monitoring period: GMP-01,GMP-02, GMP-03, GMP-4D, GMP-4S, GMP-05, GMP-5D, GMP-5S, GMP-06, GMP-6D, GMP-6S, GMP-07, GMP-7D, GMP-7S, GMP-08, GMP-09 GMP-10, GMP-11, GMP-12, GMP-13D, GMP-13S, GMP-14D, GMP-14S, GMP-15D, GMP-15S, GMP-

16D, GMP-16S, TMP-1D, TMP-1M, TMP-2D, TMP-2M, TMP-2S, TMP-3D, TMP-3M, PZ-204A-SS, and PZ-204-SS.

Quarterly-Read Probes

Sentry Probes currently monitored on a quarterly basis are GMP-05, GMP-06, and GMP-07. During this quarterly monitoring period, measurements at these probes were performed on April 1, 2020. GMP-05, GMP-06 and GMP-07 exhibited methane concentrations below 2.5%. Sentry Probe GMP-04 was decommissioned in March 2014. Although Compliance Probe GMP-08 is listed as a quarterly-read probe in the July 2013 CAP, it was monitored more frequently during this monitoring period. GMP-08 exhibited methane concentrations above 2.5% during the beginning of the 2nd quarter 2019 but has remained below 2.5% methane since April 17, 2019.

Data Review

A review of the probe readings for this quarterly monitoring period indicates that probes GMP-02 and GMP-03 exhibited methane concentrations below 2.5% during this quarter after exhibiting methane concentrations above 2.5% the previous quarter.

GMP-08 exhibited first-time measurements of greater than 2.5% methane on March 12, 2019. Subsequent to the March 12, 2019 detection, GMP-08 has previously been monitored more frequently. GMP-08 exhibited methane concentrations over 2.5% intermittently throughout the remainder of the first quarter 2019 and the beginning of second quarter 2019. However, GMP-08 methane measurements have been under the 2.5% threshold since April 17, 2019. A separate Landfill Gas Corrective Action Plan (LGCAP) for GMP-08 was submitted to the MDNR and to the St. Louis County Department of Public Health Air Pollution Control Program (SLCDPH-APCP) on March 26, 2019. The corrective action for GMP-08 is summarized in Sections 3.0 and 4.0 of this report.

3.0 RECENT GAS MIGRATION CONTROL EFFORTS

The July 2013 CAP and subsequent quarterly updates provide an overview of several ongoing and planned measures that are expected to reduce gas migration. The following are gas migration control efforts initiated, continued or completed in the second quarter of 2020.

Leachate Conveyance System

The continued operation of multiple upgraded lift stations around the perimeter of the South Quarry.

General LFG System Modifications and Improvements:

The following improvements have been completed in the South Quarry at the Bridgeton Landfill:

- Nine (9) landfill gas extraction wells were installed in the south quarry last year to increase landfill gas extraction capacity and liquid removal. The locations were targeted to provide source control adjacent to areas exhibiting migration. Wells GEW-232, GEW-233, GEW-234, GEW-235, GEW-236, GEW-237, GEW-238, GEW-239, and GEW-240 were installed in August 2019. These 9 landfill gas extraction wells have been connected to the gas collection and control system and pumps have been installed in each well to remove liquid (**Appendix D**).

- Continued operation and monitoring of the "Pure-Air" system adjacent to Metropolitan Sewer District lift station just southwest of the South Quarry. Any vapors extracted from this gravel sump are directed to a "Pure-Air" system of activated carbon to allow for direct atmospheric discharge, removing a major air source from the landfill's gas collection and control system (GCCS).

- Augmented gas well dewatering through use of additional downwell pneumatic pumps and liquid level monitoring. An ongoing systematic approach occurred this quarter to investigate all gas extraction wells in the southwest and southeast quadrants of the South Quarry, with the goal of increasing pumping and lowering water levels.

- Based on review of 2018 and 2019 gas data, methane concentrations in GMP-09 appeared to be affected by maintenance performed of the southwest portion of the interceptor trench, between access sumps TS-1, TS-2, and TS-3. Therefore, BL scheduled a vendor to remove sediment accumulation in these three sumps and to jet clean the horizontal pipes between them. This cleaning has been done quarterly. The second quarter cleaning occurred on May 4, 2020.

The following data was collected at TS-1, TS-2, and TS-3 during the second quarter 2020:

- Liquid Levels at the sumps;
- System Vacuum;
- Vacuum at sumps;
- Gas Flow at sumps, and
- Methane concentrations at the sump.

- BL installed a surface collector in the vicinity of GMP-03 (Southeast Surface Collector 2) in June 2019. This surface collector was installed and is continued to be operated to influence the methane concentrations in GMP-03.

- BL installed a landfill gas collection trench near GMP-05 in October 2019. This trench was installed 50 feet in each direction away from the probe. The trench was connected to the gas system. Methane levels in GMP-05 decreased throughout the fourth quarter and was back in compliance in the first quarter 2020 and throughout the second quarter. The performance of the collection trench for GMP-05 will continue to be monitored in the third quarter of 2020.

- 35 temporary gas monitoring points were installed in 14 different locations in the southwest corner of the south quarry to assess migration in the TMP-1S, TMP-3S, and TMP-3M area. Monitoring began within second quarter 2020 and the results will be summarized in a separate MDNR submittal.

Leachate Pretreatment Facility:

The leachate pretreatment facility continued operation during the second quarter of 2020.

4.0 PROPOSED AND ONGOING GAS MIGRATION CONTROL EFFORTS

Ongoing efforts have been successful in some areas, as suggested by the recent data in the GMP-14D area near the South Quarry's northeast corner and in the GMP-08 area near the North Quarry's northeast corner. The ongoing gas collection efforts within the South and North Quarry will continue. This includes the continuation of a program to maintain liquid levels in gas wells, including daily inspections and ongoing maintenance of gas extraction well pumps.

In order to better assess pump performance, BL collected monthly liquid levels in those gas extraction wells with pumps, beginning in February 2019. In addition, BL collected quarterly liquid levels in all gas extraction wells to review subsurface conditions over time to optimize pump installation and operation. These efforts continued during the second quarter 2020 and will continue through the third quarter 2020.

In addition, BL will continue to retain a vendor to remove sediment accumulation at sumps TS-1, TS-2, and TS-3 and to jet clean the horizontal pipes between the sumps on a quarterly basis. It is believed that the May 4, 2020 cleaning effort (as well as the subsequent efforts) was influential in the decrease in methane concentrations at GMP-09.

Due to remedial efforts implemented by BL over the past year, probes GMP-05, GMP-08, GMP-09, GMP-14D, and TMP-2S have all exhibited compliant methane levels.

At the beginning of the first quarter 2020, the remaining problematic probes were GMP-02, GMP-03 on the south side of the South Quarry, and TMP-1S and TMP-3S near the southwest corner of the South Quarry. GMP-02 and GMP-03 were back in compliance by the end of the first quarter and they remained in compliance throughout the second quarter. While ongoing efforts have been made to address the TMP-1S/TMP-3S area, additional efforts are warranted.

Southwest Corner of the South Quarry

During the fourth quarter 2019, an assessment was performed for the additional gas wells (GEW-233 and GEW-234) that were installed to potentially mitigate exceedances at TMP-1S, TMP-3S and TMP–3M. This assessment concluded that the additional wells have not initially been effective in obtaining compliant methane levels in TMP-1S and TMP-3S. The wells will continue to be operated in the third quarter 2020 and will be further assessed. However, additional measures were proposed for the southwest corner of the South Quarry.

On December 31, 2019, Cornerstone Environmental Group, LLC submitted a report to MDNR entitled "Soil Gas Monitoring Work Plan – Bridgeton Landfill" (Work Plan) which proposed the installation of a series of temporary monitoring points in the southwest corner of the South Quarry. These proposed monitoring points were intended to determine the direction of combustible gas movement in the subsurface strata near TMP-1S and TMP-3S.

The locations of the points were proposed based on the current understanding of site geology, infrastructure, and potential natural and man-made gas transmission pathways. The points were

installed utilizing a Hydraulic Soil Probe (HSP) down to the bedrock interface and completed using small-diameter PVC piping. Perforation elevations were defined by the results of the HSP borings, targeting any strata that either indicates the presence of combustible gas or possesses a higher permeability – such as sands, gravels, and weathered formations that may be conducive to gas transmission.

This work plan was approved on February 20, 2020 by the MDNR. Installation of the temporary monitoring points began on April 24, 2020. A total of 35 temporary monitoring points were installed in 14 separate locations (**Appendix E**)**.** The installation was completed on May 14, 2020. Each probe will be monitored until they are abandoned to determine any trends and/or to determine relative gradients in subsurface pressure and combustible gas concentrations. **Table 7** presents the tabulated temporary gas monitoring point data for the quarter. Results of water level measurements for the temporary gas monitoring point data for the quarter are presented in **Table 8.**

Once sufficient monitoring data are collected, the monitoring points will be abandoned. An as-built report for the geoprobe installation and abandonment will be submitted to the MDNR 30 days after abandonment.

Based upon the data collected within the temporary soil gas monitoring, a work plan will be submitted to the MDNR to propose further remedial actions to address the landfill gas migration in the southwest corner of the south quarry.

Ongoing Gas Wellfield Replacement

Within the third quarter 2020, a proposed drilling event will occur at the Bridgeton Landfill to replace compromised GEWs and to supplement landfill gas collection efforts with additional GEWs. Proposed locations will be submitted to the MDNR for approval prior to this drilling event.

5.0 CONTINUED MONITORING AND REPORTING

BL will continue the gas probe monitoring and reporting as specified in Section 5.0 of the July 2013 CAP and Section XI.39 of the June 29, 2018 Final Consent Judgment.

TABLE 1

LIST OF LANDFILL GAS MONITORING PROBES

Bridgeton Landfill
Landfill Gas Monitoring Probes
July 2013

ID	CSV ID	POINT NAME	Ref Boring/installation Record	Type	Current Monitoring Frequency
GMP-01	BRIGMP01	MP01	GMP-01	Compliance probe	weekly
GMP-02	BRIGMP02	MP02	GMP-02	Compliance probe	weekly
GMP-03	BRIGMP03	MP03	GMP-03	Compliance probe	weekly
GMP-04*	BRIGMP04	MP04	GMP-04	Sentry probe	quarterly
GMP-05	BRIGMP05	MP05	GMP-05	Sentry probe	quarterly
GMP-06	BRIGMP06	MP06	PZ-201-SS	Sentry probe	quarterly
GMP-07	BRIGMP07	MP07	PZ-200-SS	Sentry probe	quarterly
GMP-08	BRIGMP08	MP08	GMP-08	Compliance probe	quarterly
GMP-09	BRIGMP09	MP09	GMP-09	Public Safety Probe	weekly
GMP-10	BRIGMP10	MP10	GMP-10	Public Safety Probe	weekly
GMP-11	BRIGMP11	MP11	GMP-11	Public Safety Probe	weekly
GMP-12	BRIGMP12	MP12	GMP-12	Public Safety Probe	weekly
GMP-4S	BRIGMP4S	BRIGMP4S	GMP-04	Compliance nested probe	weekly
GMP-4D	BRIGMP4D	BRIGMP4D	GMP-04	Compliance nested probe	weekly
GMP-5S	BRIGMP5S	BRIGMP5S	GMP-05	Compliance nested probe	weekly
GMP-5D	BRIGMP5D	BRIGMP5D	GMP-05	Compliance nested probe	weekly
GMP-6S	BRIGMP6S	BRIGMP6S	GMP-06	Compliance nested probe	weekly
GMP-6D	BRIGMP6D	BRIGMP6D	GMP-06	Compliance nested probe	weekly
GMP-7S	BRIGMP7S	BRIGMP7S	GMP-07	Compliance nested probe	weekly
GMP-7D	BRIGMP7D	BRIGMP7D	GMP-07	Compliance nested probe	weekly
GMP-13S	BRGMP13S	BRGMP13S	GMP-13	Compliance nested probe	weekly
GMP-13D	BRGMP13D	BRGMP13D	GMP-13	Compliance nested probe	weekly
GMP-14S	BRGMP14S	BRGMP14S	GMP-14	Compliance nested probe	weekly
GMP-14D	BRGMP14D	BRGMP14D	GMP-14	Compliance nested probe	weekly
GMP-15S	BRGMP15S	BRGMP15S	GMP-15	Compliance nested probe	weekly
GMP-15D	BRGMP15D	BRGMP15D	GMP-15	Compliance nested probe	weekly
GMP-16S	BRGMP16S	BRGMP16S	GMP-16	Compliance nested probe	weekly
GMP-16D	BRGMP16D	BRGMP16D	GMP-16	Compliance nested probe	weekly
TMP-1S	BRITMP1S	BRITMP1S	TMP-01	Investigative nested probe	weekly
TMP-1M	BRITMP1M	BRITMP1M	TMP-01	Investigative nested probe	weekly
TMP-1D	BRITMP1D	BRITMP1D	TMP-01	Investigative nested probe	weekly
TMP-2S	BRITMP2S	BRITMP2S	TMP-02	Investigative nested probe	weekly
TMP-2M	BRITMP2M	BRITMP2M	TMP-02	Investigative nested probe	weekly
TMP-2D	BRITMP2D	BRITMP2D	TMP-02	Investigative nested probe	weekly
TMP-3S	BRITMP3S	BRITMP3S	TMP-03	Investigative nested probe	weekly
TMP-3M	BRITMP3M	BRITMP3M	TMP-03	Investigative nested probe	weekly
TMP-3D	BRITMP3D	BRITMP3D	TMP-03	Investigative nested probe	weekly
PZ-204-SS	PZ2040SS	4OSS	PZ-204-SS	Public Safety Probe	weekly
PZ-204A-SS	PZ204ASS	4ASS	PZ-204-ASS	Public Safety Probe	weekly

* Well has been decommissioned

TABLE 2

COMPLIANCE GAS MONITORING PROBE DATA

APRIL 01, 2020 – JUNE 30, 2020

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
GMP-01	Weekly	2	4/1/2020	0.0	1.1	20.9	78.0	30	0.01
GMP-01	Weekly	2	4/7/2020	0.0	0.5	20.6	78.9	30	0.02
GMP-01	Weekly	2	4/14/2020	0.0	0.6	20.7	78.7	30	0.00
GMP-01	Weekly	2	4/21/2020	0.0	0.9	20.4	78.7	30	0.00
GMP-01	Weekly	2	4/28/2020	0.0	0.6	20.8	78.6	30	0.04
GMP-01	Weekly	2	5/5/2020	0.0	0.6	20.5	78.9	30	0.01
GMP-01	Weekly	2	5/12/2020	0.0	0.4	20.6	79.0	30	0.01
GMP-01	Weekly	2	5/19/2020	0.0	0.6	20.2	79.2	30	0.04
GMP-01	Weekly	2	5/26/2020	0.0	0.8	20.2	79.0	30	0.04
GMP-01	Weekly	2	6/2/2020	0.0	0.8	20.6	78.6	30	0.05
GMP-01	Weekly	2	6/9/2020	0.0	2.2	20.5	77.3	30	-0.01
GMP-01	Weekly	2	6/16/2020	0.0	0.8	20.6	78.6	30	0.02
GMP-01	Weekly	2	6/23/2020	0.0	1.5	20.3	78.2	30	0.04
GMP-01	Weekly	2	6/30/2020	0.0	0.7	20.9	78.4	30	0.03
GMP-02	Weekly	4	4/1/2020	0.0	1.7	17.7	80.6	30	0.06
GMP-02	Weekly	4	4/7/2020	0.0	1.4	18.0	80.6	30	0.11
GMP-02	Weekly	4	4/14/2020	0.0	1.5	18.4	80.1	30	0.09
GMP-02	Weekly	4	4/21/2020	0.0	1.6	18.1	80.3	30	0.09
GMP-02	Weekly	4	4/28/2020	0.0	2.2	17.9	79.9	30	0.12
GMP-02	Weekly	4	5/5/2020	0.0	3.4	14.1	82.5	30	-0.76
GMP-02	Weekly	4	5/12/2020	0.0	1.8	17.4	80.8	30	0.02
GMP-02	Weekly	4	5/19/2020	0.0	2.3	17.4	80.3	30	-1.49
GMP-02	Weekly	4	5/26/2020	0.0	2.4	17.1	80.5	30	0.11
GMP-02	Weekly	4	6/2/2020	0.0	1.3	18.7	80.0	30	0.11
GMP-02	Weekly	4	6/9/2020	0.0	1.2	19.0	79.8	30	1.38
GMP-02	Weekly	4	6/16/2020	0.0	0.5	19.0	80.5	30	0.24
GMP-02	Weekly	4	6/23/2020	0.0	1.3	18.1	80.6	30	0.06
GMP-02	Weekly	4	6/30/2020	0.0	0.8	19.1	80.1	30	0.10
GMP-03	Weekly	4	4/1/2020	0.0	14.6	0.0	85.4	30	0.01
GMP-03	Weekly	4	4/7/2020	0.0	13.7	0.3	86.0	30	0.01
GMP-03	Weekly	4	4/14/2020	0.0	14.2	0.0	85.8	30	0.01
GMP-03	Weekly	4	4/21/2020	0.0	14.8	0.0	85.2	30	0.00
GMP-03	Weekly	4	4/28/2020	0.0	14.2	0.1	85.7	30	0.00
GMP-03	Weekly	4	5/5/2020	0.0	14.6	0.0	85.4	30	0.01
GMP-03	Weekly	4	5/12/2020	0.0	14.7	0.1	85.2	30	-0.07
GMP-03	Weekly	4	5/19/2020	0.0	13.6	0.3	86.1	30	-0.28
GMP-03	Weekly	4	5/26/2020	0.0	14.0	0.2	85.8	30	0.00
GMP-03	Weekly	4	6/2/2020	0.0	15.6	0.3	84.1	30	0.00
GMP-03	Weekly	4	6/9/2020	0.0	13.3	2.5	84.2	30	0.00
GMP-03	Weekly	4	6/16/2020	0.0	15.9	0.1	84.0	30	0.00

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
GMP-03	Weekly	4	6/23/2020	0.0	17.7	0.2	82.1	30	0.01
GMP-03	Weekly	4	6/30/2020	0.0	17.2	0.4	82.4	30	0.00
GMP-08	Weekly	1	4/1/2020	0.0	1.6	16.3	82.1	30	0.00
GMP-08	Weekly	1	4/7/2020	0.0	4.0	12.9	83.1	30	0.00
GMP-08	Weekly	1	4/14/2020	0.0	1.2	17.7	81.1	30	-0.02
GMP-08	Weekly	1	4/21/2020	0.0	2.3	16.0	81.7	30	-0.01
GMP-08	Weekly	1	4/28/2020	0.0	4.8	12.3	82.9	30	0.01
GMP-08	Weekly	1	5/5/2020	0.0	2.9	14.4	82.7	30	0.00
GMP-08	Weekly	1	5/12/2020	0.0	1.9	16.3	81.8	30	0.03
GMP-08	Weekly	1	5/19/2020	0.0	5.4	12.8	81.8	30	0.01
GMP-08	Weekly	1	5/26/2020	0.0	4.3	13.6	82.1	30	-0.02
GMP-08	Weekly	1	6/2/2020	0.0	2.8	14.7	82.5	30	0.03
GMP-08	Weekly	1	6/9/2020	0.0	5.1	15.5	79.4	30	-0.02
GMP-08	Weekly	1	6/16/2020	0.0	1.3	17.0	81.7	30	0.02
GMP-08	Weekly	1	6/23/2020	0.0	2.3	15.5	82.2	30	0.01
GMP-08	Weekly	1	6/30/2020	0.0	1.6	16.6	81.8	30	0.03
GMP-4D	Weekly	3	4/1/2020	0.0	0.5	20.0	79.5	30	-0.01
GMP-4D	Weekly	3	4/7/2020	0.0	0.3	20.4	79.3	30	0.05
GMP-4D	Weekly	3	4/14/2020	0.0	0.4	20.1	79.5	30	0.06
GMP-4D	Weekly	3	4/21/2020	0.0	0.4	20.1	79.5	30	0.03
GMP-4D	Weekly	3	4/28/2020	0.0	0.4	20.0	79.6	30	0.09
GMP-4D	Weekly	3	5/5/2020	0.0	0.2	20.5	79.3	30	0.27
GMP-4D	Weekly	3	5/12/2020	0.0	0.1	20.6	79.3	30	0.06
GMP-4D	Weekly	3	5/19/2020	0.0	0.1	20.7	79.2	30	0.13
GMP-4D	Weekly	3	5/26/2020	0.0	0.0	20.0	80.0	30	0.11
GMP-4D	Weekly	3	6/2/2020	0.0	0.1	20.4	79.5	30	0.06
GMP-4D	Weekly	3	6/9/2020	0.0	0.1	20.3	79.6	30	0.00
GMP-4D	Weekly	3	6/16/2020	0.0	0.2	19.6	80.2	30	0.00
GMP-4D	Weekly	3	6/23/2020	0.0	0.2	19.7	80.1	30	0.00
GMP-4D	Weekly	3	6/30/2020	0.0	0.3	19.9	79.8	30	0.00
GMP-4S	Weekly	3	4/1/2020	0.0	0.3	20.4	79.3	30	0.00
GMP-4S	Weekly	3	4/7/2020	0.0	0.1	20.5	79.4	30	0.00
GMP-4S	Weekly	3	4/14/2020	0.0	0.2	20.3	79.5	30	0.01
GMP-4S	Weekly	3	4/21/2020	0.0	0.1	20.4	79.5	30	0.00
GMP-4S	Weekly	3	4/28/2020	0.0	0.1	20.4	79.5	30	-0.02
GMP-4S	Weekly	3	5/5/2020	0.0	0.1	20.7	79.2	30	0.00
GMP-4S	Weekly	3	5/12/2020	0.0	0.1	20.7	79.2	30	0.00
GMP-4S	Weekly	3	5/19/2020	0.0	0.1	20.8	79.1	30	-0.01
GMP-4S	Weekly	3	5/26/2020	0.0	0.0	19.8	80.2	30	0.00
GMP-4S	Weekly	3	6/2/2020	0.0	0.1	20.2	79.7	30	-0.01

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
GMP-4S	Weekly	3	6/9/2020	0.0	0.2	20.3	79.5	30	0.00
GMP-4S	Weekly	3	6/16/2020	0.0	0.1	19.9	80.0	30	0.00
GMP-4S	Weekly	3	6/23/2020	0.0	0.1	20.0	79.9	30	0.00
GMP-4S	Weekly	3	6/30/2020	0.0	0.2	20.4	79.4	30	0.00
GMP-5D	Weekly	3	4/1/2020	0.0	0.3	20.1	79.6	30	0.02
GMP-5D	Weekly	3	4/7/2020	0.0	0.2	20.3	79.5	30	0.04
GMP-5D	Weekly	3	4/14/2020	0.0	0.2	20.1	79.7	30	0.05
GMP-5D	Weekly	3	4/21/2020	0.0	0.2	19.9	79.9	30	0.02
GMP-5D	Weekly	3	4/28/2020	0.0	0.3	19.9	79.8	30	0.03
GMP-5D	Weekly	3	5/5/2020	0.0	0.1	20.4	79.5	30	0.03
GMP-5D	Weekly	3	5/12/2020	0.0	0.2	20.4	79.4	30	0.02
GMP-5D	Weekly	3	5/19/2020	0.0	0.2	20.6	79.2	30	-0.02
GMP-5D	Weekly	3	5/26/2020	0.0	0.3	19.6	80.1	30	0.03
GMP-5D	Weekly	3	6/2/2020	0.0	0.1	20.2	79.7	30	0.01
GMP-5D	Weekly	3	6/9/2020	0.0	0.0	20.4	79.6	30	0.02
GMP-5D	Weekly	3	6/16/2020	0.0	0.1	20.0	79.9	30	0.01
GMP-5D	Weekly	3	6/23/2020	0.0	0.0	20.6	79.4	30	0.02
GMP-5D	Weekly	3	6/30/2020	0.0	0.0	20.7	79.3	30	0.00
GMP-5S	Weekly	3	4/1/2020	0.0	0.1	20.4	79.5	30	0.00
GMP-5S	Weekly	3	4/7/2020	0.0	0.1	20.5	79.4	30	0.04
GMP-5S	Weekly	3	4/14/2020	0.0	0.1	20.3	79.6	30	0.01
GMP-5S	Weekly	3	4/21/2020	0.0	0.1	20.1	79.8	30	0.00
GMP-5S	Weekly	3	4/28/2020	0.0	0.1	20.2	79.7	30	0.00
GMP-5S	Weekly	3	5/5/2020	0.0	0.1	20.6	79.3	30	0.01
GMP-5S	Weekly	3	5/12/2020	0.0	0.0	20.6	79.4	30	0.00
GMP-5S	Weekly	3	5/19/2020	0.0	0.0	20.9	79.1	30	0.00
GMP-5S	Weekly	3	5/26/2020	0.0	0.0	19.9	80.1	30	0.02
GMP-5S	Weekly	3	6/2/2020	0.0	0.0	20.5	79.5	30	0.01
GMP-5S	Weekly	3	6/9/2020	0.0	0.0	20.6	79.4	30	0.00
GMP-5S	Weekly	3	6/16/2020	0.0	0.0	20.2	79.8	30	0.01
GMP-5S	Weekly	3	6/23/2020	0.0	0.0	20.5	79.5	30	0.00
GMP-5S	Weekly	3	6/30/2020	0.0	0.0	20.7	79.3	30	0.00
GMP-6D	Weekly	1	4/1/2020	0.0	0.2	20.0	79.8	30	0.02
GMP-6D	Weekly	1	4/7/2020	0.0	0.2	20.2	79.6	30	0.00
GMP-6D	Weekly	1	4/14/2020	0.0	0.2	20.2	79.6	30	0.01
GMP-6D	Weekly	1	4/21/2020	0.0	0.1	20.0	79.9	30	0.00
GMP-6D	Weekly	1	4/28/2020	0.0	0.2	20.0	79.8	30	0.17
GMP-6D	Weekly	1	5/5/2020	0.0	0.1	20.4	79.5	30	0.02
GMP-6D	Weekly	1	5/12/2020	0.0	0.1	20.5	79.4	30	0.01
GMP-6D	Weekly	1	5/19/2020	0.0	0.1	20.8	79.1	30	-0.01

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
GMP-6D	Weekly	1	5/26/2020	0.0	0.0	19.7	80.3	30	0.00
GMP-6D	Weekly	1	6/2/2020	0.0	0.1	20.3	79.6	30	0.01
GMP-6D	Weekly	1	6/9/2020	0.0	0.0	20.5	79.5	30	0.00
GMP-6D	Weekly	1	6/16/2020	0.0	0.0	20.3	79.7	30	0.01
GMP-6D	Weekly	1	6/23/2020	0.0	0.1	20.7	79.2	30	0.02
GMP-6D	Weekly	1	6/30/2020	0.0	0.1	20.5	79.4	30	0.01
GMP-6S	Weekly	1	4/1/2020	0.0	0.4	18.7	80.9	30	0.03
GMP-6S	Weekly	1	4/7/2020	0.0	0.2	19.5	80.3	30	0.04
GMP-6S	Weekly	1	4/14/2020	0.0	0.2	19.8	80.0	30	0.02
GMP-6S	Weekly	1	4/21/2020	0.0	0.2	19.5	80.3	30	-0.01
GMP-6S	Weekly	1	4/28/2020	0.0	0.2	19.5	80.3	30	0.03
GMP-6S	Weekly	1	5/5/2020	0.0	0.1	20.2	79.7	30	0.08
GMP-6S	Weekly	1	5/12/2020	0.0	0.1	20.4	79.5	30	0.03
GMP-6S	Weekly	1	5/19/2020	0.0	0.3	20.6	79.1	30	0.02
GMP-6S	Weekly	1	5/26/2020	0.0	0.1	19.6	80.3	30	0.05
GMP-6S	Weekly	1	6/2/2020	0.0	0.1	20.1	79.8	30	0.03
GMP-6S	Weekly	1	6/9/2020	0.0	0.0	20.5	79.5	30	0.01
GMP-6S	Weekly	1	6/16/2020	0.0	0.1	20.3	79.6	30	0.00
GMP-6S	Weekly	1	6/23/2020	0.0	0.1	20.1	79.8	30	0.01
GMP-6S	Weekly	1	6/30/2020	0.0	0.1	20.0	79.9	30	0.00
GMP-7D	Weekly	1	4/1/2020	0.0	0.2	19.7	80.1	30	-0.01
GMP-7D	Weekly	1	4/7/2020	0.0	0.2	20.1	79.7	30	0.00
GMP-7D	Weekly	1	4/14/2020	0.0	0.3	20.2	79.5	30	0.00
GMP-7D	Weekly	1	4/21/2020	0.0	0.2	20.0	79.8	30	-0.01
GMP-7D	Weekly	1	4/28/2020	0.0	0.2	20.2	79.6	30	-0.03
GMP-7D	Weekly	1	5/5/2020	0.0	0.2	20.0	79.8	30	0.00
GMP-7D	Weekly	1	5/12/2020	0.0	0.2	20.2	79.6	30	-0.01
GMP-7D	Weekly	1	5/19/2020	0.0	0.2	20.6	79.2	30	0.00
GMP-7D	Weekly	1	5/26/2020	0.0	0.0	19.9	80.1	30	-0.01
GMP-7D	Weekly	1	6/2/2020	0.0	0.2	20.5	79.3	30	-0.02
GMP-7D	Weekly	1	6/9/2020	0.0	0.2	20.2	79.6	30	-0.01
GMP-7D	Weekly	1	6/16/2020	0.0	0.3	20.2	79.5	30	0.00
GMP-7D	Weekly	1	6/23/2020	0.0	0.3	20.7	79.0	30	0.00
GMP-7D	Weekly	1	6/30/2020	0.0	0.3	20.4	79.3	30	0.00
GMP-7S	Weekly	1	4/1/2020	0.0	1.0	8.8	90.2	30	0.00
GMP-7S	Weekly	1	4/7/2020	0.0	1.3	10.1	88.6	30	0.01
GMP-7S	Weekly	1	4/14/2020	0.0	1.5	7.8	90.7	30	0.00
GMP-7S	Weekly	1	4/21/2020	0.0	1.4	9.6	89.0	30	0.00
GMP-7S	Weekly	1	4/28/2020	0.0	1.1	8.2	90.7	30	-0.02
GMP-7S	Weekly	1	5/5/2020	0.0	1.4	6.8	91.8	30	0.00

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
GMP-7S	Weekly	1	5/12/2020	0.0	1.2	7.6	91.2	30	0.00
GMP-7S	Weekly	1	5/19/2020	0.0	1.7	4.9	93.4	30	0.00
GMP-7S	Weekly	1	5/26/2020	0.0	1.4	5.9	92.7	30	0.00
GMP-7S	Weekly	1	6/2/2020	0.0	1.4	6.2	92.4	30	0.01
GMP-7S	Weekly	1	6/9/2020	0.0	1.9	6.3	91.8	30	0.00
GMP-7S	Weekly	1	6/16/2020	0.0	2.0	6.4	91.6	30	0.00
GMP-7S	Weekly	1	6/23/2020	0.0	2.0	3.8	94.2	30	3.75
GMP-7S	Weekly	1	6/30/2020	0.0	2.0	4.2	93.8	30	12.93
GMP-13D	Weekly	4	4/1/2020	0.0	0.7	20.0	79.3	30	0.01
GMP-13D	Weekly	4	4/7/2020	0.0	0.5	20.5	79.0	30	0.02
GMP-13D	Weekly	4	4/14/2020	0.0	0.8	20.0	79.2	30	0.04
GMP-13D	Weekly	4	4/21/2020	0.0	0.6	20.3	79.1	30	0.02
GMP-13D	Weekly	4	4/28/2020	0.0	0.4	20.4	79.2	30	-0.01
GMP-13D	Weekly	4	5/5/2020	0.0	0.3	20.7	79.0	30	0.02
GMP-13D	Weekly	4	5/12/2020	0.0	0.2	20.7	79.1	30	0.02
GMP-13D	Weekly	4	5/19/2020	0.0	0.2	20.8	79.0	30	0.03
GMP-13D	Weekly	4	5/26/2020	0.0	0.0	20.3	79.7	30	0.03
GMP-13D	Weekly	4	6/2/2020	0.0	0.2	20.4	79.4	30	0.01
GMP-13D	Weekly	4	6/9/2020	0.0	0.3	20.8	78.9	30	0.03
GMP-13D	Weekly	4	6/16/2020	0.0	0.4	20.3	79.3	30	0.02
GMP-13D	Weekly	4	6/23/2020	0.0	0.3	20.3	79.4	30	0.01
GMP-13D	Weekly	4	6/30/2020	0.0	0.5	20.8	78.7	30	-0.01
GMP-13S	Weekly	4	4/1/2020	0.0	2.1	19.9	78.0	30	0.00
GMP-13S	Weekly	4	4/7/2020	0.0	0.9	19.9	79.2	30	0.00
GMP-13S	Weekly	4	4/14/2020	0.0	1.8	18.8	79.4	30	0.00
GMP-13S	Weekly	4	4/21/2020	0.0	1.3	19.3	79.4	30	0.00
GMP-13S	Weekly	4	4/28/2020	0.0	0.7	20.1	79.2	30	0.02
GMP-13S	Weekly	4	5/5/2020	0.0	0.8	20.6	78.6	30	0.03
GMP-13S	Weekly	4	5/12/2020	0.0	0.6	20.7	78.7	30	0.01
GMP-13S	Weekly	4	5/19/2020	0.0	0.6	20.3	79.1	30	0.01
GMP-13S	Weekly	4	5/26/2020	0.0	0.0	20.3	79.7	30	0.00
GMP-13S	Weekly	4	6/2/2020	0.0	0.7	19.4	79.9	30	0.00
GMP-13S	Weekly	4	6/9/2020	0.0	1.7	18.3	80.0	30	-0.01
GMP-13S	Weekly	4	6/16/2020	0.0	2.2	17.3	80.5	30	0.00
GMP-13S	Weekly	4	6/23/2020	0.0	2.2	16.6	81.2	30	0.01
GMP-13S	Weekly	4	6/30/2020	0.0	3.0	16.3	80.7	30	0.00
GMP-14D	Weekly	3	4/1/2020	1.1	0.9	19.9	78.1	30	0.02
GMP-14D	Weekly	3	4/7/2020	0.9	0.4	20.1	78.6	30	0.03
GMP-14D	Weekly	3	4/14/2020	0.8	0.3	20.0	78.9	30	0.06
GMP-14D	Weekly	3	4/21/2020	0.7	0.2	19.9	79.2	30	0.05

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
GMP-14D	Weekly	3	4/28/2020	0.7	0.2	19.9	79.2	30	0.02
GMP-14D	Weekly	3	5/5/2020	0.6	0.1	20.4	78.9	30	0.05
GMP-14D	Weekly	3	5/12/2020	0.5	0.1	20.4	79.0	30	0.03
GMP-14D	Weekly	3	5/19/2020	0.5	0.1	20.6	78.8	30	0.02
GMP-14D	Weekly	3	5/26/2020	0.4	0.1	19.7	79.8	30	0.05
GMP-14D	Weekly	3	6/2/2020	0.2	0.0	20.3	79.5	30	0.02
GMP-14D	Weekly	3	6/9/2020	0.1	0.0	20.6	79.3	30	-1.62
GMP-14D	Weekly	3	6/16/2020	0.1	0.1	19.9	79.9	30	0.02
GMP-14D	Weekly	3	6/23/2020	0.0	0.0	20.3	79.7	30	-0.06
GMP-14D	Weekly	3	6/30/2020	0.0	0.0	20.6	79.4	30	0.00
GMP-14S	Weekly	3	4/1/2020	0.0	0.3	20.4	79.3	30	0.02
GMP-14S	Weekly	3	4/7/2020	0.0	0.1	20.5	79.4	30	0.05
GMP-14S	Weekly	3	4/14/2020	0.0	0.2	20.3	79.5	30	0.06
GMP-14S	Weekly	3	4/21/2020	0.0	0.1	20.3	79.6	30	0.05
GMP-14S	Weekly	3	4/28/2020	0.0	0.1	20.3	79.6	30	0.03
GMP-14S	Weekly	3	5/5/2020	0.0	0.1	20.7	79.2	30	0.06
GMP-14S	Weekly	3	5/12/2020	0.0	0.1	20.6	79.3	30	0.04
GMP-14S	Weekly	3	5/19/2020	0.0	0.1	20.8	79.1	30	0.03
GMP-14S	Weekly	3	5/26/2020	0.0	0.0	20.0	80.0	30	0.04
GMP-14S	Weekly	3	6/2/2020	0.0	0.0	20.5	79.5	30	0.01
GMP-14S	Weekly	3	6/9/2020	0.0	0.1	20.7	79.2	30	0.03
GMP-14S	Weekly	3	6/16/2020	0.0	0.1	20.2	79.7	30	0.04
GMP-14S	Weekly	3	6/23/2020	0.0	0.1	20.4	79.5	30	0.05
GMP-14S	Weekly	3	6/30/2020	0.0	0.1	20.7	79.2	30	0.07
GMP-15D	Weekly	1	4/1/2020	0.0	1.9	19.2	78.9	30	0.17
GMP-15D	Weekly	1	4/7/2020	0.0	1.2	19.9	78.9	30	0.37
GMP-15D	Weekly	1	4/14/2020	0.0	1.1	19.8	79.1	30	0.08
GMP-15D	Weekly	1	4/21/2020	0.0	0.9	19.7	79.4	30	0.14
GMP-15D	Weekly	1	4/28/2020	0.0	0.8	19.8	79.4	30	0.05
GMP-15D	Weekly	1	5/5/2020	0.0	0.4	20.1	79.5	30	0.23
GMP-15D	Weekly	1	5/12/2020	0.0	0.2	20.4	79.4	30	0.03
GMP-15D	Weekly	1	5/19/2020	0.0	0.2	20.7	79.1	30	-0.10
GMP-15D	Weekly	1	5/26/2020	0.0	0.2	19.7	80.1	30	0.03
GMP-15D	Weekly	1	6/2/2020	0.0	0.1	20.4	79.5	30	0.19
GMP-15D	Weekly	1	6/9/2020	0.0	0.0	20.5	79.5	30	0.02
GMP-15D	Weekly	1	6/16/2020	0.0	0.1	20.2	79.7	30	0.31
GMP-15D	Weekly	1	6/23/2020	0.0	0.1	20.6	79.3	30	0.08
GMP-15D	Weekly	1	6/30/2020	0.0	0.1	20.4	79.5	30	-0.04
GMP-15S	Weekly	1	4/1/2020	0.0	1.4	19.4	79.2	30	0.02
GMP-15S	Weekly	1	4/7/2020	0.0	0.4	20.1	79.5	30	0.03

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
GMP-15S	Weekly	1	4/14/2020	0.0	0.2	20.2	79.6	30	0.09
GMP-15S	Weekly	1	4/21/2020	0.0	0.1	20.0	79.9	30	0.03
GMP-15S	Weekly	1	4/28/2020	0.0	0.1	20.1	79.8	30	0.02
GMP-15S	Weekly	1	5/5/2020	0.0	0.1	20.4	79.5	30	0.05
GMP-15S	Weekly	1	5/12/2020	0.0	0.1	20.5	79.4	30	0.05
GMP-15S	Weekly	1	5/19/2020	0.0	0.1	20.8	79.1	30	-0.10
GMP-15S	Weekly	1	5/26/2020	0.0	0.0	19.7	80.3	30	0.04
GMP-15S	Weekly	1	6/2/2020	0.0	0.0	20.5	79.5	30	0.03
GMP-15S	Weekly	1	6/9/2020	0.0	0.0	20.5	79.5	30	-0.04
GMP-15S	Weekly	1	6/16/2020	0.0	0.0	20.3	79.7	30	0.13
GMP-15S	Weekly	1	6/23/2020	0.0	0.0	20.7	79.3	30	0.05
GMP-15S	Weekly	1	6/30/2020	0.0	0.0	20.6	79.4	30	0.02
GMP-16D	Weekly	1	4/1/2020	0.0	0.4	18.9	80.7	30	-1.45
GMP-16D	Weekly	1	4/7/2020	0.0	0.3	19.5	80.2	30	-0.01
GMP-16D	Weekly	1	4/14/2020	0.0	0.3	20.1	79.6	30	0.03
GMP-16D	Weekly	1	4/21/2020	0.0	0.1	19.9	80.0	30	0.00
GMP-16D	Weekly	1	4/28/2020	0.0	0.2	19.5	80.3	30	2.37
GMP-16D	Weekly	1	5/5/2020	0.0	0.2	19.1	80.7	30	0.32
GMP-16D	Weekly	1	5/12/2020	0.0	0.2	19.1	80.7	30	-4.34
GMP-16D	Weekly	1	5/19/2020	0.0	0.1	19.7	80.2	30	1.38
GMP-16D	Weekly	1	5/26/2020	0.0	0.0	19.3	80.7	30	0.04
GMP-16D	Weekly	1	6/2/2020	0.0	0.1	20.4	79.5	30	0.00
GMP-16D	Weekly	1	6/9/2020	0.0	0.1	20.2	79.7	30	-0.01
GMP-16D	Weekly	1	6/16/2020	0.0	0.1	20.3	79.6	30	0.01
GMP-16D	Weekly	1	6/23/2020	0.0	0.1	20.6	79.3	30	-0.82
GMP-16D	Weekly	1	6/30/2020	0.0	0.0	20.4	79.6	30	-0.04
GMP-16S	Weekly	1	4/1/2020	0.0	1.3	17.1	81.6	30	-0.51
GMP-16S	Weekly	1	4/7/2020	0.0	2.3	17.4	80.3	30	0.04
GMP-16S	Weekly	1	4/14/2020	0.0	1.3	18.5	80.2	30	-6.12
GMP-16S	Weekly	1	4/21/2020	0.0	0.9	18.8	80.3	30	-2.66
GMP-16S	Weekly	1	4/28/2020	0.0	1.1	18.9	80.0	30	9.46
GMP-16S	Weekly	1	5/5/2020	0.0	1.1	18.7	80.2	30	2.70
GMP-16S	Weekly	1	5/12/2020	0.0	0.9	19.2	79.9	30	-4.93
GMP-16S	Weekly	1	5/19/2020	0.0	0.6	19.7	79.7	30	3.70
GMP-16S	Weekly	1	5/26/2020	0.0	0.4	19.3	80.3	30	0.87
GMP-16S	Weekly	1	6/2/2020	0.0	0.4	19.8	79.8	30	-1.79
GMP-16S	Weekly	1	6/9/2020	0.0	0.3	19.6	80.1	30	1.21
GMP-16S	Weekly	1	6/16/2020	0.0	0.1	20.1	79.8	30	0.03
GMP-16S	Weekly	1	6/23/2020	0.0	0.1	20.5	79.4	30	-0.28
GMP-16S	Weekly	1	6/30/2020	0.0	0.1	20.2	79.7	30	0.02

TABLE 3

SENTRY GAS MONITORING PROBE DATA

APRIL 01, 2020 – JUNE 30, 2020

Gas Monitoring Probe Data
Sentry Probe Data
04/01/20 - 06/30/20

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
GMP-05	Quarterly	3	4/1/2020	0.4	0.4	20.0	79.2	30	0.00
GMP-06	Quarterly	1	4/1/2020	0.0	0.7	19.6	79.7	30	0.00
GMP-07	Quarterly	1	4/1/2020	0.0	0.2	19.3	80.5	30	0.00

TABLE 4

INVESTIGATIVE GAS MONITORING PROBE DATA

APRIL 01, 2020 – JUNE 30, 2020

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
TMP-1D	Weekly	2	4/1/2020	0.1	0.5	21.1	78.3	30	0.07
TMP-1D	Weekly	2	4/7/2020	0.0	0.3	20.7	79.0	30	0.96
TMP-1D	Weekly	2	4/14/2020	0.1	0.5	20.7	78.7	30	1.13
TMP-1D	Weekly	2	4/21/2020	0.1	0.2	20.5	79.2	30	-0.26
TMP-1D	Weekly	2	4/28/2020	0.1	0.3	21.0	78.6	30	-2.54
TMP-1D	Weekly	2	5/5/2020	0.1	0.3	20.6	79.0	30	0.81
TMP-1D	Weekly	2	5/12/2020	0.1	0.3	20.7	78.9	30	0.23
TMP-1D	Weekly	2	5/19/2020	0.0	0.0	21.1	78.9	30	1.32
TMP-1D	Weekly	2	5/21/2020	0.0	0.2	20.9	78.9	30	3.59
TMP-1D	Weekly	2	5/26/2020	0.1	0.3	20.9	78.7	30	-0.36
TMP-1D	Weekly	2	5/28/2020	0.0	0.2	20.6	79.2	30	3.99
TMP-1D	Weekly	2	6/2/2020	0.1	0.3	20.9	78.7	30	0.00
TMP-1D	Weekly	2	6/4/2020	0.0	0.1	20.8	79.1	30	2.47
TMP-1D	Weekly	2	6/9/2020	0.0	0.1	21.0	78.9	30	-0.46
TMP-1D	Weekly	2	6/16/2020	0.1	0.2	20.8	78.9	30	1.04
TMP-1D	Weekly	2	6/18/2020	0.0	0.1	20.7	79.2	30	3.36
TMP-1D	Weekly	2	6/23/2020	0.1	0.1	20.8	79.0	30	-0.34
TMP-1D	Weekly	2	6/30/2020	0.1	0.3	21.1	78.5	30	-1.44
TMP-1M	Weekly	2	4/1/2020	0.5	1.6	20.7	77.2	30	-0.03
TMP-1M	Weekly	2	4/7/2020	0.4	1.2	20.5	77.9	30	-0.04
TMP-1M	Weekly	2	4/14/2020	0.3	1.5	20.4	77.8	30	0.00
TMP-1M	Weekly	2	4/21/2020	0.2	0.5	20.5	78.8	30	-0.02
TMP-1M	Weekly	2	4/28/2020	0.3	0.7	20.9	78.1	30	-0.03
TMP-1M	Weekly	2	5/5/2020	0.3	0.8	20.4	78.5	30	-0.01
TMP-1M	Weekly	2	5/12/2020	0.2	0.6	20.6	78.6	30	-0.03
TMP-1M	Weekly	2	5/19/2020	0.1	0.1	21.1	78.7	30	-1.68
TMP-1M	Weekly	2	5/21/2020	0.1	0.3	21.0	78.6	30	0.02
TMP-1M	Weekly	2	5/26/2020	0.3	0.7	20.8	78.2	30	0.01
TMP-1M	Weekly	2	5/28/2020	0.1	0.2	20.7	79.0	30	0.04
TMP-1M	Weekly	2	6/2/2020	0.4	0.9	20.7	78.0	30	-0.01
TMP-1M	Weekly	2	6/4/2020	0.0	0.2	20.8	79.0	30	0.04
TMP-1M	Weekly	2	6/9/2020	0.5	1.6	21.1	76.8	30	-0.01
TMP-1M	Weekly	2	6/16/2020	0.3	1.0	20.6	78.1	30	-0.02
TMP-1M	Weekly	2	6/18/2020	0.0	0.2	20.8	79.0	30	0.03
TMP-1M	Weekly	2	6/23/2020	0.3	0.5	20.6	78.6	30	-0.04
TMP-1M	Weekly	2	6/30/2020	0.3	1.8	20.7	77.2	30	-0.03
TMP-1S	Weekly	2	4/1/2020	62.8	27.0	0.4	9.8	30	0.00
TMP-1S	Weekly	2	4/7/2020	63.2	30.3	0.3	6.2	30	0.04
TMP-1S	Weekly	2	4/14/2020	44.1	28.3	0.2	27.4	30	0.02
TMP-1S	Weekly	2	4/21/2020	59.4	30.3	0.0	10.3	30	0.00

