BRIDGETON LANDFILL

NORTH QUARRY CONTINGENCY PLAN – PART 1

Submitted Pursuant to Section 17.A and 22.A of Agreed Order
Case No. 13SL-CC01088, Effective May 13, 2013

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1.0 INTRODUCTION

1.1 BACKGROUND

Bridgeton Landfill LLC (Bridgeton Landfill) is located on a 214-acre parcel, of which approximately 52 acres has been permitted for municipal solid waste disposal under the conditions of Permit #118912. In accordance with the permit, waste was placed in former limestone quarries which were reportedly about 240 feet deep. The landfill ceased accepting waste at the end of 2004.

In December 2010 Bridgeton Landfill detected changes in gas extraction well conditions; specifically, elevated temperatures and elevated carbon monoxide levels. Further investigation indicated that the landfill was experiencing an exothermic subsurface reaction which, among other effects, increases fugitive emissions and odors from the facility.

Since the time that the subsurface reaction was confirmed, Bridgeton Landfill has worked with the Missouri Department of Natural Resources (MDNR) along with other local, state and federal agencies to respond. The State has defined this reaction as a "subsurface smoldering event" (SSE), and that term shall be adopted in this Plan to refer to the subsurface reaction.

1.2 PREVIOUS EVALUATIONS AND RESPONSES

The shared goals of Bridgeton Landfill and MDNR are that sufficient information be collected and evaluated to provide a basis for planning and response and that plans be prepared and implemented to minimize and mitigate negative impacts. In addition, it is agreed that the SSE should be prevented from entering radiologically-impacted material in West Lake OU-1 Area 1.

Consistent with those goals, MDNR directed Bridgeton Landfill in July 2012 to develop plans to "conduct adequate monitoring, develop adequate data to assess the depth, extent and progression of the SSE, and respond proactively to the situation." Hence, Bridgeton Landfill has worked under the direction of the regulating agencies to evaluate, develop, and implement extensive measures including gas extraction, covering and capping, and heat removal as described in Section 3 of this Plan.

Previously, Bridgeton Landfill has submitted the following relevant documents: "North Quarry Heat Barrier System," dated January 4, 2013 (submitted in DRAFT form), "Bridgeton Landfill – Gas Interceptor Well Design," dated January 10, 2013, "Gas Interceptor Well Design – Expanded System" dated February 6, 2013, and a letter-report submitted to Ms. Charlene Fitch of the MDNR on March 29, 2013. In those reports, Bridgeton Landfill evaluated numerous additional options for the control and mitigation of the SSE. These plans are attached to this Plan at Appendix A. This North Quarry Contingency Plan is intended to incorporate and supersede these prior plans and form the basis for agreed evaluation and response processes moving forward.

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1.3 CURRENT EVALUATION AND RESPONSE EFFORTS

On May 13, 2013, Bridgeton Landfill entered into an Agreed Order with the State of Missouri which requires actions to address the SSE. One of the requirements of the Agreed Order is the preparation of a "North Quarry Contingency Plan" (Plan). The Plan is intended to build from the prior contingency and response evaluations and put in place defined triggers and response actions to allow prompt and proactive response to the SSE. The Plan, when finalized, will become part of the obligations under the Agreed Order and is intended to guide Bridgeton Landfill's response moving forward to meet the shared goals of ongoing assessment and effective response. The Agree Order requirements are:

Part 1 – Agreed Order Section 22.A

A) Within forty-five days of entry of this Agreed Order, Bridgeton Landfill shall submit Part 1 which shall include:
   i) Establishment of trigger criteria for installation of additional Temperature Monitoring Probes in the North Quarry, along with a plan and schedule for such installation, if triggered;
   ii) Establishment of trigger criteria for installing interceptor wells within the North Quarry to control further migration of the Subsurface Smoldering Event, along with a schedule for such well installation, if triggered; and
   iii) Establishment of trigger criteria for capping the North Quarry with an EVOH geomembrane cap, along with a schedule for such capping, if triggered.