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
TMP-1S	Weekly	2	4/28/2020	65.5	26.8	0.4	7.3	30	0.06
TMP-1S	Weekly	2	5/5/2020	64.8	29.0	0.2	6.0	30	0.01
TMP-1S	Weekly	2	5/12/2020	59.8	29.1	0.3	10.8	30	0.04
TMP-1S	Weekly	2	5/19/2020	68.4	21.0	0.5	10.1	30	0.03
TMP-1S	Weekly	2	5/21/2020	69.5	22.9	0.3	7.3	30	0.02
TMP-1S	Weekly	2	5/26/2020	63.2	30.2	0.0	6.6	30	0.02
TMP-1S	Weekly	2	5/28/2020	65.8	26.7	0.2	7.3	30	0.01
TMP-1S	Weekly	2	6/2/2020	61.7	30.4	0.7	7.2	30	0.02
TMP-1S	Weekly	2	6/4/2020	64.3	27.6	0.2	7.9	30	0.02
TMP-1S	Weekly	2	6/9/2020	62.5	31.7	0.3	5.5	30	0.03
TMP-1S	Weekly	2	6/11/2020	47.1	30.2	0.0	22.7	30	0.00
TMP-1S	Weekly	2	6/16/2020	55.7	30.8	0.2	13.3	30	0.02
TMP-1S	Weekly	2	6/18/2020	60.1	28.5	0.0	11.4	30	0.01
TMP-1S	Weekly	2	6/23/2020	61.1	32.7	0.2	6.0	30	0.02
TMP-1S	Weekly	2	6/25/2020	61.2	32.4	0.2	6.2	30	0.01
TMP-1S	Weekly	2	6/30/2020	66.0	32.6	0.3	1.1	30	0.01
TMP-2D	Weekly	2	4/1/2020	0.0	0.0	20.9	79.1	30	-0.20
TMP-2D	Weekly	2	4/7/2020	0.0	0.1	20.7	79.2	30	0.35
TMP-2D	Weekly	2	4/14/2020	0.0	0.2	20.9	78.9	30	0.09
TMP-2D	Weekly	2	4/21/2020	0.0	0.2	20.5	79.3	30	0.00
TMP-2D	Weekly	2	4/28/2020	1.4	0.3	20.6	77.7	30	0.01
TMP-2D	Weekly	2	5/5/2020	0.4	0.2	20.7	78.7	30	0.06
TMP-2D	Weekly	2	5/12/2020	0.4	0.4	20.5	78.7	30	0.04
TMP-2D	Weekly	2	5/19/2020	1.9	2.2	20.2	75.7	30	-1.10
TMP-2D	Weekly	2	5/26/2020	0.3	0.3	20.8	78.6	30	0.10
TMP-2D	Weekly	2	5/28/2020	0.0	0.1	20.4	79.5	30	0.20
TMP-2D	Weekly	2	6/2/2020	0.1	0.3	20.9	78.7	30	0.02
TMP-2D	Weekly	2	6/4/2020	0.0	0.1	20.6	79.3	30	0.07
TMP-2D	Weekly	2	6/9/2020	0.0	0.3	21.1	78.6	30	0.03
TMP-2D	Weekly	2	6/16/2020	0.0	0.8	20.6	78.6	30	0.00
TMP-2D	Weekly	2	6/18/2020	0.0	0.2	20.7	79.1	30	0.00
TMP-2D	Weekly	2	6/23/2020	0.0	0.6	20.4	79.0	30	0.00
TMP-2D	Weekly	2	6/30/2020	0.0	0.8	20.9	78.3	30	0.01
TMP-2M	Weekly	2	4/1/2020	0.0	0.6	21.0	78.4	30	0.01
TMP-2M	Weekly	2	4/7/2020	0.0	0.4	20.5	79.1	30	0.01
TMP-2M	Weekly	2	4/14/2020	0.0	0.7	20.7	78.6	30	0.01
TMP-2M	Weekly	2	4/21/2020	0.0	1.6	16.7	81.7	30	0.00
TMP-2M	Weekly	2	4/28/2020	0.0	1.4	18.6	80.0	30	-0.01
TMP-2M	Weekly	2	5/5/2020	0.0	0.8	19.7	79.5	30	0.00
TMP-2M	Weekly	2	5/12/2020	0.0	0.7	20.0	79.3	30	0.01

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
TMP-2M	Weekly	2	5/19/2020	0.0	1.0	19.8	79.2	30	-0.15
TMP-2M	Weekly	2	5/26/2020	0.0	0.6	20.5	78.9	30	0.02
TMP-2M	Weekly	2	5/28/2020	0.0	0.2	20.2	79.6	30	0.00
TMP-2M	Weekly	2	6/2/2020	0.0	0.6	20.8	78.6	30	-0.01
TMP-2M	Weekly	2	6/4/2020	0.0	0.4	20.5	79.1	30	0.01
TMP-2M	Weekly	2	6/9/2020	0.0	1.0	20.8	78.2	30	-0.01
TMP-2M	Weekly	2	6/16/2020	0.0	2.3	15.1	82.6	30	0.00
TMP-2M	Weekly	2	6/18/2020	0.0	5.0	10.4	84.6	30	0.00
TMP-2M	Weekly	2	6/23/2020	0.0	4.1	12.6	83.3	30	0.00
TMP-2M	Weekly	2	6/30/2020	0.0	3.2	13.8	83.0	30	0.00
TMP-2S	Weekly	2	4/1/2020	0.0	0.8	19.6	79.6	30	0.00
TMP-2S	Weekly	2	4/7/2020	0.0	1.0	18.9	80.1	30	0.00
TMP-2S	Weekly	2	4/14/2020	0.0	1.3	19.1	79.6	30	-0.01
TMP-2S	Weekly	2	4/21/2020	0.0	1.4	18.4	80.2	30	-0.01
TMP-2S	Weekly	2	4/28/2020	0.0	0.9	17.5	81.6	30	0.01
TMP-2S	Weekly	2	5/5/2020	0.0	0.9	14.9	84.2	30	-0.01
TMP-2S	Weekly	2	5/12/2020	0.0	1.2	16.2	82.6	30	0.00
TMP-2S	Weekly	2	5/19/2020	0.0	1.3	15.7	83.0	30	-0.03
TMP-2S	Weekly	2	5/26/2020	0.0	1.4	16.8	81.8	30	0.02
TMP-2S	Weekly	2	5/28/2020	0.0	3.5	14.6	81.9	30	0.00
TMP-2S	Weekly	2	6/2/2020	0.0	1.9	17.4	80.7	30	-0.01
TMP-2S	Weekly	2	6/4/2020	0.0	4.9	14.8	80.3	30	0.00
TMP-2S	Weekly	2	6/9/2020	0.0	2.0	17.9	80.1	30	-0.01
TMP-2S	Weekly	2	6/11/2020	0.2	1.2	18.6	80.0	30	0.00
TMP-2S	Weekly	2	6/16/2020	0.0	2.2	17.4	80.4	30	0.00
TMP-2S	Weekly	2	6/18/2020	0.0	4.9	15.1	80.0	30	0.00
TMP-2S	Weekly	2	6/23/2020	0.0	3.6	15.0	81.4	30	0.00
TMP-2S	Weekly	2	6/25/2020	0.0	2.4	17.1	80.5	30	0.00
TMP-2S	Weekly	2	6/30/2020	0.0	1.9	17.2	80.9	30	0.00
TMP-3D	Weekly	2	4/1/2020	1.4	4.5	19.7	74.4	30	0.07
TMP-3D	Weekly	2	4/7/2020	1.2	3.9	19.5	75.4	30	0.01
TMP-3D	Weekly	2	4/14/2020	1.5	4.6	19.5	74.4	30	0.03
TMP-3D	Weekly	2	4/21/2020	1.5	5.5	18.9	74.1	30	0.13
TMP-3D	Weekly	2	4/28/2020	1.2	5.4	19.4	74.0	30	-0.01
TMP-3D	Weekly	2	5/5/2020	0.6	3.7	19.5	76.2	30	0.04
TMP-3D	Weekly	2	5/12/2020	0.4	2.4	19.9	77.3	30	0.02
TMP-3D	Weekly	2	5/19/2020	0.4	2.8	19.9	76.9	30	0.01
TMP-3D	Weekly	2	5/21/2020	0.3	3.6	19.9	76.2	30	0.04
TMP-3D	Weekly	2	5/26/2020	0.3	3.3	19.8	76.6	30	0.01
TMP-3D	Weekly	2	5/28/2020	0.2	4.1	19.0	76.7	30	0.03

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
TMP-3D	Weekly	2	6/2/2020	0.5	3.2	19.6	76.7	30	-0.01
TMP-3D	Weekly	2	6/4/2020	0.0	0.8	20.4	78.8	30	0.02
TMP-3D	Weekly	2	6/9/2020	2.0	10.6	17.0	70.4	30	-0.16
TMP-3D	Weekly	2	6/16/2020	0.6	3.8	19.5	76.1	30	-0.01
TMP-3D	Weekly	2	6/18/2020	0.0	0.8	20.5	78.7	30	0.07
TMP-3D	Weekly	2	6/23/2020	0.7	6.5	17.9	74.9	30	-0.18
TMP-3D	Weekly	2	6/30/2020	0.1	3.7	19.5	76.7	30	-0.11
TMP-3M	Weekly	2	4/1/2020	1.1	2.1	20.4	76.4	30	0.01
TMP-3M	Weekly	2	4/7/2020	1.2	2.3	20.0	76.5	30	0.02
TMP-3M	Weekly	2	4/14/2020	0.3	0.7	20.7	78.3	30	-0.02
TMP-3M	Weekly	2	4/21/2020	0.8	1.2	20.1	77.9	30	-0.01
TMP-3M	Weekly	2	4/28/2020	0.3	0.5	21.0	78.2	30	-0.02
TMP-3M	Weekly	2	5/5/2020	0.6	0.8	20.4	78.2	30	0.05
TMP-3M	Weekly	2	5/12/2020	0.3	0.5	20.5	78.7	30	0.00
TMP-3M	Weekly	2	5/19/2020	0.5	0.5	20.8	78.2	30	0.01
TMP-3M	Weekly	2	5/21/2020	0.6	1.1	20.7	77.6	30	0.00
TMP-3M	Weekly	2	5/26/2020	1.3	2.1	20.2	76.4	30	0.07
TMP-3M	Weekly	2	5/28/2020	0.2	0.2	20.5	79.1	30	0.00
TMP-3M	Weekly	2	6/2/2020	0.5	0.9	20.7	77.9	30	-0.01
TMP-3M	Weekly	2	6/4/2020	0.0	0.2	20.6	79.2	30	0.00
TMP-3M	Weekly	2	6/9/2020	1.9	3.7	19.8	74.6	30	0.06
TMP-3M	Weekly	2	6/16/2020	1.3	2.3	20.0	76.4	30	-0.04
TMP-3M	Weekly	2	6/18/2020	1.3	3.0	19.9	75.8	30	0.03
TMP-3M	Weekly	2	6/23/2020	1.4	2.5	19.9	76.2	30	-0.01
TMP-3M	Weekly	2	6/30/2020	2.3	2.9	19.8	75.0	30	0.01
TMP-3S	Weekly	2	4/1/2020	30.7	3.6	2.0	63.7	30	-0.30
TMP-3S	Weekly	2	4/7/2020	35.9	5.2	0.9	58.0	30	0.50
TMP-3S	Weekly	2	4/14/2020	46.2	20.2	1.5	32.1	30	0.04
TMP-3S	Weekly	2	4/21/2020	59.3	36.2	0.0	4.5	30	-0.01
TMP-3S	Weekly	2	4/28/2020	0.3	0.1	20.9	78.7	30	-0.32
TMP-3S	Weekly	2	5/5/2020	0.0	0.1	20.7	79.2	30	-1.30
TMP-3S	Weekly	2	5/12/2020	27.5	8.6	0.3	63.6	30	0.05
TMP-3S	Weekly	2	5/19/2020	34.8	4.5	2.2	58.5	30	-0.49
TMP-3S	Weekly	2	5/21/2020	33.1	4.4	0.2	62.3	30	-0.09
TMP-3S	Weekly	2	5/26/2020	0.3	0.1	20.8	78.8	30	-0.31
TMP-3S	Weekly	2	5/28/2020	29.4	4.5	0.3	65.8	30	-0.42
TMP-3S	Weekly	2	6/2/2020	7.0	0.3	16.5	76.2	30	-1.80
TMP-3S	Weekly	2	6/4/2020	28.2	6.3	0.2	65.3	30	-0.22
TMP-3S	Weekly	2	6/9/2020	47.9	20.6	0.1	31.4	30	0.03
TMP-3S	Weekly	2	6/11/2020	45.8	18.3	0.0	35.9	30	-0.01

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
TMP-3S	Weekly	2	6/16/2020	54.3	26.8	0.2	18.7	30	0.01
TMP-3S	Weekly	2	6/18/2020	57.6	28.0	0.0	14.4	30	0.01
TMP-3S	Weekly	2	6/23/2020	49.3	3.4	5.7	41.6	30	-4.46
TMP-3S	Weekly	2	6/25/2020	0.1	0.0	21.1	78.8	30	-0.83
TMP-3S	Weekly	2	6/30/2020	34.3	7.9	0.7	57.1	30	0.00

TABLE 5

PUBLIC SAFETY GAS MONITORING PROBE DATA

APRIL 01, 2020 – JUNE 30, 2020

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
4ASS	Weekly	4	4/1/2020	0.1	2.6	19.3	78.0	30	0.17
4ASS	Weekly	4	4/7/2020	0.0	0.5	20.2	79.3	30	0.01
4ASS	Weekly	4	4/14/2020	0.0	0.2	20.9	78.9	30	0.01
4ASS	Weekly	4	4/21/2020	0.0	0.1	20.4	79.5	30	0.02
4ASS	Weekly	4	4/28/2020	0.0	0.1	20.7	79.2	30	0.03
4ASS	Weekly	4	5/5/2020	0.0	0.2	20.5	79.3	30	0.18
4ASS	Weekly	4	5/12/2020	0.0	0.1	20.4	79.5	30	0.44
4ASS	Weekly	4	5/19/2020	0.0	0.3	20.4	79.3	30	-2.94
4ASS	Weekly	4	5/26/2020	0.0	0.6	20.6	78.8	30	0.01
4ASS	Weekly	4	6/2/2020	0.0	0.4	20.6	79.0	30	-0.01
4ASS	Weekly	4	6/9/2020	0.0	0.1	21.1	78.8	30	-0.01
4ASS	Weekly	4	6/16/2020	0.0	0.1	20.7	79.2	30	0.00
4ASS	Weekly	4	6/23/2020	0.0	0.2	20.0	79.8	30	0.02
4ASS	Weekly	4	6/30/2020	0.0	0.2	20.9	78.9	30	0.01
4OSS	Weekly	4	4/1/2020	0.0	0.9	19.7	79.4	30	-0.88
4OSS	Weekly	4	4/7/2020	0.0	0.3	19.8	79.9	30	1.80
4OSS	Weekly	4	4/14/2020	0.0	0.2	20.3	79.5	30	-3.50
4OSS	Weekly	4	4/21/2020	0.0	0.2	19.4	80.4	30	-0.92
4OSS	Weekly	4	4/28/2020	0.0	0.2	20.1	79.7	30	0.92
4OSS	Weekly	4	5/5/2020	0.0	0.3	20.0	79.7	30	-0.53
4OSS	Weekly	4	5/12/2020	0.0	0.1	20.5	79.4	30	1.07
4OSS	Weekly	4	5/19/2020	0.0	0.4	19.9	79.7	30	1.60
4OSS	Weekly	4	5/26/2020	0.0	0.2	20.7	79.1	30	0.04
4OSS	Weekly	4	6/2/2020	0.0	0.1	20.8	79.1	30	0.01
4OSS	Weekly	4	6/9/2020	0.0	0.1	21.1	78.8	30	0.02
4OSS	Weekly	4	6/16/2020	0.0	0.0	20.7	79.3	30	0.19
4OSS	Weekly	4	6/23/2020	0.0	0.1	19.9	80.0	30	0.02
4OSS	Weekly	4	6/30/2020	0.0	0.1	20.7	79.2	30	-0.02
GMP-09	Weekly	2	4/1/2020	0.0	0.3	20.6	79.1	30	0.04
GMP-09	Weekly	2	4/7/2020	0.0	0.3	20.3	79.4	30	0.05
GMP-09	Weekly	2	4/14/2020	0.0	0.4	20.6	79.0	30	-2.64
GMP-09	Weekly	2	4/21/2020	0.0	0.7	20.0	79.3	30	-2.05
GMP-09	Weekly	2	4/28/2020	0.0	0.7	20.2	79.1	30	2.36
GMP-09	Weekly	2	5/5/2020	0.0	0.4	20.5	79.1	30	-1.22
GMP-09	Weekly	2	5/12/2020	0.0	0.4	20.3	79.3	30	-3.74
GMP-09	Weekly	2	5/19/2020	0.0	0.8	20.6	78.6	30	0.52
GMP-09	Weekly	2	5/26/2020	0.0	0.3	20.5	79.2	30	-0.04
GMP-09	Weekly	2	6/2/2020	0.0	0.2	20.8	79.0	30	0.02
GMP-09	Weekly	2	6/9/2020	0.0	0.2	21.0	78.8	30	-0.01
GMP-09	Weekly	2	6/16/2020	0.0	0.3	20.5	79.2	30	0.04

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
GMP-09	Weekly	2	6/23/2020	0.0	0.2	20.4	79.4	30	-0.01
GMP-09	Weekly	2	6/30/2020	0.0	0.3	20.7	79.0	30	-0.03
GMP-10	Weekly	4	4/1/2020	0.0	0.5	14.7	84.8	30	-0.32
GMP-10	Weekly	4	4/7/2020	0.0	0.5	17.0	82.5	30	0.08
GMP-10	Weekly	4	4/14/2020	0.0	0.4	19.3	80.3	30	-2.03
GMP-10	Weekly	4	4/21/2020	0.0	0.6	19.1	80.3	30	-1.08
GMP-10	Weekly	4	4/28/2020	0.0	0.8	17.3	81.9	30	1.43
GMP-10	Weekly	4	5/5/2020	0.0	0.5	14.1	85.4	30	-0.20
GMP-10	Weekly	4	5/12/2020	0.0	0.5	18.6	80.9	30	-5.19
GMP-10	Weekly	4	5/19/2020	0.0	1.2	16.3	82.5	30	7.13
GMP-10	Weekly	4	5/26/2020	0.0	0.5	17.3	82.2	30	0.04
GMP-10	Weekly	4	6/2/2020	0.0	0.3	20.1	79.6	30	0.06
GMP-10	Weekly	4	6/9/2020	0.0	0.3	20.7	79.0	30	0.03
GMP-10	Weekly	4	6/16/2020	0.0	0.4	20.1	79.5	30	0.03
GMP-10	Weekly	4	6/23/2020	0.0	0.3	19.5	80.2	30	0.07
GMP-10	Weekly	4	6/30/2020	0.0	0.3	20.3	79.4	30	0.07
GMP-11	Weekly	4	4/1/2020	0.0	0.8	19.5	79.7	30	-0.54
GMP-11	Weekly	4	4/7/2020	0.0	0.4	19.7	79.9	30	-1.12
GMP-11	Weekly	4	4/14/2020	0.0	0.3	20.2	79.5	30	-2.15
GMP-11	Weekly	4	4/21/2020	0.0	0.3	19.2	80.5	30	-0.44
GMP-11	Weekly	4	4/28/2020	0.0	0.2	20.2	79.6	30	0.35
GMP-11	Weekly	4	5/5/2020	0.0	0.3	19.6	80.1	30	-2.53
GMP-11	Weekly	4	5/12/2020	0.0	0.0	19.8	80.2	30	-3.89
GMP-11	Weekly	4	5/19/2020	0.0	0.0	19.2	80.8	30	-0.46
GMP-11	Weekly	4	5/26/2020	0.0	0.2	20.5	79.3	30	-2.01
GMP-11	Weekly	4	6/2/2020	0.0	0.1	20.4	79.5	30	-1.84
GMP-11	Weekly	4	6/9/2020	0.0	0.1	20.9	79.0	30	-0.91
GMP-11	Weekly	4	6/16/2020	0.0	0.0	20.6	79.4	30	-1.25
GMP-11	Weekly	4	6/23/2020	0.0	0.4	19.5	80.1	30	-0.52
GMP-11	Weekly	4	6/30/2020	0.0	0.1	20.7	79.2	30	-1.27
GMP-12	Weekly	4	4/1/2020	0.0	0.7	19.6	79.7	30	2.29
GMP-12	Weekly	4	4/7/2020	0.0	0.0	19.1	80.9	30	1.61
GMP-12	Weekly	4	4/14/2020	0.0	0.0	19.6	80.4	30	1.26
GMP-12	Weekly	4	4/21/2020	0.0	0.4	19.1	80.5	30	0.23
GMP-12	Weekly	4	4/28/2020	0.0	0.0	19.0	81.0	30	1.22
GMP-12	Weekly	4	5/5/2020	0.0	0.0	19.3	80.7	30	1.86
GMP-12	Weekly	4	5/12/2020	0.0	0.0	19.8	80.2	30	1.54
GMP-12	Weekly	4	5/19/2020	0.0	0.0	19.4	80.6	30	2.66
GMP-12	Weekly	4	5/26/2020	0.0	0.2	20.2	79.6	30	0.93
GMP-12	Weekly	4	6/2/2020	0.0	0.0	20.0	80.0	30	0.93

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
GMP-12	Weekly	4	6/9/2020	0.0	0.0	20.3	79.7	30	0.77
GMP-12	Weekly	4	6/16/2020	0.0	0.0	20.4	79.6	30	-3.06
GMP-12	Weekly	4	6/23/2020	0.0	0.0	19.0	81.0	30	-1.67
GMP-12	Weekly	4	6/30/2020	0.0	0.1	20.7	79.2	30	-4.26

TABLE 6

GAS MONITORING PROBE WATER LEVEL DATA

APRIL 01, 2020 – JUNE 30, 2020

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
4AOSS	4/1/2020	4	8.9	No Comment
4AOSS	4/7/2020	4	9.1	No Comment
4AOSS	4/14/2020	4	9.1	No Comment
4AOSS	4/21/2020	4	9.3	No Comment
4AOSS	4/28/2020	4	8.9	No Comment
4AOSS	5/5/2020	4	9.0	No Comment
4AOSS	5/12/2020	4	9.2	No Comment
4AOSS	5/19/2020	4	9.2	No Comment
4AOSS	5/26/2020	4	10.6	No Comment
4AOSS	6/2/2020	4	9.3	No Comment
4AOSS	6/9/2020	4	9.3	No Comment
4AOSS	6/16/2020	4	9.7	No Comment
4AOSS	6/23/2020	4	9.5	No Comment
4AOSS	6/30/2020	4	9.6	No Comment
4ASS	4/1/2020	4	4.3	No Comment
4ASS	4/7/2020	4	4.5	No Comment
4ASS	4/14/2020	4	4.5	No Comment
4ASS	4/21/2020	4	4.8	No Comment
4ASS	4/28/2020	4	4.4	No Comment
4ASS	5/5/2020	4	4.4	No Comment
4ASS	5/12/2020	4	4.6	No Comment
4ASS	5/19/2020	4	4.1	No Comment
4ASS	5/26/2020	4	4.5	No Comment
4ASS	6/2/2020	4	4.6	No Comment
4ASS	6/9/2020	4	4.6	No Comment
4ASS	6/16/2020	4	5.1	No Comment
4ASS	6/23/2020	4	5.0	No Comment
4ASS	6/30/2020	4	5.1	No Comment
GMP-01	4/1/2020	2	11.8	No Comment
GMP-01	4/7/2020	2	11.8	No Comment
GMP-01	4/14/2020	2	11.8	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
GMP-01	4/21/2020	2	11.8	No Comment
GMP-01	4/28/2020	2	11.8	No Comment
GMP-01	5/5/2020	2	11.8	No Comment
GMP-01	5/12/2020	2	11.8	No Comment
GMP-01	5/19/2020	2	11.4	No Comment
GMP-01	5/26/2020	2	11.8	No Comment
GMP-01	6/2/2020	2	11.8	No Comment
GMP-01	6/9/2020	2	11.8	No Comment
GMP-01	6/16/2020	2	11.8	No Comment
GMP-01	6/23/2020	2	11.8	No Comment
GMP-01	6/30/2020	2	11.8	No Comment
GMP-02	4/1/2020	4	9.4	No Comment
GMP-02	4/7/2020	4	9.3	No Comment
GMP-02	4/14/2020	4	9.3	No Comment
GMP-02	4/21/2020	4	9.3	No Comment
GMP-02	4/28/2020	4	9.3	No Comment
GMP-02	5/5/2020	4	9.3	No Comment
GMP-02	5/12/2020	4	9.1	No Comment
GMP-02	5/19/2020	4	8.6	No Comment
GMP-02	5/26/2020	4	9.3	No Comment
GMP-02	6/2/2020	4	9.3	No Comment
GMP-02	6/9/2020	4	9.3	No Comment
GMP-02	6/16/2020	4	9.3	No Comment
GMP-02	6/23/2020	4	9.2	No Comment
GMP-02	6/30/2020	4	9.2	No Comment
GMP-03	4/1/2020	4	11.4	No Comment
GMP-03	4/7/2020	4	11.7	No Comment
GMP-03	4/14/2020	4	12.4	No Comment
GMP-03	4/21/2020	4	12.8	No Comment
GMP-03	4/28/2020	4	11.3	No Comment
GMP-03	5/5/2020	4	11.2	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
GMP-03	5/12/2020	4	11.9	No Comment
GMP-03	5/19/2020	4	10.6	No Comment
GMP-03	5/26/2020	4	11.5	No Comment
GMP-03	6/2/2020	4	12.0	No Comment
GMP-03	6/9/2020	4	12.2	No Comment
GMP-03	6/16/2020	4	13.3	No Comment
GMP-03	6/23/2020	4	13.5	No Comment
GMP-03	6/30/2020	4	14.2	No Comment
GMP-05	4/1/2020	3	8.6	No Comment
GMP-06	4/1/2020	1	8.9	No Comment
GMP-07	4/1/2020	1	21.7	No Comment
GMP-08	4/1/2020	1	33.8	No Comment
GMP-08	4/7/2020	1	33.7	No Comment
GMP-08	4/14/2020	1	34.0	No Comment
GMP-08	4/21/2020	1	34.3	No Comment
GMP-08	4/28/2020	1	33.7	No Comment
GMP-08	5/5/2020	1	33.3	No Comment
GMP-08	5/12/2020	1	34.0	No Comment
GMP-08	5/19/2020	1	33.7	No Comment
GMP-08	5/26/2020	1	33.8	No Comment
GMP-08	6/2/2020	1	34.4	No Comment
GMP-08	6/9/2020	1	34.2	No Comment
GMP-08	6/16/2020	1	34.2	No Comment
GMP-08	6/23/2020	1	33.0	No Comment
GMP-08	6/30/2020	1	32.9	No Comment
GMP-09	4/1/2020	2	8.0	No Comment
GMP-09	4/7/2020	2	8.7	No Comment
GMP-09	4/14/2020	2	9.5	No Comment
GMP-09	4/21/2020	2	9.8	No Comment
GMP-09	4/28/2020	2	8.3	No Comment
GMP-09	5/5/2020	2	8.0	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
GMP-09	5/12/2020	2	8.9	No Comment
GMP-09	5/19/2020	2	6.9	No Comment
GMP-09	5/26/2020	2	8.4	No Comment
GMP-09	6/2/2020	2	8.9	No Comment
GMP-09	6/9/2020	2	9.0	No Comment
GMP-09	6/16/2020	2	10.5	No Comment
GMP-09	6/23/2020	2	10.8	No Comment
GMP-09	6/30/2020	2	10.9	No Comment
GMP-10	4/1/2020	4	8.5	No Comment
GMP-10	4/7/2020	4	8.5	No Comment
GMP-10	4/14/2020	4	8.8	No Comment
GMP-10	4/21/2020	4	8.9	No Comment
GMP-10	4/28/2020	4	8.9	No Comment
GMP-10	5/5/2020	4	8.4	No Comment
GMP-10	5/12/2020	4	8.7	No Comment
GMP-10	5/19/2020	4	7.7	No Comment
GMP-10	5/26/2020	4	8.7	No Comment
GMP-10	6/2/2020	4	8.6	No Comment
GMP-10	6/9/2020	4	8.7	No Comment
GMP-10	6/16/2020	4	8.9	No Comment
GMP-10	6/23/2020	4	9.0	No Comment
GMP-10	6/30/2020	4	8.8	No Comment
GMP-11	4/1/2020	4	0.4	No Comment
GMP-11	4/7/2020	4	0.3	No Comment
GMP-11	4/14/2020	4	0.5	No Comment
GMP-11	4/21/2020	4	0.5	No Comment
GMP-11	4/28/2020	4	0.1	No Comment
GMP-11	5/5/2020	4	0.0	No Comment
GMP-11	5/12/2020	4	0.1	No Comment
GMP-11	5/19/2020	4	0.1	No Comment
GMP-11	5/26/2020	4	0.3	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
GMP-11	6/2/2020	4	0.5	No Comment
GMP-11	6/9/2020	4	0.5	No Comment
GMP-11	6/16/2020	4	0.7	No Comment
GMP-11	6/23/2020	4	0.6	No Comment
GMP-11	6/30/2020	4	0.6	No Comment
GMP-12	4/1/2020	4	0.1	No Comment
GMP-12	4/7/2020	4	0.0	No Comment
GMP-12	4/14/2020	4	0.0	No Comment
GMP-12	4/21/2020	4	0.2	No Comment
GMP-12	4/28/2020	4	0.0	No Comment
GMP-12	5/5/2020	4	0.0	No Comment
GMP-12	5/12/2020	4	0.0	No Comment
GMP-12	5/19/2020	4	0.0	No Comment
GMP-12	5/26/2020	4	0.0	No Comment
GMP-12	6/2/2020	4	0.1	No Comment
GMP-12	6/9/2020	4	0.1	No Comment
GMP-12	6/16/2020	4	0.1	No Comment
GMP-12	6/23/2020	4	0.1	No Comment
GMP-12	6/30/2020	4	0.1	No Comment
GMP-13D	4/1/2020	4	9.5	No Comment
GMP-13D	4/7/2020	4	9.2	No Comment
GMP-13D	4/14/2020	4	9.1	No Comment
GMP-13D	4/21/2020	4	9.2	No Comment
GMP-13D	4/28/2020	4	9.1	No Comment
GMP-13D	5/5/2020	4	8.8	No Comment
GMP-13D	5/12/2020	4	8.7	No Comment
GMP-13D	5/19/2020	4	8.6	No Comment
GMP-13D	5/26/2020	4	8.4	No Comment
GMP-13D	6/2/2020	4	8.3	No Comment
GMP-13D	6/9/2020	4	8.4	No Comment
GMP-13D	6/16/2020	4	8.7	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
GMP-13D	6/23/2020	4	9.0	No Comment
GMP-13D	6/30/2020	4	9.5	No Comment
GMP-13S	4/1/2020	4	7.4	No Comment
GMP-13S	4/7/2020	4	7.8	No Comment
GMP-13S	4/14/2020	4	8.8	No Comment
GMP-13S	4/21/2020	4	9.2	No Comment
GMP-13S	4/28/2020	4	6.6	No Comment
GMP-13S	5/5/2020	4	6.9	No Comment
GMP-13S	5/12/2020	4	7.7	No Comment
GMP-13S	5/19/2020	4	5.6	No Comment
GMP-13S	5/26/2020	4	7.3	No Comment
GMP-13S	6/2/2020	4	7.8	No Comment
GMP-13S	6/9/2020	4	7.5	No Comment
GMP-13S	6/16/2020	4	9.7	No Comment
GMP-13S	6/23/2020	4	10.5	No Comment
GMP-13S	6/30/2020	4	11.2	No Comment
GMP-14D	4/1/2020	3	7.0	No Comment
GMP-14D	4/7/2020	3	7.4	No Comment
GMP-14D	4/14/2020	3	8.2	No Comment
GMP-14D	4/21/2020	3	8.5	No Comment
GMP-14D	4/28/2020	3	7.0	No Comment
GMP-14D	5/5/2020	3	7.0	No Comment
GMP-14D	5/12/2020	3	7.5	No Comment
GMP-14D	5/19/2020	3	6.4	No Comment
GMP-14D	5/26/2020	3	7.1	No Comment
GMP-14D	6/2/2020	3	7.7	No Comment
GMP-14D	6/9/2020	3	8.3	No Comment
GMP-14D	6/16/2020	3	9.3	No Comment
GMP-14D	6/23/2020	3	10.0	No Comment
GMP-14D	6/30/2020	3	10.7	No Comment
GMP-14S	4/1/2020	3	5.1	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
GMP-14S	4/7/2020	3	5.5	No Comment
GMP-14S	4/14/2020	3	6.3	No Comment
GMP-14S	4/21/2020	3	6.5	No Comment
GMP-14S	4/28/2020	3	4.4	No Comment
GMP-14S	5/5/2020	3	4.9	No Comment
GMP-14S	5/12/2020	3	5.7	No Comment
GMP-14S	5/19/2020	3	3.9	No Comment
GMP-14S	5/26/2020	3	5.4	No Comment
GMP-14S	6/2/2020	3	6.0	No Comment
GMP-14S	6/9/2020	3	6.5	No Comment
GMP-14S	6/16/2020	3	7.6	No Comment
GMP-14S	6/23/2020	3	8.1	No Comment
GMP-14S	6/30/2020	3	8.8	No Comment
GMP-15D	4/1/2020	1	11.2	No Comment
GMP-15D	4/7/2020	1	11.2	No Comment
GMP-15D	4/14/2020	1	11.7	No Comment
GMP-15D	4/21/2020	1	11.8	No Comment
GMP-15D	4/28/2020	1	11.1	No Comment
GMP-15D	5/5/2020	1	11.2	No Comment
GMP-15D	5/12/2020	1	11.4	No Comment
GMP-15D	5/19/2020	1	10.6	No Comment
GMP-15D	5/26/2020	1	10.9	No Comment
GMP-15D	6/2/2020	1	11.1	No Comment
GMP-15D	6/9/2020	1	11.3	No Comment
GMP-15D	6/16/2020	1	11.9	No Comment
GMP-15D	6/23/2020	1	11.7	No Comment
GMP-15D	6/30/2020	1	11.8	No Comment
GMP-15S	4/1/2020	1	6.7	No Comment
GMP-15S	4/7/2020	1	7.0	No Comment
GMP-15S	4/14/2020	1	7.2	No Comment
GMP-15S	4/21/2020	1	7.4	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
GMP-15S	4/28/2020	1	6.6	No Comment
GMP-15S	5/5/2020	1	6.8	No Comment
GMP-15S	5/12/2020	1	6.9	No Comment
GMP-15S	5/19/2020	1	6.0	No Comment
GMP-15S	5/26/2020	1	6.6	No Comment
GMP-15S	6/2/2020	1	7.0	No Comment
GMP-15S	6/9/2020	1	6.9	No Comment
GMP-15S	6/16/2020	1	7.3	No Comment
GMP-15S	6/23/2020	1	7.2	No Comment
GMP-15S	6/30/2020	1	9.3	No Comment
GMP-16D	4/1/2020	1	5.8	No Comment
GMP-16D	4/7/2020	1	5.8	No Comment
GMP-16D	4/14/2020	1	6.7	No Comment
GMP-16D	4/21/2020	1	6.9	No Comment
GMP-16D	4/28/2020	1	6.0	No Comment
GMP-16D	5/5/2020	1	5.8	No Comment
GMP-16D	5/12/2020	1	5.9	No Comment
GMP-16D	5/19/2020	1	5.3	No Comment
GMP-16D	5/26/2020	1	5.5	No Comment
GMP-16D	6/2/2020	1	5.7	No Comment
GMP-16D	6/9/2020	1	5.9	No Comment
GMP-16D	6/16/2020	1	6.7	No Comment
GMP-16D	6/23/2020	1	6.6	No Comment
GMP-16D	6/30/2020	1	6.9	No Comment
GMP-16S	4/1/2020	1	5.5	No Comment
GMP-16S	4/7/2020	1	5.5	No Comment
GMP-16S	4/14/2020	1	6.3	No Comment
GMP-16S	4/21/2020	1	6.5	No Comment
GMP-16S	4/28/2020	1	5.7	No Comment
GMP-16S	5/5/2020	1	5.3	No Comment
GMP-16S	5/12/2020	1	5.4	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
GMP-16S	5/19/2020	1	4.7	No Comment
GMP-16S	5/26/2020	1	5.2	No Comment
GMP-16S	6/2/2020	1	5.5	No Comment
GMP-16S	6/9/2020	1	5.6	No Comment
GMP-16S	6/16/2020	1	6.4	No Comment
GMP-16S	6/23/2020	1	6.3	No Comment
GMP-16S	6/30/2020	1	6.4	No Comment
GMP-4D	4/1/2020	3	6.3	No Comment
GMP-4D	4/7/2020	3	6.7	No Comment
GMP-4D	4/14/2020	3	7.5	No Comment
GMP-4D	4/21/2020	3	7.8	No Comment
GMP-4D	4/28/2020	3	6.3	No Comment
GMP-4D	5/5/2020	3	6.3	No Comment
GMP-4D	5/12/2020	3	6.8	No Comment
GMP-4D	5/19/2020	3	5.8	No Comment
GMP-4D	5/26/2020	3	6.6	No Comment
GMP-4D	6/2/2020	3	7.1	No Comment
GMP-4D	6/9/2020	3	7.7	No Comment
GMP-4D	6/16/2020	3	8.7	No Comment
GMP-4D	6/23/2020	3	9.3	No Comment
GMP-4D	6/30/2020	3	10.1	No Comment
GMP-4S	4/1/2020	3	5.8	No Comment
GMP-4S	4/7/2020	3	6.1	No Comment
GMP-4S	4/14/2020	3	6.9	No Comment
GMP-4S	4/21/2020	3	7.4	No Comment
GMP-4S	4/28/2020	3	5.5	No Comment
GMP-4S	5/5/2020	3	5.6	No Comment
GMP-4S	5/12/2020	3	6.4	No Comment
GMP-4S	5/19/2020	3	4.8	No Comment
GMP-4S	5/26/2020	3	5.9	No Comment
GMP-4S	6/2/2020	3	6.6	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
GMP-4S	6/9/2020	3	7.2	No Comment
GMP-4S	6/16/2020	3	8.2	No Comment
GMP-4S	6/23/2020	3	8.9	No Comment
GMP-4S	6/30/2020	3	9.7	No Comment
GMP-5D	4/1/2020	3	17.7	No Comment
GMP-5D	4/7/2020	3	17.9	No Comment
GMP-5D	4/14/2020	3	18.3	No Comment
GMP-5D	4/21/2020	3	18.6	No Comment
GMP-5D	4/28/2020	3	17.7	No Comment
GMP-5D	5/5/2020	3	17.8	No Comment
GMP-5D	5/12/2020	3	18.1	No Comment
GMP-5D	5/19/2020	3	17.3	No Comment
GMP-5D	5/26/2020	3	17.6	No Comment
GMP-5D	6/2/2020	3	17.8	No Comment
GMP-5D	6/9/2020	3	18.2	No Comment
GMP-5D	6/16/2020	3	18.9	No Comment
GMP-5D	6/23/2020	3	18.8	No Comment
GMP-5D	6/30/2020	3	19.0	No Comment
GMP-5S	4/1/2020	3	12.0	No Comment
GMP-5S	4/7/2020	3	12.4	No Comment
GMP-5S	4/14/2020	3	12.9	No Comment
GMP-5S	4/21/2020	3	13.1	No Comment
GMP-5S	4/28/2020	3	12.0	No Comment
GMP-5S	5/5/2020	3	12.0	No Comment
GMP-5S	5/12/2020	3	12.4	No Comment
GMP-5S	5/19/2020	3	11.3	No Comment
GMP-5S	5/26/2020	3	12.0	No Comment
GMP-5S	6/2/2020	3	12.4	No Comment
GMP-5S	6/9/2020	3	12.9	No Comment
GMP-5S	6/16/2020	3	13.5	No Comment
GMP-5S	6/23/2020	3	13.7	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
GMP-5S	6/30/2020	3	14.4	No Comment
GMP-6D	4/1/2020	1	9.1	No Comment
GMP-6D	4/7/2020	1	9.2	No Comment
GMP-6D	4/14/2020	1	9.8	No Comment
GMP-6D	4/21/2020	1	9.9	No Comment
GMP-6D	4/28/2020	1	9.1	No Comment
GMP-6D	5/5/2020	1	9.3	No Comment
GMP-6D	5/12/2020	1	9.5	No Comment
GMP-6D	5/19/2020	1	8.3	No Comment
GMP-6D	5/26/2020	1	9.0	No Comment
GMP-6D	6/2/2020	1	9.2	No Comment
GMP-6D	6/9/2020	1	9.4	No Comment
GMP-6D	6/16/2020	1	10.2	No Comment
GMP-6D	6/23/2020	1	10.2	No Comment
GMP-6D	6/30/2020	1	10.4	No Comment
GMP-6S	4/1/2020	1	5.4	No Comment
GMP-6S	4/7/2020	1	5.6	No Comment
GMP-6S	4/14/2020	1	6.0	No Comment
GMP-6S	4/21/2020	1	6.3	No Comment
GMP-6S	4/28/2020	1	5.2	No Comment
GMP-6S	5/5/2020	1	5.6	No Comment
GMP-6S	5/12/2020	1	5.8	No Comment
GMP-6S	5/19/2020	1	4.9	No Comment
GMP-6S	5/26/2020	1	5.2	No Comment
GMP-6S	6/2/2020	1	5.6	No Comment
GMP-6S	6/9/2020	1	6.2	No Comment
GMP-6S	6/16/2020	1	7.0	No Comment
GMP-6S	6/23/2020	1	6.9	No Comment
GMP-6S	6/30/2020	1	7.0	No Comment
GMP-7D	4/1/2020	1	16.4	No Comment
GMP-7D	4/7/2020	1	16.7	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
GMP-7D	4/14/2020	1	17.1	No Comment
GMP-7D	4/21/2020	1	17.6	No Comment
GMP-7D	4/28/2020	1	16.3	No Comment
GMP-7D	5/5/2020	1	16.0	No Comment
GMP-7D	5/12/2020	1	16.6	No Comment
GMP-7D	5/19/2020	1	15.6	No Comment
GMP-7D	5/26/2020	1	16.3	No Comment
GMP-7D	6/2/2020	1	16.6	No Comment
GMP-7D	6/9/2020	1	16.6	No Comment
GMP-7D	6/16/2020	1	17.5	No Comment
GMP-7D	6/23/2020	1	16.9	No Comment
GMP-7D	6/30/2020	1	17.2	No Comment
GMP-7S	4/1/2020	1	15.2	No Comment
GMP-7S	4/7/2020	1	15.7	No Comment
GMP-7S	4/14/2020	1	15.9	No Comment
GMP-7S	4/21/2020	1	16.7	No Comment
GMP-7S	4/28/2020	1	14.9	No Comment
GMP-7S	5/5/2020	1	14.5	No Comment
GMP-7S	5/12/2020	1	15.4	No Comment
GMP-7S	5/19/2020	1	14.0	No Comment
GMP-7S	5/26/2020	1	15.1	No Comment
GMP-7S	6/2/2020	1	15.4	No Comment
GMP-7S	6/9/2020	1	15.6	No Comment
GMP-7S	6/16/2020	1	16.6	No Comment
GMP-7S	6/23/2020	1	15.3	No Comment
GMP-7S	6/30/2020	1	16.3	No Comment
TMP-1D	4/1/2020	2	17.8	No Comment
TMP-1D	4/7/2020	2	19.5	No Comment
TMP-1D	4/14/2020	2	19.9	No Comment
TMP-1D	4/21/2020	2	20.0	No Comment
TMP-1D	4/28/2020	2	18.7	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
TMP-1D	5/5/2020	2	18.5	No Comment
TMP-1D	5/12/2020	2	19.3	No Comment
TMP-1D	5/19/2020	2	17.8	No Comment
TMP-1D	5/21/2020	2	17.4	No Comment
TMP-1D	5/26/2020	2	18.6	No Comment
TMP-1D	5/28/2020	2	18.2	No Comment
TMP-1D	6/2/2020	2	19.1	No Comment
TMP-1D	6/4/2020	2	19.2	No Comment
TMP-1D	6/9/2020	2	19.1	No Comment
TMP-1D	6/16/2020	2	20.3	No Comment
TMP-1D	6/18/2020	2	19.7	No Comment
TMP-1D	6/23/2020	2	20.2	No Comment
TMP-1D	6/30/2020	2	20.5	No Comment
TMP-1M	4/1/2020	2	19.5	No Comment
TMP-1M	4/7/2020	2	19.4	No Comment
TMP-1M	4/14/2020	2	19.9	No Comment
TMP-1M	4/21/2020	2	20.0	No Comment
TMP-1M	4/28/2020	2	18.7	No Comment
TMP-1M	5/5/2020	2	18.6	No Comment
TMP-1M	5/12/2020	2	19.4	No Comment
TMP-1M	5/19/2020	2	17.8	No Comment
TMP-1M	5/21/2020	2	19.1	No Comment
TMP-1M	5/26/2020	2	18.7	No Comment
TMP-1M	5/28/2020	2	19.3	No Comment
TMP-1M	6/2/2020	2	19.2	No Comment
TMP-1M	6/4/2020	2	19.2	No Comment
TMP-1M	6/9/2020	2	19.1	No Comment
TMP-1M	6/16/2020	2	20.3	No Comment
TMP-1M	6/18/2020	2	20.5	No Comment
TMP-1M	6/23/2020	2	20.3	No Comment
TMP-1M	6/30/2020	2	20.5	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
TMP-1S	4/1/2020	2	17.8	No Comment
TMP-1S	4/7/2020	2	18.3	No Comment
TMP-1S	4/14/2020	2	19.5	No Comment
TMP-1S	4/21/2020	2	19.5	No Comment
TMP-1S	4/28/2020	2	18.0	No Comment
TMP-1S	5/5/2020	2	17.7	No Comment
TMP-1S	5/12/2020	2	18.6	No Comment
TMP-1S	5/19/2020	2	16.8	No Comment
TMP-1S	5/21/2020	2	17.2	No Comment
TMP-1S	5/26/2020	2	18.0	No Comment
TMP-1S	5/28/2020	2	18.1	No Comment
TMP-1S	6/2/2020	2	18.5	No Comment
TMP-1S	6/4/2020	2	18.6	No Comment
TMP-1S	6/9/2020	2	18.8	No Comment
TMP-1S	6/11/2020	2	19.4	No Comment
TMP-1S	6/16/2020	2	19.8	No Comment
TMP-1S	6/18/2020	2	19.8	No Comment
TMP-1S	6/23/2020	2	19.9	No Comment
TMP-1S	6/25/2020	2	20.0	No Comment
TMP-1S	6/30/2020	2	20.1	No Comment
TMP-2D	4/1/2020	2	18.1	No Comment
TMP-2D	4/7/2020	2	18.9	No Comment
TMP-2D	4/14/2020	2	19.9	No Comment
TMP-2D	4/21/2020	2	20.4	No Comment
TMP-2D	4/28/2020	2	18.2	No Comment
TMP-2D	5/5/2020	2	18.0	No Comment
TMP-2D	5/12/2020	2	19.0	No Comment
TMP-2D	5/19/2020	2	16.6	No Comment
TMP-2D	5/26/2020	2	18.2	No Comment
TMP-2D	5/28/2020	2	18.4	No Comment
TMP-2D	6/2/2020	2	18.9	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
TMP-2D	6/4/2020	2	19.2	No Comment
TMP-2D	6/9/2020	2	19.7	No Comment
TMP-2D	6/16/2020	2	20.6	No Comment
TMP-2D	6/18/2020	2	20.7	No Comment
TMP-2D	6/23/2020	2	20.7	No Comment
TMP-2D	6/30/2020	2	21.0	No Comment
TMP-2M	4/1/2020	2	18.1	No Comment
TMP-2M	4/7/2020	2	18.9	No Comment
TMP-2M	4/14/2020	2	19.9	No Comment
TMP-2M	4/21/2020	2	20.4	No Comment
TMP-2M	4/28/2020	2	18.3	No Comment
TMP-2M	5/5/2020	2	18.0	No Comment
TMP-2M	5/12/2020	2	19.0	No Comment
TMP-2M	5/19/2020	2	16.6	No Comment
TMP-2M	5/26/2020	2	18.2	No Comment
TMP-2M	5/28/2020	2	18.4	No Comment
TMP-2M	6/2/2020	2	18.9	No Comment
TMP-2M	6/4/2020	2	19.2	No Comment
TMP-2M	6/9/2020	2	19.7	No Comment
TMP-2M	6/16/2020	2	20.6	No Comment
TMP-2M	6/18/2020	2	20.5	No Comment
TMP-2M	6/23/2020	2	20.7	No Comment
TMP-2M	6/30/2020	2	21.1	No Comment
TMP-2S	4/1/2020	2	17.5	No Comment
TMP-2S	4/7/2020	2	17.5	No Comment
TMP-2S	4/14/2020	2	17.5	No Comment
TMP-2S	4/21/2020	2	17.5	No Comment
TMP-2S	4/28/2020	2	17.5	No Comment
TMP-2S	5/5/2020	2	17.5	No Comment
TMP-2S	5/12/2020	2	17.5	No Comment
TMP-2S	5/19/2020	2	16.0	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
TMP-2S	5/26/2020	2	17.5	No Comment
TMP-2S	5/28/2020	2	17.4	No Comment
TMP-2S	6/2/2020	2	17.5	No Comment
TMP-2S	6/4/2020	2	17.4	No Comment
TMP-2S	6/9/2020	2	17.5	No Comment
TMP-2S	6/11/2020	2	17.5	No Comment
TMP-2S	6/16/2020	2	17.5	No Comment
TMP-2S	6/18/2020	2	17.4	No Comment
TMP-2S	6/23/2020	2	17.5	No Comment
TMP-2S	6/25/2020	2	17.5	No Comment
TMP-2S	6/30/2020	2	17.5	No Comment
TMP-3D	4/1/2020	2	17.9	No Comment
TMP-3D	4/7/2020	2	18.0	No Comment
TMP-3D	4/14/2020	2	19.2	No Comment
TMP-3D	4/21/2020	2	19.2	No Comment
TMP-3D	4/28/2020	2	17.8	No Comment
TMP-3D	5/5/2020	2	17.7	No Comment
TMP-3D	5/12/2020	2	18.7	No Comment
TMP-3D	5/19/2020	2	17.4	No Comment
TMP-3D	5/21/2020	2	17.5	No Comment
TMP-3D	5/26/2020	2	18.0	No Comment
TMP-3D	5/28/2020	2	18.2	No Comment
TMP-3D	6/2/2020	2	18.4	No Comment
TMP-3D	6/4/2020	2	18.7	No Comment
TMP-3D	6/9/2020	2	18.8	No Comment
TMP-3D	6/16/2020	2	19.9	No Comment
TMP-3D	6/18/2020	2	19.8	No Comment
TMP-3D	6/23/2020	2	19.5	No Comment
TMP-3D	6/30/2020	2	19.8	No Comment
TMP-3M	4/1/2020	2	18.4	No Comment
TMP-3M	4/7/2020	2	18.7	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
TMP-3M	4/14/2020	2	20.8	No Comment
TMP-3M	4/21/2020	2	19.7	No Comment
TMP-3M	4/28/2020	2	18.6	No Comment
TMP-3M	5/5/2020	2	18.1	No Comment
TMP-3M	5/12/2020	2	19.3	No Comment
TMP-3M	5/19/2020	2	17.8	No Comment
TMP-3M	5/21/2020	2	18.0	No Comment
TMP-3M	5/26/2020	2	18.4	No Comment
TMP-3M	5/28/2020	2	18.5	No Comment
TMP-3M	6/2/2020	2	18.9	No Comment
TMP-3M	6/4/2020	2	19.1	No Comment
TMP-3M	6/9/2020	2	19.1	No Comment
TMP-3M	6/16/2020	2	20.2	No Comment
TMP-3M	6/18/2020	2	20.2	No Comment
TMP-3M	6/23/2020	2	19.4	No Comment
TMP-3M	6/30/2020	2	20.2	No Comment
TMP-3S	4/1/2020	2	19.2	No Comment
TMP-3S	4/7/2020	2	19.9	No Comment
TMP-3S	4/14/2020	2	20.7	No Comment
TMP-3S	4/21/2020	2	20.9	No Comment
TMP-3S	4/28/2020	2	17.3	No Comment
TMP-3S	5/5/2020	2	18.5	No Comment
TMP-3S	5/12/2020	2	20.3	No Comment
TMP-3S	5/19/2020	2	17.5	No Comment
TMP-3S	5/21/2020	2	18.2	No Comment
TMP-3S	5/26/2020	2	19.0	No Comment
TMP-3S	5/28/2020	2	19.4	No Comment
TMP-3S	6/2/2020	2	19.9	No Comment
TMP-3S	6/4/2020	2	20.1	No Comment
TMP-3S	6/9/2020	2	20.5	No Comment
TMP-3S	6/11/2020	2	20.7	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
TMP-3S	6/16/2020	2	21.4	No Comment
TMP-3S	6/18/2020	2	21.2	No Comment
TMP-3S	6/23/2020	2	16.0	No Comment
TMP-3S	6/25/2020	2	19.7	No Comment
TMP-3S	6/30/2020	2	21.4	No Comment