Part 2 – Agreed Order Section 22.B

B) Within seventy-five days of entry of this Agreed Order, Bridgeton Landfill shall submit Part 2 which shall include:
   i) Construction Plans for the installation of additional interceptor wells in the North Quarry, if triggered;
   ii) Construction Plans for installation of an EVOH geomembrane cap over the North Quarry, if triggered;
   iii) Establishment of trigger criteria for an isolation break between the North Quarry and radiological materials contained in West Lake Landfill Site OU-1 Area 1, along with a schedule for such break, if triggered.

This Plan is intended to meet the requirements of the Agreed Order Section 22.A. In addition, as a voluntary measure, Bridgeton Landfill has incorporated the requirements of Agreed Order Section 22.B.iii (establishment of trigger criteria for an isolation barrier between the North Quarry and the OU-1 Area 1) into this Plan so that all triggers and actions are defined in one document.

Bridgeton Landfill understands that approval of this Plan will result in mutually-agreed triggers and response actions intended to further the shared goal of proactive response and allow

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Bridgeton Landfill to mobilize quickly to address any changed conditions and prevent or mitigate any resulting negative impacts.

This Plan is presented in sections as described below:

2.0 Current Conditions at the Bridgeton Landfill
3.0 Monitoring and Containment Features
4.0 Evaluation of Potential Trigger Criteria
5.0 Contingent Future Actions Determined by Triggers

The Plan and its requirements will be part of the Bridgeton Landfill closure and post closure operations until it is determined that the SSE is no longer presenting operational challenges or Bridgeton Landfill has been released from the requirements of the Agreed Order.

Part 2 of the North Quarry Contingency Plan will be submitted on July 26, 2013 and will contain construction plans and implementation schedules as directed by the Agreed Order Section 22.B. The purpose of Part 2 of the Plan is to ensure that approved work plans are prepared, approved, and available in advance of any triggering conditions.

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2.0 CURRENT CONDITIONS AT THE BRIDGETON LANDFILL

2.1 LANDFILL AREAS

The permitted landfill is generally described in two sections which refer directionally to the landfilled areas: the North Quarry, and the South Quarry which comprise approximately 52 acres of the property. The remainder of the 214 acre site includes several inactive landfill units, including the West Lake Landfill Operational Unit 1, where soils contaminated with radiologically-impacted materials were deposited in 1973. See Figure 1 for a general overview of the facility.

The North and South Quarry areas are contiguous and waste material that was placed therein is connected by a relatively thin "neck" area which is about 300 feet wide at the top and narrows as it approaches the bottom at a depth of about 250 feet. A 3-D rendering illustrating the relationship of these two areas is presented on Figure 2. West Lake OU-1 Area 1 abuts the North Quarry area but not any of the other landfill areas. The depth of the waste material shallows significantly moving from the South Quarry toward West Lake OU-1 Area 1 as seen on the cross section on Figure 2.

2.2 EXISTING SUBSURFACE SMOLDERING EVENT (SSE) AREA

Bridgeton Landfill has been addressing an SSE that is occurring in the South Quarry portion of the landfill and which has resulted in elevated temperatures and accelerated decomposition of waste. The impacts have included increased rate of settlement along with odorous emissions. Efforts have focused on establishing the necessary infrastructure to isolate, contain, and monitor the SSE, with an emphasis on preventing the SSE from moving into the North Quarry area.

For these efforts, the facility has implemented extensive modifications to the gas collection and control system (GCCS) and leachate collection system, and is currently installing an additional capping system over the South Quarry. Additionally, Bridgeton Landfill has installed monitoring and containment features at the northwest edge of the impacted area including temperature monitoring probes (TMPs) and Gas Interceptor Wells (GIWs). These measures can be seen in Appendix B which contains drawings that show their extensive nature.

As discussed in more detail in Section 3 and in the approved plans included in Appendix A, the gas interceptor well system is designed to remove heat energy from the SSE zone in order to limit the propagation. Monitoring of the gas interceptor well system is part of ongoing site activities and results are included in the recent reports included in Appendices C and D.