TABLE 7

TEMPORARY MONITORING POINT DATA

APRIL 01, 2020 – JUNE 30, 2020

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
Temporary Probe 01004	Bi-Weekly	2	5/19/2020	0.3	0.6	20.1	79.0	30	0.22
Temporary Probe 01004	Bi-Weekly	2	5/21/2020	0.1	0.4	20.5	79.0	30	0.87
Temporary Probe 01004	Bi-Weekly	2	5/26/2020	0.4	1.3	19.8	78.5	30	0.82
Temporary Probe 01004	Bi-Weekly	2	5/28/2020	0.6	1.2	19.5	78.7	30	0.43
Temporary Probe 01004	Bi-Weekly	2	6/2/2020	1.1	2.7	18.8	77.4	30	0.89
Temporary Probe 01004	Bi-Weekly	2	6/4/2020	0.7	1.3	19.4	78.6	30	-0.15
Temporary Probe 01004	Bi-Weekly	2	6/9/2020	1.7	4.5	18.4	75.4	30	2.28
Temporary Probe 01004	Bi-Weekly	2	6/11/2020	0.3	0.8	20.3	78.6	30	0.39
Temporary Probe 01004	Bi-Weekly	2	6/16/2020	2.7	3.6	18.0	75.7	30	0.27
Temporary Probe 01004	Bi-Weekly	2	6/18/2020	3.2	3.6	18.2	75.0	30	0.54
Temporary Probe 01004	Bi-Weekly	2	6/23/2020	4.3	4.5	17.4	73.8	30	0.10
Temporary Probe 01004	Bi-Weekly	2	6/25/2020	3.9	2.8	18.6	74.7	30	0.55
Temporary Probe 01004	Bi-Weekly	2	6/30/2020	2.2	2.8	19.3	75.7	30	-0.09
Temporary Probe 1001D	Bi-Weekly	2	5/19/2020	0.0	0.0	21.0	79.0	30	0.00
Temporary Probe 1001D	Bi-Weekly	2	5/21/2020	0.0	0.3	20.8	78.9	30	0.00
Temporary Probe 1001D	Bi-Weekly	2	5/26/2020	0.0	1.2	20.3	78.5	30	0.00
Temporary Probe 1001D	Bi-Weekly	2	5/28/2020	0.2	0.8	19.7	79.3	30	0.08
Temporary Probe 1001D	Bi-Weekly	2	6/2/2020	0.8	2.1	19.3	77.8	30	0.00
Temporary Probe 1001D	Bi-Weekly	2	6/4/2020	0.6	1.4	19.6	78.4	30	-0.05
Temporary Probe 1001D	Bi-Weekly	2	6/9/2020	1.1	2.7	19.4	76.8	30	0.02
Temporary Probe 1001D	Bi-Weekly	2	6/11/2020	1.1	1.3	19.7	77.9	30	-0.01
Temporary Probe 1001D	Bi-Weekly	2	6/16/2020	1.3	2.9	18.8	77.0	30	0.00
Temporary Probe 1001D	Bi-Weekly	2	6/18/2020	0.6	0.9	20.0	78.5	30	-0.05
Temporary Probe 1001D	Bi-Weekly	2	6/23/2020	0.2	0.5	20.4	78.9	30	-0.01
Temporary Probe 1001D	Bi-Weekly	2	6/25/2020	0.4	0.6	20.7	78.3	30	-0.02
Temporary Probe 1001D	Bi-Weekly	2	6/30/2020	1.4	3.2	18.8	76.6	30	0.00
Temporary Probe 1001S	Bi-Weekly	2	5/19/2020	0.0	0.0	21.1	78.9	30	0.00
Temporary Probe 1001S	Bi-Weekly	2	5/21/2020	0.0	0.3	20.6	79.1	30	0.01
Temporary Probe 1001S	Bi-Weekly	2	5/26/2020	0.0	3.2	18.2	78.6	30	0.00
Temporary Probe 1001S	Bi-Weekly	2	5/28/2020	0.0	6.6	13.8	79.6	30	0.08
Temporary Probe 1001S	Bi-Weekly	2	6/2/2020	0.0	4.0	17.6	78.4	30	0.05
Temporary Probe 1001S	Bi-Weekly	2	6/4/2020	0.0	8.0	13.3	78.7	30	-0.03
Temporary Probe 1001S	Bi-Weekly	2	6/9/2020	0.0	10.5	12.5	77.0	30	0.02
Temporary Probe 1001S	Bi-Weekly	2	6/11/2020	0.1	2.3	17.5	80.1	30	-0.02
Temporary Probe 1001S	Bi-Weekly	2	6/16/2020	0.0	11.6	10.9	77.5	30	0.01
Temporary Probe 1001S	Bi-Weekly	2	6/18/2020	0.0	9.7	10.7	79.6	30	0.08
Temporary Probe 1001S	Bi-Weekly	2	6/23/2020	0.0	4.3	17.6	78.1	30	0.03
Temporary Probe 1001S	Bi-Weekly	2	6/25/2020	0.0	5.2	14.8	80.0	30	-0.01
Temporary Probe 1001S	Bi-Weekly	2	6/30/2020	0.0	3.6	18.7	77.7	30	0.05
Temporary Probe 1002D	Bi-Weekly	2	5/19/2020	0.0	0.2	20.6	79.2	30	0.00

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
Temporary Probe 1002D	Bi-Weekly	2	5/21/2020	0.0	0.0	21.0	79.0	30	0.00
Temporary Probe 1002D	Bi-Weekly	2	5/26/2020	0.0	1.1	20.0	78.9	30	0.04
Temporary Probe 1002D	Bi-Weekly	2	5/28/2020	0.0	0.2	20.1	79.7	30	0.03
Temporary Probe 1002D	Bi-Weekly	2	6/2/2020	0.0	0.0	20.5	79.5	30	0.01
Temporary Probe 1002D	Bi-Weekly	2	6/4/2020	0.0	0.0	20.6	79.4	30	0.00
Temporary Probe 1002D	Bi-Weekly	2	6/9/2020	0.0	0.0	20.9	79.1	30	-0.01
Temporary Probe 1002D	Bi-Weekly	2	6/11/2020	0.0	0.0	20.7	79.3	30	0.00
Temporary Probe 1002D	Bi-Weekly	2	6/16/2020	0.1	1.0	19.7	79.2	30	0.02
Temporary Probe 1002D	Bi-Weekly	2	6/18/2020	0.0	0.0	20.8	79.2	30	0.00
Temporary Probe 1002D	Bi-Weekly	2	6/23/2020	0.0	0.0	20.7	79.3	30	0.00
Temporary Probe 1002D	Bi-Weekly	2	6/25/2020	0.0	0.1	21.2	78.7	30	0.00
Temporary Probe 1002D	Bi-Weekly	2	6/30/2020	0.3	1.8	19.9	78.0	30	-0.01
Temporary Probe 1002M	Bi-Weekly	2	5/19/2020	0.0	0.0	20.9	79.1	30	0.00
Temporary Probe 1002M	Bi-Weekly	2	5/21/2020	0.0	0.1	21.0	78.9	30	0.00
Temporary Probe 1002M	Bi-Weekly	2	5/26/2020	0.0	0.0	20.8	79.2	30	0.00
Temporary Probe 1002M	Bi-Weekly	2	5/28/2020	0.0	0.0	20.5	79.5	30	0.00
Temporary Probe 1002M	Bi-Weekly	2	6/2/2020	0.0	0.0	20.6	79.4	30	0.00
Temporary Probe 1002M	Bi-Weekly	2	6/4/2020	0.0	0.0	20.6	79.4	30	0.00
Temporary Probe 1002M	Bi-Weekly	2	6/9/2020	0.0	0.0	21.0	79.0	30	0.00
Temporary Probe 1002M	Bi-Weekly	2	6/11/2020	0.0	0.1	20.7	79.2	30	0.00
Temporary Probe 1002M	Bi-Weekly	2	6/16/2020	0.0	0.0	20.5	79.5	30	0.00
Temporary Probe 1002M	Bi-Weekly	2	6/18/2020	0.0	0.0	20.8	79.2	30	0.00
Temporary Probe 1002M	Bi-Weekly	2	6/23/2020	0.0	0.1	20.7	79.2	30	0.01
Temporary Probe 1002M	Bi-Weekly	2	6/25/2020	0.1	0.3	21.1	78.5	30	0.00
Temporary Probe 1002M	Bi-Weekly	2	6/30/2020	0.0	0.2	20.9	78.9	30	0.01
Temporary Probe 1002S	Bi-Weekly	2	5/19/2020	0.0	9.3	13.9	76.8	30	0.00
Temporary Probe 1002S	Bi-Weekly	2	5/21/2020	0.0	3.7	15.9	80.4	30	0.03
Temporary Probe 1002S	Bi-Weekly	2	5/26/2020	0.0	0.2	20.7	79.1	30	0.00
Temporary Probe 1002S	Bi-Weekly	2	5/28/2020	0.0	0.1	20.4	79.5	30	0.00
Temporary Probe 1002S	Bi-Weekly	2	6/2/2020	0.0	0.1	20.5	79.4	30	0.01
Temporary Probe 1002S	Bi-Weekly	2	6/4/2020	0.0	0.1	20.5	79.4	30	0.01
Temporary Probe 1002S	Bi-Weekly	2	6/9/2020	0.0	0.1	21.0	78.9	30	0.00
Temporary Probe 1002S	Bi-Weekly	2	6/11/2020	0.0	0.8	20.3	78.9	30	0.00
Temporary Probe 1002S	Bi-Weekly	2	6/16/2020	0.0	0.1	20.3	79.6	30	0.04
Temporary Probe 1002S	Bi-Weekly	2	6/18/2020	0.0	0.1	20.7	79.2	30	0.00
Temporary Probe 1002S	Bi-Weekly	2	6/23/2020	0.0	0.1	20.7	79.2	30	0.01
Temporary Probe 1002S	Bi-Weekly	2	6/25/2020	0.0	0.2	21.0	78.8	30	0.00
Temporary Probe 1002S	Bi-Weekly	2	6/30/2020	0.0	0.5	20.7	78.8	30	0.00
Temporary Probe 1003D	Bi-Weekly	2	5/19/2020	0.0	7.5	6.7	85.8	30	0.24
Temporary Probe 1003D	Bi-Weekly	2	5/21/2020	0.0	6.5	9.7	83.8	30	1.91

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
Temporary Probe 1003D	Bi-Weekly	2	5/26/2020	0.0	11.6	6.1	82.3	30	1.46
Temporary Probe 1003D	Bi-Weekly	2	5/28/2020	0.0	5.0	12.9	82.1	30	1.15
Temporary Probe 1003D	Bi-Weekly	2	6/2/2020	0.0	13.0	6.4	80.6	30	0.92
Temporary Probe 1003D	Bi-Weekly	2	6/4/2020	0.0	6.6	12.6	80.8	30	-0.15
Temporary Probe 1003D	Bi-Weekly	2	6/9/2020	0.0	13.0	8.3	78.7	30	0.73
Temporary Probe 1003D	Bi-Weekly	2	6/11/2020	0.0	3.5	15.7	80.8	30	-0.16
Temporary Probe 1003D	Bi-Weekly	2	6/16/2020	0.0	12.4	8.9	78.7	30	0.17
Temporary Probe 1003D	Bi-Weekly	2	6/18/2020	0.0	9.6	11.3	79.1	30	0.15
Temporary Probe 1003D	Bi-Weekly	2	6/23/2020	0.0	12.9	9.0	78.1	30	-0.12
Temporary Probe 1003D	Bi-Weekly	2	6/25/2020	0.0	5.7	14.7	79.6	30	-0.02
Temporary Probe 1003D	Bi-Weekly	2	6/30/2020	0.0	13.4	9.1	77.5	30	-0.20
Temporary Probe 1003S	Bi-Weekly	2	5/19/2020	0.0	4.0	6.8	89.2	30	0.00
Temporary Probe 1003S	Bi-Weekly	2	5/21/2020	0.0	5.2	8.4	86.4	30	0.11
Temporary Probe 1003S	Bi-Weekly	2	5/26/2020	0.0	4.5	14.7	80.8	30	0.00
Temporary Probe 1003S	Bi-Weekly	2	5/28/2020	0.0	3.0	16.8	80.2	30	0.00
Temporary Probe 1003S	Bi-Weekly	2	6/2/2020	0.0	9.5	12.8	77.7	30	0.24
Temporary Probe 1003S	Bi-Weekly	2	6/4/2020	0.0	7.5	14.9	77.6	30	0.02
Temporary Probe 1003S	Bi-Weekly	2	6/9/2020	0.0	10.3	14.9	74.8	30	0.14
Temporary Probe 1003S	Bi-Weekly	2	6/11/2020	0.0	2.8	17.3	79.9	30	-0.11
Temporary Probe 1003S	Bi-Weekly	2	6/16/2020	0.0	10.7	14.4	74.9	30	0.13
Temporary Probe 1003S	Bi-Weekly	2	6/18/2020	0.0	7.6	16.0	76.4	30	0.05
Temporary Probe 1003S	Bi-Weekly	2	6/23/2020	0.0	8.3	16.3	75.4	30	0.14
Temporary Probe 1003S	Bi-Weekly	2	6/25/2020	0.0	5.3	17.4	77.3	30	0.02
Temporary Probe 1003S	Bi-Weekly	2	6/30/2020	0.0	7.4	17.8	74.8	30	0.05
Temporary Probe 1005D	Bi-Weekly	2	5/19/2020	0.0	0.4	20.3	79.3	30	0.02
Temporary Probe 1005D	Bi-Weekly	2	5/21/2020	0.2	1.4	20.3	78.1	30	-0.04
Temporary Probe 1005D	Bi-Weekly	2	5/26/2020	0.2	3.1	19.3	77.4	30	-0.44
Temporary Probe 1005D	Bi-Weekly	2	5/28/2020	0.3	2.8	19.2	77.7	30	0.26
Temporary Probe 1005D	Bi-Weekly	2	6/2/2020	0.0	0.5	19.7	79.8	30	0.14
Temporary Probe 1005D	Bi-Weekly	2	6/4/2020	0.3	3.0	19.9	76.8	30	0.35
Temporary Probe 1005D	Bi-Weekly	2	6/9/2020	0.0	1.7	20.1	78.2	30	-2.64
Temporary Probe 1005D	Bi-Weekly	2	6/11/2020	0.2	0.8	20.4	78.6	30	0.06
Temporary Probe 1005D	Bi-Weekly	2	6/16/2020	0.0	0.7	19.9	79.4	30	0.16
Temporary Probe 1005D	Bi-Weekly	2	6/18/2020	0.1	0.8	20.2	78.9	30	0.12
Temporary Probe 1005D	Bi-Weekly	2	6/23/2020	0.1	1.1	20.1	78.7	30	0.73
Temporary Probe 1005D	Bi-Weekly	2	6/25/2020	0.3	1.2	20.2	78.3	30	-0.04
Temporary Probe 1005D	Bi-Weekly	2	6/30/2020	0.0	1.2	20.4	78.4	30	-0.25
Temporary Probe 1005M	Bi-Weekly	2	5/19/2020	0.1	1.4	19.7	78.8	30	0.12
Temporary Probe 1005M	Bi-Weekly	2	5/21/2020	0.1	1.0	20.3	78.6	30	0.00
Temporary Probe 1005M	Bi-Weekly	2	5/26/2020	0.1	1.7	19.7	78.5	30	-0.05

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
Temporary Probe 1005M	Bi-Weekly	2	5/28/2020	0.7	3.0	18.9	77.4	30	-0.49
Temporary Probe 1005M	Bi-Weekly	2	6/2/2020	1.3	4.1	18.4	76.2	30	0.58
Temporary Probe 1005M	Bi-Weekly	2	6/4/2020	1.3	2.6	19.8	76.3	30	0.23
Temporary Probe 1005M	Bi-Weekly	2	6/9/2020	1.5	4.3	18.9	75.3	30	0.73
Temporary Probe 1005M	Bi-Weekly	2	6/11/2020	0.5	0.6	20.3	78.6	30	0.01
Temporary Probe 1005M	Bi-Weekly	2	6/16/2020	1.3	3.1	18.8	76.8	30	0.28
Temporary Probe 1005M	Bi-Weekly	2	6/18/2020	1.1	2.3	19.3	77.3	30	0.55
Temporary Probe 1005M	Bi-Weekly	2	6/23/2020	1.1	3.0	19.1	76.8	30	-2.07
Temporary Probe 1005M	Bi-Weekly	2	6/25/2020	0.5	1.0	20.3	78.2	30	0.14
Temporary Probe 1005M	Bi-Weekly	2	6/30/2020	0.8	3.1	19.5	76.6	30	-0.11
Temporary Probe 1005S	Bi-Weekly	2	5/19/2020	1.6	11.6	9.4	77.4	30	0.80
Temporary Probe 1005S	Bi-Weekly	2	5/21/2020	0.6	7.0	12.1	80.3	30	0.62
Temporary Probe 1005S	Bi-Weekly	2	5/26/2020	0.0	6.7	11.8	81.5	30	0.93
Temporary Probe 1005S	Bi-Weekly	2	5/28/2020	0.0	12.8	7.1	80.1	30	1.17
Temporary Probe 1005S	Bi-Weekly	2	6/2/2020	0.0	11.6	9.3	79.1	30	0.75
Temporary Probe 1005S	Bi-Weekly	2	6/4/2020	0.0	15.3	7.8	76.9	30	0.93
Temporary Probe 1005S	Bi-Weekly	2	6/9/2020	0.0	14.3	8.9	76.8	30	-1.04
Temporary Probe 1005S	Bi-Weekly	2	6/11/2020	0.0	1.3	18.4	80.3	30	-0.05
Temporary Probe 1005S	Bi-Weekly	2	6/16/2020	0.0	10.9	11.2	77.9	30	0.25
Temporary Probe 1005S	Bi-Weekly	2	6/18/2020	0.0	11.8	11.3	76.9	30	0.51
Temporary Probe 1005S	Bi-Weekly	2	6/23/2020	0.0	17.5	7.4	75.1	30	-0.55
Temporary Probe 1005S	Bi-Weekly	2	6/25/2020	0.1	2.4	18.2	79.3	30	0.41
Temporary Probe 1005S	Bi-Weekly	2	6/30/2020	0.0	14.6	10.7	74.7	30	0.11
Temporary Probe 1006D	Bi-Weekly	2	5/19/2020	0.0	0.0	20.9	79.1	30	0.01
Temporary Probe 1006D	Bi-Weekly	2	5/21/2020	0.0	0.1	20.5	79.4	30	0.55
Temporary Probe 1006D	Bi-Weekly	2	5/26/2020	0.0	0.1	20.2	79.7	30	0.24
Temporary Probe 1006D	Bi-Weekly	2	5/28/2020	0.0	0.0	20.4	79.6	30	1.75
Temporary Probe 1006D	Bi-Weekly	2	6/2/2020	0.0	0.0	19.7	80.3	30	0.54
Temporary Probe 1006D	Bi-Weekly	2	6/4/2020	0.1	0.0	20.8	79.1	30	0.48
Temporary Probe 1006D	Bi-Weekly	2	6/9/2020	0.0	0.1	20.5	79.4	30	0.02
Temporary Probe 1006D	Bi-Weekly	2	6/11/2020	0.1	0.2	20.5	79.2	30	-0.15
Temporary Probe 1006D	Bi-Weekly	2	6/16/2020	0.2	0.0	19.6	80.2	30	0.26
Temporary Probe 1006D	Bi-Weekly	2	6/18/2020	0.2	0.1	20.0	79.7	30	0.38
Temporary Probe 1006D	Bi-Weekly	2	6/23/2020	0.5	0.1	19.6	79.8	30	0.31
Temporary Probe 1006D	Bi-Weekly	2	6/25/2020	0.4	0.2	20.4	79.0	30	-0.12
Temporary Probe 1006D	Bi-Weekly	2	6/30/2020	0.1	0.1	20.9	78.9	30	0.13
Temporary Probe 1006M	Bi-Weekly	2	5/19/2020	1.5	1.2	20.5	76.8	30	0.11
Temporary Probe 1006M	Bi-Weekly	2	5/21/2020	4.1	2.0	19.2	74.7	30	0.23
Temporary Probe 1006M	Bi-Weekly	2	5/26/2020	3.6	2.3	18.9	75.2	30	0.08
Temporary Probe 1006M	Bi-Weekly	2	5/28/2020	3.4	1.8	19.0	75.8	30	0.04

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
Temporary Probe 1006M	Bi-Weekly	2	6/2/2020	1.7	1.4	19.1	77.8	30	0.19
Temporary Probe 1006M	Bi-Weekly	2	6/4/2020	1.5	1.1	20.2	77.2	30	0.07
Temporary Probe 1006M	Bi-Weekly	2	6/9/2020	9.1	4.5	17.8	68.6	30	-0.14
Temporary Probe 1006M	Bi-Weekly	2	6/11/2020	5.5	1.6	18.8	74.1	30	0.00
Temporary Probe 1006M	Bi-Weekly	2	6/16/2020	0.1	0.0	20.1	79.8	30	0.07
Temporary Probe 1006M	Bi-Weekly	2	6/18/2020	8.3	4.9	17.0	69.8	30	0.26
Temporary Probe 1006M	Bi-Weekly	2	6/23/2020	8.5	5.3	16.9	69.3	30	0.05
Temporary Probe 1006M	Bi-Weekly	2	6/25/2020	3.5	1.0	19.7	75.8	30	0.00
Temporary Probe 1006M	Bi-Weekly	2	6/30/2020	4.0	3.4	19.0	73.6	30	-0.81
Temporary Probe 1006S	Bi-Weekly	2	5/19/2020	0.9	4.6	5.2	89.3	30	0.01
Temporary Probe 1006S	Bi-Weekly	2	5/21/2020	0.7	4.1	7.8	87.4	30	0.10
Temporary Probe 1006S	Bi-Weekly	2	5/26/2020	1.2	6.0	2.0	90.8	30	1.68
Temporary Probe 1006S	Bi-Weekly	2	5/28/2020	0.6	1.8	14.5	83.1	30	0.07
Temporary Probe 1006S	Bi-Weekly	2	6/2/2020	1.2	4.1	9.4	85.3	30	0.16
Temporary Probe 1006S	Bi-Weekly	2	6/4/2020	0.8	2.6	14.2	82.4	30	0.06
Temporary Probe 1006S	Bi-Weekly	2	6/9/2020	0.8	4.1	13.7	81.4	30	-0.05
Temporary Probe 1006S	Bi-Weekly	2	6/11/2020	0.6	1.1	15.9	82.4	30	-0.08
Temporary Probe 1006S	Bi-Weekly	2	6/16/2020	0.7	3.7	14.0	81.6	30	0.03
Temporary Probe 1006S	Bi-Weekly	2	6/18/2020	0.8	4.2	12.6	82.4	30	3.89
Temporary Probe 1006S	Bi-Weekly	2	6/23/2020	0.4	4.1	15.6	79.9	30	0.10
Temporary Probe 1006S	Bi-Weekly	2	6/25/2020	0.5	1.3	16.8	81.4	30	0.00
Temporary Probe 1006S	Bi-Weekly	2	6/30/2020	0.2	6.5	13.6	79.7	30	0.12
Temporary Probe 1007D	Bi-Weekly	2	5/19/2020	1.7	0.1	20.4	77.8	30	0.26
Temporary Probe 1007D	Bi-Weekly	2	5/21/2020	1.0	0.1	20.4	78.5	30	-0.07
Temporary Probe 1007D	Bi-Weekly	2	5/26/2020	0.7	0.1	19.8	79.4	30	0.44
Temporary Probe 1007D	Bi-Weekly	2	5/28/2020	0.4	0.1	20.5	79.0	30	0.39
Temporary Probe 1007D	Bi-Weekly	2	6/2/2020	0.3	0.1	19.7	79.9	30	0.50
Temporary Probe 1007D	Bi-Weekly	2	6/4/2020	0.3	0.1	20.5	79.1	30	0.35
Temporary Probe 1007D	Bi-Weekly	2	6/9/2020	0.2	0.2	20.5	79.1	30	-0.11
Temporary Probe 1007D	Bi-Weekly	2	6/11/2020	0.1	0.0	20.9	79.0	30	-0.14
Temporary Probe 1007D	Bi-Weekly	2	6/16/2020	0.1	0.1	19.5	80.3	30	0.28
Temporary Probe 1007D	Bi-Weekly	2	6/18/2020	0.2	0.1	19.8	79.9	30	1.09
Temporary Probe 1007D	Bi-Weekly	2	6/23/2020	0.5	0.1	19.5	79.9	30	0.40
Temporary Probe 1007D	Bi-Weekly	2	6/25/2020	0.6	0.1	20.6	78.7	30	-0.02
Temporary Probe 1007D	Bi-Weekly	2	6/30/2020	1.6	0.8	19.8	77.8	30	-0.17
Temporary Probe 1007M	Bi-Weekly	2	5/19/2020	14.9	6.4	15.9	62.8	30	0.24
Temporary Probe 1007M	Bi-Weekly	2	5/21/2020	16.0	7.1	15.2	61.7	30	0.24
Temporary Probe 1007M	Bi-Weekly	2	5/26/2020	23.5	11.7	12.4	52.4	30	0.14
Temporary Probe 1007M	Bi-Weekly	2	5/28/2020	21.9	11.3	13.5	53.3	30	0.20
Temporary Probe 1007M	Bi-Weekly	2	6/2/2020	24.9	13.6	11.7	49.8	30	0.16

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
Temporary Probe 1007M	Bi-Weekly	2	6/4/2020	13.8	7.1	16.0	63.1	30	0.25
Temporary Probe 1007M	Bi-Weekly	2	6/9/2020	60.3	25.6	2.6	11.5	30	2.95
Temporary Probe 1007M	Bi-Weekly	2	6/11/2020	24.0	10.9	13.7	51.4	30	2.45
Temporary Probe 1007M	Bi-Weekly	2	6/16/2020	6.9	2.5	18.0	72.6	30	0.67
Temporary Probe 1007M	Bi-Weekly	2	6/18/2020	50.6	23.4	4.9	21.1	30	2.18
Temporary Probe 1007M	Bi-Weekly	2	6/23/2020	39.0	18.1	8.5	34.4	30	1.93
Temporary Probe 1007M	Bi-Weekly	2	6/25/2020	15.2	6.4	16.5	61.9	30	2.57
Temporary Probe 1007M	Bi-Weekly	2	6/30/2020	21.2	11.9	14.4	52.5	30	2.87
Temporary Probe 1007S	Bi-Weekly	2	5/19/2020	67.1	29.7	0.0	3.2	30	0.62
Temporary Probe 1007S	Bi-Weekly	2	5/21/2020	67.0	29.6	0.0	3.4	30	0.58
Temporary Probe 1007S	Bi-Weekly	2	5/26/2020	65.7	30.1	0.0	4.2	30	0.34
Temporary Probe 1007S	Bi-Weekly	2	5/28/2020	66.5	30.4	0.0	3.1	30	0.91
Temporary Probe 1007S	Bi-Weekly	2	6/2/2020	65.4	30.1	0.0	4.5	30	0.70
Temporary Probe 1007S	Bi-Weekly	2	6/4/2020	65.7	30.7	0.0	3.6	30	0.57
Temporary Probe 1007S	Bi-Weekly	2	6/9/2020	65.1	31.0	0.0	3.9	30	0.71
Temporary Probe 1007S	Bi-Weekly	2	6/11/2020	61.2	33.2	0.0	5.6	30	-0.04
Temporary Probe 1007S	Bi-Weekly	2	6/16/2020	65.5	29.8	0.0	4.7	30	0.48
Temporary Probe 1007S	Bi-Weekly	2	6/18/2020	63.7	30.9	0.0	5.4	30	0.67
Temporary Probe 1007S	Bi-Weekly	2	6/23/2020	64.7	30.3	0.0	5.0	30	0.25
Temporary Probe 1007S	Bi-Weekly	2	6/25/2020	63.0	34.0	0.0	3.0	30	0.47
Temporary Probe 1007S	Bi-Weekly	2	6/30/2020	64.3	31.4	0.0	4.3	30	0.36
Temporary Probe 1008D	Bi-Weekly	2	5/19/2020	4.1	0.6	20.1	75.2	30	0.14
Temporary Probe 1008D	Bi-Weekly	2	5/21/2020	15.5	4.5	16.6	63.4	30	0.27
Temporary Probe 1008D	Bi-Weekly	2	5/26/2020	37.6	9.0	10.0	43.4	30	3.42
Temporary Probe 1008D	Bi-Weekly	2	5/28/2020	36.8	9.1	10.3	43.8	30	4.65
Temporary Probe 1008D	Bi-Weekly	2	6/2/2020	19.0	4.1	15.0	61.9	30	1.04
Temporary Probe 1008D	Bi-Weekly	2	6/4/2020	37.0	7.7	10.5	44.8	30	3.12
Temporary Probe 1008D	Bi-Weekly	2	6/9/2020	30.8	5.9	12.6	50.7	30	2.99
Temporary Probe 1008D	Bi-Weekly	2	6/11/2020	12.9	1.8	17.5	67.8	30	2.60
Temporary Probe 1008D	Bi-Weekly	2	6/16/2020	23.4	4.3	14.7	57.6	30	2.41
Temporary Probe 1008D	Bi-Weekly	2	6/18/2020	46.8	8.0	7.6	37.6	30	5.16
Temporary Probe 1008D	Bi-Weekly	2	6/23/2020	26.7	3.9	13.9	55.5	30	2.91
Temporary Probe 1008D	Bi-Weekly	2	6/25/2020	26.1	3.1	14.0	56.8	30	2.18
Temporary Probe 1008D	Bi-Weekly	2	6/30/2020	17.8	2.3	16.0	63.9	30	-0.27
Temporary Probe 1008S	Bi-Weekly	2	5/19/2020	2.5	0.1	16.6	80.8	30	0.02
Temporary Probe 1008S	Bi-Weekly	2	5/21/2020	4.9	0.1	12.6	82.4	30	0.28
Temporary Probe 1008S	Bi-Weekly	2	5/26/2020	8.3	0.5	11.6	79.6	30	0.14
Temporary Probe 1008S	Bi-Weekly	2	5/28/2020	5.3	0.3	15.1	79.3	30	0.18
Temporary Probe 1008S	Bi-Weekly	2	6/2/2020	5.9	0.5	15.2	78.4	30	0.21
Temporary Probe 1008S	Bi-Weekly	2	6/4/2020	4.8	0.3	17.4	77.5	30	-0.51

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
Temporary Probe 1008S	Bi-Weekly	2	6/9/2020	8.4	1.3	18.2	72.1	30	-0.07
Temporary Probe 1008S	Bi-Weekly	2	6/11/2020	9.1	0.8	18.4	71.7	30	0.11
Temporary Probe 1008S	Bi-Weekly	2	6/16/2020	16.2	4.8	16.5	62.5	30	0.49
Temporary Probe 1008S	Bi-Weekly	2	6/18/2020	30.4	8.9	12.0	48.7	30	0.13
Temporary Probe 1008S	Bi-Weekly	2	6/23/2020	16.9	5.5	16.3	61.3	30	0.15
Temporary Probe 1008S	Bi-Weekly	2	6/25/2020	13.9	2.4	17.4	66.3	30	0.01
Temporary Probe 1008S	Bi-Weekly	2	6/30/2020	9.9	2.8	19.0	68.3	30	0.07
Temporary Probe 1009D	Bi-Weekly	2	5/19/2020	8.9	2.2	16.7	72.2	30	0.15
Temporary Probe 1009D	Bi-Weekly	2	5/21/2020	10.1	1.7	17.7	70.5	30	0.13
Temporary Probe 1009D	Bi-Weekly	2	5/26/2020	7.1	1.7	18.7	72.5	30	0.15
Temporary Probe 1009D	Bi-Weekly	2	5/28/2020	0.1	0.0	20.7	79.2	30	0.00
Temporary Probe 1009D	Bi-Weekly	2	6/2/2020	0.0	0.0	20.8	79.2	30	1.80
Temporary Probe 1009D	Bi-Weekly	2	6/4/2020	0.1	0.0	21.1	78.8	30	1.11
Temporary Probe 1009D	Bi-Weekly	2	6/9/2020	0.1	0.0	20.5	79.4	30	-0.03
Temporary Probe 1009D	Bi-Weekly	2	6/11/2020	9.3	2.9	16.8	71.0	30	0.18
Temporary Probe 1009D	Bi-Weekly	2	6/16/2020	6.1	2.0	18.7	73.2	30	0.12
Temporary Probe 1009D	Bi-Weekly	2	6/18/2020	0.0	0.1	20.7	79.2	30	-0.01
Temporary Probe 1009D	Bi-Weekly	2	6/23/2020	11.3	4.9	16.2	67.6	30	-0.38
Temporary Probe 1009D	Bi-Weekly	2	6/25/2020	10.6	3.1	16.8	69.5	30	0.06
Temporary Probe 1009D	Bi-Weekly	2	6/30/2020	43.6	16.0	8.8	31.6	30	2.95
Temporary Probe 1009S	Bi-Weekly	2	5/19/2020	0.6	2.5	19.1	77.8	30	0.01
Temporary Probe 1009S	Bi-Weekly	2	5/21/2020	1.8	6.0	14.9	77.3	30	0.05
Temporary Probe 1009S	Bi-Weekly	2	5/26/2020	2.4	9.4	13.4	74.8	30	0.05
Temporary Probe 1009S	Bi-Weekly	2	5/28/2020	1.5	4.5	16.3	77.7	30	0.10
Temporary Probe 1009S	Bi-Weekly	2	6/2/2020	2.7	12.2	11.3	73.8	30	0.22
Temporary Probe 1009S	Bi-Weekly	2	6/4/2020	1.6	6.6	14.9	76.9	30	0.09
Temporary Probe 1009S	Bi-Weekly	2	6/9/2020	0.1	0.0	20.8	79.1	30	-0.01
Temporary Probe 1009S	Bi-Weekly	2	6/11/2020	0.0	0.3	20.6	79.1	30	0.00
Temporary Probe 1009S	Bi-Weekly	2	6/16/2020	0.1	0.0	21.0	78.9	30	0.00
Temporary Probe 1009S	Bi-Weekly	2	6/18/2020	0.5	10.4	11.9	77.2	30	0.09
Temporary Probe 1009S	Bi-Weekly	2	6/23/2020	0.0	0.0	20.8	79.2	30	-0.16
Temporary Probe 1009S	Bi-Weekly	2	6/25/2020	0.1	0.2	20.3	79.4	30	-0.02
Temporary Probe 1009S	Bi-Weekly	2	6/30/2020	0.0	0.1	20.9	79.0	30	0.29
Temporary Probe 1010D	Bi-Weekly	2	5/19/2020	0.0	0.1	21.0	78.9	30	0.00
Temporary Probe 1010D	Bi-Weekly	2	5/21/2020	1.5	1.1	20.0	77.4	30	0.13
Temporary Probe 1010D	Bi-Weekly	2	5/26/2020	13.4	5.9	16.7	64.0	30	0.16
Temporary Probe 1010D	Bi-Weekly	2	5/28/2020	9.8	4.9	17.5	67.8	30	0.20
Temporary Probe 1010D	Bi-Weekly	2	6/2/2020	8.5	4.2	17.7	69.6	30	0.21
Temporary Probe 1010D	Bi-Weekly	2	6/4/2020	7.3	2.8	18.6	71.3	30	0.18
Temporary Probe 1010D	Bi-Weekly	2	6/9/2020	7.4	4.2	18.1	70.3	30	0.02