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2.3 CONDITIONS CAUSED BY THE SSE

The Bridgeton quarry fills are deep and, as a result, contain dense, compact waste with very little pore space. This results in: slow heat dissipation (heat is retained much in the same way insulation holds heat), confinement of pressure caused by water to vapor phase changes, and resistance to heat front and SSE propagation.

At the Bridgeton Landfill, the primary manifestations of the SSE include:

- Curtailment of methane production in portions of the waste mass where temperature is elevated above 160° F (which exceed conditions survivable by the bacteria responsible for methanogenesis);
- Elevated temperatures (currently recorded up to about 300° F) which require special construction materials for gas and liquid handling features;
- Production of hydrogen, carbon dioxide, volatile organics, and carbon monoxide; some of which migrate outward and away from the reacting waste materials;
- Creation of odorous emissions;
- Generation of pressure within the waste mass resulting from the phase change of liquid entrained in the waste mass to vapor phase;
- Increased gas capture complexity due to the pressure increases at depth that release upward within the waste mass due to the increasing density of the waste with depth;
- Heating of waste which results in a steam/water vapor front moving out, up, and away from the SSE, which then condenses in the cooler surrounding waste mass and gas extraction wells resulting in higher localized leachate generation;
- Leachate characteristic changes including elevated constituents such as BOD, volatile organic compounds, and dissolved and suspended solids that result from liberation of constituents from the as-received waste material and from thermal degradation of biological material; and
- Greater than normal settlement at the location of and/or adjacent to reacting waste mass (see Figure 2 for the current area of greater than normal settlement caused by the SSE). This settlement results from the significantly reduced volume of waste mass.

The above-listed manifestations are monitored and are reported in a Weekly and/or Monthly Data Submittal; recent reports are included as Appendices C and D of this Plan.

2.4 PROGRESSION OF THE SSE

Subsurface smoldering events caused by reactions within a landfill begin at a point of origin, and then spread slowly into adjacent areas until conditions cease to be favorable for the SSE to continue.

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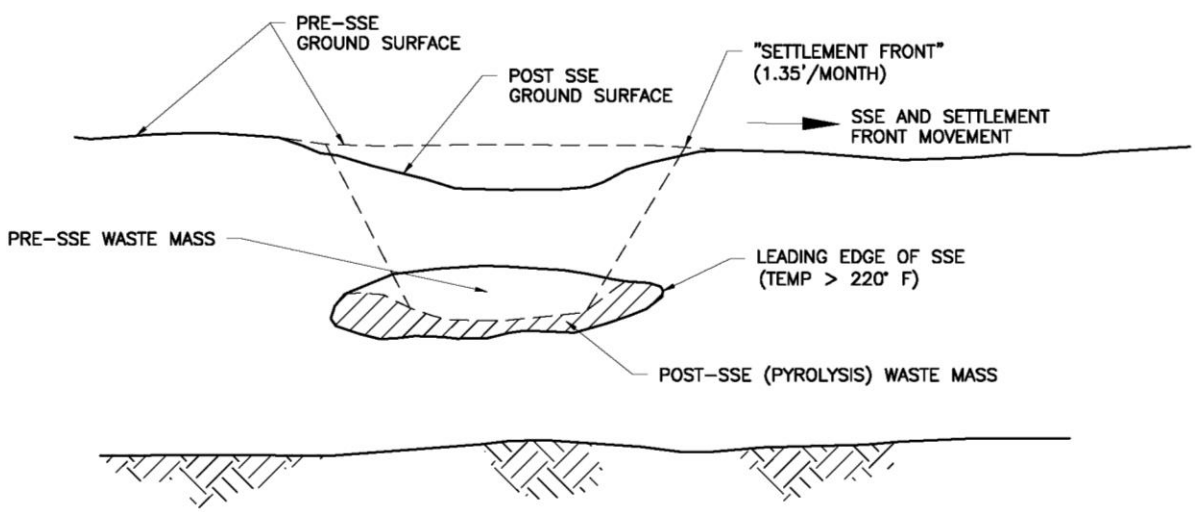
Visual evidence of a deep SSE appears as surface settlement. The surface settlement occurs because the liquid entrained within the waste mass is converted to steam and removed from the waste while the waste undergoes volume reduction as a result of pyrolysis (thermochemical decomposition of organic material at elevated temperatures in the absence of oxygen). The material that exists above the pyrolyzing waste settles into the resulting void such that it is readily evident at the surface. In fact, when the settlement is due to a deep pyrolysis event the cone-like shape of settlement causes the surface manifestation to be wider than the zone of actual settlement, as illustrated below:

SETTLEMENT CAUSED BY PYROLYSIS AND SETTLEMENT FRONT



NOT TO SCALE

While settlement has been monitored for some time at the Bridgeton Landfill, in January 2013 the facility developed a more detailed, repeatable, grid-point settlement monitoring approach so that comparable monthly settlement evaluations can be developed. Figure 3 shows the progression of a surface boundary line referred to as the "settlement front." The settlement front has been defined as the outward boundary of the rate of settlement of 1.35 feet over a one-month period. This rate of settlement has been selected so that the settlement front is near the estimated limits of volume-reduction mechanisms (i.e. pyrolysis) as shown on the illustration above.

Examination of settlement front movement suggests that heat generated by the SSE is expanding radially outward, including movement at a very slow rate toward the North Quarry. It is possible that this slow movement may continue, and it is possible that the SSE may slow even further or cease as the mitigative measures succeed and conditions in the area become unfavorable to sustain the SSE. Based on the last fifteen weeks of settlement front movement

(January 31 to May 15, 2013), the corresponding rates of movement of the settlement front and SSE toward the North Quarry are indicated below for three vectors toward the North Quarry area:

Date Range (all 2013)	1/31-2/28	2/28-3/20	3/20-4/15	4/15-5/13	Total	Average Movement (ft./day)
No. of Days	*28*	*20*	*26*	*28*	*102*	
NE Vector (feet)	14	11	43	0	68	0.67
N Vector (feet)	29	0	34	-7	56	0.55
NW Vector (feet)	26	6	10	12	54	0.53

As can be seen on Figure 3, settlement front location and rate of advancement appears to fluctuate. While it is likely that variable subsurface conditions produce some of these fluctuations, there are many factors that may influence the apparent settlement, and therefore settlement front interpretation at each measurement. Some of these variables are due to ground surface conditions (including events where soil material is added to, or cut away from, a monitored area), barometric pressure and/or pressure conditions in the landfill, etc. So, when determining rate of movement, it can be useful to look at several months previous data to eliminate the month-to-month variables. Based on the above analyses for the past four and one-half months, the overall average settlement front advancement toward the North Quarry is about 0.58 feet per day.

However such averaging may not provide the best assessment of future advancement. Measurements taken after the newly installed control features such as the GIWs and expansion of the GCCS, as illustrated by the period April 15, 2013 to May 13, 2013, show no forward movement of the settlement front along two of the three northern vectors. Additionally, the soon-to-be-completed capping system will provide for enhanced operation of the liquids and gas collection systems. Accordingly, it will be important to continue this monitoring to evaluate the impact of these containment systems on the already reduced rate of northward expansion.

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3.0 ISOLATION, CONTAINMENT, AND MONITORING FEATURES

The main strategies for responding to an SSE include:

- Isolation – Physical separation of the waste that is experiencing the SSE from other potentially-impacted areas;
- Containment – Features that are designed to collect and prevent the negative manifestations of the SSE from impacting the environment; and
- Monitoring – Observation of the SSE to determine its direction and rate of movement so that appropriate isolation and/or containment features can be implemented.

At the present time, Bridgeton Landfill has implemented several isolation, monitoring, and containment features as described in the following sections.

3.1 ISOLATION FEATURES

In cooperation with MDNR and the Missouri Attorney General's Office, Bridgeton Landfill assessed both the existing and previously evaluated isolation features in order to select the elements best suited for inclusion in the North Quarry Contingency Plan.

3.1.1 Existing Isolation Features

Heat removal can be used to isolate pyrolysis associated with an SSE which needs added heat to continue. If the amount of heat removed from a particular portion of the landfill can balance the heat added by local subsurface reaction, the advancement of the SSE can be curtailed and effectively isolated.