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
Temporary Probe 1010D	Bi-Weekly	2	6/11/2020	3.3	0.6	19.4	76.7	30	0.09
Temporary Probe 1010D	Bi-Weekly	2	6/16/2020	5.8	3.2	18.5	72.5	30	0.25
Temporary Probe 1010D	Bi-Weekly	2	6/18/2020	3.4	2.0	19.3	75.3	30	0.11
Temporary Probe 1010D	Bi-Weekly	2	6/23/2020	4.1	3.0	18.7	74.2	30	0.08
Temporary Probe 1010D	Bi-Weekly	2	6/25/2020	3.1	0.9	19.2	76.8	30	-0.10
Temporary Probe 1010D	Bi-Weekly	2	6/30/2020	1.8	1.5	20.2	76.5	30	-0.37
Temporary Probe 1010M	Bi-Weekly	2	5/19/2020	0.8	1.4	20.3	77.5	30	0.02
Temporary Probe 1010M	Bi-Weekly	2	5/21/2020	0.6	1.1	20.1	78.2	30	0.12
Temporary Probe 1010M	Bi-Weekly	2	5/26/2020	2.5	2.5	19.5	75.5	30	0.23
Temporary Probe 1010M	Bi-Weekly	2	5/28/2020	11.5	8.3	16.1	64.1	30	0.23
Temporary Probe 1010M	Bi-Weekly	2	6/2/2020	13.3	9.0	15.6	62.1	30	0.20
Temporary Probe 1010M	Bi-Weekly	2	6/4/2020	6.3	3.9	18.4	71.4	30	0.08
Temporary Probe 1010M	Bi-Weekly	2	6/9/2020	5.6	3.9	18.2	72.3	30	-0.15
Temporary Probe 1010M	Bi-Weekly	2	6/11/2020	2.7	0.8	19.3	77.2	30	-0.08
Temporary Probe 1010M	Bi-Weekly	2	6/16/2020	2.7	1.9	19.4	76.0	30	2.86
Temporary Probe 1010M	Bi-Weekly	2	6/18/2020	2.9	2.5	19.1	75.5	30	0.08
Temporary Probe 1010M	Bi-Weekly	2	6/23/2020	4.5	3.1	18.5	73.9	30	-2.17
Temporary Probe 1010M	Bi-Weekly	2	6/25/2020	52.0	43.8	0.0	4.2	30	22.88
Temporary Probe 1010M	Bi-Weekly	2	6/30/2020	40.3	30.2	5.5	24.0	30	0.20
Temporary Probe 1010S	Bi-Weekly	2	5/19/2020	1.5	8.7	9.2	80.6	30	0.13
Temporary Probe 1010S	Bi-Weekly	2	5/21/2020	1.2	10.1	8.2	80.5	30	0.07
Temporary Probe 1010S	Bi-Weekly	2	5/26/2020	0.0	12.7	5.1	82.2	30	0.05
Temporary Probe 1010S	Bi-Weekly	2	5/28/2020	0.0	10.8	8.2	81.0	30	0.11
Temporary Probe 1010S	Bi-Weekly	2	6/2/2020	0.0	14.4	5.6	80.0	30	0.30
Temporary Probe 1010S	Bi-Weekly	2	6/4/2020	0.0	11.9	7.2	80.9	30	0.09
Temporary Probe 1010S	Bi-Weekly	2	6/9/2020	0.0	15.2	6.5	78.3	30	-0.34
Temporary Probe 1010S	Bi-Weekly	2	6/11/2020	0.0	1.1	16.9	82.0	30	-0.04
Temporary Probe 1010S	Bi-Weekly	2	6/16/2020	0.0	5.5	15.8	78.7	30	0.07
Temporary Probe 1010S	Bi-Weekly	2	6/18/2020	0.0	12.3	8.2	79.5	30	0.13
Temporary Probe 1010S	Bi-Weekly	2	6/23/2020	0.0	13.5	8.3	78.2	30	-0.13
Temporary Probe 1010S	Bi-Weekly	2	6/25/2020	0.1	7.2	11.8	80.9	30	0.05
Temporary Probe 1010S	Bi-Weekly	2	6/30/2020	0.0	13.4	8.7	77.9	30	0.30
Temporary Probe 1011D	Bi-Weekly	2	5/19/2020	15.3	13.5	14.6	56.6	30	-0.38
Temporary Probe 1011D	Bi-Weekly	2	5/21/2020	8.3	6.5	17.5	67.7	30	-0.34
Temporary Probe 1011D	Bi-Weekly	2	5/26/2020	3.4	3.2	19.0	74.4	30	0.58
Temporary Probe 1011D	Bi-Weekly	2	5/29/2020	2.1	0.8	19.8	77.3	30	0.45
Temporary Probe 1011D	Bi-Weekly	2	6/2/2020	7.2	6.4	17.3	69.1	30	0.40
Temporary Probe 1011D	Bi-Weekly	2	6/4/2020	2.4	1.7	19.6	76.3	30	5.33
Temporary Probe 1011D	Bi-Weekly	2	6/9/2020	3.5	3.5	18.7	74.3	30	0.83
Temporary Probe 1011D	Bi-Weekly	2	6/11/2020	1.5	0.6	19.6	78.3	30	0.66

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
Temporary Probe 1011D	Bi-Weekly	2	6/16/2020	5.7	4.3	17.9	72.1	30	0.48
Temporary Probe 1011D	Bi-Weekly	2	6/18/2020	4.6	2.8	18.8	73.8	30	3.59
Temporary Probe 1011D	Bi-Weekly	2	6/23/2020	3.8	4.0	17.6	74.6	30	0.44
Temporary Probe 1011D	Bi-Weekly	2	6/25/2020	0.9	0.3	19.3	79.5	30	0.75
Temporary Probe 1011D	Bi-Weekly	2	6/30/2020	0.0	0.0	20.8	79.2	30	0.28
Temporary Probe 1011M	Bi-Weekly	2	5/19/2020	0.0	0.0	20.1	79.9	30	0.02
Temporary Probe 1011M	Bi-Weekly	2	5/21/2020	8.9	1.9	10.8	78.4	30	0.07
Temporary Probe 1011M	Bi-Weekly	2	5/26/2020	13.3	4.6	9.5	72.6	30	0.04
Temporary Probe 1011M	Bi-Weekly	2	5/29/2020	13.5	4.3	7.9	74.3	30	-0.21
Temporary Probe 1011M	Bi-Weekly	2	6/2/2020	60.4	22.4	0.2	17.0	30	0.12
Temporary Probe 1011M	Bi-Weekly	2	6/4/2020	55.1	24.0	2.4	18.5	30	0.34
Temporary Probe 1011M	Bi-Weekly	2	6/9/2020	59.6	27.5	1.7	11.2	30	0.41
Temporary Probe 1011M	Bi-Weekly	2	6/11/2020	49.7	21.9	5.7	22.7	30	0.57
Temporary Probe 1011M	Bi-Weekly	2	6/16/2020	24.9	11.8	12.9	50.4	30	0.30
Temporary Probe 1011M	Bi-Weekly	2	6/18/2020	58.8	23.7	2.9	14.6	30	0.62
Temporary Probe 1011M	Bi-Weekly	2	6/23/2020	54.4	22.1	4.5	19.0	30	4.82
Temporary Probe 1011M	Bi-Weekly	2	6/25/2020	34.4	13.5	10.3	41.8	30	0.33
Temporary Probe 1011M	Bi-Weekly	2	6/30/2020	45.5	18.8	7.8	27.9	30	5.84
Temporary Probe 1011S	Bi-Weekly	2	5/19/2020	2.1	0.0	16.5	81.4	30	0.00
Temporary Probe 1011S	Bi-Weekly	2	5/21/2020	0.7	0.0	18.5	80.8	30	-0.03
Temporary Probe 1011S	Bi-Weekly	2	5/26/2020	1.0	0.1	18.3	80.6	30	0.04
Temporary Probe 1011S	Bi-Weekly	2	5/29/2020	0.8	0.0	19.6	79.6	30	-0.42
Temporary Probe 1011S	Bi-Weekly	2	6/2/2020	0.5	0.0	18.1	81.4	30	0.12
Temporary Probe 1011S	Bi-Weekly	2	6/4/2020	0.6	0.0	18.4	81.0	30	0.14
Temporary Probe 1011S	Bi-Weekly	2	6/9/2020	0.1	0.0	20.6	79.3	30	0.07
Temporary Probe 1011S	Bi-Weekly	2	6/11/2020	0.2	0.0	19.8	80.0	30	0.05
Temporary Probe 1011S	Bi-Weekly	2	6/16/2020	0.0	0.0	20.7	79.3	30	-1.64
Temporary Probe 1011S	Bi-Weekly	2	6/18/2020	0.2	0.0	19.6	80.2	30	0.22
Temporary Probe 1011S	Bi-Weekly	2	6/23/2020	0.1	0.1	20.3	79.5	30	-0.44
Temporary Probe 1011S	Bi-Weekly	2	6/25/2020	0.3	0.1	19.3	80.3	30	1.14
Temporary Probe 1011S	Bi-Weekly	2	6/30/2020	0.0	0.0	21.1	78.9	30	0.43
Temporary Probe 1012D	Bi-Weekly	2	5/19/2020	7.1	0.4	18.5	74.0	30	-0.01
Temporary Probe 1012D	Bi-Weekly	2	5/21/2020	4.7	0.4	19.1	75.8	30	0.25
Temporary Probe 1012D	Bi-Weekly	2	5/26/2020	1.7	0.2	20.0	78.1	30	0.40
Temporary Probe 1012D	Bi-Weekly	2	5/29/2020	1.2	0.0	20.1	78.7	30	-0.73
Temporary Probe 1012D	Bi-Weekly	2	6/2/2020	1.4	0.4	19.8	78.4	30	1.09
Temporary Probe 1012D	Bi-Weekly	2	6/4/2020	0.8	0.2	20.1	78.9	30	0.22
Temporary Probe 1012D	Bi-Weekly	2	6/9/2020	1.0	0.4	19.8	78.8	30	-0.13
Temporary Probe 1012D	Bi-Weekly	2	6/11/2020	4.2	0.4	19.2	76.2	30	0.07
Temporary Probe 1012D	Bi-Weekly	2	6/16/2020	9.0	1.9	18.4	70.7	30	0.10

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
Temporary Probe 1012D	Bi-Weekly	2	6/18/2020	8.9	2.1	18.5	70.5	30	0.11
Temporary Probe 1012D	Bi-Weekly	2	6/23/2020	6.9	1.7	18.6	72.8	30	-0.72
Temporary Probe 1012D	Bi-Weekly	2	6/25/2020	4.6	0.5	18.7	76.2	30	0.00
Temporary Probe 1012D	Bi-Weekly	2	6/30/2020	7.2	2.3	18.6	71.9	30	-0.07
Temporary Probe 1012S	Bi-Weekly	2	5/19/2020	1.0	0.0	17.3	81.7	30	0.00
Temporary Probe 1012S	Bi-Weekly	2	5/21/2020	4.2	0.0	8.2	87.6	30	0.00
Temporary Probe 1012S	Bi-Weekly	2	5/26/2020	2.4	0.0	12.8	84.8	30	0.04
Temporary Probe 1012S	Bi-Weekly	2	5/29/2020	0.5	0.0	19.0	80.5	30	0.10
Temporary Probe 1012S	Bi-Weekly	2	6/2/2020	0.0	0.0	20.6	79.4	30	0.04
Temporary Probe 1012S	Bi-Weekly	2	6/4/2020	0.0	0.0	20.8	79.2	30	0.05
Temporary Probe 1012S	Bi-Weekly	2	6/9/2020	0.1	0.0	20.7	79.2	30	0.02
Temporary Probe 1012S	Bi-Weekly	2	6/11/2020	0.9	0.3	17.5	81.3	30	-0.03
Temporary Probe 1012S	Bi-Weekly	2	6/16/2020	0.0	0.0	20.7	79.3	30	0.00
Temporary Probe 1012S	Bi-Weekly	2	6/18/2020	0.0	0.0	20.8	79.2	30	0.07
Temporary Probe 1012S	Bi-Weekly	2	6/23/2020	0.1	0.0	20.2	79.7	30	0.15
Temporary Probe 1012S	Bi-Weekly	2	6/25/2020	1.2	0.1	15.0	83.7	30	0.00
Temporary Probe 1012S	Bi-Weekly	2	6/30/2020	0.0	0.0	20.8	79.2	30	0.05
Temporary Probe 1013B	Bi-Weekly	2	5/19/2020	0.0	0.0	20.9	79.1	30	0.01
Temporary Probe 1013B	Bi-Weekly	2	5/21/2020	0.0	0.0	20.9	79.1	30	0.08
Temporary Probe 1013B	Bi-Weekly	2	5/26/2020	0.0	0.0	20.5	79.5	30	0.96
Temporary Probe 1013B	Bi-Weekly	2	5/29/2020	0.0	0.0	20.6	79.4	30	-0.64
Temporary Probe 1013B	Bi-Weekly	2	6/2/2020	0.0	0.0	20.8	79.2	30	0.04
Temporary Probe 1013B	Bi-Weekly	2	6/4/2020	0.0	0.0	20.5	79.5	30	0.22
Temporary Probe 1013B	Bi-Weekly	2	6/9/2020	0.0	0.0	20.5	79.5	30	-1.97
Temporary Probe 1013B	Bi-Weekly	2	6/11/2020	0.0	0.0	20.6	79.4	30	0.95
Temporary Probe 1013B	Bi-Weekly	2	6/16/2020	0.0	0.0	21.0	79.0	30	0.05
Temporary Probe 1013B	Bi-Weekly	2	6/18/2020	0.0	0.0	20.6	79.4	30	0.99
Temporary Probe 1013B	Bi-Weekly	2	6/23/2020	0.0	0.0	20.5	79.5	30	-0.46
Temporary Probe 1013B	Bi-Weekly	2	6/25/2020	0.1	0.1	19.8	80.0	30	0.85
Temporary Probe 1013B	Bi-Weekly	2	6/30/2020	0.0	0.2	20.1	79.7	30	-0.14
Temporary Probe 1013D	Bi-Weekly	2	5/19/2020	0.1	0.0	21.0	78.9	30	-0.02
Temporary Probe 1013D	Bi-Weekly	2	5/21/2020	0.0	0.0	20.9	79.1	30	0.09
Temporary Probe 1013D	Bi-Weekly	2	5/26/2020	0.0	0.0	20.6	79.4	30	-0.03
Temporary Probe 1013D	Bi-Weekly	2	5/29/2020	0.0	0.1	20.6	79.3	30	0.02
Temporary Probe 1013D	Bi-Weekly	2	6/2/2020	0.0	0.0	20.7	79.3	30	0.06
Temporary Probe 1013D	Bi-Weekly	2	6/4/2020	0.0	0.0	20.7	79.3	30	0.14
Temporary Probe 1013D	Bi-Weekly	2	6/9/2020	0.0	0.0	20.5	79.5	30	0.05
Temporary Probe 1013D	Bi-Weekly	2	6/11/2020	0.0	0.1	20.6	79.3	30	0.08
Temporary Probe 1013D	Bi-Weekly	2	6/16/2020	0.0	0.1	21.0	78.9	30	0.24
Temporary Probe 1013D	Bi-Weekly	2	6/18/2020	0.0	0.0	20.8	79.2	30	0.11

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
Temporary Probe 1013D	Bi-Weekly	2	6/23/2020	0.2	0.0	20.4	79.4	30	0.44
Temporary Probe 1013D	Bi-Weekly	2	6/25/2020	0.2	0.2	19.9	79.7	30	0.67
Temporary Probe 1013D	Bi-Weekly	2	6/30/2020	0.3	0.1	20.4	79.2	30	0.07
Temporary Probe 1013M	Bi-Weekly	2	5/19/2020	0.8	0.4	20.6	78.2	30	-0.05
Temporary Probe 1013M	Bi-Weekly	2	5/21/2020	2.6	1.0	19.8	76.6	30	-0.59
Temporary Probe 1013M	Bi-Weekly	2	5/26/2020	0.1	0.0	20.9	79.0	30	0.06
Temporary Probe 1013M	Bi-Weekly	2	5/29/2020	0.2	0.1	20.6	79.1	30	0.13
Temporary Probe 1013M	Bi-Weekly	2	6/2/2020	0.0	0.0	21.0	79.0	30	0.05
Temporary Probe 1013M	Bi-Weekly	2	6/4/2020	0.7	0.3	20.4	78.6	30	0.22
Temporary Probe 1013M	Bi-Weekly	2	6/9/2020	1.1	0.6	19.9	78.4	30	0.29
Temporary Probe 1013M	Bi-Weekly	2	6/11/2020	1.0	0.1	20.3	78.6	30	0.34
Temporary Probe 1013M	Bi-Weekly	2	6/16/2020	6.7	1.9	18.9	72.5	30	0.21
Temporary Probe 1013M	Bi-Weekly	2	6/18/2020	23.0	9.5	13.6	53.9	30	2.73
Temporary Probe 1013M	Bi-Weekly	2	6/23/2020	11.9	5.2	16.8	66.1	30	-0.49
Temporary Probe 1013M	Bi-Weekly	2	6/25/2020	3.0	0.8	19.2	77.0	30	0.50
Temporary Probe 1013M	Bi-Weekly	2	6/30/2020	4.3	2.2	19.1	74.4	30	0.14
Temporary Probe 1013S	Bi-Weekly	2	5/19/2020	66.2	25.9	0.0	7.9	30	0.01
Temporary Probe 1013S	Bi-Weekly	2	5/21/2020	64.0	25.1	0.0	10.9	30	0.04
Temporary Probe 1013S	Bi-Weekly	2	5/26/2020	57.0	24.5	0.2	18.3	30	0.11
Temporary Probe 1013S	Bi-Weekly	2	5/29/2020	48.4	20.3	4.1	27.2	30	-0.25
Temporary Probe 1013S	Bi-Weekly	2	6/2/2020	46.1	20.4	3.6	29.9	30	0.52
Temporary Probe 1013S	Bi-Weekly	2	6/4/2020	43.3	20.0	4.4	32.3	30	0.78
Temporary Probe 1013S	Bi-Weekly	2	6/9/2020	1.7	0.7	19.7	77.9	30	0.11
Temporary Probe 1013S	Bi-Weekly	2	6/11/2020	13.0	5.9	13.4	67.7	30	-0.07
Temporary Probe 1013S	Bi-Weekly	2	6/16/2020	12.0	12.9	8.8	66.3	30	0.28
Temporary Probe 1013S	Bi-Weekly	2	6/18/2020	8.1	12.0	9.3	70.6	30	0.84
Temporary Probe 1013S	Bi-Weekly	2	6/23/2020	4.8	13.6	7.1	74.5	30	-0.87
Temporary Probe 1013S	Bi-Weekly	2	6/25/2020	2.1	5.6	12.9	79.4	30	0.21
Temporary Probe 1013S	Bi-Weekly	2	6/30/2020	0.2	12.8	10.7	76.3	30	-0.17
Temporary Probe 1014D	Bi-Weekly	2	5/19/2020	2.7	0.2	17.2	79.9	30	0.02
Temporary Probe 1014D	Bi-Weekly	2	5/21/2020	17.8	6.6	0.5	75.1	30	-0.01
Temporary Probe 1014D	Bi-Weekly	2	5/26/2020	3.7	0.8	16.4	79.1	30	0.15
Temporary Probe 1014D	Bi-Weekly	2	5/29/2020	1.6	0.1	18.6	79.7	30	-0.25
Temporary Probe 1014D	Bi-Weekly	2	6/2/2020	1.2	0.5	19.1	79.2	30	0.12
Temporary Probe 1014D	Bi-Weekly	2	6/4/2020	0.5	0.2	20.1	79.2	30	0.02
Temporary Probe 1014D	Bi-Weekly	2	6/9/2020	0.1	0.0	20.8	79.1	30	0.07
Temporary Probe 1014D	Bi-Weekly	2	6/11/2020	0.2	0.1	20.2	79.5	30	0.06
Temporary Probe 1014D	Bi-Weekly	2	6/16/2020	0.0	0.1	20.9	79.0	30	0.11
Temporary Probe 1014D	Bi-Weekly	2	6/18/2020	0.0	0.1	20.8	79.1	30	0.06
Temporary Probe 1014D	Bi-Weekly	2	6/23/2020	0.0	0.2	20.5	79.3	30	-0.33

Point Name	Frequency	Quadrant	Record Date	CH4 (%)	CO2 (%)	O2 (%)	Balance Gas (%)	Barometric Pressure	Relative Pressure
Temporary Probe 1014D	Bi-Weekly	2	6/25/2020	0.1	0.3	19.6	80.0	30	0.00
Temporary Probe 1014D	Bi-Weekly	2	6/30/2020	0.1	0.5	20.2	79.2	30	-0.16
Temporary Probe 1014S	Bi-Weekly	2	5/19/2020	6.7	7.1	9.8	76.4	30	0.05
Temporary Probe 1014S	Bi-Weekly	2	5/21/2020	5.8	0.5	15.2	78.5	30	0.05
Temporary Probe 1014S	Bi-Weekly	2	5/26/2020	12.5	8.1	1.6	77.8	30	0.02
Temporary Probe 1014S	Bi-Weekly	2	5/29/2020	11.8	5.0	8.5	74.7	30	-0.26
Temporary Probe 1014S	Bi-Weekly	2	6/2/2020	9.4	10.4	2.0	78.2	30	0.15
Temporary Probe 1014S	Bi-Weekly	2	6/4/2020	10.5	11.4	2.0	76.1	30	0.09
Temporary Probe 1014S	Bi-Weekly	2	6/9/2020	10.1	10.8	5.2	73.9	30	0.11
Temporary Probe 1014S	Bi-Weekly	2	6/11/2020	5.6	5.3	11.1	78.0	30	0.17
Temporary Probe 1014S	Bi-Weekly	2	6/16/2020	2.3	7.1	10.4	80.2	30	0.14
Temporary Probe 1014S	Bi-Weekly	2	6/18/2020	1.1	6.2	11.9	80.8	30	0.09
Temporary Probe 1014S	Bi-Weekly	2	6/23/2020	0.3	9.5	9.1	81.1	30	0.23
Temporary Probe 1014S	Bi-Weekly	2	6/25/2020	0.1	4.4	13.1	82.4	30	0.19
Temporary Probe 1014S	Bi-Weekly	2	6/30/2020	0.0	13.4	7.8	78.8	30	0.51

TABLE 8

TEMPORARY MONITORING POINT WATER LEVEL DATA

APRIL 01, 2020 – JUNE 30, 2020

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
Temporary Probe 01004	5/19/2020	2	24.4	No Comment
Temporary Probe 01004	5/21/2020	2	24.4	No Comment
Temporary Probe 01004	5/26/2020	2	24.6	No Comment
Temporary Probe 01004	5/28/2020	2	24.8	No Comment
Temporary Probe 01004	6/2/2020	2	25.2	No Comment
Temporary Probe 01004	6/4/2020	2	25.3	No Comment
Temporary Probe 01004	6/9/2020	2	25.3	No Comment
Temporary Probe 01004	6/11/2020	2	26.3	No Comment
Temporary Probe 01004	6/16/2020	2	26.5	No Comment
Temporary Probe 01004	6/18/2020	2	26.2	No Comment
Temporary Probe 01004	6/23/2020	2	26.5	No Comment
Temporary Probe 01004	6/25/2020	2	26.6	No Comment
Temporary Probe 01004	6/30/2020	2	26.7	No Comment
Temporary Probe 1001D	5/19/2020	2	22.3	No Comment
Temporary Probe 1001D	5/21/2020	2	22.0	No Comment
Temporary Probe 1001D	5/26/2020	2	22.7	No Comment
Temporary Probe 1001D	5/28/2020	2	22.6	No Comment
Temporary Probe 1001D	6/2/2020	2	23.1	No Comment
Temporary Probe 1001D	6/4/2020	2	22.8	No Comment
Temporary Probe 1001D	6/9/2020	2	23.5	No Comment
Temporary Probe 1001D	6/11/2020	2	23.5	No Comment
Temporary Probe 1001D	6/16/2020	2	25.1	No Comment
Temporary Probe 1001D	6/18/2020	2	23.6	No Comment
Temporary Probe 1001D	6/23/2020	2	23.9	No Comment
Temporary Probe 1001D	6/25/2020	2	24.1	No Comment
Temporary Probe 1001D	6/30/2020	2	24.8	No Comment
Temporary Probe 1001S	5/19/2020	2	17.5	No Comment
Temporary Probe 1001S	5/21/2020	2	17.4	No Comment
Temporary Probe 1001S	5/26/2020	2	17.1	No Comment
Temporary Probe 1001S	5/28/2020	2	17.2	No Comment
Temporary Probe 1001S	6/2/2020	2	17.6	No Comment
Temporary Probe 1001S	6/4/2020	2	17.6	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
Temporary Probe 1001S	6/9/2020	2	17.8	No Comment
Temporary Probe 1001S	6/11/2020	2	18.0	No Comment
Temporary Probe 1001S	6/16/2020	2	18.2	No Comment
Temporary Probe 1001S	6/18/2020	2	18.2	No Comment
Temporary Probe 1001S	6/23/2020	2	18.3	No Comment
Temporary Probe 1001S	6/25/2020	2	18.4	No Comment
Temporary Probe 1001S	6/30/2020	2	18.5	No Comment
Temporary Probe 1002D	5/19/2020	2	20.0	No Comment
Temporary Probe 1002D	5/21/2020	2	21.2	No Comment
Temporary Probe 1002D	5/26/2020	2	20.8	No Comment
Temporary Probe 1002D	5/28/2020	2	21.4	No Comment
Temporary Probe 1002D	6/2/2020	2	22.2	No Comment
Temporary Probe 1002D	6/4/2020	2	22.3	No Comment
Temporary Probe 1002D	6/9/2020	2	22.3	No Comment
Temporary Probe 1002D	6/11/2020	2	22.9	No Comment
Temporary Probe 1002D	6/16/2020	2	23.2	No Comment
Temporary Probe 1002D	6/18/2020	2	23.3	No Comment
Temporary Probe 1002D	6/23/2020	2	23.2	No Comment
Temporary Probe 1002D	6/25/2020	2	23.5	No Comment
Temporary Probe 1002D	6/30/2020	2	23.2	No Comment
Temporary Probe 1002M	5/19/2020	2	20.9	No Comment
Temporary Probe 1002M	5/21/2020	2	21.1	No Comment
Temporary Probe 1002M	5/26/2020	2	21.7	No Comment
Temporary Probe 1002M	5/28/2020	2	21.8	No Comment
Temporary Probe 1002M	6/2/2020	2	22.2	No Comment
Temporary Probe 1002M	6/4/2020	2	22.2	No Comment
Temporary Probe 1002M	6/9/2020	2	22.5	No Comment
Temporary Probe 1002M	6/11/2020	2	22.8	No Comment
Temporary Probe 1002M	6/16/2020	2	23.3	No Comment
Temporary Probe 1002M	6/18/2020	2	23.3	No Comment
Temporary Probe 1002M	6/23/2020	2	23.2	No Comment
Temporary Probe 1002M	6/25/2020	2	23.4	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
Temporary Probe 1002M	6/30/2020	2	23.5	No Comment
Temporary Probe 1002S	5/19/2020	2	18.7	No Comment
Temporary Probe 1002S	5/21/2020	2	18.7	No Comment
Temporary Probe 1002S	5/26/2020	2	18.6	No Comment
Temporary Probe 1002S	5/28/2020	2	18.4	No Comment
Temporary Probe 1002S	6/2/2020	2	18.6	No Comment
Temporary Probe 1002S	6/4/2020	2	18.6	No Comment
Temporary Probe 1002S	6/9/2020	2	18.6	No Comment
Temporary Probe 1002S	6/11/2020	2	18.7	No Comment
Temporary Probe 1002S	6/16/2020	2	19.0	No Comment
Temporary Probe 1002S	6/18/2020	2	18.9	No Comment
Temporary Probe 1002S	6/23/2020	2	19.0	No Comment
Temporary Probe 1002S	6/25/2020	2	19.0	No Comment
Temporary Probe 1002S	6/30/2020	2	19.1	No Comment
Temporary Probe 1003D	5/19/2020	2	18.1	No Comment
Temporary Probe 1003D	5/21/2020	2	18.5	No Comment
Temporary Probe 1003D	5/26/2020	2	18.3	No Comment
Temporary Probe 1003D	5/28/2020	2	18.2	No Comment
Temporary Probe 1003D	6/2/2020	2	18.1	No Comment
Temporary Probe 1003D	6/4/2020	2	18.0	No Comment
Temporary Probe 1003D	6/9/2020	2	18.0	No Comment
Temporary Probe 1003D	6/11/2020	2	18.0	No Comment
Temporary Probe 1003D	6/16/2020	2	18.1	No Comment
Temporary Probe 1003D	6/18/2020	2	18.1	No Comment
Temporary Probe 1003D	6/23/2020	2	18.2	No Comment
Temporary Probe 1003D	6/25/2020	2	18.2	No Comment
Temporary Probe 1003D	6/30/2020	2	18.3	No Comment
Temporary Probe 1003S	5/19/2020	2	12.7	No Comment
Temporary Probe 1003S	5/21/2020	2	12.6	No Comment
Temporary Probe 1003S	5/26/2020	2	12.6	No Comment
Temporary Probe 1003S	5/28/2020	2	12.6	No Comment
Temporary Probe 1003S	6/2/2020	2	12.9	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
Temporary Probe 1003S	6/4/2020	2	12.8	No Comment
Temporary Probe 1003S	6/9/2020	2	12.8	No Comment
Temporary Probe 1003S	6/11/2020	2	12.9	No Comment
Temporary Probe 1003S	6/16/2020	2	13.2	No Comment
Temporary Probe 1003S	6/18/2020	2	13.2	No Comment
Temporary Probe 1003S	6/23/2020	2	12.9	No Comment
Temporary Probe 1003S	6/25/2020	2	12.8	No Comment
Temporary Probe 1003S	6/30/2020	2	12.8	No Comment
Temporary Probe 1005D	5/19/2020	2	20.7	No Comment
Temporary Probe 1005D	5/21/2020	2	21.3	No Comment
Temporary Probe 1005D	5/26/2020	2	21.7	No Comment
Temporary Probe 1005D	5/28/2020	2	21.8	No Comment
Temporary Probe 1005D	6/2/2020	2	22.2	No Comment
Temporary Probe 1005D	6/4/2020	2	22.2	No Comment
Temporary Probe 1005D	6/9/2020	2	22.5	No Comment
Temporary Probe 1005D	6/11/2020	2	22.8	No Comment
Temporary Probe 1005D	6/16/2020	2	23.4	No Comment
Temporary Probe 1005D	6/18/2020	2	23.4	No Comment
Temporary Probe 1005D	6/23/2020	2	23.3	No Comment
Temporary Probe 1005D	6/25/2020	2	23.5	No Comment
Temporary Probe 1005D	6/30/2020	2	23.6	No Comment
Temporary Probe 1005M	5/19/2020	2	21.6	No Comment
Temporary Probe 1005M	5/21/2020	2	22.7	No Comment
Temporary Probe 1005M	5/26/2020	2	23.0	No Comment
Temporary Probe 1005M	5/28/2020	2	23.0	No Comment
Temporary Probe 1005M	6/2/2020	2	21.9	No Comment
Temporary Probe 1005M	6/4/2020	2	23.2	No Comment
Temporary Probe 1005M	6/9/2020	2	21.9	No Comment
Temporary Probe 1005M	6/11/2020	2	24.5	No Comment
Temporary Probe 1005M	6/16/2020	2	23.9	No Comment
Temporary Probe 1005M	6/18/2020	2	23.5	No Comment
Temporary Probe 1005M	6/23/2020	2	23.7	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
Temporary Probe 1005M	6/25/2020	2	25.0	No Comment
Temporary Probe 1005M	6/30/2020	2	24.4	No Comment
Temporary Probe 1005S	5/19/2020	2	23.2	No Comment
Temporary Probe 1005S	5/21/2020	2	22.9	No Comment
Temporary Probe 1005S	5/26/2020	2	22.8	No Comment
Temporary Probe 1005S	5/28/2020	2	22.8	No Comment
Temporary Probe 1005S	6/2/2020	2	22.7	No Comment
Temporary Probe 1005S	6/4/2020	2	22.8	No Comment
Temporary Probe 1005S	6/9/2020	2	22.7	No Comment
Temporary Probe 1005S	6/11/2020	2	22.9	No Comment
Temporary Probe 1005S	6/16/2020	2	23.1	No Comment
Temporary Probe 1005S	6/18/2020	2	23.1	No Comment
Temporary Probe 1005S	6/23/2020	2	23.1	No Comment
Temporary Probe 1005S	6/25/2020	2	23.1	No Comment
Temporary Probe 1005S	6/30/2020	2	23.1	No Comment
Temporary Probe 1006D	5/19/2020	2	20.9	No Comment
Temporary Probe 1006D	5/21/2020	2	18.2	No Comment
Temporary Probe 1006D	5/26/2020	2	18.3	No Comment
Temporary Probe 1006D	5/28/2020	2	18.5	No Comment
Temporary Probe 1006D	6/2/2020	2	17.5	No Comment
Temporary Probe 1006D	6/4/2020	2	17.6	No Comment
Temporary Probe 1006D	6/9/2020	2	17.8	No Comment
Temporary Probe 1006D	6/11/2020	2	22.3	No Comment
Temporary Probe 1006D	6/16/2020	2	19.5	No Comment
Temporary Probe 1006D	6/18/2020	2	20.8	No Comment
Temporary Probe 1006D	6/23/2020	2	21.0	No Comment
Temporary Probe 1006D	6/25/2020	2	27.9	No Comment
Temporary Probe 1006D	6/30/2020	2	22.5	No Comment
Temporary Probe 1006M	5/19/2020	2	17.4	No Comment
Temporary Probe 1006M	5/21/2020	2	17.9	No Comment
Temporary Probe 1006M	5/26/2020	2	18.2	No Comment
Temporary Probe 1006M	5/28/2020	2	18.4	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
Temporary Probe 1006M	6/2/2020	2	18.8	No Comment
Temporary Probe 1006M	6/4/2020	2	18.8	No Comment
Temporary Probe 1006M	6/9/2020	2	18.9	No Comment
Temporary Probe 1006M	6/11/2020	2	19.8	No Comment
Temporary Probe 1006M	6/16/2020	2	20.0	No Comment
Temporary Probe 1006M	6/18/2020	2	19.8	No Comment
Temporary Probe 1006M	6/23/2020	2	20.0	No Comment
Temporary Probe 1006M	6/25/2020	2	20.2	No Comment
Temporary Probe 1006M	6/30/2020	2	20.2	No Comment
Temporary Probe 1006S	5/19/2020	2	18.1	No Comment
Temporary Probe 1006S	5/21/2020	2	17.9	No Comment
Temporary Probe 1006S	5/26/2020	2	17.5	No Comment
Temporary Probe 1006S	5/28/2020	2	17.4	No Comment
Temporary Probe 1006S	6/2/2020	2	17.2	No Comment
Temporary Probe 1006S	6/4/2020	2	17.2	No Comment
Temporary Probe 1006S	6/9/2020	2	17.1	No Comment
Temporary Probe 1006S	6/11/2020	2	17.2	No Comment
Temporary Probe 1006S	6/16/2020	2	17.2	No Comment
Temporary Probe 1006S	6/18/2020	2	17.2	No Comment
Temporary Probe 1006S	6/23/2020	2	17.3	No Comment
Temporary Probe 1006S	6/25/2020	2	17.4	No Comment
Temporary Probe 1006S	6/30/2020	2	17.4	No Comment
Temporary Probe 1007D	5/19/2020	2	21.1	No Comment
Temporary Probe 1007D	5/21/2020	2	21.3	No Comment
Temporary Probe 1007D	5/26/2020	2	21.8	No Comment
Temporary Probe 1007D	5/28/2020	2	22.0	No Comment
Temporary Probe 1007D	6/2/2020	2	22.3	No Comment
Temporary Probe 1007D	6/4/2020	2	22.4	No Comment
Temporary Probe 1007D	6/9/2020	2	22.5	No Comment
Temporary Probe 1007D	6/11/2020	2	23.3	No Comment
Temporary Probe 1007D	6/16/2020	2	23.5	No Comment
Temporary Probe 1007D	6/18/2020	2	23.4	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
Temporary Probe 1007D	6/23/2020	2	23.5	No Comment
Temporary Probe 1007D	6/25/2020	2	23.7	No Comment
Temporary Probe 1007D	6/30/2020	2	23.8	No Comment
Temporary Probe 1007M	5/19/2020	2	18.0	No Comment
Temporary Probe 1007M	5/21/2020	2	18.0	No Comment
Temporary Probe 1007M	5/26/2020	2	18.8	No Comment
Temporary Probe 1007M	5/28/2020	2	18.9	No Comment
Temporary Probe 1007M	6/2/2020	2	19.2	No Comment
Temporary Probe 1007M	6/4/2020	2	19.4	No Comment
Temporary Probe 1007M	6/9/2020	2	19.5	No Comment
Temporary Probe 1007M	6/11/2020	2	20.3	No Comment
Temporary Probe 1007M	6/16/2020	2	20.4	No Comment
Temporary Probe 1007M	6/18/2020	2	20.4	No Comment
Temporary Probe 1007M	6/23/2020	2	20.5	No Comment
Temporary Probe 1007M	6/25/2020	2	20.7	No Comment
Temporary Probe 1007M	6/30/2020	2	20.8	No Comment
Temporary Probe 1007S	5/19/2020	2	16.4	No Comment
Temporary Probe 1007S	5/21/2020	2	16.5	No Comment
Temporary Probe 1007S	5/26/2020	2	16.4	No Comment
Temporary Probe 1007S	5/28/2020	2	16.4	No Comment
Temporary Probe 1007S	6/2/2020	2	16.4	No Comment
Temporary Probe 1007S	6/4/2020	2	16.4	No Comment
Temporary Probe 1007S	6/9/2020	2	16.3	No Comment
Temporary Probe 1007S	6/11/2020	2	16.6	No Comment
Temporary Probe 1007S	6/16/2020	2	16.6	No Comment
Temporary Probe 1007S	6/18/2020	2	16.6	No Comment
Temporary Probe 1007S	6/23/2020	2	16.6	No Comment
Temporary Probe 1007S	6/25/2020	2	16.7	No Comment
Temporary Probe 1007S	6/30/2020	2	16.6	No Comment
Temporary Probe 1008D	5/19/2020	2	19.2	No Comment
Temporary Probe 1008D	5/21/2020	2	19.3	No Comment
Temporary Probe 1008D	5/26/2020	2	19.7	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
Temporary Probe 1008D	5/28/2020	2	19.8	No Comment
Temporary Probe 1008D	6/2/2020	2	20.1	No Comment
Temporary Probe 1008D	6/4/2020	2	20.1	No Comment
Temporary Probe 1008D	6/9/2020	2	20.2	No Comment
Temporary Probe 1008D	6/11/2020	2	21.0	No Comment
Temporary Probe 1008D	6/16/2020	2	21.1	No Comment
Temporary Probe 1008D	6/18/2020	2	21.0	No Comment
Temporary Probe 1008D	6/23/2020	2	21.1	No Comment
Temporary Probe 1008D	6/25/2020	2	21.2	No Comment
Temporary Probe 1008D	6/30/2020	2	21.3	No Comment
Temporary Probe 1008S	5/19/2020	2	17.9	No Comment
Temporary Probe 1008S	5/21/2020	2	17.0	No Comment
Temporary Probe 1008S	5/26/2020	2	17.7	No Comment
Temporary Probe 1008S	5/28/2020	2	17.9	No Comment
Temporary Probe 1008S	6/2/2020	2	18.1	No Comment
Temporary Probe 1008S	6/4/2020	2	18.3	No Comment
Temporary Probe 1008S	6/9/2020	2	18.3	No Comment
Temporary Probe 1008S	6/11/2020	2	20.1	No Comment
Temporary Probe 1008S	6/16/2020	2	19.7	No Comment
Temporary Probe 1008S	6/18/2020	2	19.6	No Comment
Temporary Probe 1008S	6/23/2020	2	19.6	No Comment
Temporary Probe 1008S	6/25/2020	2	20.4	No Comment
Temporary Probe 1008S	6/30/2020	2	19.7	No Comment
Temporary Probe 1009D	5/19/2020	2	18.1	No Comment
Temporary Probe 1009D	5/21/2020	2	18.8	No Comment
Temporary Probe 1009D	5/26/2020	2	19.3	No Comment
Temporary Probe 1009D	5/28/2020	2	19.5	No Comment
Temporary Probe 1009D	6/2/2020	2	19.9	No Comment
Temporary Probe 1009D	6/4/2020	2	20.0	No Comment
Temporary Probe 1009D	6/9/2020	2	19.4	No Comment
Temporary Probe 1009D	6/11/2020	2	20.8	No Comment
Temporary Probe 1009D	6/16/2020	2	21.3	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
Temporary Probe 1009D	6/18/2020	2	21.2	No Comment
Temporary Probe 1009D	6/23/2020	2	21.1	No Comment
Temporary Probe 1009D	6/25/2020	2	21.2	No Comment
Temporary Probe 1009D	6/30/2020	2	21.0	No Comment
Temporary Probe 1009S	5/19/2020	2	16.5	No Comment
Temporary Probe 1009S	5/21/2020	2	16.5	No Comment
Temporary Probe 1009S	5/26/2020	2	16.4	No Comment
Temporary Probe 1009S	5/28/2020	2	16.3	No Comment
Temporary Probe 1009S	6/2/2020	2	16.4	No Comment
Temporary Probe 1009S	6/4/2020	2	16.3	No Comment
Temporary Probe 1009S	6/9/2020	2	16.2	No Comment
Temporary Probe 1009S	6/11/2020	2	16.4	No Comment
Temporary Probe 1009S	6/16/2020	2	16.5	No Comment
Temporary Probe 1009S	6/18/2020	2	16.5	No Comment
Temporary Probe 1009S	6/23/2020	2	16.4	No Comment
Temporary Probe 1009S	6/25/2020	2	16.5	No Comment
Temporary Probe 1009S	6/30/2020	2	16.5	No Comment
Temporary Probe 1010D	5/19/2020	2	18.1	No Comment
Temporary Probe 1010D	5/21/2020	2	18.0	No Comment
Temporary Probe 1010D	5/26/2020	2	19.0	No Comment
Temporary Probe 1010D	5/28/2020	2	17.6	No Comment
Temporary Probe 1010D	6/2/2020	2	17.5	No Comment
Temporary Probe 1010D	6/4/2020	2	18.9	No Comment
Temporary Probe 1010D	6/9/2020	2	18.1	No Comment
Temporary Probe 1010D	6/11/2020	2	20.3	No Comment
Temporary Probe 1010D	6/16/2020	2	20.5	No Comment
Temporary Probe 1010D	6/18/2020	2	19.9	No Comment
Temporary Probe 1010D	6/23/2020	2	19.1	No Comment
Temporary Probe 1010D	6/25/2020	2	20.5	No Comment
Temporary Probe 1010D	6/30/2020	2	19.7	No Comment
Temporary Probe 1010M	5/19/2020	2	18.3	No Comment
Temporary Probe 1010M	5/21/2020	2	18.1	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
Temporary Probe 1010M	5/26/2020	2	19.4	No Comment
Temporary Probe 1010M	5/28/2020	2	19.5	No Comment
Temporary Probe 1010M	6/2/2020	2	19.6	No Comment
Temporary Probe 1010M	6/4/2020	2	19.5	No Comment
Temporary Probe 1010M	6/9/2020	2	20.0	No Comment
Temporary Probe 1010M	6/11/2020	2	21.0	No Comment
Temporary Probe 1010M	6/16/2020	2	21.0	No Comment
Temporary Probe 1010M	6/18/2020	2	20.6	No Comment
Temporary Probe 1010M	6/23/2020	2	20.5	No Comment
Temporary Probe 1010M	6/25/2020	2	21.4	No Comment
Temporary Probe 1010M	6/30/2020	2	21.2	No Comment
Temporary Probe 1010S	5/19/2020	2	17.8	No Comment
Temporary Probe 1010S	5/21/2020	2	15.7	No Comment
Temporary Probe 1010S	5/26/2020	2	15.6	No Comment
Temporary Probe 1010S	5/28/2020	2	15.6	No Comment
Temporary Probe 1010S	6/2/2020	2	15.8	No Comment
Temporary Probe 1010S	6/4/2020	2	15.7	No Comment
Temporary Probe 1010S	6/9/2020	2	15.9	No Comment
Temporary Probe 1010S	6/11/2020	2	16.1	No Comment
Temporary Probe 1010S	6/16/2020	2	16.5	No Comment
Temporary Probe 1010S	6/18/2020	2	16.5	No Comment
Temporary Probe 1010S	6/23/2020	2	16.5	No Comment
Temporary Probe 1010S	6/25/2020	2	16.5	No Comment
Temporary Probe 1010S	6/30/2020	2	16.3	No Comment
Temporary Probe 1011D	5/19/2020	2	22.9	No Comment
Temporary Probe 1011D	5/21/2020	2	23.1	No Comment
Temporary Probe 1011D	5/26/2020	2	23.3	No Comment
Temporary Probe 1011D	5/29/2020	2	23.4	No Comment
Temporary Probe 1011D	6/2/2020	2	23.3	No Comment
Temporary Probe 1011D	6/4/2020	2	23.3	No Comment
Temporary Probe 1011D	6/9/2020	2	23.3	No Comment
Temporary Probe 1011D	6/11/2020	2	23.7	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
Temporary Probe 1011D	6/16/2020	2	23.6	No Comment
Temporary Probe 1011D	6/18/2020	2	23.7	No Comment
Temporary Probe 1011D	6/23/2020	2	23.7	No Comment
Temporary Probe 1011D	6/25/2020	2	23.8	No Comment
Temporary Probe 1011D	6/30/2020	2	23.8	No Comment
Temporary Probe 1011M	5/19/2020	2	19.0	No Comment
Temporary Probe 1011M	5/21/2020	2	19.4	No Comment
Temporary Probe 1011M	5/26/2020	2	19.9	No Comment
Temporary Probe 1011M	5/29/2020	2	19.9	No Comment
Temporary Probe 1011M	6/2/2020	2	20.3	No Comment
Temporary Probe 1011M	6/4/2020	2	20.3	No Comment
Temporary Probe 1011M	6/9/2020	2	20.4	No Comment
Temporary Probe 1011M	6/11/2020	2	21.4	No Comment
Temporary Probe 1011M	6/16/2020	2	21.5	No Comment
Temporary Probe 1011M	6/18/2020	2	21.3	No Comment
Temporary Probe 1011M	6/23/2020	2	21.4	No Comment
Temporary Probe 1011M	6/25/2020	2	21.0	No Comment
Temporary Probe 1011M	6/30/2020	2	21.6	No Comment
Temporary Probe 1011S	5/19/2020	2	22.6	No Comment
Temporary Probe 1011S	5/21/2020	2	22.6	No Comment
Temporary Probe 1011S	5/26/2020	2	22.6	No Comment
Temporary Probe 1011S	5/29/2020	2	22.6	No Comment
Temporary Probe 1011S	6/2/2020	2	22.6	No Comment
Temporary Probe 1011S	6/4/2020	2	22.6	No Comment
Temporary Probe 1011S	6/9/2020	2	22.6	No Comment
Temporary Probe 1011S	6/11/2020	2	22.6	No Comment
Temporary Probe 1011S	6/16/2020	2	22.6	No Comment
Temporary Probe 1011S	6/18/2020	2	22.6	No Comment
Temporary Probe 1011S	6/23/2020	2	22.6	No Comment
Temporary Probe 1011S	6/25/2020	2	22.7	No Comment
Temporary Probe 1011S	6/30/2020	2	22.6	No Comment
Temporary Probe 1012D	5/19/2020	2	16.0	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
Temporary Probe 1012D	5/21/2020	2	16.9	No Comment
Temporary Probe 1012D	5/26/2020	2	17.5	No Comment
Temporary Probe 1012D	5/29/2020	2	17.6	No Comment
Temporary Probe 1012D	6/2/2020	2	18.1	No Comment
Temporary Probe 1012D	6/4/2020	2	18.0	No Comment
Temporary Probe 1012D	6/9/2020	2	18.3	No Comment
Temporary Probe 1012D	6/11/2020	2	18.6	No Comment
Temporary Probe 1012D	6/16/2020	2	19.3	No Comment
Temporary Probe 1012D	6/18/2020	2	19.1	No Comment
Temporary Probe 1012D	6/23/2020	2	19.3	No Comment
Temporary Probe 1012D	6/25/2020	2	19.4	No Comment
Temporary Probe 1012D	6/30/2020	2	19.6	No Comment
Temporary Probe 1012S	5/19/2020	2	14.4	No Comment
Temporary Probe 1012S	5/21/2020	2	14.4	No Comment
Temporary Probe 1012S	5/26/2020	2	14.3	No Comment
Temporary Probe 1012S	5/29/2020	2	14.4	No Comment
Temporary Probe 1012S	6/2/2020	2	14.4	No Comment
Temporary Probe 1012S	6/4/2020	2	14.3	No Comment
Temporary Probe 1012S	6/9/2020	2	14.3	No Comment
Temporary Probe 1012S	6/11/2020	2	14.5	No Comment
Temporary Probe 1012S	6/16/2020	2	14.6	No Comment
Temporary Probe 1012S	6/18/2020	2	14.6	No Comment
Temporary Probe 1012S	6/23/2020	2	14.7	No Comment
Temporary Probe 1012S	6/25/2020	2	14.7	No Comment
Temporary Probe 1012S	6/30/2020	2	14.6	No Comment
Temporary Probe 1013B	5/19/2020	2	24.3	No Comment
Temporary Probe 1013B	5/21/2020	2	24.6	No Comment
Temporary Probe 1013B	5/26/2020	2	24.9	No Comment
Temporary Probe 1013B	5/29/2020	2	25.0	No Comment
Temporary Probe 1013B	6/2/2020	2	24.9	No Comment
Temporary Probe 1013B	6/4/2020	2	25.0	No Comment
Temporary Probe 1013B	6/9/2020	2	25.0	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
Temporary Probe 1013B	6/11/2020	2	25.3	No Comment
Temporary Probe 1013B	6/16/2020	2	25.3	No Comment
Temporary Probe 1013B	6/18/2020	2	25.3	No Comment
Temporary Probe 1013B	6/23/2020	2	24.3	No Comment
Temporary Probe 1013B	6/25/2020	2	32.6	No Comment
Temporary Probe 1013B	6/30/2020	2	25.5	No Comment
Temporary Probe 1013D	5/19/2020	2	17.1	No Comment
Temporary Probe 1013D	5/21/2020	2	17.9	No Comment
Temporary Probe 1013D	5/26/2020	2	18.4	No Comment
Temporary Probe 1013D	5/29/2020	2	18.9	No Comment
Temporary Probe 1013D	6/2/2020	2	18.6	No Comment
Temporary Probe 1013D	6/4/2020	2	19.0	No Comment
Temporary Probe 1013D	6/9/2020	2	19.1	No Comment
Temporary Probe 1013D	6/11/2020	2	19.9	No Comment
Temporary Probe 1013D	6/16/2020	2	19.9	No Comment
Temporary Probe 1013D	6/18/2020	2	19.9	No Comment
Temporary Probe 1013D	6/23/2020	2	20.0	No Comment
Temporary Probe 1013D	6/25/2020	2	20.1	No Comment
Temporary Probe 1013D	6/30/2020	2	20.3	No Comment
Temporary Probe 1013M	5/19/2020	2	16.3	No Comment
Temporary Probe 1013M	5/21/2020	2	16.8	No Comment
Temporary Probe 1013M	5/26/2020	2	18.2	No Comment
Temporary Probe 1013M	5/29/2020	2	18.5	No Comment
Temporary Probe 1013M	6/2/2020	2	18.7	No Comment
Temporary Probe 1013M	6/4/2020	2	18.5	No Comment
Temporary Probe 1013M	6/9/2020	2	17.5	No Comment
Temporary Probe 1013M	6/11/2020	2	19.6	No Comment
Temporary Probe 1013M	6/16/2020	2	18.9	No Comment
Temporary Probe 1013M	6/18/2020	2	18.8	No Comment
Temporary Probe 1013M	6/23/2020	2	18.1	No Comment
Temporary Probe 1013M	6/25/2020	2	19.9	No Comment
Temporary Probe 1013M	6/30/2020	2	19.3	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
Temporary Probe 1013S	5/19/2020	2	17.6	No Comment
Temporary Probe 1013S	5/21/2020	2	17.3	No Comment
Temporary Probe 1013S	5/26/2020	2	16.7	No Comment
Temporary Probe 1013S	5/29/2020	2	16.6	No Comment
Temporary Probe 1013S	6/2/2020	2	16.5	No Comment
Temporary Probe 1013S	6/4/2020	2	16.3	No Comment
Temporary Probe 1013S	6/9/2020	2	16.3	No Comment
Temporary Probe 1013S	6/11/2020	2	16.3	No Comment
Temporary Probe 1013S	6/16/2020	2	16.3	No Comment
Temporary Probe 1013S	6/18/2020	2	16.3	No Comment
Temporary Probe 1013S	6/23/2020	2	16.2	No Comment
Temporary Probe 1013S	6/25/2020	2	16.2	No Comment
Temporary Probe 1013S	6/30/2020	2	16.3	No Comment
Temporary Probe 1014D	5/19/2020	2	15.0	No Comment
Temporary Probe 1014D	5/21/2020	2	15.3	No Comment
Temporary Probe 1014D	5/26/2020	2	16.1	No Comment
Temporary Probe 1014D	5/29/2020	2	16.2	No Comment
Temporary Probe 1014D	6/2/2020	2	16.7	No Comment
Temporary Probe 1014D	6/4/2020	2	16.8	No Comment
Temporary Probe 1014D	6/9/2020	2	17.0	No Comment
Temporary Probe 1014D	6/11/2020	2	17.4	No Comment
Temporary Probe 1014D	6/16/2020	2	17.8	No Comment
Temporary Probe 1014D	6/18/2020	2	17.8	No Comment
Temporary Probe 1014D	6/23/2020	2	18.0	No Comment
Temporary Probe 1014D	6/25/2020	2	18.0	No Comment
Temporary Probe 1014D	6/30/2020	2	18.1	No Comment
Temporary Probe 1014S	5/19/2020	2	17.7	No Comment
Temporary Probe 1014S	5/21/2020	2	16.7	No Comment
Temporary Probe 1014S	5/26/2020	2	16.8	No Comment
Temporary Probe 1014S	5/29/2020	2	17.0	No Comment
Temporary Probe 1014S	6/2/2020	2	17.3	No Comment
Temporary Probe 1014S	6/4/2020	2	17.3	No Comment

Point Name	Date	Quadrant	Depth to Water (ft)	Comments
Temporary Probe 1014S	6/9/2020	2	17.4	No Comment
Temporary Probe 1014S	6/11/2020	2	17.5	No Comment
Temporary Probe 1014S	6/16/2020	2	17.7	No Comment
Temporary Probe 1014S	6/18/2020	2	17.8	No Comment
Temporary Probe 1014S	6/23/2020	2	17.8	No Comment
Temporary Probe 1014S	6/25/2020	2	17.9	No Comment
Temporary Probe 1014S	6/30/2020	2	17.9	No Comment

APPENDIX A

LANDFILL GAS CORRECTIVE ACTION PLAN UPDATE, JULY 26, 2013

BRIDGETON LANDFILL

LANDFILL GAS CORRECTIVE ACTION PLAN UPDATE

Submitted Pursuant to Section 23 of Agreed Order
Case No. 13SL-CC01088, Effective May 13, 2013

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July 26, 2013

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APPENDICES

Appendix A – Gas Monitoring Probe Methane Level Graphs
Appendix B – GMP and TMP Boring Logs/Construction Logs
Appendix C – Bridgeton Landfill Infrastructure As-Built Drawing, July 2013

1.0 INTRODUCTION

On May 13, 2013, Bridgeton Landfill entered into an Agreed Order with the State of Missouri which requires actions to address what was called a subsurface smoldering event (SSE). Section 23 of the Agreed Order requires the preparation of an updated "Landfill Gas Corrective Action Plan" (CAP) and requests that the update consider SSE control measures.

Missouri Solid Waste Management Regulations require that subsurface landfill gas be controlled so that it does not exceed 2.5% (which is equal to 50% of the lower explosive limit, or LEL) in the ground at the facility property boundary. If this level is exceeded at the property boundary, the facility must implement enhanced monitoring and corrective measures. Corrective Action Plans are frequently used to present and communicate these measures.

Bridgeton Landfill has been monitoring for gas migration using permanent gas monitoring probes since 1998. Since that time, landfill gas Corrective Action Plans have been implemented, additional monitoring locations have been added, and many control features have been installed. These efforts have been previously documented and are incorporated by reference as background for this current work.

Lateral landfill gas migration is common at unlined municipal solid waste (MSW) landfills, and especially in quarry fill environments. Bridgeton Landfill has some areas where the property line is close to solid waste limits (near the edge of the quarry wall) and monitoring has detected methane near the property line in certain locations. In addition, the SSE that Bridgeton Landfill has been experiencing since 2010, and that intensified in 2012, has further challenged methane control in those areas.

The purpose of this document, as required by the Agreed Order, is to provide an update to the November 27, 2012 CAP that considers the SSE control measures. As such, this document includes monitoring data up to July 2013, reviews the status of gas migration control, presents recent (since the approved November 27, 2012 CAP) efforts to reduce methane migration, and discusses forward-going monitoring and reporting procedures. It is intended that this CAP supplements and/or supersedes the previous CAPs and agreements.

2.0 REVIEW OF CURRENT GAS MIGRATION CONTROL STATUS

The intensification of the SSE has created conditions that have made control of gas migration more challenging, including:

- Increased pressure within the landfill waste with pressure-gradient which forces gas outward;
- Increased liquid generation resulting in steam and saturated gas which effects collection efficiency, and
- Carefully controlled and reduced application of gas extraction well vacuum with efforts to minimize oxygen content in the gas well.

Detailed graphs showing methane concentrations for the past three years are included in Appendix A. Appendix B includes a list of the gas monitoring probes monitored at the Bridgeton Landfill along with the boring logs and/or construction logs for each probe. Please note, the gas monitoring probes has been referenced with different abbreviations and the table in Appendix B is included to provide clarity.

As can be seen on the graphs, there are several compliance point and sentry monitoring probe locations that have been historically elevated (GMP-01, GMP-04, GMP-05 GMP-06 and GMP-07), as well as elevated levels in new gas monitoring probes where monitoring began in October 2012 after the SSE intensified (GMP-5S, GMP-14S, GMP-14D). Temporary monitoring probes installed to determine the rate and extent of the methane migration in the vicinity of impacted probe GMP-01 (TMP-1S, TMP-2S, TMP-2M, TMP-2D, TMP-3S, TMP-3M, and TMP-3D) have also exhibited elevated levels of methane since installation.

Due to the additional gas monitoring probes, which initiated monitoring in October 2012 to better define the zone of migration on the eastern boundary of the landfill, GMP-04 through GMP-07 located closer to the landfill are typically monitored on a quarterly basis but are sentry probes and are no longer utilized as the compliance probes in accordance with Missouri Solid Waste Law and Rules. Tables 1 through 4 present the probe results for the monitoring period November 21, 2012 through July 5, 2013.

Along the southern boundary of the landfill, adjacent to Boenker Road, GMP-01 has continued to show elevated levels above the regulatory threshold. Corrective measures have not been effective to address the migration in this vicinity. Corrective actions taken to date have focused on methane migration within the soil overburden due to investigative action demonstrating shallow migration. However, after the installation of the interceptor trench, which was constructed to the soil/bedrock interface between the waste disposal area and impacted GMP-01, elevated levels continued to be exhibited in GMP-01. Due to the ineffectiveness of the perimeter gas wells (2005) and interceptor trench (2010) installed in the vicinity of GMP-01 to eliminate or reduce methane impacts, further investigation was deemed necessary under the conditions of the Settlement Agreement.

In order to effectively determine the zone of migration in the vicinity of GMP-01, temporary probes (TMP-1, TMP-2 and TMP-3) were installed as investigation probes to better define the zone of migration. In order to do this, each temporary probe were installed as nested probes with three monitored zones – shallow (S), middle (M) and deep (D). The shallow zone was screened within the soil overburden; the middle zone was screened through the uppermost weathered/fractured bedrock and the deep zone within the saturated bedrock. As presented in Appendix A, TMP-1 located west of GMP-01 is impacted with elevated methane levels within the soil overburden and weathered bedrock. TMP-2, located east of GMP-01, and TMP-3, located north of GMP-01, has observed elevated methane in each of the monitored zones. It is likely the observed elevated methane within the deep monitored zone observed in TMP-2 and TMP-3 are a result of diffusion transport due to these probes located less than 75 feet from the waste mass as well as the pressure-gradient force caused by the SSE as noted with increased relative pressure during monitoring of the probes.

As noted in the TMP boring logs, weathered bedrock was observed at lower elevations than the base of the interceptor trench. TMP-1, located west of GMP-1, the weathered bedrock was observed between 36 feet below ground surface (bgs) to 66.5 feet bgs. TMP-2, located east of GMP-1, the weathered bedrock was observed between 18 feet bgs to 47 feet bgs. TMP-3, located between the landfill and GMP-1, the weathered bedrock was observed between 31 feet bgs to 50 feet bgs. TMP-2, located between the landfill and GMP-1, the weathered bedrock was observed between 31 feet bgs to 50 feet bgs. Due to weathered bedrock observed at lower elevations than the base of the interceptor trench, it is likely methane continues to migrate through these weathered zones. Table 3 presents the temporary gas monitoring probe data.

The intensification of the SSE in 2012, resulting in increased pressure within the landfill, brought challenges associated within dewatering the interceptor trench located south of the waste boundary and maintaining sufficient vacuum on select gas extraction wells located within the south quarry. As a result, elevated levels of methane continue to be observed since October 2012.

Currently the public safety probes located across Boenker Road, on private property (GMP-09, GMP-10, GMP-11, and GMP-12) have no detectable levels of methane and have not observed elevated methane in two years (GMP-11). There is no evidence of methane migration onto adjacent properties at this time. Table 4 presents the gas monitoring probe data for the public safety probes.

Along the east property boundary, adjacent to the south quarry, elevated methane has been observed at two gas monitoring probe locations utilized for compliance: GMP-5S, GMP-14S, GMP-14D. The gas monitoring probes installed between August and September 2012 were installed as nested probes with two monitoring zones - shallow (S) and deep (D). The shallow zone was screened within the soil overburden; the deep zone was screened through the uppermost weathered bedrock to approximately 10 feet below the historic low water table.

The intent of these nested probes is to determine if methane migration is occurring at the property boundary as well as to ascertain the zone in which it is occurring. Similar to GMP-01, weathered bedrock was observed below the soil overburden at GMP-14 where GMP-14D is screened. The weathered bedrock is likely providing a zone of migration within the deeper zone, GMP-14D.

As described in Section 3.0, Bridgeton Landfill has performed recent improvements that should ultimately reduce landfill gas migration.

3.0 RECENT GAS MIGRATION CONTROL EFFORTS

Many recent additional measures have been recently undertaken that should ultimately reduce gas migration, including:

1. The SSE has impacted the facility's infrastructure designed to remove liquid efficiently from the waste mass which results in increased liquid in the force main and the gas conveyance system resulting in a reduction of their efficiency to remove landfill gas. Adding new gas extraction wells, replacing compromised gas extraction wells, and adding liquid pumps and extraction points will improve landfill gas collection and improve overall efficiency of the system. The following features have been installed per the November 27, 2012 CAP and in addition to the measures proposed in the CAP:

    - In November 2012 the Bridgeton Landfill installed 5 new trench wells, 5 new liquid sumps, and 7 new gas extraction wells.
    - During the January 1, 2013 through June 30, 2013 period the following additional extraction points were installed at the Bridgeton Landfill:
    - In February 2013 the Bridgeton Landfill installed 9 new gas extraction wells,
    - In March 2013 the Bridgeton Landfill installed 3 new gas extraction wells,
    - In April 2013 the Bridgeton Landfill installed 11 new gas extraction wells,
    - In May 2013 the Bridgeton Landfill installed 13 new gas extraction wells,

2. Addition of a 2,500 scfm utility flare in the southeastern portion of the disposal area in June 2013. This flare has improved vacuum distribution around the well field, especially in the southern and southeastern end where migration has been problematic.

3. Installation of 25 perimeter liquid sumps connected by perforated liquid/gas collection piping in May and June 2013. These were installed as part of the South Quarry capping project, and will allow collection of additional gas at the perimeter of the landfill, and

4. Placement of 32 acres of geomembrane cap and enhanced gas collection features which should be completed in August 2013. The cap will allow additional vacuum to be pulled from the cover integrity system consisting of a composite liner system which will reduce concern for oxygen intrusion. This should result in better long term gas capture and, in time, reduced gas pressure.

An updated as-built map that shows all of these features that were in place as of June 30, 2013 is included in Appendix C.

Due to the increased liquid generation and increased pressure within the landfill the improvements completed within the past nine months have not yet resulted in a reduction of methane observed within the gas monitoring probes. It is premature to evaluate the

effectiveness of the recent gas migration control efforts outlined in this section due to impacts associated with increased liquid generation and the continued dynamic movement and changes of the SSE in the South Quarry area.

4.0 PROPOSED AND ONGOING GAS MIGRATION CONTROL EFFORTS

The recent additional measures outlined in Section 3.0 are on-going efforts to improve landfill gas control at the Bridgeton Landfill. These upgrades should reduce pressure within the waste mass that may be contributing to the exceedances and in turn alleviate methane migration along the southern and eastern property boundaries. Improvements to the landfill are on-going and will continue until the SSE is controlled. Below are additional improvements that are being proposed or currently implemented:

1. The SSE has resulted in an increase in condensate generation. In order to improve liquid removal at the site a third party consultant has been contracted to evaluate the effectiveness of the existing force main. Due to the increased liquid movement within the force main pressure has built up within the system resulting in back pressure and reduced pump functionality. Pressure relief valves have been installed on numerous pneumatic pumps to address this issue. However, due to the increased liquid generation additional capacity within the force main is needed. As such, the preliminary design proposes utilizing the existing force main for management of liquid removed from the LCSs and a second separate force main for liquids removed from the remaining extraction points. The additional liquid force main will allow optimum operations of the pumps while providing increased available vacuum on the landfill gas collection system. This corrective action measure will be submitted to the MDNR in third quarter 2013 sealed by a Missouri Professional Engineer.

2. In order to improve liquid management once the liquids are removed from the disposal area the Bridgeton Landfill has contracted with a third party consulting firm for additional storage and pretreatment of the extracted liquid. During the second quarter 2013 the landfill installed a 316,000 gallon above ground liquid storage and treatment tank The preliminary treatment plant design includes incorporation of the existing 96,000 gallon tank located near Boenker Road, the newly installed 316,000 gallon tank, four-1,000,000 gallon tanks and a pretreatment facility. This will provide the landfill additional capacity to remove the liquid from the disposal area at a design capacity of 300,000 gallons per day. The treatment plant design will be submitted to the MDNR in third quarter 2013 sealed by a Missouri Professional Engineer.

3. The Bridgeton Landfill has submitted a Permit to Construct application to the St. Louis County Department of Health for the installation of two 4,000 scfm utility flares. These utility flares would replace the existing enclosed flares with a design flow of 3,500 scfm each. The replacement of the enclosed flares with the two 4,000 scfm utility flares coupled with the existing 3,500 scfm John Zink utility flare and the 2,500 scfm LFG Specialties utility flare will provide a combined design flow of the four utility flares of 14,000 scfm. Authorization to Construct is anticipated to be issued by the end of July 2013. The installation of the 4,000 scfm utility flares is anticipated to be completed shortly after permit issuance with operations of each unit by the end of third quarter

2013. Utility flares are better suited to handle the lower heating value gas at the Bridgeton Landfill resulting in less downtime of the control devices.

4. A natural gas line has been installed in the vicinity of the flare compound. It will be connected to the gas collection system if the lower heating value or hydrogen concentration drop below levels to effectively operate the landfill gas control devices.

5. The Bridgeton Landfill will be upgrading the landfill gas coolers at the east utility flare (2,500 scfm LFG Specialties) and at the flare compound in the near future. This improvement will result in additional vacuum available to the well field.

The improvements associated with the liquid conveyance system and the landfill gas control devices are essential to address methane migration at the facility. These efforts should result in a decrease in pressure within the landfill and improved landfill gas collection efficiencies within the south quarry. The liquid force main modification and the liquid treatment system will be submitted to the MDNR for review and approval. The landfill appreciates the continued support to address the SSE in a timely manner and appreciates an expedited review of these submittals.

Monitoring results of the nested gas and temporary monitoring probes have shown that methane is migrating through the weathered bedrock and additional controls are likely needed to address these exceedances. However, due to increased liquid generation associated with the SSE, the effectiveness of the recent improvements could not be determined. It is requested to further evaluate the zone of migration of the impacted gas monitoring and temporary monitoring probes with weekly water level readings and monitoring of the impacted probes to better delineate if methane is migrating through deeper zones. It is requested that this evaluation period be extended through the third quarter 2013. At that time a comprehensive corrective action plan will be submitted evaluating the impact of the recently-completed capping, other recent measures, and the proposed measures described above. During this period the landfill will continue to complete improvements to the liquid conveyance system in efforts to minimize liquids within the gas collection system.

5.0 CONTINUED MONITORING AND REPORTING

The Bridgeton Landfill will initiate weekly monitoring of all monitoring probes including the gas monitoring probes, sentry probes and temporary monitoring probes. The Bridgeton Landfill proposes that landfill gas corrective summary reports to be incorporated into the quarterly report and submitted by the 15th of each month following a calendar quarter. These reports will summarize all corrective action completed to address methane migration within the prior quarter and, if elevated levels persist, provide a corrective action plan to address the methane exceedances.

Bridgeton Landfill understands that the submittal of quarterly landfill gas corrective action summary reports and corrective action plans is at a higher frequency than outlined in Paragraph 4 of the January 17, 2011 Settlement Agreement between the MDNR and the Bridgeton Landfill but believes that incorporation in the quarterly report is valuable.

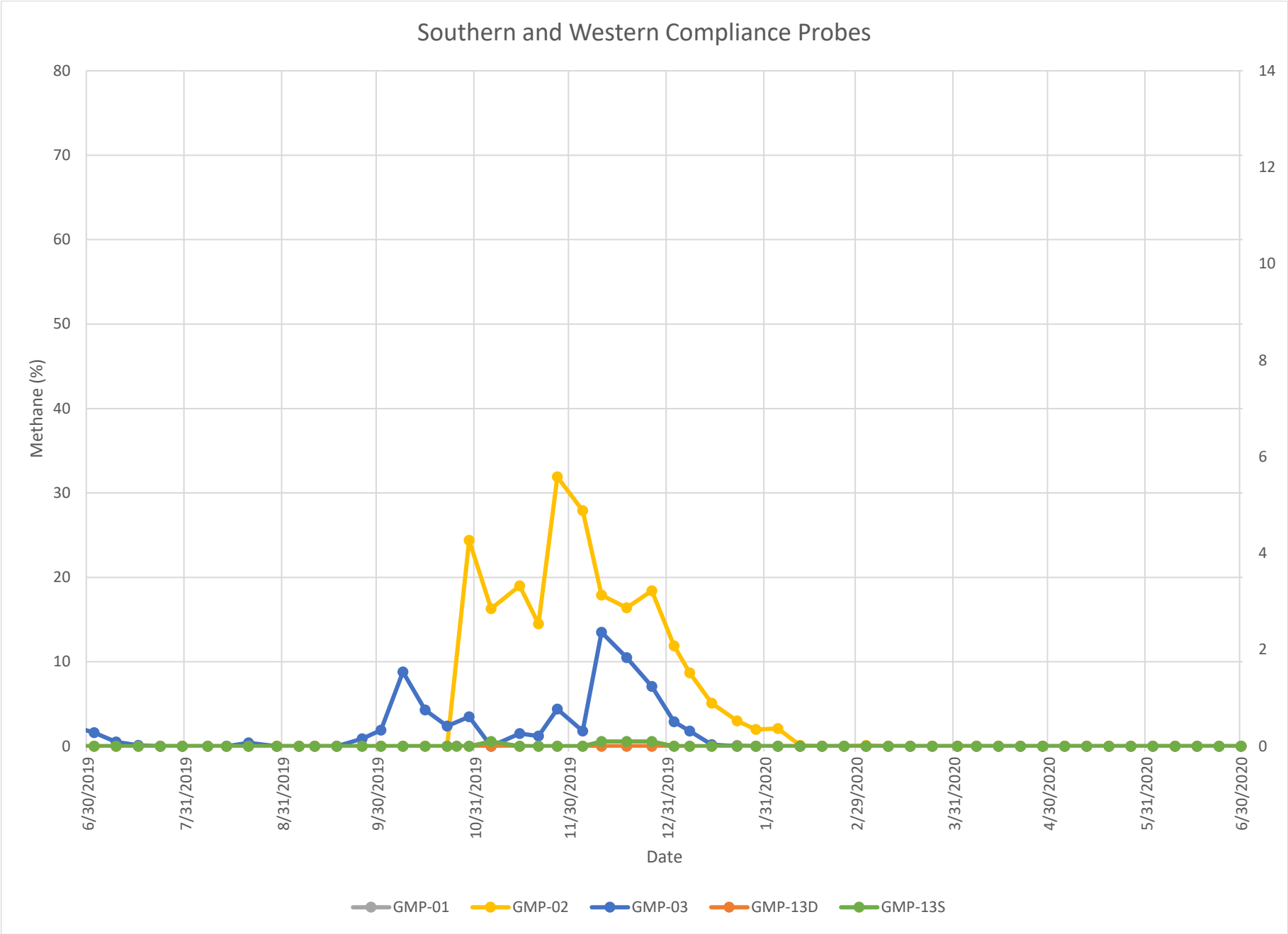
This section of the report will include at a minimum a review previous data, evaluate effectiveness of efforts made to control migration, and propose additional measures directed at eliminating detection levels in gas monitoring probes. As a regular procedure, these reports will be submitted by the 15th of each month following a calendar quarter.

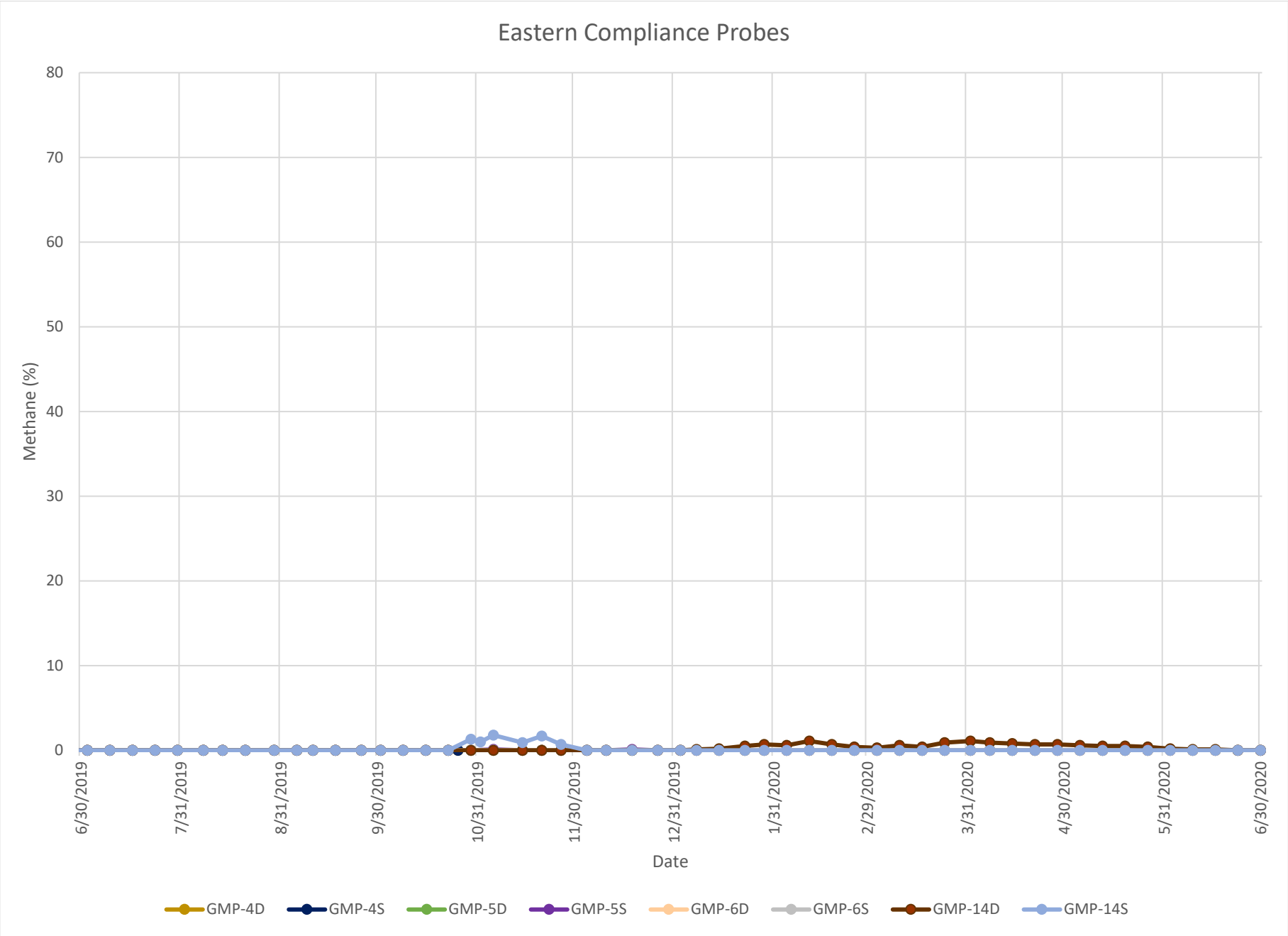
Bridgeton Landfill will continue to take aggressive action to control the impacts of the SSE, evaluate corrective measures to address methane migration within the weathered bedrock and improve gas collection within the limits of waste. Any major new gas migration control features needed--particularly those located outside the limit of waste--would be designed and sealed by a Missouri professional engineer and submitted to the MDNR for comment and approval.

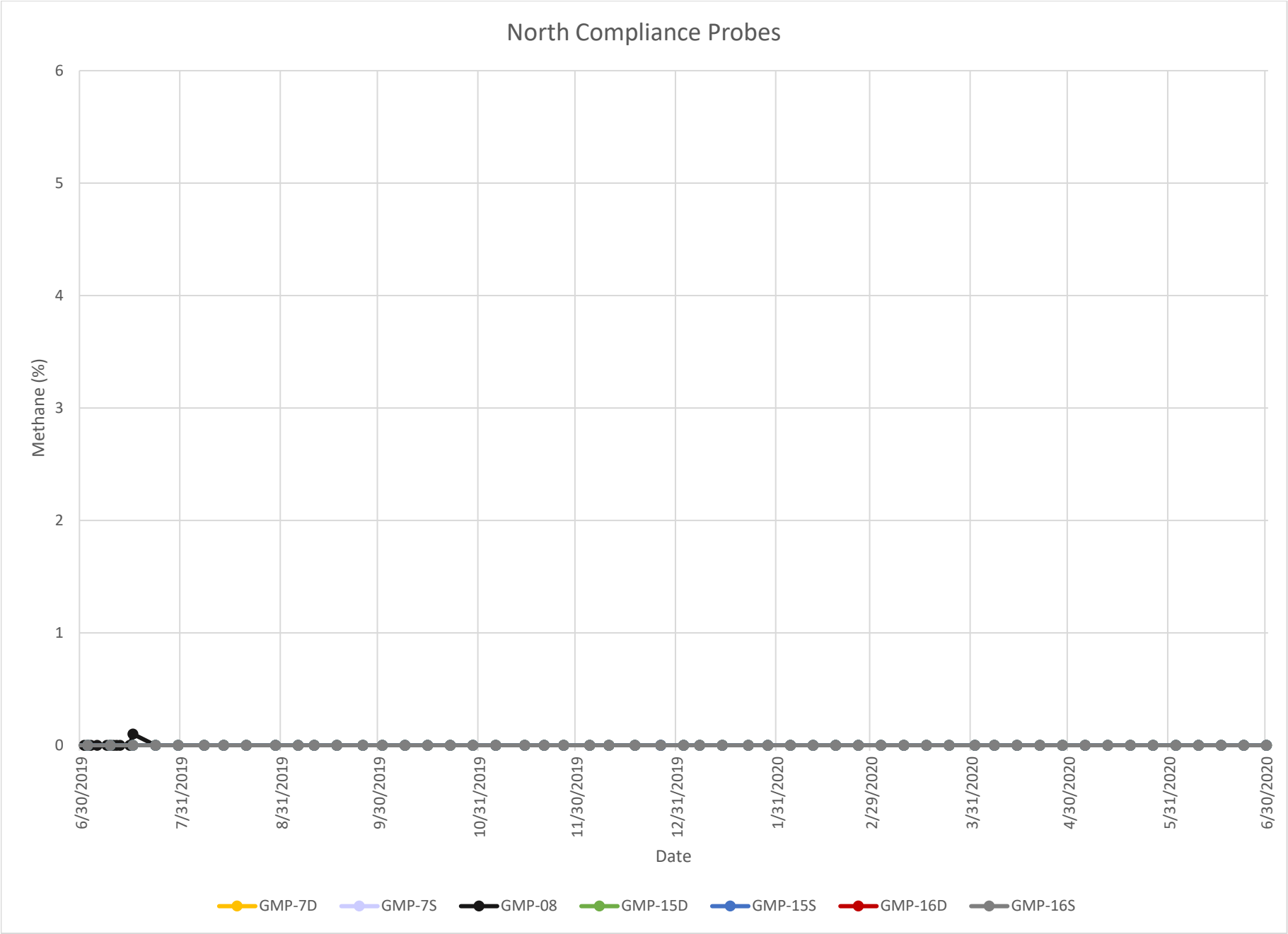
The MDNR will continue to provide ongoing review, comment, and approval of actions as it deems necessary. This reporting process will continue until Bridgeton Landfill demonstrates uninterrupted compliance with the MDNR's methane regulations (all compliance gas monitoring probes less than 2.5% methane) for a period of one year.

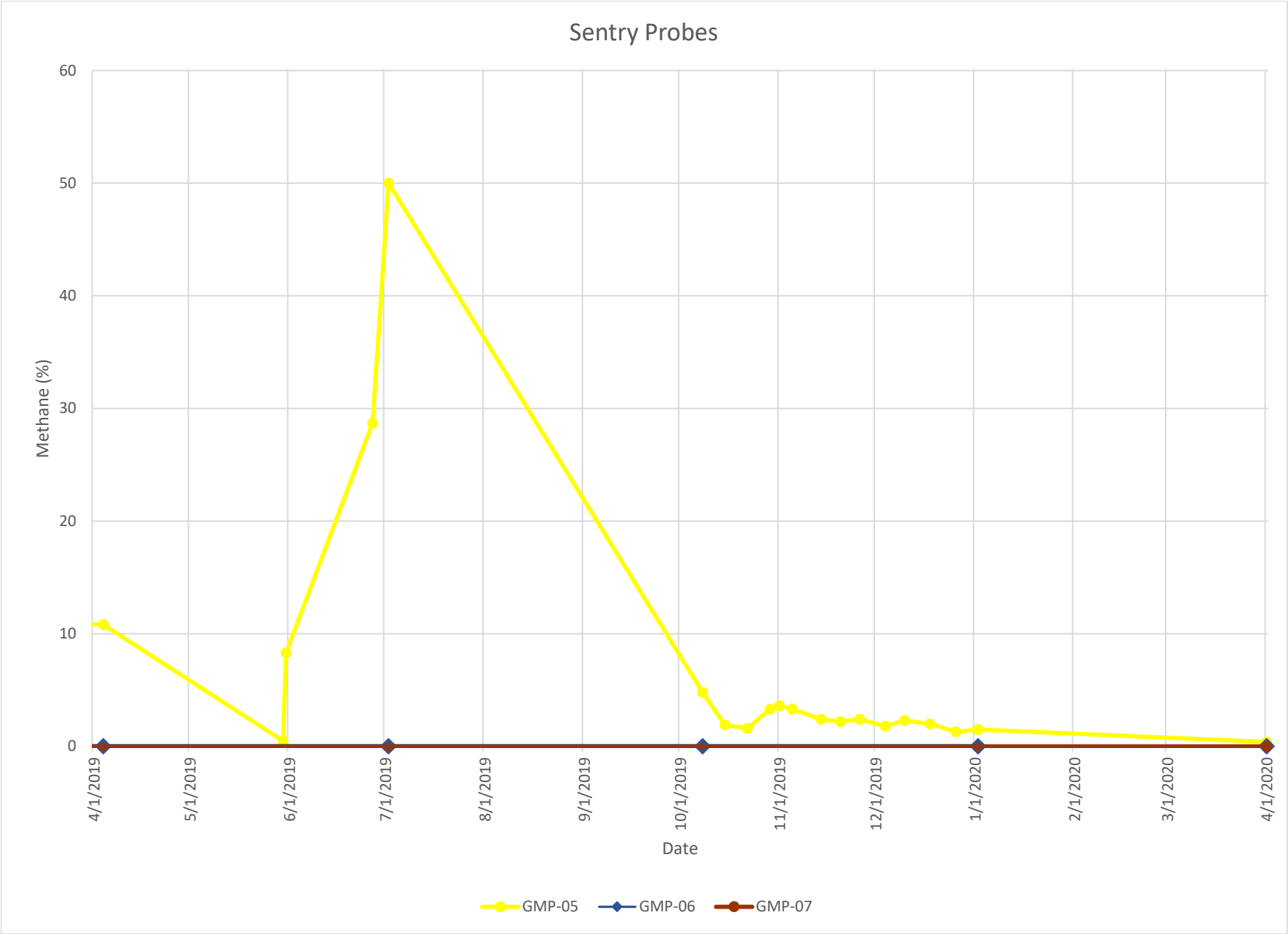
APPENDIX B

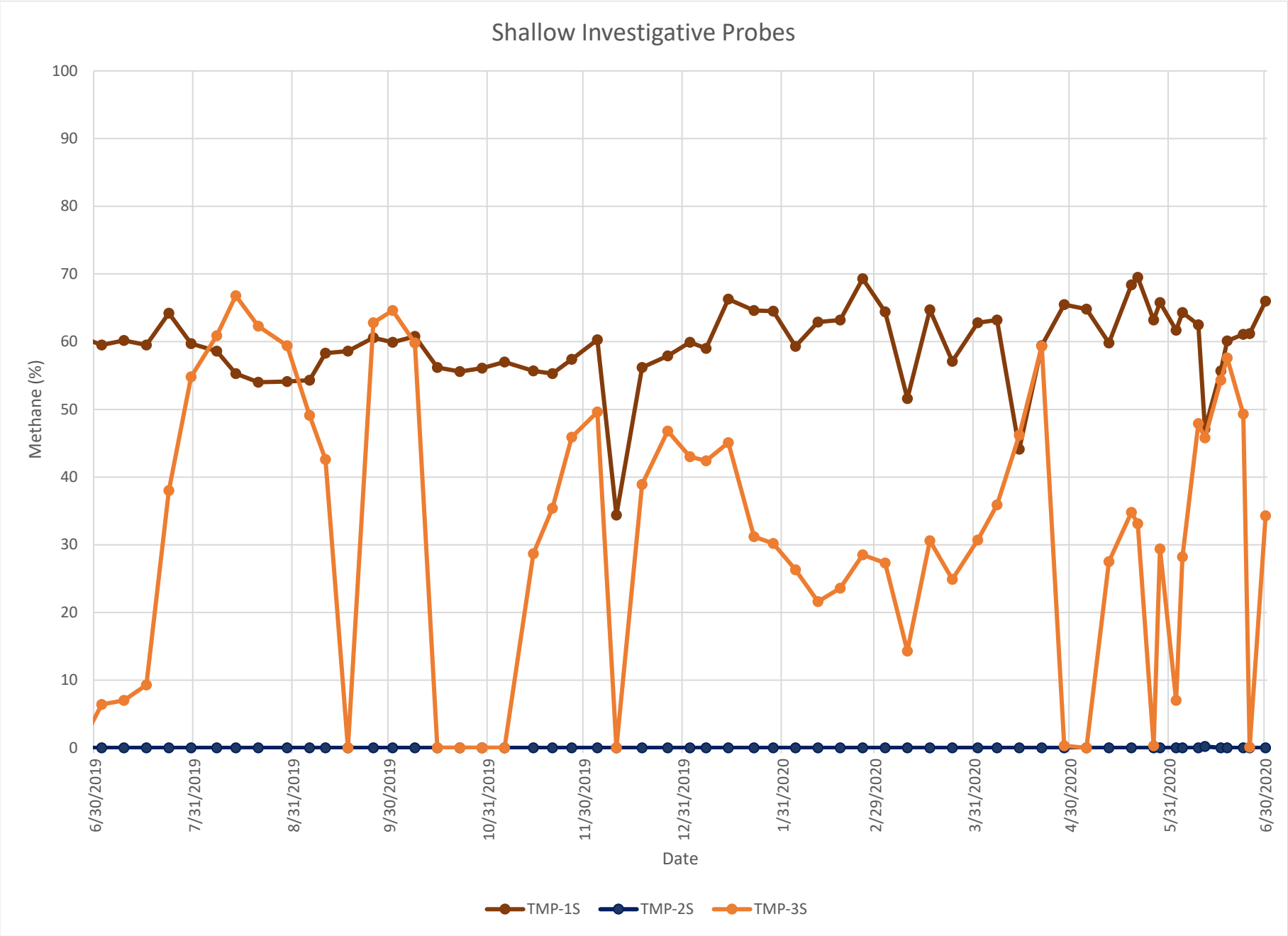
GAS MONITORING PROBE METHANE LEVEL GRAPHS

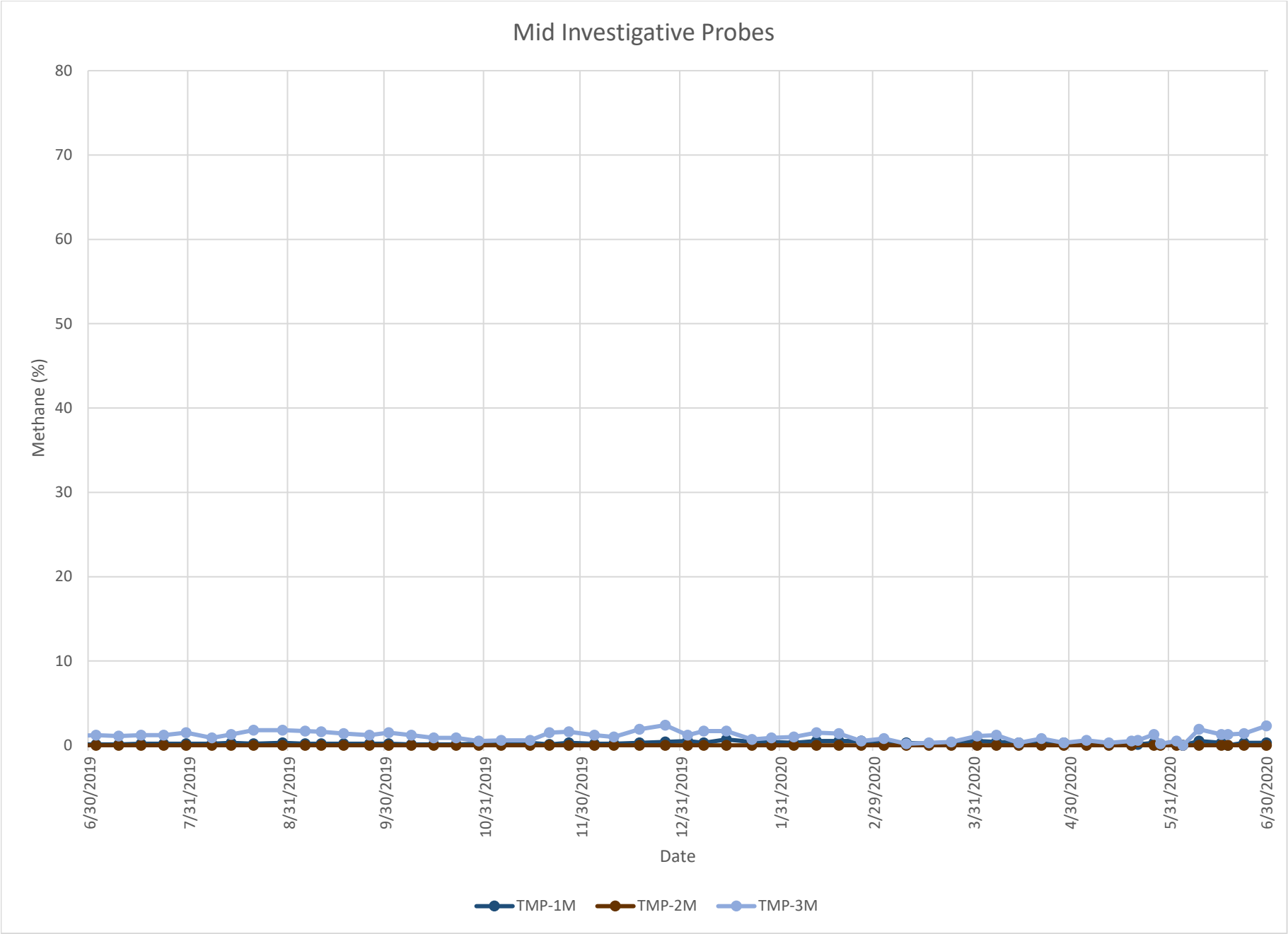

Southern and Western Compliance Probes
Methane (%)
80
70
60
50
40
30
20
10
0
14
12
10
8
6
4
2
0
6/30/2019
7/31/2019
8/31/2019
9/30/2019
10/31/2019
11/30/2019
12/31/2019
1/31/2020
2/29/2020
3/31/2020
4/30/2020
5/31/2020
6/30/2020
Date
GMP-01
GMP-02
GMP-03
GMP-13D
GMP-13S