At the Bridgeton Landfill, special gas extraction wells, known as Gas Interceptor Wells (GIWs) have been installed specifically to stop movement of heat and to disrupt the subsurface migration of SSE-impacted gas. The GIWs are positioned in a manner that will allow for removal of heat and pressure that is exerted laterally. See Figure 2, and the drawings contained in Appendix B for location and details of the existing GIWs. These features are constructed with high temperature-resistant materials as they are expected to draw significant heat energy. Appendix A includes the detailed GIW work plans approved by MDNR. Monitoring of this system's operation is part of ongoing efforts and results are included in the weekly and monthly reports attached as Appendices C and D.

3.1.2 Screening of Additional Isolation Options

As part of the extensive evaluation of isolation and containment options, Bridgeton Landfill has prepared two prior reports (which are contained in Appendix A). These reports considered three primary types of isolation options: heat removal, physical barriers, and excavated isolation barriers.

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Heat Removal

As discussed in Section 3.1.1, Bridgeton Landfill has already implemented heat removal as an isolation measure in the form of gas interceptor wells and, to date, these appear to be having the desired effect (refer to Section 2.4).

Earlier evaluations also considered the viability of an injection system wherein cool material (typically inert gas like carbon dioxide or nitrogen) would be injected to crowd out oxygen and/or absorb heat. Since there is currently no evidence of free oxygen at depth, the only effect of inert gas injection would be to remove heat. There are no reported uses of inert gas in landfills other than at fires that are quite shallow (less than 50 feet) and isolated in nature. There is no evidence that such injections could enter the waste mass at the depths of this SSE due to the high density of the waste material and pressures that exist at depth as described in Section 2.3.

As acknowledged by MDNR's consultant Todd Thalhamer, carbon dioxide injection takes a lot of trial and error to make it work, and it is not a preferred method in the landfill industry because of its uncertainty. He also specifically noted in a recent presentation for MDNR that while it has been used in near-surface fires in California and Hawaii; it has not been used on something this extensive, again making it an uncertain remedy. Given this level of uncertainty and the demonstrated success of the gas interceptor wells, injection systems for heat removal have not been selected for further evaluation.

Physical Barriers

As discussed in more detail in the reports contained in Appendix A, deep, thin barriers of material (soil, concrete, or slurry) can prove to be ineffective when settlement caused by pyrolysis on the SSE side of the barrier creates deformations and breaches in the barrier. This situation is exacerbated by depth because the bending and overturning stress increase rapidly with increasing depth.

Depending on the type of physical barrier, construction at the neck area would take from one to two years and result in associated challenges related to managing odors, minimizing environmental impacts, and controlling nuisance issues like birds and truck traffic. Physical barrier construction in the "neck" area of the landfill is also complicated by the need to accommodate certain airport covenants given the extensive volume of waste that would be disturbed by construction of a barrier to that depth. Therefore, a physical barrier at the neck area between the South and North Quarry areas, at depths of 250 feet for a full barrier, is extremely problematic and is not being considered for further development.

A physical barrier between the North Quarry and OU-1 Area 1 where waste may be about 40 feet thick may be feasible as discussed in the next section.

Excavated Isolation Barriers

Complete, excavated breaks, or "isolation barriers" can be created by excavating completely through waste materials resulting in a full, structurally-stable permanent feature which isolates

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the reacting waste mass; this has been effectively employed at another facility where conditions (waste thickness, moisture conditions, and geometry of non-waste materials) were favorable.

A deep excavated isolation barrier between the South and North Quarry would not be feasible due to many of the same issues as discussed for a physical barrier. Excavation at the neck area would take a substantial amount of time and involve handling large quantities of decomposed and wet waste with associated challenges related to managing odors, minimizing environmental impacts, and controlling nuisance issues like birds and truck traffic. Additionally, a large open excavation would not allow passive drainage of surface water and would require perpetual pumping of accumulated precipitation. A large excavation in the neck area of the landfill is also complicated by the need to accommodate certain airport covenants given the extensive volume of waste that would be disturbed by construction of a barrier to that depth.