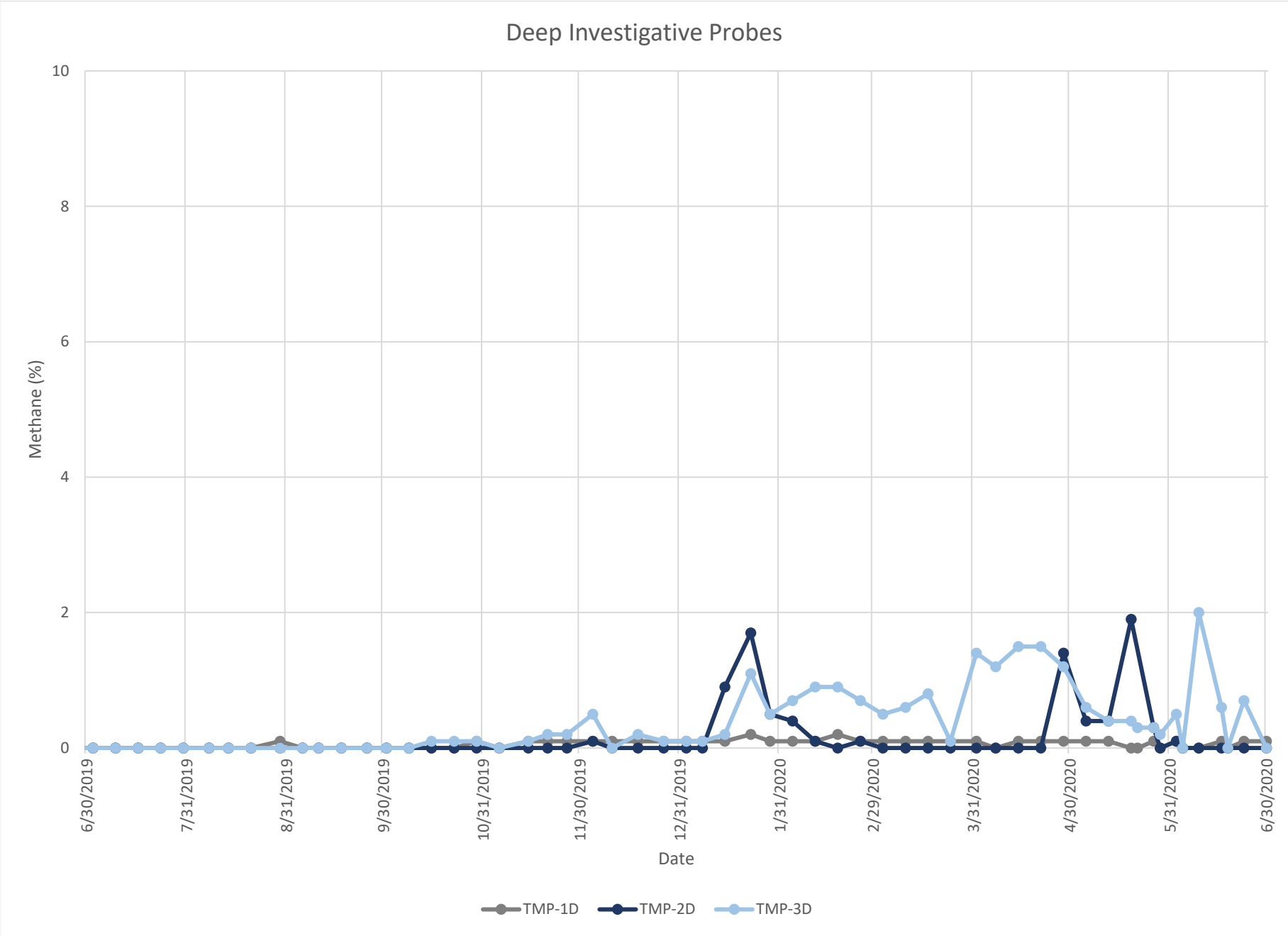

Eastern Compliance Probes
Methane (%)
80
70
60
50
40
30
20
10
0
6/30/2019
7/31/2019
8/31/2019
9/30/2019
10/31/2019
11/30/2019
12/31/2019
1/31/2020
2/29/2020
3/31/2020
4/30/2020
5/31/2020
6/30/2020
Date
GMP-4D
GMP-4S
GMP-5D
GMP-5S
GMP-6D
GMP-6S
GMP-14D
GMP-14S

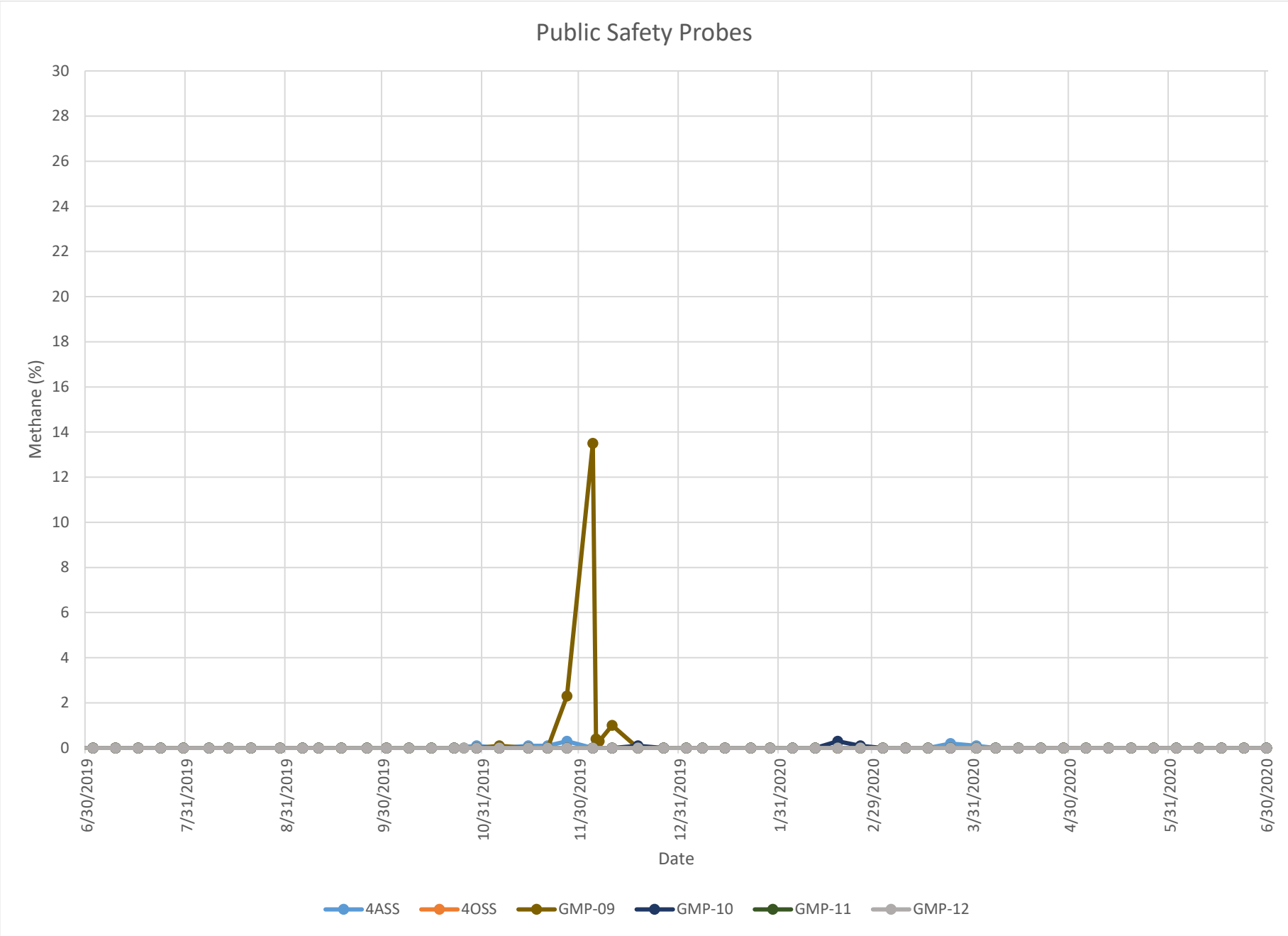

North Compliance Probes
Methane (%)
6
5
4
3
2
1
0
6/30/2019
7/31/2019
8/31/2019
9/30/2019
10/31/2019
11/30/2019
12/31/2019
1/31/2020
2/29/2020
3/31/2020
4/30/2020
5/31/2020
6/30/2020
Date
GMP-7D
GMP-7S
GMP-08
GMP-15D
GMP-15S
GMP-16D
GMP-16S


Sentry Probes
Methane (%)
60
50
40
30
20
10
0
4/1/2019
5/1/2019
6/1/2019
7/1/2019
8/1/2019
9/1/2019
10/1/2019
11/1/2019
12/1/2019
1/1/2020
2/1/2020
3/1/2020
4/1/2020
Date
GMP-05
GMP-06
GMP-07


Shallow Investigative Probes
Methane (%)
100
90
80
70
60
50
40
30
20
10
0
6/30/2019
7/31/2019
8/31/2019
9/30/2019
10/31/2019
11/30/2019
12/31/2019
1/31/2020
2/29/2020
3/31/2020
4/30/2020
5/31/2020
6/30/2020
Date
TMP-1S
TMP-2S
TMP-3S

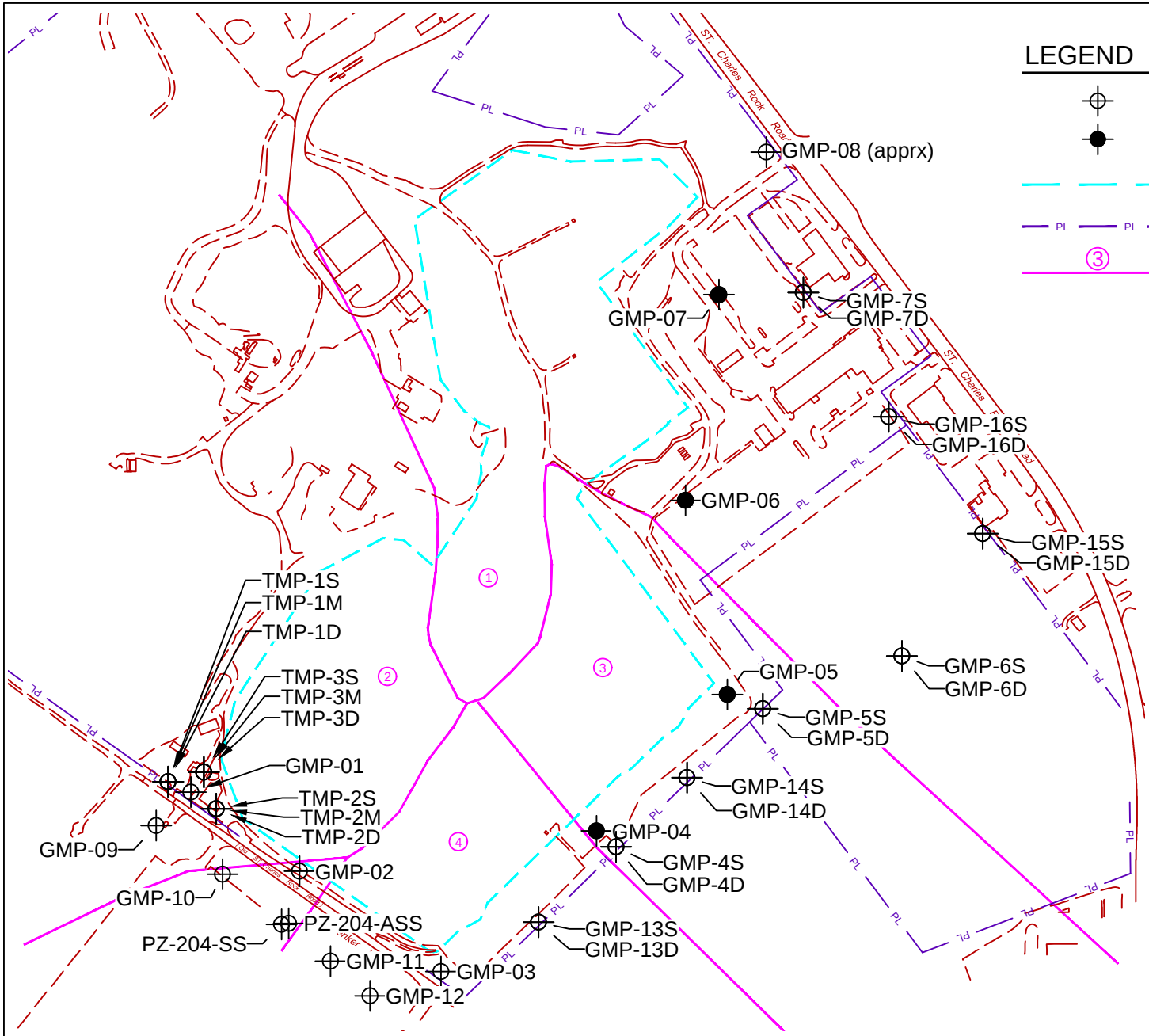

Mid Investigative Probes
Methane (%)
80
70
60
50
40
30
20
10
0
6/30/2019
7/31/2019
8/31/2019
9/30/2019
10/31/2019
11/30/2019
12/31/2019
1/31/2020
2/29/2020
3/31/2020
4/30/2020
5/31/2020
6/30/2020
Date
TMP-1M
TMP-2M
TMP-3M


Deep Investigative Probes
Methane (%)
10
8
6
4
2
0
6/30/2019
7/31/2019
8/31/2019
9/30/2019
10/31/2019
11/30/2019
12/31/2019
1/31/2020
2/29/2020
3/31/2020
4/30/2020
5/31/2020
6/30/2020
Date
TMP-1D
TMP-2D
TMP-3D


Public Safety Probes
Methane (%)
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
6/30/2019
7/31/2019
8/31/2019
9/30/2019
10/31/2019
11/30/2019
12/31/2019
1/31/2020
2/29/2020
3/31/2020
4/30/2020
5/31/2020
6/30/2020
Date
4ASS
4OSS
GMP-09
GMP-10
GMP-11
GMP-12

APPENDIX C

INFRASTRUCTURE SITE PLAN, GAS MONITORING PROBE LOCATIONS



LEGEND

- LFG WEEKLY MONITORING PROBE
- LFG QUARTERLY MONITORING PROBE
- PERMITTED WASTE LIMIT
- PROPERTY LINE
- QUADRANT BOUNDARIES

0 400 800 Feet

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

BRIDGETON LANDFILL
SITE INFRASTRUCTURE

GAS MONITORING PROBES

PROJECT NUMBER: BT-133

FILE PATH: C:\Users\plins\Dropbox (Feezor Engineering)\Bridgeton\100-149\BT-133 LFG\BT-133 2020\to file\gas monitoring system 2nd quarter 2014 - rev.7-8-2020.dwg

Engineering for a Better World
FEEZOR ENGINEERING, INC.

JULY 2020
DESIGNED BY: PML
APPROVED BY: ---

REVISION	DATE

DRAWING NO.:
001

APPENDIX D

2019 GCCS IMPROVEMENTS

AS-BUILT RECORD DRAWINGS FOR THE

BRIDGETON LANDFILL
2019 GCCS INSTALLATION

SEPTEMBER 2019
PREPARED FOR:

LOCATION MAP

N

Bridgeton Landfill, LLC

13570 ST. CHARLES ROCK ROAD
BRIDGETON, MISSOURI 63044

Engineering for a Better World
FEEZOR
ENGINEERING, INC.

3377 HOLLENBERG DRIVE
BRIDGETON, MO 63044
TEL. (217) 483-3118

INDEX OF DRAWINGS

	TITLE PAGE
001	GCCS PLAN VIEW
002	DETAILS

STATE OF MISSOURI
DANIEL RICHARD FEEZOR
NUMBER PE-030292
PROFESSIONAL ENGINEER
9-26-19

LEGEND

	SOLID WASTE BOUNDARY
Q	QUARRY WALL
GEW-38	GAS EXTRACTION WELL
PEW-20	PERIMETER GAS EXTRACTION WELL
SEW-63	SURFACE EXTRACTION WELL
CT-1	CONDENSATE SUMP
PEW-20	PERIMETER GAS EXTRACTION WELL
GIW-1	GAS INTERCEPTOR WELL
GIW-4	GAS INTERCEPTOR WELL/HEAT EXTRACTION POINT
GEW-38(S)	GAS EXTRACTION WELL WITH 4" STINGER
GEW-38	2019 GAS EXTRACTION WELL
4G 4G	4" ABOVE GROUND LFG COLLECTION LATERAL PIPING
6G 6G	6" ABOVE GROUND LFG COLLECTION LATERAL PIPING

0 60 120 Feet

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

DANIEL RICHARD FEEZOR
PE-030292

STATE OF MISSOURI
DANIEL RICHARD FEEZOR
NUMBER PE-030292
PROFESSIONAL ENGINEER
9/26/19

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-200912211

PROJECT
BRDIGETON LANDFILL
2019 GCCS INSTALLATION
BRIDGETON, ST. LOUIS COUNTY, MO

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

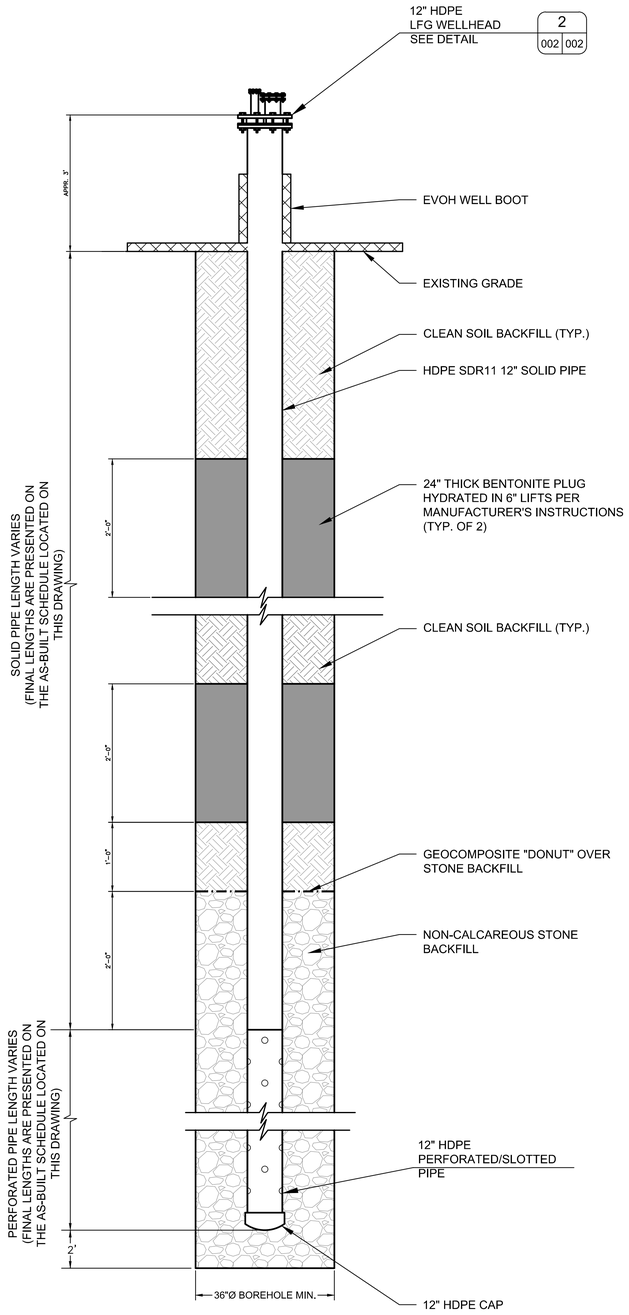
SEPTEMBER 2019
DESIGNED BY: AMR
APPROVED BY: DRF

DRAWING #
001

REVISIONS:	DATE	DSN.	APV.

DRAWING TITLE
2019 GCCS PLAN VIEW

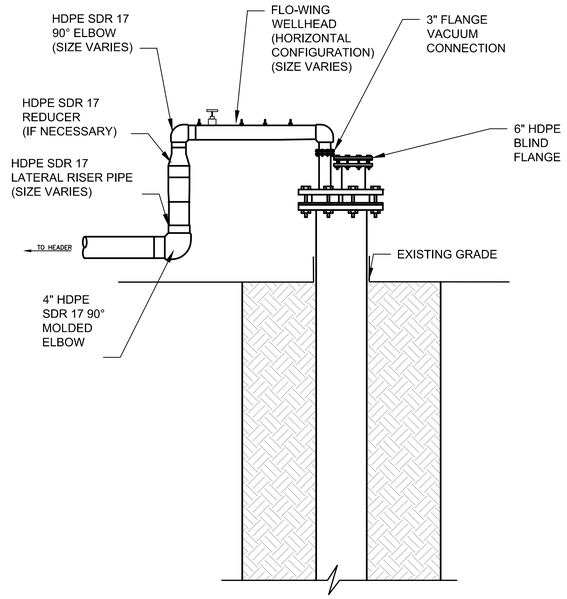
PROJECT NUMBER: BT-143-19 | FILE PATH: C:\Users\aaron\Dropbox (Feezor Engineering)\Bridgeton\100-149\BT-143 (2017 Gas Wells)\2019\6 - Report\1 - Appendices\C - Drawings



LFG EXTRACTION WELL DETAIL

1 | 001 | 002

NOT TO SCALE



GEW WELLHEAD DETAIL

2 | 002 | 002

NOT TO SCALE

NOTES:

1. CONTRACTOR WILL INSTALL BRIDGETON LANDFILL TYPICAL WELLHEAD.

2019 GCCS AS-BUILT WELL SCHEDULE

WELL ID	Northing	Easting	As-Built Survey	Db Boring Depth	Solid Pipe Above Grade	Solid Pipe Below Grade	Dp Perforated Pipe	Thickness of Gravel Pack
			(Feet MSL)	(Feet)	(Feet)	(Feet)	(Feet)	(Feet)
GEW-232	1,067,533.5	515,882.1	477.77	70	2.90	20	48	52
GEW-233	1,067,180.0	515,519.7	470.58	54	2.56	20	30	36
GEW-234	1,066,943.3	515,522.6	481.17	89	1.67	15	70	76
GEW-235	1,066,832.7	515,508.1	479.66	85	2.74	20	60	67
GEW-236	1,067,086.7	515,764.6	497.71	93	2.25	20	70	75
GEW-237	1,067,232.5	516,794.7	498.01	85	2.95	20	60	67
GEW-238	1,067,455.3	515,763.4	483.35	85	1.96	20	60	67
GEW-239	1,067,517.5	516,377.1	485.66	82	2.51	20	60	66
GEW-240	1,066,987.7	516,082.9	502.35	92	1.59	20	70	74

NOTES:

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

DANIEL RICHARD FEEZOR
PE-030292

STATE OF MISSOURI
DANIEL RICHARD FEEZOR
NUMBER PE-030292
PROFESSIONAL ENGINEER
9/24/19

PREPARED BY

Engineering for a Better World
FEEZOR ENGINEERING, INC.
3377 Hollenberg Dr, Bridgeton, MO 63044. Ph: 217-483-3118
Missouri State Certificate Of Authority #: E-200912211

PROJECT
BRIDGETON LANDFILL
2019 GCCS INSTALLATION
BRIDGETON, ST. LOUIS COUNTY, MO

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

SEPTEMBER 2019
DESIGNED BY: AMR
APPROVED BY: DRF

DRAWING # 002

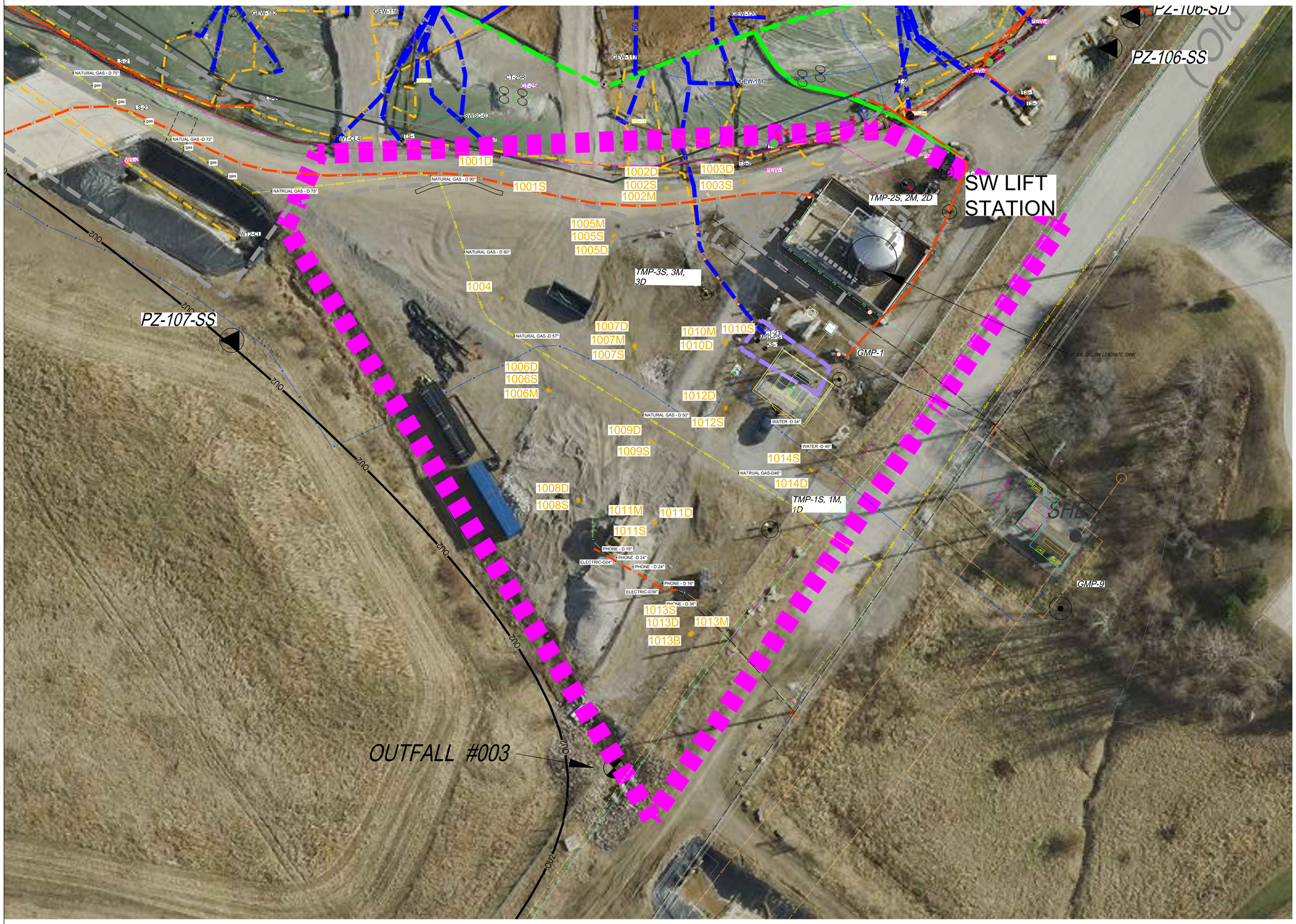
REVISIONS:	DATE	DSN	APV

DRAWING TITLE
GCCS DETAILS

PROJECT NUMBER: BT-143-19 | FILE PATH: C:\Users\andre\Dropbox (Feezor Engineering)\Bridgeton\100-140\BT-143 (2017 Gas Wells)\2019\6 - Report\1 - Appendices\C - Drawings

APPENDIX E

AS-BUILT BORING LOCATIONS – DRAWING 003 (FROM GEOPROBE AS-BUILT REPORT)



LEGEND

	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
HD-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
PL-7	PERIMETER LEACHATE SUMP
	WELL HEAD RISER
RR-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
OHP	OVERHEAD ELECTRIC LINE
UE	UNDERGROUND ELECTRIC LINE
SS	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
1001S	AS-BUILT GEOPROBE LOCATION

0 20 40 Feet

SCALE - 1" = 20'

NOTES:
- AERIAL TOPOGRAPHY PROVIDED BY COOPER AERIAL SURVEYS CO. AND IS DATED DECEMBER 10, 2019

DISCLAIMER:
THE EXISTENCE AND APPROXIMATE LOCATION OF UTILITIES KNOWN TO EXIST, AS SHOWN ON THESE DRAWINGS ARE BASED ON THE BEST INFORMATION PROVIDED TO FEI AT THE TIME OF THIS SUBMITTAL. THIS INFORMATION HAS BEEN PROVIDED TO FEI "AS-IS"AND FEI EXPRESSLY DISCLAIMS ANY REPRESENTATION OR WARRANTY AS TO THE COMPLETENESS OR ACCURACY OF THE INFORMATION FOR ANY USE. IT IS THE RESPONSIBILITY OF ANY PARTIES PERFORMING WORK TO VERIFY THE EXISTENCE, LOCATION AND STATUS OF ANY FACILITY. SUCH VERIFICATION INCLUDES DIRECT CONTACT WITH THE LISTED UTILITIES.

PREPARED BY
Engineering for a Better World
FEEZOR ENGINEERING, INC.
3377 Hollenberg Dr, Bridgeton, MO 63044. Ph: 217-483-3118
Missouri State Certificate Of Authority #: E 2009012211

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

MAY 2020
DESIGNED BY: AMR
APPROVED BY: DRF

DRAWING # 003

REVISIONS:	DATE	DSN.	APV.

DRAWING TITLE
AS-BUILT BORING LOCATIONS

PROJECT NUMBER: BT-209 | FILE PATH: C:\Users\ronrow\Dropbox (Feezor Engineering)\Bridgeton\BT-209 (Soil Gas CQA and PM)\1 - Project Management\1 - Design Layout\Soil Gas Work Plan Figures

ATTACHMENT G

SWANA Landfill Gas Operation and Maintenance Manual of Practices

The Solid Waste Association of North Americ

Landfill Gas Operation & Maintenance

Manual of Practice

SWANA®

SOLID WASTE ASSOCIATION
of North America

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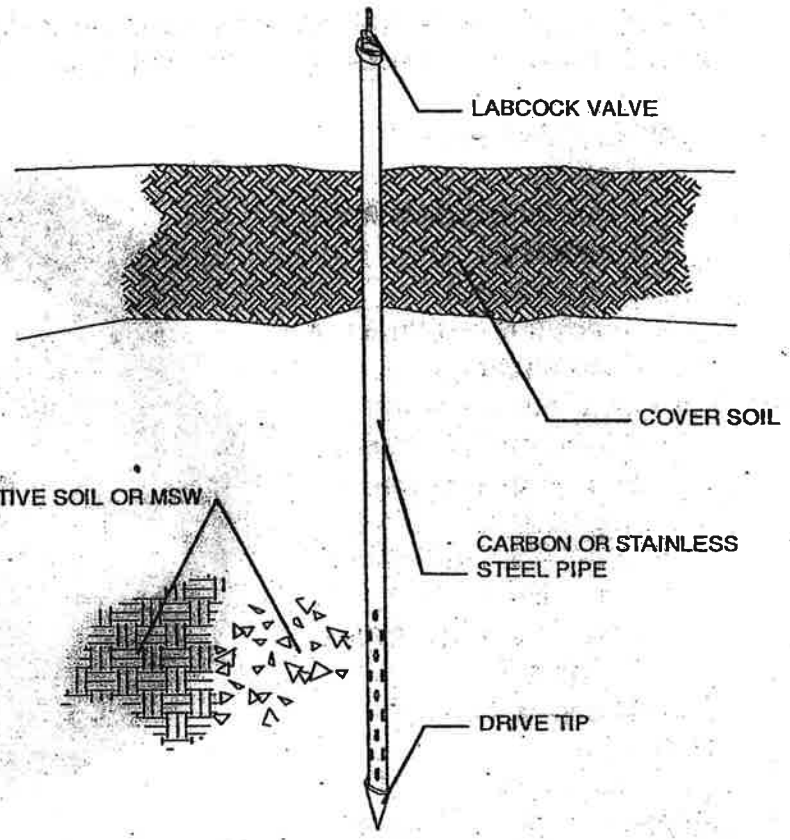


Figure 6.3
Typical Driven Gas Probe

6.3. PROBE MONITORING PROCEDURES

Prior to collection of probe monitoring data, the technician should obtain the following:

- A map showing probe locations and gas well locations
- Information on landfill depth
- As-built monitoring probe details
- As-built control well details
- Hydrologic/geologic reports

- A sample pump and knowledge of sample pump flow rate. Note sample pump may be integral to the monitoring instrument.

- Monitoring instruments:
  - Methane gas monitoring instrument (necessary)
  - Oxygen gas monitoring instrument (recommended)
  - CO_2 gas monitoring instrument (optional)
  - Low range pressure gages. (e.g., 0-.25, 0-.50, 0-1.0, 0-5, 0-10 in. w.c. scale ranges) (recommended) See Figure 6.4
- Connecting tubing and fittings, etc.
- Data logger (optional)
- Barometric data (obtainable from nearby airport) or barograph (optional)
- Reading sheets, clipboard, pen, etc.

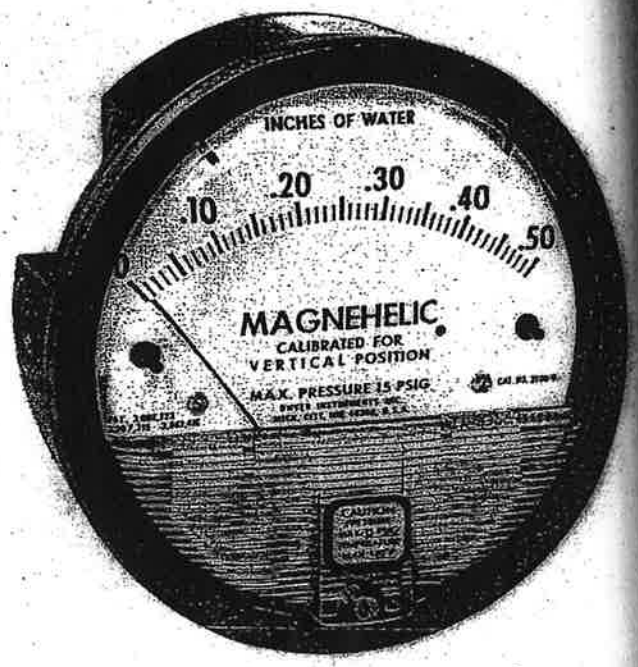


Figure 6.4

Typical Magnehelic™ Pressure Gage
Photo Credit - Dwyer Instruments

The steps in performing subsurface gas migration probe monitoring are as follows:

1) Measure and record the undisturbed probe pressure/vacuum. This requires connecting the pressure gauge to a labcock valve, quick connect, or other valve device and then opening the valve to measure the pressure.

2) Leak check the entire sample train. This is done by sealing the end of the monitoring hose and verifying that air does not leak into the sample train either through stoppage of the pump or maintaining a

complete seal. Air infiltration must not be allowed while probe purging and monitoring.

3) Purge the probe casing (piping). It is desirable for evaluative purposes to note both maximum and stabilized readings. Normally the stabilized reading is used. (Note: the high value may reflect some gas separation by preferential solubalization of CO_2 in liquid.) During the purging process observe and record the maximum methane concentration. This may be different than the steady state value. Based on probe casing volume and sample pump flow rate, determine the pumping time to pump just over two probe volumes from the casing using the sample pump. The probe casing should be sealed during purging. The objective is to monitor soil gas from void spaces surrounding the probe screened interval.

4) Read and record concentration of measured gases (methane, oxygen, and if necessary, carbon dioxide).

5) If the methane reading is slowly increasing as the probe is pumped, the value at two probe volumes is recorded. The objective is to record the conditions of the gas around the probe and not gases that can be pulled to the probe via the purging process.

Limit Monitoring to the Vapor Around the Probe Screened Interval

It is desirable to pump continually while monitoring to insure that steady state conditions are being monitored. To do this properly, the LFG technician should calculate the internal probe volume (see Appendix B.5). Apply the pump flow rate to determine the time required to evacuate two probe volumes.

High Methane Conditions May Give a False Negative

The technician should be particularly alert for temporary upscale meter needle deflection and return to zero or negative reading of the combustible gas indicator indicating an over scale or over range condition. Sufficient oxygen must be present to operate most combustible gas meters. Check the instrument operation manual for the required oxygen concentration and verify if the minimum concentration exists.

The following data should be recorded for each probe monitored:

- Name of person taking readings
- Date and time
- Ambient temperature
- Weather conditions
- Atmospheric pressure
- Probe identification and location
- Slot interval depth
- Probe pressure/vacuum
- Gas composition (methane, oxygen and CO_2).

Be careful to always note whether probe pressures are positive or negative, (i.e., pressure or vacuum). See Appendix C.2 for Sample Probe Monitoring Log.

Reseal the probe when finished monitoring. The probe should always remain sealed when not being monitored.

Some additional comments on probe sampling:

1) If gas samples are to be collected for trace constituent gas analysis, sample pump and all connecting tubing should be non-contaminating, (e.g., Teflon™ and stainless steel, etc.) Sampling

flow rate should range from about 1/3 to 2-3 liters per minute (lpm), at or very near atmospheric pressure and ambient temperature.

2) Samples may also be collected into a sample container (e.g., a Tedlar™ bag or Summa™ canister), and then analyzed using portable direct reading instruments or by an analytical laboratory by gas chromatography or mass spectrometer.

3) Certain direct reading methane instruments require that a minimum oxygen concentration be present to operate properly. Knowledge of a given instrument's requirements and limitations is necessary. Instruments typically used are combustible gas analyzers (CGAs), organic vapor analyzers using a flame-ionization detector (OVA/FID), and infrared analyzers. These units are discussed in detail in Chapter 16, Instrumentation.

4) Almost all oxygen cells, which operate on a partial pressure principle, must be calibrated at the elevation at which they are to be used, prior to actual use. Otherwise readings will be inaccurate. These cells are also subject to pressure changes in the instrument samples stream, e.g., sample pump pressure.

5) Newly installed probes should be allowed to stand free for at least 24 hours to allow soil gases to equilibrate prior to sampling.

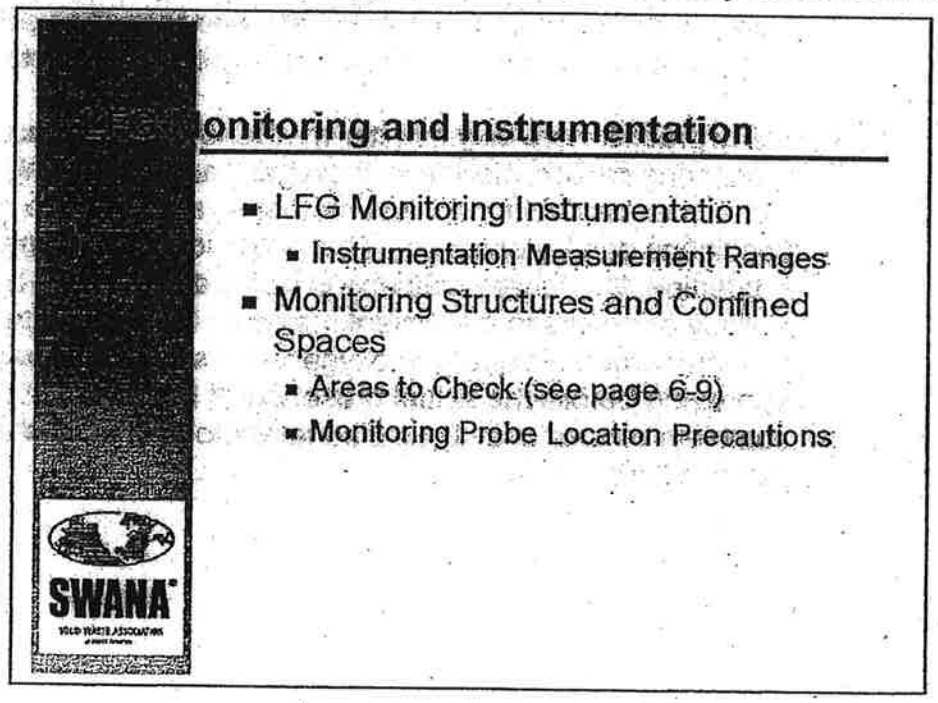
6) Many practitioners only monitor methane and pressure. By monitoring carbon dioxide and oxygen, and estimating nitrogen, rather than monitoring for just methane, a better idea of soil gas conditions can be obtained. This helps identify probes that are borderline, i.e., where methane is not present but its appearance is likely or occurs in a transient manner. This could be indicated by high carbon dioxide, low oxygen and sometimes low nitrogen appearing before the actual presence of methane. A more complete picture of soil gas also tends to confirm the accuracy of the monitoring data.

Trace Methane May Indicate a Larger Problem

As explained in previous sections, LFG tends to migrate away from the landfill and accumulate in confined spaces. The occurrence and accumulation of methane is sometimes transient. The presence of slight amounts of methane less than the LEL (5% UEL) is an indication that more may accumulate under other conditions if corrective action is not taken. If methane is detected in concentrations greater than 15 percent (the UEL) by volume, there is always the potential for an explosive methane-air "front" that could be formed nearby by dilution.

LFG Migration Can Deplete Oxygen

A second serious hazard is oxygen deficiency which may cause death by



asphyxiation. As LFG builds up it displaces air, hence oxygen in the gas inhaled. The legal limit for oxygen deficiency may vary by state but 19.5 percent is a safe number to use (and is the most stringent). It is imperative that confined space regulations and procedures be followed before personnel enter any confined spaces or any location where oxygen deficiency could occur. Under certain circumstances special "permitted entry" requirements apply. Information on confined space entry regulations and procedures is in Chapter 19, Safety.

Methane and carbon dioxide are gases which may be present from sources other than the landfill. Field instruments cannot differentiate between the sources of these compounds.

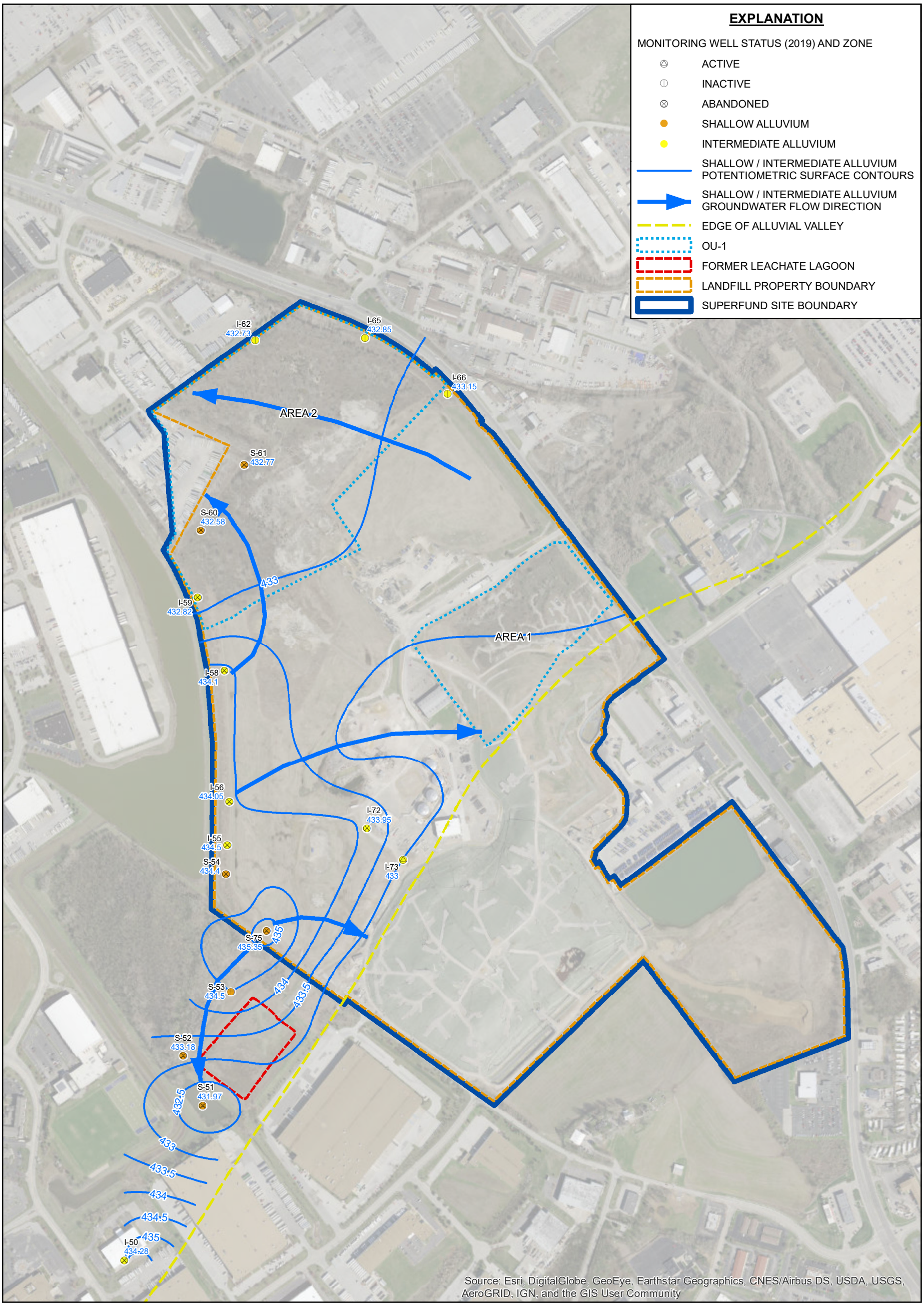
6.4. LFG Monitoring Instrumentation

Pressure, methane, carbon dioxide,, and balance gas (indicating nitrogen) indicators are used to monitor LFG probes. A portable organic vapor analyzer/flame ionization detector (OVA/FID) is sometimes used to measure very low levels of combustible gas or volatile organic compounds. (The OVA/FID is also useful for monitoring surface emissions, identifying piping and equipment fugitive leaks or monitoring human exposure in specialized applications.) Table 6.1, "Typical Instrumentation Measurement Ranges", shows the measurement range for some monitoring instrumentation. Monitoring for methane in the parts per million range is not normally necessary for monitoring gas migration. It is necessary to have a thorough understanding of the principles of operation, operating procedures and maintenance of these instruments in order to perform accurate monitoring. The operator must also understand the operating limitations of the instruments. There is more discussion of LFG instrumentation in Chapter 16, Instrumentation.