Bridgeton Landfill has evaluated the possibility of an excavated isolation barrier to prevent the SSE from advancing into the radiologically-impacted material in West Lake OU-1 Area 1. Specifically, Bridgeton Landfill evaluated the excavation of waste to create an isolation barrier south of the southern limit of radiologically-impacted material. Such an approach would also limit the volume of waste excavation, consistent with concerns raised by the Airport Authority. Finally the relative speed of construction, about three months, allows such a system to be implemented quickly. This isolation barrier would provide the physical barrier that MDNR has requested.

Therefore, the northern isolation barrier contingency as directed by the Agreed Order is preferable to physical barrier systems located in the “neck area of the landfill” because it offers superior protection with reduced construction time that can be organized to more easily comply with the airport easement and covenants.

3.2 CONTAINMENT FEATURES

Bridgeton Landfill has constructed a number of containment features directed at preventing the negative manifestations of the SSE from impacting the environment. These features are shown in detail on the drawings contained in Appendix B and include:

- Expanded and enhanced gas collection and control systems (GCCS) including additional gas extraction wells and gas destruction devices (flares), to allow for a greater removal of gas and pressure that is exerted upward by the SSE and enhance the preferential upward motion of the steam such that less pressure is exerted laterally;
- Synthetic capping to prevent fugitive emissions from the landfill cover and help improve operation of gas and liquids collection systems; and
- Subcap liquid and gas collection systems.

Successful use of these three containment measures at other facilities experiencing subsurface reactions validates continued employment at the Bridgeton Landfill.

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3.3 MONITORING FEATURES

Bridgeton Landfill utilizes numerous features to observe, monitor symptoms of the SSE, and to determine its direction and rate of movement so that appropriate isolation and/or containment features can be implemented:

- Monitoring of the gas temperature and composition at gas extraction wellheads (primarily the Gas Extraction Well or GEW series);
- Measurement of in situ waste temperature with buried thermocouples (known as Temperature Monitoring Probes or TMPs); and
- Mapping of landfill surface settlement.

These features are shown in detail on the drawings contained in Appendix B and monitoring results are contained in Appendices C and D. Successful use of these three monitoring measures at other facilities experiencing deep subsurface reactions validates continued employment at the Bridgeton Landfill. Detailed discussion of data that results from these monitoring efforts, and selection of the most appropriate monitoring for continued use at the facility is presented in Section 4 of this Plan.

3.4 CONTINGENT ISOLATION, CONTAINMENT, AND MONITORING FEATURES

As contemplated by the Agreed Order, isolation, containment, and monitoring features to be deployed on a contingent basis in the North Quarry area include:

- Installation of additional temperature monitoring probes (TMPs);
- Installation of additional gas interceptor wells (GIWs);
- Construction of EVOH cap over the North Quarry; and
- Construction of an isolation barrier between the North Quarry and the West Lake OU-1 Area 1 radiologically-impacted material.

Bridgeton Landfill has outlined these prescribed contingent North Quarry measures in Section 5 of this Plan.

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4.0 EVALUATION OF POTENTIAL TRIGGER CRITERIA

The intent of trigger criteria is to identify where the SSE is occurring and the rate at which it is advancing toward a pre-agreed location in order to evaluate the appropriateness and best timing for contingent isolation, containment, and monitoring features. Properly established and utilized, such triggers should allow Bridgeton Landfill to determine when an additional mitigative measure should be completed to prevent adverse impacts (further movement of the SSE, odor, and fugitive emissions) from developing in the North Quarry, and to prevent the SSE from ever being able to affect waste contained in the West Lake OU-1 Area 1.

4.1 CHARACTERISTICS OF RELIABLE TRIGGERS

Data used as a trigger should have the following characteristics:

- Readily obtained –Data that is measured with field instruments is preferred;
- Easily confirmed – Unusual or questionable results can be quickly confirmed with a follow-up reading; and
- Confidently interpreted – Results should directly reflect a physical condition that is known to be associated with the SSE or related heat generation.