TABLE 6.1 - Typical Instrumentation Measurement Ranges

ATTACHMENT H

Groundwater Elevation Contour Maps



NOTE:

ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 600 '

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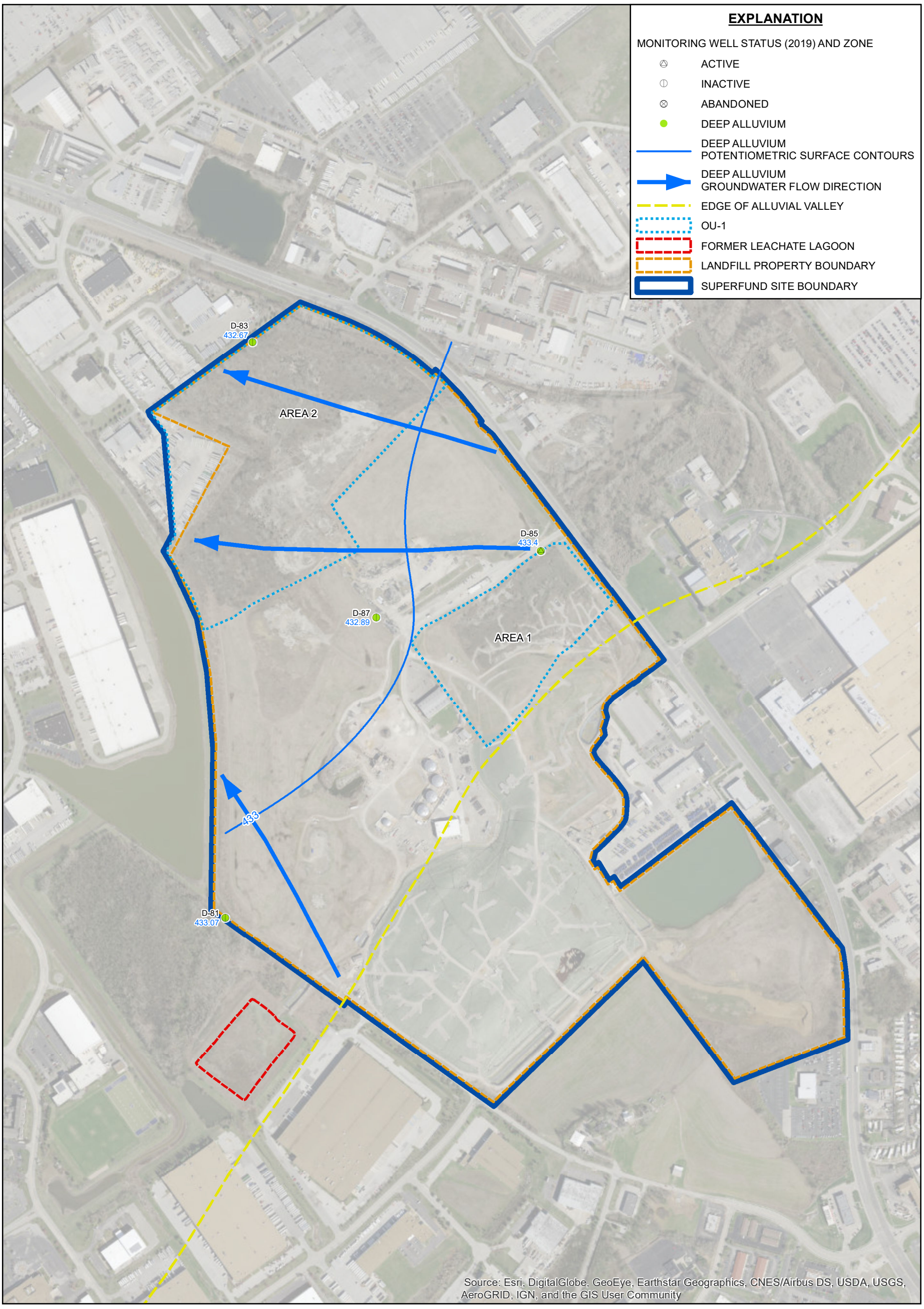
FIGURE 3-12a

MISSOURI RIVER SHALLOW/INTERMEDIATE ALLUVIUM GROUNDWATER ELEVATION CONTOUR MAP OCTOBER 26, 1984

WEST LAKE LANDFILL OU-3 REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 4/21/20	File: 3-12a_19841026PS_S_Fig3-12a.mxd

M:\WTO2\WESTLAKELANDFILL_ACP\GIS\MAPPING\202203_RIFS_WP\3-12A_19841026PS_S_FIG3-12A.MXD



NOTE:

ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 600'

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FIGURE 3-12b

MISSOURI RIVER DEEP ALLUVIUM GROUNDWATER ELEVATION CONTOUR MAP OCTOBER 26, 1984

WEST LAKE LANDFILL OU-3 REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 4/21/20	File: 3-12b_19841026PS_D_Fig3-12b.mxd

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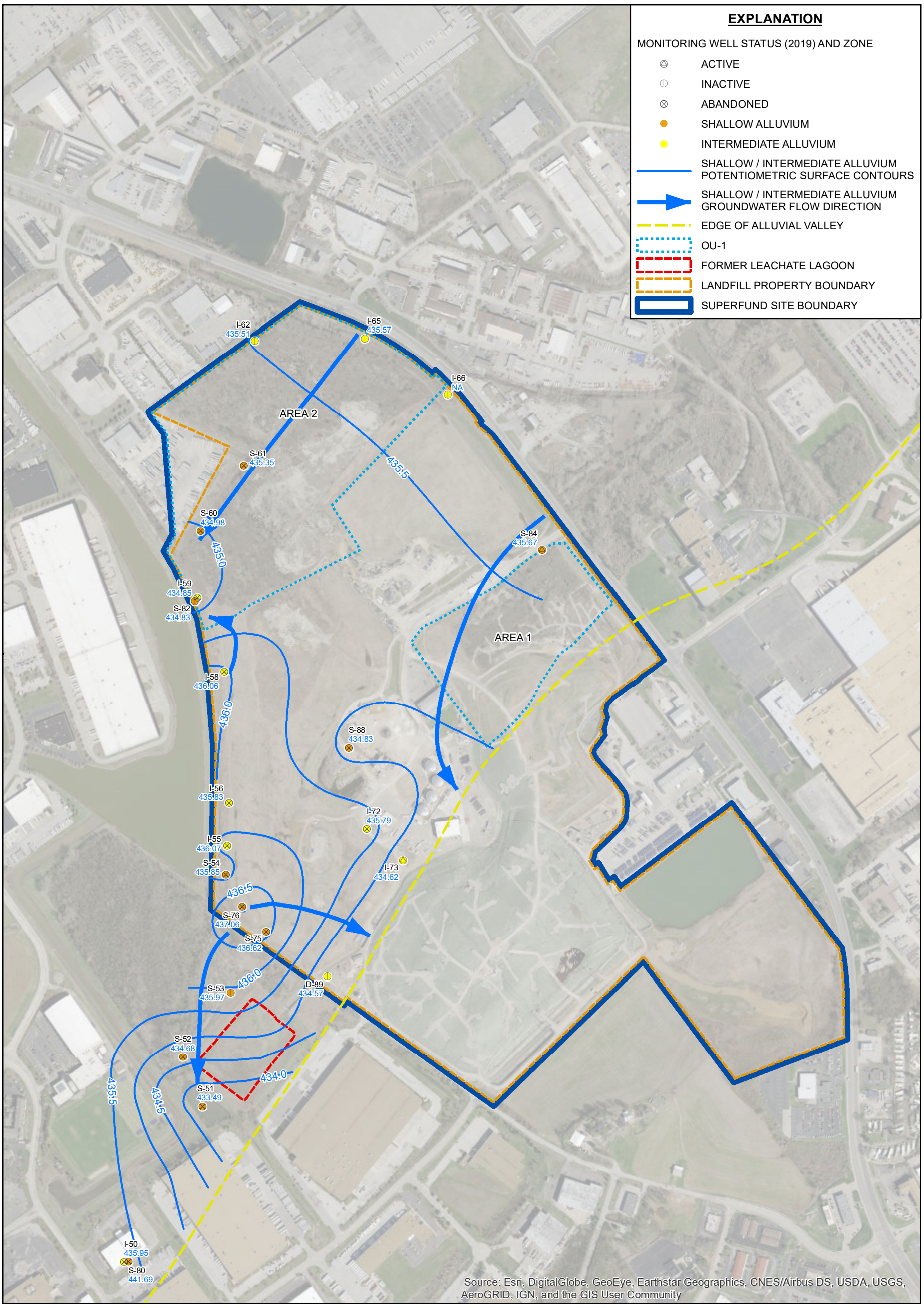

NOTE:

ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 600'

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FIGURE 3-13a

MISSOURI RIVER SHALLOW/INTERMEDIATE ALLUVIUM GROUNDWATER ELEVATION CONTOUR MAP APRIL 25, 1985

WEST LAKE LANDFILL OU-3 REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 4/21/20	File: 3-13a_19850425PS_S_Fig3-13a.mxd

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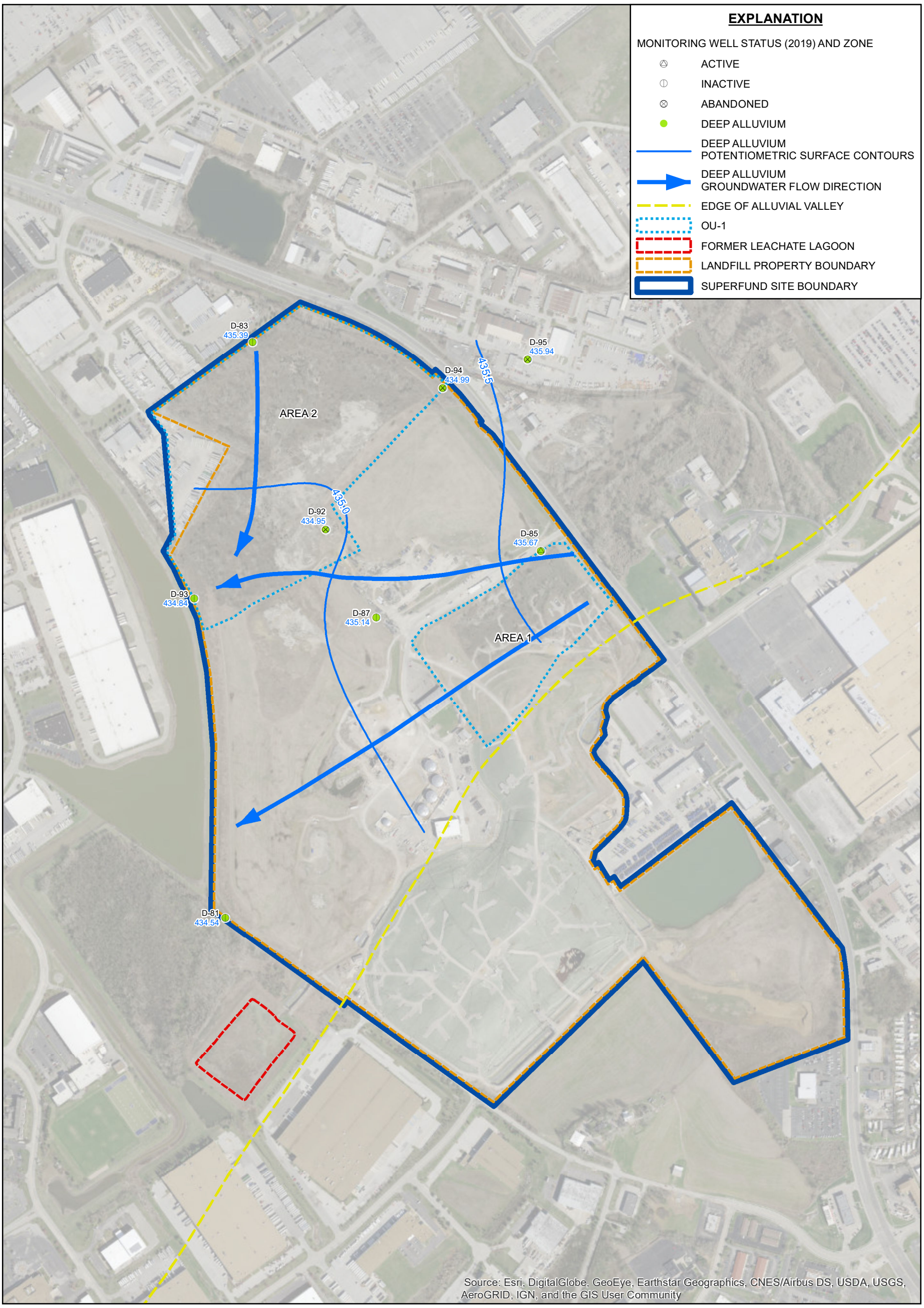

NOTE:

ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 600'

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FIGURE 3-13b

MISSOURI RIVER DEEP ALLUVIUM GROUNDWATER ELEVATION CONTOUR MAP APRIL 25, 1985

WEST LAKE LANDFILL OU-3 REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 4/21/20	File: 3-13b_19850425PS_D_Fig3-13b.mxd

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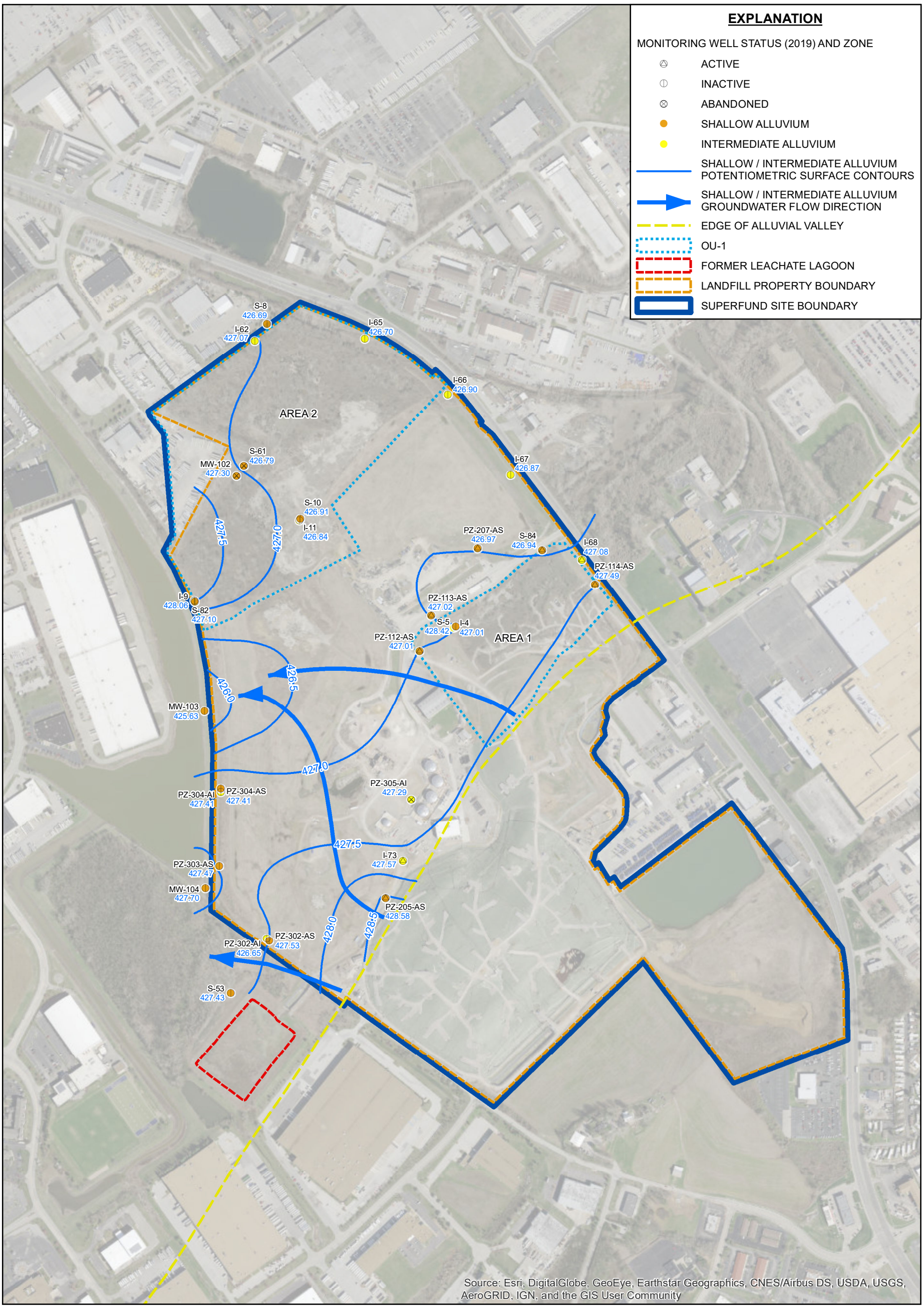

NOTES:

1. MONITORING WELLS S-5 AND PZ-302-AI NOT CONTOURED
2. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 600'

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FIGURE 3-14a

MISSOURI RIVER SHALLOW/INTERMEDIATE ALLUVIUM GROUNDWATER ELEVATION CONTOUR MAP APRIL 2, 2013

WEST LAKE LANDFILL OU-3 REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 4/21/20	File: 3-14a_201304MA_S_Fig3-14a.mxd

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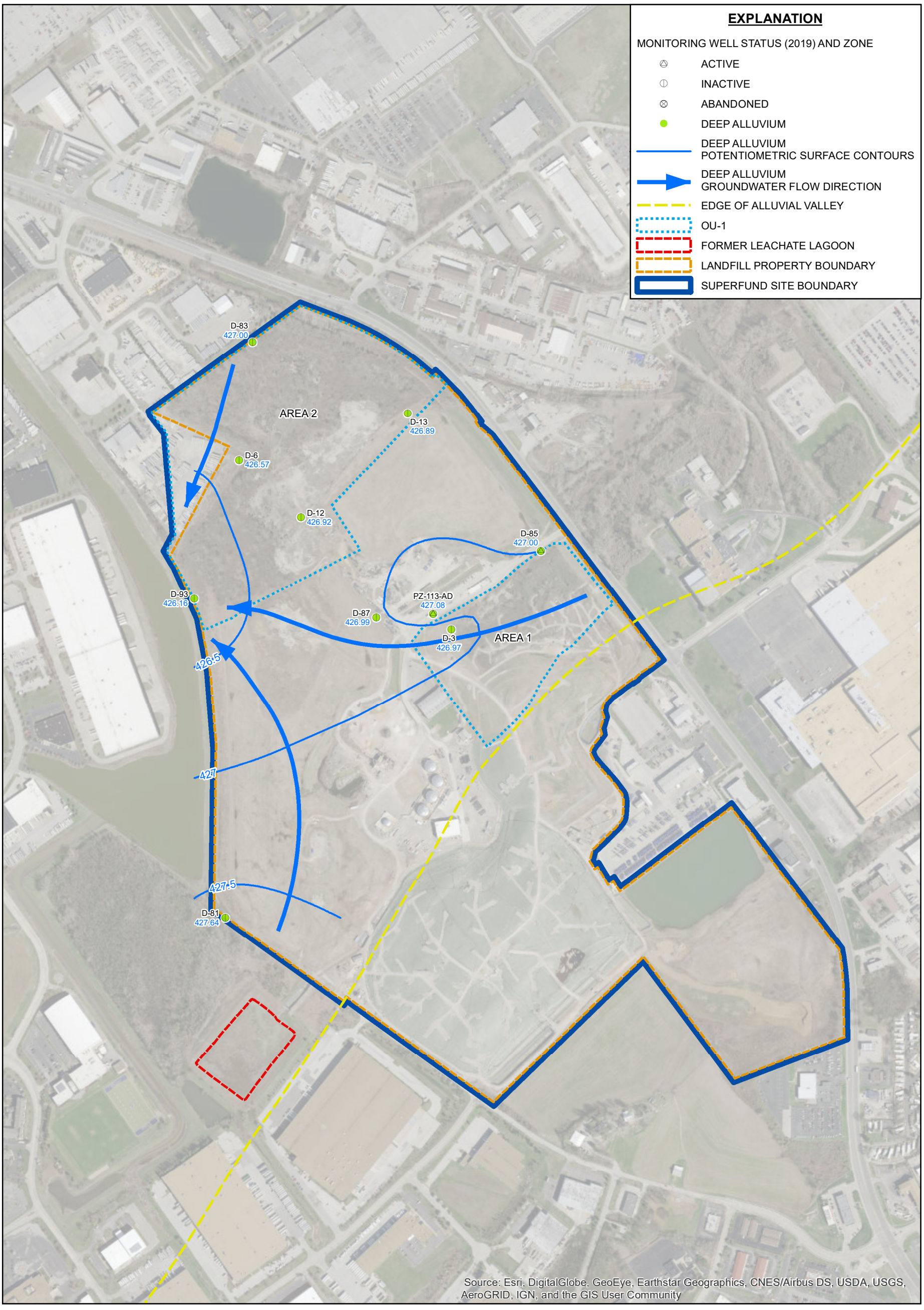

NOTES:

1. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 600'

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FIGURE 3-14b

MISSOURI RIVER DEEP ALLUVIUM GROUNDWATER ELEVATION CONTOUR MAP APRIL 2, 2013

WEST LAKE LANDFILL OU-3 REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 4/21/20	File: 3-14b_201304MA_D_Fig3-14b.mxd

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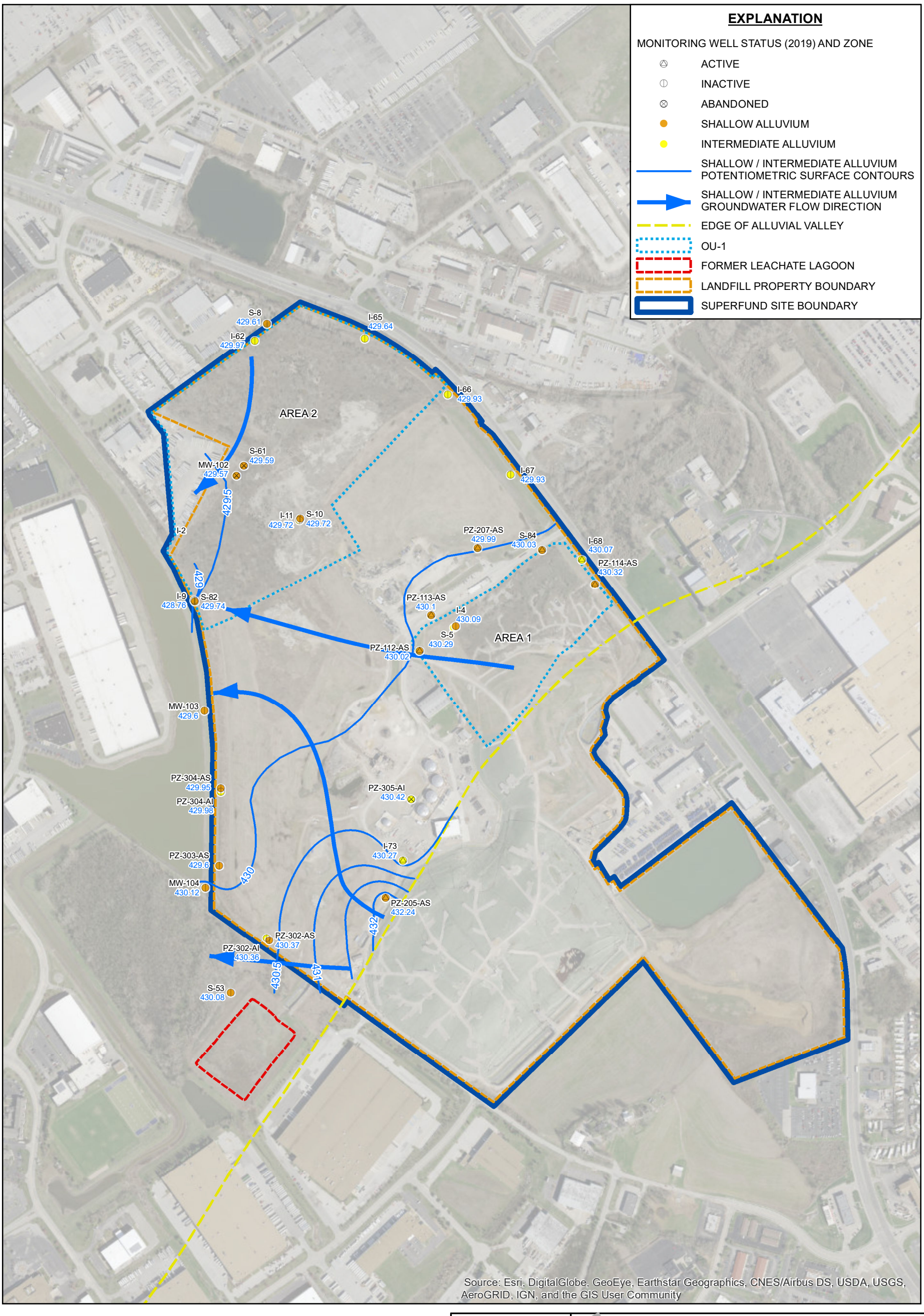

NOTES:

1. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 600'

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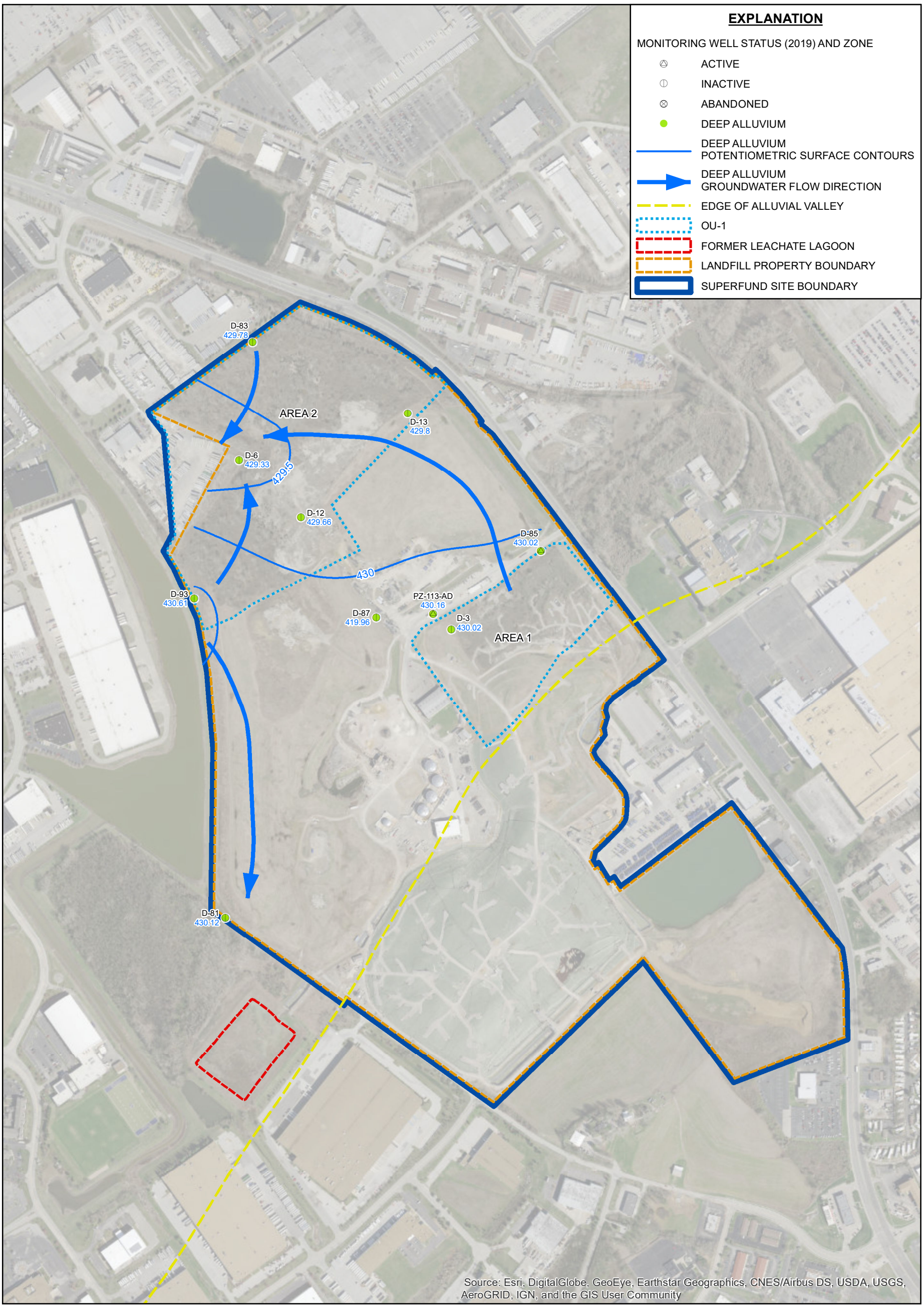
FIGURE 3-15a

MISSOURI RIVER SHALLOW/INTERMEDIATE ALLUVIUM GROUNDWATER ELEVATION CONTOUR MAP SEPTEMBER 30, 2013

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 4/21/20	File: 3-15a_201309MA_S_Fig3-15a.mxd

M:\WTOZ\WESTLAKELANDFILL_ACP\GIS\MAPPING\202003_RIFS_WP\3-15A_201309MA_S_FIG3-15A.MXD



NOTES:

1. MONITORING WELL D-87 NOT CONTOURED DUE TO POSSIBLE GAUGING ERROR
2. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 600'

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FIGURE 3-15b

MISSOURI RIVER DEEP ALLUVIUM GROUNDWATER ELEVATION CONTOUR MAP SEPTEMBER 30, 2013

WEST LAKE LANDFILL OU-3 REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 4/21/20	File: 3-15b_201309MA_D_Fig3-15b.mxd

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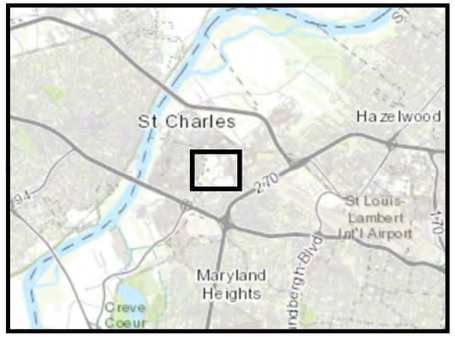
ATTACHMENT B JANUARY 2021 POTENTIOMETRIC SURFACE MAPS



Legend

- Well Location
- 456.87 Groundwater Elevation (ft. amsl)
- Groundwater Elevation Contour
- OU-1
- Former Leachate Lagoon
- Landfill Property Boundary
- Superfund Site Boundary
- Bridgeton Landfill Boundary
- Edge of Alluvium (approximate)

NOTES:

1. Aerial Imagery: Cooper Aerial Surveys Inc., from December 10, 2020
2. amsl = Above Mean Sea Level
3. For well clusters, the lowest value was included during contouring.
4. The alluvium is a single hydrostratigraphic unit; therefore, the shallow, intermediate and deep units were combined.
5. * = Well measurement not used in contouring.
6. ^ = Anomalous head value, not utilized in contouring

N

0 250 500 1,000
Feet

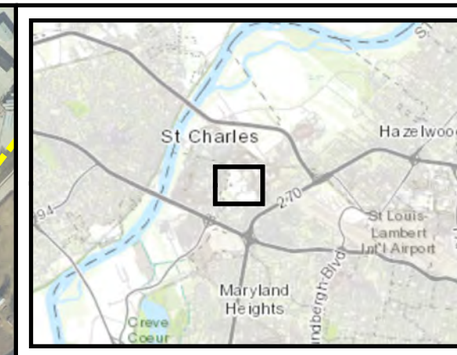
Alluvium Potentiometric Surface Map

January 2021
West Lake Landfill OU-3
Bridgeton, Missouri

ERM

Q:\Boston\term\MMV\Clients_V_Z\WestLake\WestLakeLandfill_MO\MXD\GW_Contours\202111_January\WestLake_GWContours_January2021_Alluvium_20210412.mxd -- Sarah Poulin -- 4/26/2021

ATTACHMENT C FEBRUARY 2021 POTENTIOMETRIC SURFACE MAPS



Legend

- Well Location
- 456.87 Groundwater Elevation (ft. amsl)
- Groundwater Elevation Contour
- OU-1
- Former Leachate Lagoon
- Landfill Property Boundary
- Superfund Site Boundary
- Bridgeton Landfill Boundary
- Edge of Alluvium (approximate)

NOTES:

1. Aerial Imagery: Cooper Aerial Surveys Inc., from December 10, 2020
2. amsl = Above Mean Sea Level
3. For well clusters, the lowest value was included during contouring.
4. The alluvium is a single hydrostratigraphic unit; therefore the shallow, intermediate and deep units were combined.
5. * = Well measurement not used in contouring.
6. Inward-facing groundwater contour hatches indicate a localized depression in water elevations.

N

0 250 500 1,000

Feet

Alluvium Potentiometric Surface Map

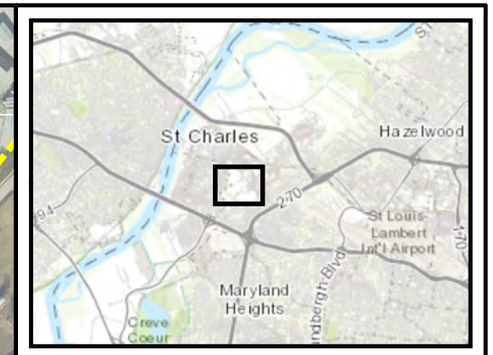
February 2021

West Lake Landfill OU-3

Bridgeton, Missouri

ERM

ATTACHMENT D MARCH 2021 POTENTIOMETRIC SURFACE MAPS



Legend

- Well Location
- 456.87 Groundwater Elevation (ft. amsl)
- Groundwater Elevation Contour
- OU-1
- Former Leachate Lagoon
- Landfill Property Boundary
- Superfund Site Boundary
- Bridgeton Landfill Boundary
- Edge of Alluvium (approximate)

NOTES:

1. Aerial Imagery: Cooper Aerial Surveys Inc., from December 10, 2020
2. amsl = Above Mean Sea Level
3. For well clusters, the lowest value was included during contouring.
4. The alluvium is a single hydrostratigraphic unit; therefore, the shallow, intermediate and deep units were combined.
5. * = Well measurement not used in contouring.
6. ^ = Anomalous head value, not utilized in contouring
7. NM = Not measured; the OU-3 Respondents do not have legal access to this well location

N

0 250 500 1,000

Feet

Alluvium Potentiometric Surface Map

March 2021

West Lake Landfill OU-3

Bridgeton, Missouri

ERM

ATTACHMENT I

Job Safety Analysis or Task Hazardous Analysis

Geosyntec consultants

TASK HAZARD ANALYSIS (Ver. 2, June 2015)

Geosyntec HS Procedures referenced herein are available on Geosyntec's H&S SharePoint site and should be consulted, as appropriate, per project-specific needs. This THA prepared per HS-106-Accident Prevention Program, HS-204-Task Hazard Analysis, and meets the requirements for a "Site-Specific Health and Safety Plan" per Geosyntec HS Procedures and regulations referenced herein (see Section B.14.).

PART A – SITE SAFETY PLAN

A.1. PROJECT/TASK INFORMATION

TASK:	Landfill Gas Monitoring		
Project Name:	West Lake Landfill OU-2	**Project Number/Org:**	CHE8424
Project Address:	13570 St Charles Rock Rd, Bridgeton, MO 63044		
Description of Task & Worksite:	The work to be conducted will consist of: monitoring existing gas probes for concentrations of methane, carbon dioxide, oxygen, and vacuum/pressure using a landfill gas meter.		
Geosyntec Personnel	**Name**	**Desktop Office Phone**	**Cell Phone**
Site Lead/HS Officer	Tom Ward	636-812-0803	636-459-9835
Project Manager	Jesse Varsho	630-203-3349	630-803-2659
Project Director	Paul Sabatini	630-203-3352	312-504-3569
HS Coordinator	James Bannantine	262-834-0227	414-339-5630
Regional HS Mngr.	Joe Esseichick	720-509-8906	734-417-0909
Corp. HS Director	Dale Prokopchak	804-332-6376	804-349-8067
Client Contact(s):	Dana Sincox	314-656-2116	314-313-0838
Subcontractor(s):	☐ Not Applicable ☒ Applicable, provide contact information below:		
	TBD		

A.2. EMERGENCY RESPONSE

Based on analysis of worksite factors, client/regulatory requirements, availability of emergency services.

Consider all Relevant Risk Factors & Response Procedures *(fire/explosion, medical, chemicals/spills, security, site factors, weather, communications).*
EXPLANATORY NOTES, CLARIFICATIONS:

Available Means of Jobsite Emergency Communication/Alerting	☒ Verbal ☒ Cell Phone ☐ Land Line ☒ 2-Way Radio ☒ On-site alarm/signal system ☐ Other:
To Summon Emergency Services Police, Fire, Ambulance	☒ **DIAL 911**, for external responders ☐ **Other**:
Other Emergency Contacts, as needed *(such as security, spill responder, utility):*	
Nearest Emergency Medical Services	Hospital Name: SSM Health DePaul Hospital – St. Louis Address: 12303 De Paul Dr, Bridgeton, MO 63044 Phone #: (314) 344-6000 ☒ See Attached Directions
For **Non-Emergency Urgent Care**	☒ Contact WorkCare, 24/7 at: 888-449-7787 ☐ Other:
Job-site **Evacuation** Procedure, Rally Point, Place of refuge:	Leave location and head towards the site entrance.
Special Emergency Equipment/Procedures	N/A

IMPORTANT: After initial emergency response actions and incident stabilization, contact appropriate project personnel listed in Part A.1.

A.3. SUMMARY OF WORK STEPS, HAZARDS, CONTROLS

Based on **PART B, "HAZARD ANALYSIS,"** and worksite/client/project factors.

Summary/outline of work steps/hazards/controls, with references to applicable Sections in Parts B and C, as applicable: Mobilize to existing gas probes and measure/record concentrations of methane, carbon dioxide, oxygen and vacuum/pressure using a field landfill gas meter.

WORK STEPS	HAZARDS	CONTROLS
Task 1: Mobilization Daily travel to and from the site.	• Vehicle Safety • Parking • Traffic • Construction/Road Hazards • Animals • Weather	1. Plan/map travel to site. Inspect vehicle using 360 degree walkaround before starting to drive. 2. Allow sufficient time for transit. Plan for adverse weather conditions while driving. Obey speed limit and traffic. Pay close attention to the road and drive appropriately for the conditions. 3. Cell phone use prohibited while driving (includes hand free devices). 4. Pull through (drive-through) parking is preferred means for stopping / parking a vehicle of equipment. Back-in parking is secondary means for parking a vehicle or equipm,ent so that next movement of vehicle or equipment will be in forward direction.
Task 2: Inspect and Calibrate LFG Monitoring Equipment	• Slips, Trips, and Falls. • Compressed Gas Cylinders	1. Pay close attention to foot placement; slow deliberate movement. 2. Keep hands out of potential pinch points.
Task 3: Conduct LFG Monitoring	• Slips, Trips, and Falls. • Hand and Foot Injuries • Heat and Cold Stress • Stinging Insects	1. Pay close attention to foot placement; slow deliberate movement. 2. Wear appropriate PPE, including steel toed boots and long pants. 3. Plan ahead and bring appropriate clothing, fluids, etc required for weather. 4. If monitoring is concurrent with remedial construction activites, wear a reflective vest, safety glasses, hard hat, and ear plugs. Pay attention to heavy equipment and make sure the operator sees you before moving near the equipment. Use lookouts as needed.

A.4. H&S EQUIPMENT LIST

List worksite equipment for worker protection; provide details in Explanatory Notes, Clarifications.

EXPLANATORY NOTES, CLARIFICATIONS:

☒	**ROUTINE PPE**	☒ Standard work clothes appropriate for task ☒ Hard-toed boots/shoes ☒ Hardhat ☒ Safety glasses	☒ Work gloves appropriate for task ☒ Noise/hearing protection ☒ High-visibility/reflective vest ☐ Ice creepers (boot attachments)	
		☒ Basic PPE for protection from low-hazard chemical contact & dust (nitrile gloves, Tyvek suit, dust mask, boot covers).		
☒	**ROUTINE H&S EQUIPMENT/GEAR**	☒ First Aid Kit ☒ Fire extinguisher ☐ Emergency eyewash bottle(s) ☒ Insect control (repellant, wasp spray, other) ☐ Caution tape	☒ Sun protection (sunscreen, shade canopy, other) ☒ Project-supplied drinking water and/or hygiene facilities ☒ Poison ivy skin wash (Technu or similar) ☒ Vehicle emergency kit (flares, lights, reflective device) ☐ Traffic control warning devices (cones, or similar)	
		☐ Other:		
☐	**NON-ROUTINE PERSONAL PROTECTIVE EQUIPMENT (PPE)** (Indicate specific types of PPE in Explanatory Notes, Clarifications)	☐ Goggles and/or face shield ☐ Chemical protective gloves ☐ Coveralls (Tyvek, or other) ☐ Outer boots, boot covers	☐ Disposable n-95 dust mask ☐ Half-face respirator (APR), cartridges ☐ Full-face respirator (APR), cartridges ☐ Personal flotation device	☐ Fire retardant clothing ☐ Arc Flash Protection ☐ Electrical-Hazard-rated boots, gloves ☐ Personal fall apparatus
		☐ Other:		
☐	**SPECIAL HAZARD CONTROLS**	☐ Portable GFCI ☐ Eyewash - 15 min. flow	☐ Lockout/tagout equipment ☐ Emergency deluge shower	☐ Ventilation equipment (fan, blower) ☐ Air horn, alarm
		☐ Other:		
☐	**DECON, PPE DISPOSAL**	☐ Receptacle for disposable PPE	☐ Hand washing provisions	☐ Decon solution, related supplies
		☐ Other:		
☒	**AIR MONITORING EQUIPMENT, OTHER EQUIPMENT FOR WORKER EXPOSURE TESTING**	Personnel 4-gas meter		

PART B – HAZARD ANALYSIS and CONTROLS *Complete Section B.1., then subsequent sections as applicable to the task(s).*

B.1. ROUTINE HAZARD PREPAREDNESS This section required for all tasks.

Explanatory Notes, Clarifications:

General Safety, Wellness, Preparedness – **Delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.**

☒ **General premises** hazards - housekeeping, rough terrain, trip hazards, steep slope, remote location.

☒ **Weather/climate-related hazards** – heat stress/cold stress measures, sun screen, severe weather shelter/refuge, "30/30 rule" for lightning

☒ **Plant/Insect/Animal Hazards** - Precautions: poison ivy wash; insect repellant; check for ticks; hornet nest spray; animal precautions.

☒ **Worksite traffic hazards** – Implement measures to protect personnel (high visibility/reflective clothing, on-person lighting, traffic control measures).

☐ **Illumination hazards/night work** - Illuminate work areas and/or access routes, use reflective/hi-visibility clothing or on-person lighting, as appropriate.

☒ **Lifting, manual material handling** – use proper lifting procedures, seek help for >50 lbs.

Geosyntec Procedures: *HS-124-Heat Stress, HS-125-Cold Stress, HS-127-Ticks, HS-208-Housekeeping, HS-210-Walking and Working Surfaces, HS-401-Back Injury Prevention, HS 517 Traffic Safety*

Routine Personal Protection – **Delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.**

☒ **Head protection from overhead hazards** - Wear hardhat or "bump cap" as appropriate for hazard.

☒ **Hand protection** - Wear protective work gloves appropriate for the hazard and work tasks.

☒ **Eye protection** - Wear safety glasses (with side shield or wrap around, either clear or shaded for sun protection), or other appropriate eye protection.

☒ **Foot protection, rough terrain** - Wear work boots/shoes with hard toes, ankle support, puncture resistance, traction, as appropriate for conditions.

☒ **Hearing protection** – use earplugs, earmuffs (or both) as appropriate for conditions; at a minimum where noise levels exceed 85dBA.

☒ **Dust, unsanitary conditions** – For general protection against minimal non-specific hazards, use protective clothing and/or disposable dust mask, as needed.