4.2 POTENTIAL TRIGGER PARAMETERS

The primary candidates for trigger parameters, along with current monitoring frequency are listed below.

Parameter	Measure Frequency	Comments
Wellhead Gas Temperature	Weekly	Obtained with handheld field instrument. Results immediately available. Obtains average gas temperature of flowing gas in a well column.
Field Gas Quality	Weekly	Methane, oxygen, carbon dioxide, and "balance gas." Obtained with handheld field instrument, immediately available.
Lab Gas Quality	Monthly or Quarterly	Carbon monoxide, hydrogen, methane, oxygen, carbon dioxide. Takes three weeks to get results after decision to sample.
In Situ Waste Temperature	Weekly	Buried thermocouples referred to as temperature monitoring probes (TMPs). Results immediately available. Gives discrete temperature data.
Ground Settlement	Monthly or Quarterly	Takes up to one week to compile and analyze results. Provides direct physical evidence of location and direction of movement of SSE.

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Triggers can be made using any of these parameters independently, or in combination, or as ratios of one parameter with another. A detailed assessment of these parameters and their applicability for use as triggers is presented in Appendix E.

4.3 EVALUATION OF POTENTIAL TRIGGER PARAMETERS

Data has been collected for each of the items listed in Section 4.2 at the site in the past, so the efficacy of the various data at predicting the onset and motion of the byproducts of the SSE can be evaluated specifically for the Bridgeton Landfill. The following data evaluation is divided into those values that are point measurements, and those that represent larger zones of waste (non-point measurements).

4.3.1 Point Measurements

Point measurements at the Bridgeton Landfill consist of in situ waste temperatures using thermocouples, referred to as temperature monitoring probes or TMPs. The TMPs are comprised of thermocouples installed at 20-foot intervals typically through the full depth of waste. Temperature data that is obtained is representative of a zone of waste around an individual thermocouple at a particular depth. Recent TMP data is included in Appendix C of this Plan.

As a direct temperature measurement at a specific location, TMPs are very effective. However, there are some shortcomings of the TMPs and these include:

- The units are adversely affected by the lateral strains associated with settlement in the adjacent areas. This results in the thermocouples' wire being strain-hardened, causing the resistance to rise and making the readings inaccurate;
- The design of the TMPs results in the Kevlar sleeve acting as a conduit when the temperature exceeds the stable temperature of the bentonite grout used in the unit placement. This can result in false indications of rapid vertical temperature migration;
- Teflon insulation on the wires can abrade, causing the units to be in electrical contact with the waste and leachate, making the readings not valid; and
- The units are impacted by minor RFI (radio frequency interference) causing reading fluctuations.

Nevertheless, as long as they are intact, TMP readings provide a very good indicator of specific subsurface conditions at a specific location. When aberrant readings are suspected, or when certain measurements need to be confirmed or verified, there are procedures to verify the data and to determine if the TMP is compromised as presented in Appendix F.

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4.3.2 Non-Point Measurements

Landfill Gas System Measurements

Non-point measurements include any data collected from gas wells, gas collection headers, or other common points. The types of data available from gas wells are listed as the first three items in the table contained in Section 4.2.

Data values from gas wells represent a composite value for a zone from which the gas well is collecting. Given that the flow of gas into the well can occur along variable pathways, and that the performance of a gas well depends on many factors, it is not possible to attribute data collected therein as a strong indicator of temporal, specific conditions. Instead, the gas well is useful as an effective indicator of temporal, general conditions. At Bridgeton Landfill, the denser-than-normal spatial distribution of gas extraction wells allows these indicators of temporal general conditions to be used in comparison to one another for site wide assessments of trends.

Experience at other sites where subsurface reactions are occurring has shown that some SSE process-related gasses, such as hydrogen and carbon monoxide, can occur in gas wells far in advance of significantly elevated temperatures within the waste. This is attributable to the "projection effect", or "halo effect" wherein warmed vapor produced at the SSE front is pushed ahead and carries with it the gasses associated with the SSE. This has been observed to occur well over 100 feet from the SSE area.