Geosyntec Procedures: *HS-109-Hearing Conservation, HS 112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-207-Working Alone, HS-105-Driver and Vehicle Safety*

Tools, Equipment, Machinery – **Delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.**

☐ **Manual hand tools -** proper tool for the job, maintain in good condition, use vise/clamp to hold work piece, proper follow through, stay clear of "line of fire."

☐ **Knives, cutting tools -** Utility/folding/collapsible knives and fixed open-bladed knives/cutting tools are *not* permitted, unless specifically authorized. Cutting tools with automatically-retracting blades, or with enclosed/guarded blades are permitted. See HS-502-*Manual Hand Tools* for additional Information.

☐ ***Working near*** **powered tools/equipment/machinery** – safe distance, heed warning signs, stay out of "line of fire," use PPE (for eye/hearing/dust protection).

☐ ***Operation/use of*** **powered tools/equipment/machinery – See Section B.5.**

HS-502-Manual Hand Tools

Security– **Delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.**

☐ **High crime, urban** – Use appropriate measures for personal security (such as buddy system, security service, work scheduling, other measures)

☒ **Working alone** - Establish "check in" procedure with supervisor/project manager.

Geosyntec Procedures: *HS-207-Working Alone*

Routine Driving Hazards – **Delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.**

☒ **Routine work travel** - Use routine safe/defensive driving practices (seat belts, safe speeds, eyes ahead, no tailgating, limit distractions, safe cell phone use, no texting, clear windows, account for weather/road conditions, adequate sleep, other measures as appropriate).

☒ **Unfamiliar location** - Plan travel route before driving (assemble maps, enter destination in GPS).

☐ **Long Distance or During Sleep Hours** – Minimize fatigue: rest breaks, light snacks (avoid heavy meals), stay hydrated, fresh air, no loud music, clean windshield.

☒ **Unfamiliar vehicle** – Become familiar with vehicle operational controls and handling characteristics before operating vehicle.

Geosyntec Procedures: *HS-105-Driver and Vehicle Safety*

B.2. SPECIAL DRIVING/TRAFFIC/TRANSPORTATION HAZARDS ☒Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☒	**SPECIAL DRIVING HAZARDS** Off-Road Driving or use of non-typical vehicle, heavy vehicle, van, golf/utility cart, ATV Hazards: Worker injury due to vehicle collision, rollover	☒ For off road driving, do not exceed capability of vehicle, beware of wet conditions, speed low, avoid unsafe orientation on slopes. ☐ Follow ATV specific procedures for training, safety equipment, operation, manufacturer's instructions. ☐ Special Skills Required for Vehicle type - For vehicles requiring special skills (such as windowless van, heavy work vehicle, utility vehicle, similar) ensure operator is provided training and/or has appropriate operator skills through experience. ***Geosyntec Procedure(s):*** *HS-510-All Terrain Vehicles*
☐	**TRANSPORTING MATERIALS, TOWING/HAULING LOADS** Hazards: Vehicle accident, occupant injury from shifting load, unsafe equipment.	☐ Ensure load is firmly secured (rope, straps, load configuration) to prevent shifting during travel. ☐ Slings, chains, strap, rope and related equipment used for towing, hauling, load-securing shall be appropriate for use, and used in a manner as to prevent an unsafe condition. ☐ For trailer use, verify signal/braking lights operational, rear-view mirrors effective, hitch/safety chains secure.

☒	**WORKSITE TRAFFIC HAZARDS** Where the project worksite is located in/near vehicle thoroughfare. Hazards: Worker injury from being struck by vehicle traveling in thoroughfare.	☒ Wear reflective vests where exposed to traffic hazards. ☒ Where possible, park vehicles as protective shield from oncoming traffic. ☒ Configure work area and support vehicles to minimize worker exposure to traffic hazards. ☐ Use DOT signal devices to re-route vehicles around work area, site entrances/exits. ☐ Use DOT-trained flaggers or police detail where appropriate or required. ***Geosyntec Procedure(s):*** *HS-517-Traffic Safety*
☐	**RAILROAD HAZARD** Hazard: Worker injury from being struck by train in R.R. right-of-way	☐ Coordinate with rail company and implement required safety and security measures. ☐ Site workers to receive safety training for railroad work. **Geosyntec Procedure(s):** HS-305-Rail Operations
☐	**WATER TRANSPORTATION**	☐ Follow HS 312 "Water Transportation Safety," and Section B.3., "Water/Boating Hazards." **Geosyntec Procedure(s):** HS-312-Water Transportation Safety
☐	**AIRPORT, AIRCRAFT** Worker injury when working on/near airport runway, or use of helicopter, light aircraft	☐ Coordinate safety requirements with Airport personnel and implement required safety measures. ☐ Site workers to receive safety training for railroad/airport work. ☐ Follow provisions of applicable Geosyntec HS Procedures, below: ***Geosyntec Procedure(s):*** *HS-310-Helicopter Safety, HS 311-General Aviation (Small Aircraft) Safety*
☐	**TRAFFIC/VEHICLE HAZARDS REALATED TO HEAVY EQUIPMENT, CONSTRUCTION SITE ACTIVITIES**	☐ See Section B.7., "Construction, Heavy Equipment, Lift Equipment"

B.3. WATER/BOATING HAZARDS ☐ Applicable ☒ Not Applicable or Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☐	**OPERATOR OF WATER CRAFT OR PASSENGER/WORKER ON WATER CRAFT OR PLATFORM** Hazards: Drowning, hypothermia, collision, motor/fuel hazards, navigation	☐ Wear regulatory-approved personal flotation device (PFD) or buoyant work vest. ☐ Bring emergency rescue equipment (ring buoy, reaching device, flares). Use "reach, throw, row, go" strategy. ☐ Use fuel safety practices, fire extinguisher present in boat. ☐ Have lifesaving skiff/boat available. ☐ Monitor weather, develop float plan, ensure navigation/communication equipment operable. ☐ For tidal, flash flood, dam release hazards, plan/locate work accordingly, other precautions as appropriate. ☐ Where ice/slip hazards are present adjacent to water body, and for working directly on ice over water, wear ice creepers, sand work area, or take other appropriate measures to address slip hazard. ☐ For high-hazard work over very cold water, have immersion survival suit available, as appropriate. ☐ For electrical hazards associated with water/wet locations, see Section B.8., "Electrical Hazards." ***Geosyntec Procedure(s):*** *HS-306-Working on/near Water and Ice, HS-312-Water Transportation Safety*
☐	**WORK NEAR WATER HAZARDS OR ENTERING WATER** Hazards: drowning, hypothermia from water immersion, related injuries. ☐ Wading, wetland, mud/silt ☐ Dam release, flash flood, tide ☐ Diving ☐ Ice on/near water body	

B.4. FALL HAZARDS ☐ Applicable ☒ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☐	**WORKING AT HEIGHTS (GENERAL)** Hazards: Falls, overhead hazards, impalement hazard (such as from falling onto unprotected rebar and similar)	*General fall protection requirement thresholds: required @ ≥4' (industry), ≥6' (construction), ≥10' (scaffolds)* ☐ Ensure guardrails present ☐ Use personal fall apparatus (PFA) ☐ Use tether or positioning device ☐ Restrict access to hazard (barriers, tape, sign) ☐ Ensure covers in place over holes ☐ Use designated "watch person" ☐ Use fall protection net ☐ Restrict access beneath work to protect other site personnel from overhead hazards ☐ Ensure safe access to elevated work location (ladder, stair,) ☐ Install caps on protruding rebar ***Geosyntec Procedure(s):*** *HS-120-Fall Protection, HS-210-Walking and Working Surfaces*
☐	**LADDERS / STAIRS** ☐ Extension/straight ladders ☐ Step ladders ☐ Fixed ladders ☐ Stairs Hazards: Falls, overhead hazards	☐ Follow safe work practices: • Use ladders according to safe practices and manufacturer's instructions. • Maintain 3 points of contact at all times on ladder; keep center of gravity within side rails. • Do not use metal (conductive) ladder near electrical hazard. • Extension/straight ladders shall be properly footed, secured, angled, extend above upper work surface. • Stepladders are set on level ground or properly shimmed, spreaders locked; do not climb/stand on top step, top cap, or rear non-climbing side; use step ladder of sufficient length for work. • Equip stairs with stair-rails where more than 4 steps, and for stairway height 4' or more. ***Geosyntec Procedure(s):*** *HS-501-Ladders*

☐	**SCAFFOLD** ☐ Supported scaffold ☐ Suspended scaffold ☐ Free-standing/mobile scaffold Hazards: Falls, overhead hazards, equipment collapse.	☐ Follow safe work practices: • Identify/coordinate operations with subcontractor's competent person. • Supported scaffold level, stable, proper attachments, tiebacks, planking, • Suspended scaffolds anchored properly. • Guardrails or personal fall apparatus required above 10 feet. • Proper means of accessing scaffold (proper ladders, stair tower). • Total height of free-standing scaffold not to exceed four times the minimum base dimension. • Do not exceed load limits; store/stage materials in quantities sufficient for immediate use. ***Geosyntec Procedure(s):*** *HS-507-Scaffolds*
☐	**AERIAL LIFT** Hazards: Falls, overhead hazards, struck-by, run-over, caught between (pinch points), tip over, fluid leaks.	☐ Follow safe work practices: • Operators to be sufficiently trained, experienced and qualified. • Equipment is inspected after mobilization and is in good condition. • Harness & lanyard worn whenever operating the lift (possible exception for scissor lifts). • Overhead and surface obstructions to be reviewed with operators prior to use. ***Geosyntec Procedure(s):*** *HS-509-Aerial Lifts*
☐	**IMPORTANT!** This work may/will include close proximity to overhead electric utility lines.	☐ Follow safe work practices per Section B.9., "Utility Related Hazards"

B.5. POWERED TOOLS, EQUIPMENT, MACHINERY ☒ Applicable ☒ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☐	**POWERED HAND TOOLS** ☐ Battery-operated ☐ Electric-powered, 120v/240v ☐ Fuel-powered ☐ Pneumatic ☐ Powder-actuated Hazards: Eye/hand/body injury, fuel-related hazards, Inhalation hazards, noise, sparks, heat, fire hazard, electrical hazards	☐ For all power tools: • Inspect tools to ensure safe operating condition before each use. • Use tool in accordance with manufacturer's specifications. • Ensure guards are in place and no hazardous equipment modifications. • Use PPE or other safety practices, as appropriate, for eye/hearing/hand/head/body protection. • Provide training or verify operator competency for use of power tool. • Stay clear of hazard zone, "line of fire," when working near where power tools are used. • For spark/heat generating tool, control fire hazards, segregate combustible/flammable materials. • Use vise/clamp/work bench or other appropriate means to hold/secure the work piece. ☐ Use respirators, ventilation, wet methods, other appropriate means to control inhalation hazard. ☐ See fuel-safety practices in Section B.13., "Commercial Chemical Products." ☐ For electrical hazards, see Section B.8., "Electrical Hazards". ***Geosyntec Procedure(s):*** *HS-109-Hearing Conservation, HS-113-Personal Protective Equipment, HS-121-Electrical Safety, HS-503-Powered Hand Tools, Others as applicable*
☐	**OPERATION OF EQUIPMENT/MACHINERY** ☐ Point-of-operation hazards ☐ Pinch points, moving parts ☐ 'Struck-by,' 'caught between' ☐ Hot surfaces, heat ☐ Extension cords, flexible wire ☐ Fuel related (gas or liquid) ☐ Hydraulic pressure ☐ Pneumatic pressure ☐ Kinetic, stored energy ☐ Noise ☐ Emissions, discharge gases ☐ Working at heights, falls ☐ Lifting, repetitive motion ☐ Illumination ☐ Electrical	☒ General safety requirements for equipment, machinery: • Arrange worksite for safe access to equipment/machinery. • Use equipment/machinery in accordance with manufacturer's use and safety instructions. • Ensure point-of-operation, mechanical power transmission, other moving parts are guarded with protective devices; do not override interlocks, guards, protective devices. • Secure long hair/loose clothing/hanging jewelry near moving/rotating parts. • Heed warning signs/labels, keep safe distance; avoid locations of "struck by" and "caught between" hazards. • Implement lockout/tagout for repairs/adjustments/tooling changes. ☐ Use safe lifting practices for movement of heavy portable equipment ☐ Implement safe work practices for compressed air, pressurized systems (pneumatic/hydraulic), stored energy. ☐ For climbing/fall hazards associated with large equipment, see Section B.4., "Fall Hazards." ☐ For electrical hazards, see Section B.8., "Electrical Hazards." ☐ Operate fuel-powered equipment in well ventilated location. ☐ Use safe practices for fuels, see Section B.13., "Commercial Chemical Products." ***Geosyntec Procedure(s):*** *HS-109-Hearing Conservation, HS-113-Personal Protective Equipment, HS-119-Lockout/Tagout, HS-121-Electrical Safety, HS-503-Powered Hand Tools, Others as applicable*
☐	**LOCKOUT/TAGOUT OF HAZARDOUS ENERGY**	☐ Implement control-of-hazardous-energy practices (lockout/tagout), provide lockout/tagout locks and devices, training workers, designate "authorized" personnel, notify "affected" personnel. ***Geosyntec Procedure(s):*** *HS-119-Lockout Tagout*

☐	**WELDING, CUTTING, HOT WORK (GAS OR ARC)** UV/IR light-eye/skin burns, hot-work hazards, toxic welding fumes, compressed gases, electrical shock	☐ General safe work practices: • Hot work permit system to be implemented. • Operator properly protected (eye protection, clothing, apron, etc.). • Fire hazard controls (watcher, fire extinguisher, water, isolate combustibles). • Protect nearby personnel from hazardous UV, IR light (shielding, curtain). ☐ For gas welding/cutting, use gas cylinder safe practices (secured, upright, caps on when not in use, prevent Damage; never secure gas cylinders to metal bench used for arc welding). ☐ For arc welding, follow electrical safe work practices. See Section B.8., "Electrical Hazards." ☐ See Section B.13., "Commercial Chemical Products," for hazards of welding rods (toxic metals), welding gases. ***Geosyntec Procedure(s):*** *HS-511-Welding, Cutting and Other Hot Work*
☒	**COMPRESSED AIR, COMPRESSOR** (for compressed gases, see Section B.13., "Compressed Gases")	☐ Never direct nozzle toward body; do not use compressed air for cleaning clothes. ☐ If compressed air is used for cleaning, restrict pressure to 30 psi or below, equip nozzle with chip guard. ☒ Use eye protection. ☒ Ensure air tank, hoses, fittings are in good repair using factory fittings.
☐	**PORTABLE GENERATOR** Hazards: Electrical shock, carbon monoxide in exhaust, fuel-related fire, injury from mechanical hazards, lifting	☐ Follow general safety practices for Operation of Equipment/Machinery (above), and as follows: • Use in accordance with manufacturer's instructions. • Keep generator and work area dry. • Never use indoors, or near building air intake vents due to carbon monoxide hazard. • Provide for ventilation and/or air monitoring where hazardous accumulation of exhaust emissions is possible. • Use hearing protection in close proximity to operating generator, as needed. • Use power cords/extension cords specified by instructions. • Use ground-fault circuit interrupters (GFCIs) in accordance with manufacturer's instructions. • See Section B.8., "Electrical Hazards." • Shut down equipment before refueling. See safe practices for flammable/combustible liquids in Section B.13., "Commercial Chemical Products." ***Geosyntec Procedures:*** *HS-109-Hearing Conservation, HS-111-Air Monitoring, HS-115-Hazard Communication (for fuel), HS-121-Electrical Safety, Others as applicable*
☐	**PORTABLE HEATERS (electric or fuel powered)** Hazards: Electric-powered: Electrical shock, fires from hot surfaces. Fuel powered: Carbon monoxide in exhaust, fires from hot surfaces, fuel-related fires	☐ Follow general safety practices for Operation of Equipment/Machinery (above), and as follows: • Keep heater dry, and locate heater on level surface away from high traffic areas. • Never use fuel-powered heaters indoors, or near air intake vents, due to carbon monoxide hazard. • Provide for ventilation and/or air monitoring where hazardous accumulation of exhaust emissions is possible. • Keep combustible materials at least 3 feet from hot surfaces. • Do not use an extension cord or power strip to power an electric heater. • For electric heaters, See Section B.8., "Electrical Hazards." • Shut down fuel-powered equipment before refueling. See safe practices for flammable/combustible liquids and/or compressed gases in Section B.13., "Commercial Chemical Products." ***Geosyntec Procedures:*** *HS-111-Air Monitoring, HS-115-Hazard Communication (for fuel, HS-121-Electrical Safety, Others as applicable*

B.6. DRILLING ☐ Applicable ☒ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☒	**DRILLING** Hazards: Struck-by, run-over, caught between (pinch points), manual lifting, roll over, fluid leaks, fuel hazards, suspended equipment	☒ Follow safe work practices, as applicable: • Non-essential personnel to stay clear of drilling work zone when drill rig in operation. • Equipment inspected daily upon mobilization; maintained in good repair, backup alarms. • Leaks or defective safety equipment should be repaired before use. • Establish eye contact with operator and use hand signals prior to approaching near equipment. • PPE used near operating rig (eye/head/hearing/hand/foot protection, high visibility vests or equivalent). • Contractor inspects drill rig daily before use, verify daily that emergency stop is functional. • Drill rig to be equipped with operational emergency stop, equipment in good repair, machine guards in place, whip checks on high pressure lines. • Park personal/support vehicles in a location as to not obstruct travel lanes or other site operations. • Operators/helpers maintain safe distance from moving parts; secure loose hair, loose clothing, equipment. • Drill rigs will only be moved with masts lowered. • Max. safe slope for rig will be followed, drill rig leveled, appropriate blocking/cribbing as needed. • Use safety practices for refueling, fuel handling/storage/transport. • Spill equipment is available for fuel and hydraulic fluid leaks. • Verify mechanical lift/rigging equipment (cables, sheaves, boom, attachments) is in proper working order. • Ventilate and conduct air monitoring, as appropriate, when drilling indoors. ***Geosyntec Procedure(s):*** *HS-403-Drilling, Others as applicable*
☐	**IMPORTANT!** This work may/will include close proximity to overhead electric utility lines.	☐ Follow safe work practices per Section B.9., "Utility Related Hazards"

B.7. CONSTRUCTION, HEAVY EQUIPMENT, LIFT EQUIPMENT ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☒	**HEAVY EQUIPMENT** Hazards: Struck-by, run-over, caught between (pinch points), roll over, fluid leaks, overhead hazards	☐ Follow general safe work practices for heavy equipment: • Trained/qualified persons operate all heavy equipment. • Do not get into a potential crush situation below or between equipment, or in an excavation. • No passengers on moving/operating equipment except where passenger seat/restraint is present. • Equipment inspected daily upon mobilization; maintained in good repair, backup alarms. • Leaks or defective safety equipment should be repaired before use. • Operators required to use seatbelts. • Maintain eye contact with operator and use hand signals prior to approaching near equipment. • High visibility vests for all personnel in construction vehicle work area, on-site roadways and travel lanes. • Maximum safe slope for each vehicle will be followed. • Personnel to stay clear of, or restrict access to, swing radius and travel path of equipment. • Spill equipment available for fuel and hydraulic fluid leaks. • Equipment locked, secured, brakes set, buckets/forks lowered, when not in use. • Park personal/support vehicles in a location as to not obstruct travel lanes or other site operations. • Mark temporary roadways clearly, provide berms/stop logs where needed. ***Geosyntec Procedure(s):*** *HS-504-Heavy Equipment, HS-132-Competent Persons*
☐	**CRANES** Hazards: – electrocution by overhead utility – injury in swing radius – injury from falling load – crane tipping over due to overbalancing, high winds, unstable ground, unsafe slope, bad placement of outriggers – injury from mechanical hazards	☐ In addition to general safety practices for heavy equipment (above), as applicable: • Only qualified persons operate cranes (certificate required). • Critical Lift Plan & Checklist prepared/executed (HS 506) prior to mobilization. • Equipment to be inspected prior to mobilization and daily by crane operator. • Crane operator will remain at the controls at all times during operation. • Crane operation must be performed under the direction of an appointed signal person at all times. • Communication between crane operator and signal person will be maintained through standard hand signals or voice communication equipment. • Keep area beneath suspended loads clear of personnel. • Rigging procedures – see Mechanical Lifting, Rigging, below. ***Geosyntec Procedure(s):*** *HS-506-Cranes, HS-132-Competent Persons*
☐	**MECHANICAL LIFTING, RIGGING** Applies to lifting by crane, truck-mounted boom rig (e.g. drill rig), mechanical/electrical hoist, similar equipment. Hazards: falling loads, personnel under suspended loads.	☐ In addition to general safety practices for heavy equipment and cranes (above), as applicable: • Coordinate lifting operations with competent person. • Do not exceed loading limits of lifting equipment; perform work in accordance with equipment load chart. • Slings, chains, rope, wire rope and related equipment used for lifting shall be maintained in good condition, and used in a manner as to protect from damage. • Rigging, wire rope and hoisting equipment will be inspected and maintained on a weekly basis. • Hooks will be equipped with safety latches.

		• Ensure anchor points for winch or other lift device (such as davit arm) are engineered for intended use. ***Geosyntec Procedure(s):*** *HS-506-Cranes*
☐	**FORKLIFT** Hazards: Struck-by, run-over, overhead hazards, caught between (pinch points), roll over, fluid leaks.	☐ <u>In addition to general safety practices for heavy equipment (above), as applicable:</u> • Qualified operator, per established forklift training (certificate is required). • Equipment inspected daily and documented on Forklift Preoperational Inspection Checklist. • Do not exceed lifting load limits. • Forklift shall not be moved/driven with empty forks in raised position. • When not in use, forks lowered, brake set, controls in neutral, key removed. ***Geosyntec Procedure(s):*** *HS-505-Safe Operation of Forklifts, HS-132-Competent Persons*
☐	**AERIAL LIFTS**	☐ See Section B.4., "Fall Hazards" *Geosyntec Procedure(s): HS-509-Aerial Lifts*
☐	**TRENCHING/EXCAVATION** Hazards: Cave-in, hazardous atmosphere, structures & foundations, falls into excavations	☐ <u>Safe work practices when personnel will enter trenches/excavations:</u> • Activities under supervision/oversight of competent person, daily inspection. • Excavated materials placed at least 4' from trench sidewall. • Heavy mobile equipment will maintain a distance of at least 10' from the edge of the excavation. • Prevent water accumulation in trench. • Sloping & shoring for excavations ≥20' must be approved by a professional engineer. • Sloping/shoring/trench box for excavations ≥5' when persons enter trench/excavation. • Sloping/shoring/trench box for shallow (<5') excavations with cave-in hazard . • Workers in trenches to be within 25 feet of ladder or sloped entryway. • Excavations to be protected by perimeter fencing (not barricade tape), if potential for personnel to fall into. • If potential for atmospheric hazard, see Section B.10, "Confined Space Entry, Hazardous Enclosed Spaces" ***Geosyntec Procedure(s):*** *HS-402-Excavation and Trenching, HS-132-Competent Persons*
☐	**IMPORTANT!** This work may/will include close proximity to overhead and/or underground utility lines.	☐ Follow safe work practices per Section B.9., "Utility Related Hazards"
☐	**DEMOLITION**	☐ Develop/implement demolition safety plan. ***Geosyntec Procedure(s):*** *HS-132-Competent Persons*
☐	**BLASTING**	☐ Develop/implement blasting safety plan. ***Geosyntec Procedure(s):*** *HS-307-Blasting and Use of Explosives, HS-132-Competent Persons*
☐	**PUBLIC AT RISK, SITE SECURITY**	☐ During site operations protect public (overhead protection, barriers, warning signs). ☐ During off hours, protect public with barriers, warning signs/lights, other measures as appropriate. ☐ Lock/secure hazardous materials and/or equipment.
B.8. ELECTRICAL HAZARDS	**☐ Applicable**	**☒ Not Applicable, Not Anticipated**
EXPLANATORY NOTES, CLARIFICATIONS:		
☐	**BASIC ELECTRICAL HAZARDS TO SKILLED NON ELECTRICAL WORKERS** Equipment/tool use/operation, use of extension cords, working near electrical equipment. Hazards: Electrical shock, secondary hazards (falls, other injuries).	☒ <u>Follow safe work practices:</u> • Control water-related/wet-location hazards in a manner appropriate for the job tasks/equipment/tool. • Never touch electrical equipment if you are wet, or standing in water or on wet surfaces. • Use extension cords/power cords properly, prevent damage, take out of service if damaged. • Inspect tool/equipment/extension cords/power cords/welding cables before each use; do not use if damaged. • Use GFCI-protected outlet or portable GFCI in wet locations, outdoors, basements, concrete floors. • Ensure live parts are guarded, enclosures secure. • Enclosures, circuits properly labeled. ***Geosyntec Procedure(s):*** *HS-121-Electrical Safety*
☐	**HANDS-ON ELECTRICAL WORK BY ELECTRICAL WORKER/TECHNICIAN:** ☐ Voltage < 50 v ☐ Voltage 50-600v ☐ Voltage > 600v ☐ AC ☐ DC ☐ 3-phase ☐ Battery and/or solar power ☐ Capacitor/transformer	☐ <u>Implement electrical safe work practices pertaining to:</u> • Worker training/qualification (Level 1, Level 2, Level 3) • General electrical safe work practices, grounding, use of GFCIs • Safe work practices during diagnostics/troubleshooting, maintenance, repair • Safe design features for electrical equipment • Arc flash protection ***Geosyntec Procedure(s):*** *HS-121-Electrical Safety, HS-129-High Voltage Electricity Safety*
☐	**LOCKOUT/TAGOUT OF ELECTRICAL ENERGY**	☐ Implement control-of-hazardous-energy practices (lockout/tagout), provide lockout/tagout locks and devices, training workers, designate "authorized" personnel, notify "affected" personnel. ***Geosyntec Procedure(s):*** *HS-119-Lockout Tagout, HS-121-Electrical Safety*
☐	**IMPORTANT!** This work may/will include close proximity to electric utility lines.	☒ Follow safe work practices per Section B.9., "Utility Related Hazards"

B.9. UTILITY RELATED HAZARDS ☐ Applicable ☒ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☐	**OVERHEAD, ABOVE-GROUND UTILITIES**	☒ Maintain proper clearance, employ other appropriate precautions for the conditions. ***Geosyntec Procedure(s):*** *HS-304-Overhead Electrical Lines*
☐	**UNDERGROUND UTILITIES**	☒ Confirm appropriate underground utility clearance procedures have been completed prior to ground penetrations, and employ other utility clearance/locator practices, as appropriate for conditions. ☒ Hand digging or vacuum post-holing within 3' of utility locations or other high risk condition.

B.10. CONFINED SPACE ENTRY, HAZARDOUS ENCLOSED SPACES ☐ Applicable ☒ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

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☐	**CONFINED SPACE(S)** Potential/actual hazards: ☐ Atmospheric hazards: ☐ Flammable/explosive ☐ Oxygen deficiency ☐ Hydrogen sulfide ☐ Other toxic ☐ Combustible dust ☐ Electrical ☐ Mechanical, engulfment, entrapment, stored energy	☐ Develop effective site-specific entry procedure **per applicable regulatory requirements**: • Personnel to be trained/qualified. • Hazards properly characterized • Use equipment necessary for safe entry (for access, retrieval, PPE, air monitoring, ventilation) • Develop measures for emergency rescue, as applicable. • IMPORTANT: – Describe site-specific safety measures above in Explanatory Notes, Clarifications – Modify this THA or attach separate confined space safety plan/permit, as appropriate ☐ Protect non-entry personnel working near confined spaces thru control measures to prevent unauthorized entry (such as safety orientation, labeling, delineation, barriers) ***Geosyntec Procedure(s):*** *HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-118-Confined Space Entry, Others as applicable*
☐	**HAZARDOUS ENCLOSED OR INDOOR SPACE(S)** ☐ Indoors (occupied or vacant) ☐ Machine/equipment pit/vault ☐ Basement/crawl space ☐ Tunnel, shaft, gallery ☐ Trench, excavation ☐ Hazardous exhaust or emissions ☐ Building-related hazards	☐ Use personal protective clothing to protect from chemical, physical, biological hazards. ☐ Use respiratory protection, if necessary/appropriate. ☐ Duct equipment exhaust to outdoors using passive duct or active exhaust ventilation. ☐ Use fans, blowers or other effective means of ventilation to introduce fresh air/dissipate atmospheric hazards. ☐ Conduct air monitoring, as appropriate for conditions and hazards (see Part C, "Air Monitoring"). ☐ For a trench/excavation, also see subsection entitled "Trenching/Excavation" in Section B.7. "Construction, Heavy Equipment, Lift Equipment." ☐ If space classified/regulated as a "confined space," follow confined space entry requirements (above). ***Geosyntec Procedures****: HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, Others as applicable*

B.11. STORAGE OF BULK MATERIALS ☐ Applicable ☒ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☐	**STORAGE OF BULK MATERIALS** (for Storage of Hazardous Materials, See Section B.13.)	☐ Store materials in stable manner (stacked, racked, blocked, interlocked, tied, wrapped, or otherwise secured) to prevent tipping, sliding, rolling, falling or collapse. ☐ Do not exceed load limits of racks, platform, scaffold; ensure racks are stable, robust, secure. ☐ Ensure stored materials do not block aisles, passageways.

B.12. INFECTIOUS / ALLERGENIC BIOHAZARDS ☒ Applicable ☒ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☒	☐ Wastewater, sewer ☐ Bird Guano ☐ Mold, fungi, Valley Fever ☐ Bloodborne pathogens ☐ Other (describe above)	☒ Low hazard - use basic hygiene practices, protective gloves, provide for hand washing. ☐ More severe hazard - add protective clothing, respirator/dust mask, decon, as appropriate. ☐ For human pathogens use "Universal Precautions" per Bloodborne Pathogen Program. ***Geosyntec Procedure(s):*** *HS-133-Bloodborne Pathogens*

B.13. COMMERCIAL CHEMICAL PRODUCTS ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☐	**PRODUCTS REGULATED BY HAZARD COMMUNICATION STANDARD**	☒ Safety Data Sheets available, either on site or readily available within same work shift, containers labelled properly, workers trained/oriented on hazards ☐ For subcontractor use of chemical products, coordinate/discuss during safety meetings. ☐ Conduct air monitoring, as appropriate (see Part C, "Air Monitoring, Worker Exposure Monitoring").
☒	**COMPRESSED GAS (flammable or nonflammable)**	☒ Secure cylinders upright, caps on when not in use, handle with care, prevent damage. ☐ Propane cylinders not in use must be stored outdoors in cage or similar secure enclosure.

		☐ Ensure acetylene cylinders NOT secured to steel arc welding bench. ☐ Store/use in a manner to prevent asphyxiation hazard. ☐ Segregate oxygen and fuel gases by distance (20') or barrier. ☐ Control ignition sources. ☐ "No smoking" signage at cylinder storage area for flammable gases. ☐ Use/store in a manner to control inhalation exposure hazards, PPE, air monitoring.
☐	**FLAMMABLE/COMBUSTIBLE LIQUIDS**	☐ Proper storage (flam. storage cabinets, other storage precautions). ☐ Use proper fuel safety can (metal fuel can preferred). ☐ Control ignition sources. ☐ Grounding and bonding where appropriate.
☐	**ACIDS, CAUSTICS, OTHER CORROSIVES**	☐ Handle with care, use appropriate eye/face/skin protection. ☐ Eyewash, deluge shower, drench hose, hand washing (with water), as appropriate.
☐	**TOXIC**	☐ For toxic substances, use/store in a manner to control exposure hazards (inhalation, ingestion, skin contact, skin absorption); use PPE as appropriate, conduct air monitoring as appropriate.
☐	**EMISSIONS FROM FUEL COMBUSTION, INDUSTRIAL PROCESSES** ☐ Gasoline ☐ Diesel ☐ Propane/Natural Gas ☐ Welding/cutting/hot work ☐ Vehicle/equipment exhaust ☐ Other	☐ Position outdoor personnel upwind of exhaust source. ☐ Use blowers, fans to provide fresh air to work area and dissipate atmospheric hazards. ☐ Use respiratory protection for high levels of smoke, exhaust particulates, soot. ☐ Conduct air monitoring as appropriate (see Part C, "Air Monitoring").
☐	**OTHER HAZARDS**	☐ Describe other hazardous substances and safety measures under "Explanatory Notes, Clarifications," above.
☐	**CHEMICAL/HAZMAT STORAGE** Check this when jobsite requirements include special provisions for chemical storage.	☐ Chemical storage cabinet, cage, storage room, or similar. ☐ Ensure incompatible chemicals are segregated. ☐ Provide secondary containment. ☐ Locate special safety equipment near chemical storage

Geosyntec Procedures: *HS-115-Hazard Communication, HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-114-Safety Training Programs, Others as applicable*

B.14. SITE CONTAMINANTS, CHEMICAL WASTES ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

CHECK ALL THAT APPLY. Provide explanatory notes above.

☐ Soil/groundwater contaminants (historical release)	☒ Oxygen deficiency	☐ Corrosive, acids/caustics, strong irritants
☐ Recent release, known high concentrations	☐ Chlorinated volatile organic compounds (VOCs)	☐ Sulfides, hydrogen sulfide (H_2S)
☐ Former chemical disposal site, landfill	☐ BTEX, petroleum derived VOCs	☐ Cyanides, hydrogen cyanide (HCN)
☐ Urban fill, residual contaminants	☐ Fuel oils, petroleum, waste oil, lubricants	☐ Asbestos
☐ Containerized waste (drums, process equipment)	☐ Metals, metal compounds, metal dusts	☐ Lead paint
☐ Buried drums (known or potential)	☐ Elemental mercury	☐ Pesticides, herbicides, fungicides
☐ Large containers, potential for spills	☐ Polyaromatic hydrocarbons (PAHs)	☐ Sensitizers
☐ Contaminated building surfaces	☐ Polychlorinated biphenyls (PCBs)	☐ Radioactive contaminants
☐ Unexploded ordnance	☒ Potential for flammable vapors	☐ Other (see Explanatory Notes, above)
☐ Explosive dust	☒ Potential for flammable gas (methane)	

☐ **FOR WORK CONSISTING OF CLEANUP OPERATIONS, CORRECTIVE ACTIONS, PRELIMINARY INVESTIGATIONS at an "UNCONTROLLED HAZ. WASTE SITE" (per HAZWOPER, 29 CFR 1910.120), implement the following as applicable to the work:**

- Implement site control plan via Exclusion Zone(s), Contaminant Reduction Zone(s) and Support Zone (aka EZ, CRZ, SZ)
- Workers to be aware of and trained on hazards per OSHA Hazard Communication Standard.
- Include site map/figure depicting work locations and other relevant site-specific information.
- Site workers in EZ or CRZ to have OSHA 40-hour training, current 8-hour refresher, 3 days supervised field experience.
- Site supervisor(s) required to have 8-hr. Supervisor training.
- Site workers in EZ or CRZ to participate in Medical Monitoring program, as applicable.
- Implement site-specific procedures for worker protection via engineering controls, work practices, personal protective equipment (PPE), air monitoring, decontamination procedures, spill containment, emergency preparedness and response.
- Conduct air monitoring, as appropriate (see Part C, "Air Monitoring, Worker Exposure Monitoring").

IMPORTANT: Provide supplemental information to sufficiently detail site-specific procedures for the above elements, as appropriate for the work.

Geosyntec Procedures: *HS-301-HAZWOPER, HS-108-Medical Monitoring Surveillance, HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-114-Safety Training Programs, HS-115-Hazard Communication, HS-405-Drum Sampling, Others as applicable*

☒ **FOR SITE WITH CHEMICAL CONTAMINANTS OR WASTE BUT NOT REGULATED BY HAZWOPER**

- Workers to be knowledgeable/aware of chemical hazards thru safety training/orientation and availability of hazard information

		– Implement controls to minimize worker exposure through engineering controls, work practices, PPE, as appropriate. – Conduct air monitoring/sampling to monitor/evaluate worker exposure, as applicable. ***Geosyntec Procedures:*** *HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-114-Safety Training Programs, HS-115-Hazard Communication, Others as applicable*
☐	**OFF-SITE MIGRATION OF CONTAMINANTS**	☐ Implement controls to minimize hazard migration (dust suppression, covers, foam, etc.) ☐ Community/perimeter air monitoring to be conducted per perimeter air monitoring plan.
☐	**SPILL CONTAINMENT, CONTAINERS**	☐ Describe above any site-specific procedures for spill containment, container handling, as applicable. ***Geosyntec Procedures****: HS-406-Unknown Hazardous Waste Drum Handling*

B.15. RADIATION HAZARDS (Other than Sunlight) ☐ **Applicable** ☒ **Not Applicable, Not Anticipated**

EXPLANATORY NOTES, CLARIFICATIONS:

☐	**IONIZING RADIATION**	Describe hazards & safety measures above in Explanatory Notes, Clarifications. Conduct exposure monitoring, as appropriate (see Part C, "Air Monitoring, Worker Exposure Monitoring"). ***Geosyntec Procedures:*** *HS-126-Radiation Safety Program, HS-128-Ionizing and Non-Ionizing Radiation*
☐	**NON-IONIZING RADIATION**	Describe hazards & safety measures above in Explanatory Notes, Clarifications. Conduct exposure monitoring, as appropriate (see Part C, "Air Monitoring, Worker Exposure Monitoring"). ***Geosyntec Procedures:*** *HS-128-Ionizing and Non-IonizingRadiation*

B.16. HAZMAT/DANGEROUS GOODS SHIPPING/TRANSPORTATION ☐ **Applicable** ☒ **Not Applicable, Not Anticipated**

MODE(S) OF TRANSPORT:	☐ Road	☐ Rail	☐ Air	☐ Sea	☐ Inland Waterway	☐ International

IMPORTANT: Ensure that each individual who will be involved in shipping/transportation of hazardous material is current with required training (awareness, function-specific, safety, security) in accordance with applicable regulatory authority (DOT, FAA, IATA, TDG), and ensure adherence to applicable regulations.
Geosyntec Procedures: *HS-135-Hazardous Materials Procedures*

EXPLANATORY NOTES, CLARIFICATIONS:

PART C – AIR MONITORING, WORKER EXPOSURE MONITORING

C.1. AIR MONITORING (Direct-Reading Instruments) ☒ **Applicable** ☐ **Not Applicable, Not Anticipated**

EXPLANATORY NOTES, CLARIFICATIONS:

☒	**AIR-TESTING PARAMETERS**	☐ VOCs, GASES ☐ PID, Lamp energy: _11.6_ eV ☐ FID ☒ Carbon monoxide ☒ Hydrogen sulfide ☒ Oxygen (O_2)	☒ Flammable gas (LEL) ☐ Particulate (dust) ☐ Calibration kit for each parameter ☐ Other:
☒	**ACTION LEVELS FOR O2/LEL**	☒ Oxygen	≤19.5% - ventilate to raise O_2 to acceptable levels, or STOP work – contract EHS Departmemt. ≥23.0% - ventilate to lower O_2 to acceptable levels, STOP work – contract EHS Departmemt.
		☒ LEL	Confirm at least 12% oxygen is present to ensure accuracy of LEL readings. At <10% LEL - Continue working, continue to monitor LEL levels At ≥10% LEL- Immediately withdraw from area. Resume work ONLY after LEL readings reduced to <10%, and source for elevated reading has been identified.

		Parameters	**Level D, Modified D***	**Use levels C or B*, as indicated below, OR take action to reduce breathing zone level to concentration acceptable for Level D*.**
☐	**ACTION LEVELS FOR TOXICS** (sustained breathing zone concentrations)	☐ VOCs	< 1 ppm	> 1 ppm STOP work – contract EHS Departmemt
		☒ Carbon Monoxide	< 35 ppm	≥35 ppm - STOP work – contract EHS Departmemt
		☒ Hydrogen Sulfide	< 10 ppm	≥10 ppm - STOP work – contract EHS Departmemt
		☐ Total Dust	< __ mg/m^3	>___ mg/m^3 -
		☐		
		☐		

Geosyntec Procedures: *HS-111-Air Monitoring*

C.2. OTHER WORKER EXPOSURE MONITORING ☐ **Applicable** ☒ **Not Applicable, Not Anticipated**

☐ Air Sampling *(sample collection, passive dosimeter)*	☐ Ionizing or Non-ionizing Radiation Testing	☐ Heat Stress Testing
☐ Wipe/Bulk Sampling *(to evaluate worker exposure)*	☐ Noise Testing	☐ Other

EXPLANATORY NOTES, CLARIFICATIONS:

Geosyntec Procedures: *HS-109-Hearing Protection, HS-111-Air Monitoring, HS-124-Heat Stress Prevention, HS-126-Radiation Safety Program, HS-128-Ionizing and Non-ionizing Radiation, HS-601-Asbestos, HS-602-Lead*

PART D – APPROVALS, ACKNOWLEDGEMENTS

D.1. THA PREPARATION, REVIEW/APPROVAL SIGNATURES - THA typically prepared by project staff, reviewed/approved by Project Manager, Supervisor, qualified/knowledgeable designee, with support of HS personnel as deemed appropriate by the Project Manager.			
THA PREPARED BY: (minimum one person)	***Printed Name***	***Signature***	***Date***
	David Kein		15 September 2020
	Jesse Varsho		15 September 2020
THA REVIEWED/ APPROVED BY: (minimum one person)	***Printed Name***	***Signature***	***Date***
	James Bannantine		

D.2. FIELD CREW ACKNOWLEDGEMENTS

GEOSYNTEC FIELD CREW

Please sign below to acknowledge you reviewed and understand this THA, participated in project safety briefing and had an opportunity to ask questions about the information herein.

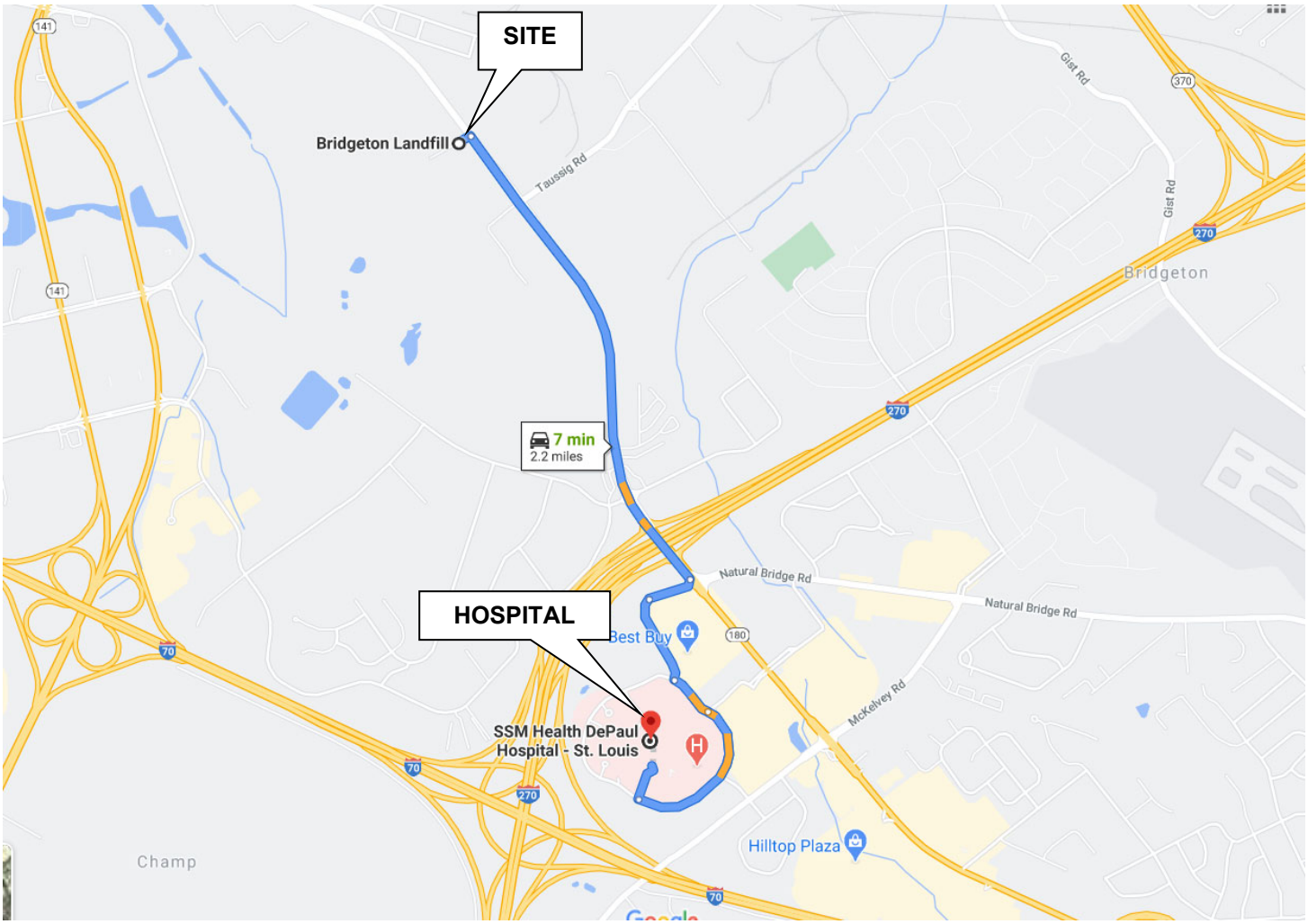
Printed Name	Signature	Employee No.	Date

SUBCONTRACTOR'S FIELD CREW

Please sign below to acknowledge that this THA was made available to you, and you had an opportunity to ask questions about the information herein.

Printed Name	Signature	Company Name	Date

SITE LOCATION MAP and ROUTE TO HOSPITAL



HOSPITAL NAME
SSM Health DePaul Hospital – St. Louis
12303 De Paul Dr, Bridgeton, MO 63044
Tel: (314) 344-6000

Written Directions to Hospital from Site:

From site, head south on St Charles Rock Rd
Travel 1.2 miles then turn right on Mareschal Ln
Travel 0.1 miles then turn slightly left on De Paul Ln
Drive for 0.7 miles
Hospital is on the right

Total Distance = 2.2 miles Time = 7 minutes