Elevated levels of carbon monoxide and hydrogen have been observed in gas wells where the maximum temperature in proximate TMP devices indicate that temperature in the nearby waste mass is lower than that which can cause pyrolysis. Examples of these phenomena are provided in Appendix E. Gas well head temperatures are also subject to variables of this type.

Gas well head temperatures and laboratory-analyzed gas constituents were examined to look for trends and correlations. The data, as presented in Appendix E, indicates that well head temperature, hydrogen and the carbon monoxide (CO) can be easily used to *rule out* the presence of alteration of waste by heat generated by the SSE, but are less helpful to *confirm* the location of an SSE.

Comparisons of settlement rate to CO levels or the ratio of CO_2/CO show that either measure can be a good predictor of temperature levels high enough to cause waste alteration by heat. However, these measures can over predict the presence of high in situ temperature due to the projection effect. The data also suggests that, in the case of a slowly advancing heat front, the length of time that a well is proximate to the heat front increases the over prediction using gas constituents.

Other gas ratios, such as those using methane, can be effective at evaluating conditions where in situ temperature approaches 165° F but do not appear to be useful in predicting the

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occurrence of temperatures above that (as methane ceases to be generated at about 160° F). As such, wells within the areas between TMP 13 and the TMP 1 through 4 line collect very little methane yet show no predictable relationship in gas ratio, well head temperature, or TMP temperatures (see Appendix E).

Settlement Front Data

Waste which has been heated to temperatures in excess of 220 °F is found at depths of between 80 feet and 150 feet deep at the Bridgeton Landfill (see TMP data in Appendix A). When heated to these temperatures, pyrolyzation and significant reduction in volume of the waste occurs. The surface expression of this volume reduction extends beyond the limit of significant volume reduction (as previously discussed and illustrated in Section 2.4 of this Plan).

The term "settlement front" refers to a zone where settlement rate is exceeding a selected value expressed in feet per month. The selected rate was identified using statistical analysis of the monthly surveys performed in 2012. The rate, while it could be adjusted from the current value of 1.35 feet per month, is a measure of the leading edge of volume reduction associated with the pyrolizing of waste. An illustration of the settlement front was provided in Section 2.4 of this Plan.

Advantages of the settlement front as a measure of the location of the heat front are:

- Strongly correlated to all indicators of an SSE;
- Can be easily observed at the ground surface;
- Does not require insertion of devices and can be measured whenever the need arises;
- Large areas of the site can be covered in the survey for a complete record;
- Correlation to the subsurface conditions can be re-assessed and re-demonstrated by using gas well and or TMP data at routine intervals; and
- Rate of movement and direction of movement can be determined.

Starting in January 2013, settlement front data collection methods were modified from the use of general topographic surface comparisons based on monthly GPS surveys to the use of point-specific location GPS surveys. The change to a point to point comparison method has greatly reduced the scatter of data and indicated a more consistent settlement front diagram. Plots of settlement rate, gas constituents and wellhead temperatures are included in Appendix E. The data shows that the settlement rate associated with the settlement front limits is a good predictor of the rise in CO and CO_2/CO ratios.

Settlement front limits since January 3, 2013 are also shown to enclose the majority of wells that show CO values above 4,500 ppm (or CO_2/CO ratio of less than 132). This information is included in Appendix E.

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4.4 SELECTION OF TRIGGER PARAMETERS

Based on the evaluation of potential trigger criteria, and the discussion contained in Appendix E, Bridgeton Landfill proposes three parameters for identifying the presence, location, and estimating the rate and direction of movement of the SSE. These trigger parameters and associated values have been demonstrated to meet the criteria described in Section 4.1: readily obtained, easily confirmed, and confidently interpreted, and are representative of a proximate SSE. The selected parameters and trigger values are:

- TMP maximum temperature above 220° F,
- Location and velocity of movement of the settlement front (defined as the line at which settlement equals 1.35 feet per month); and
- Combination of wellhead temperature greater than 170° F and laboratory carbon monoxide (CO) above 3,000 ppm.

Proposed uses for these trigger criteria, including validation procedures to prevent false or inadvertent triggering, are described in Section 5.0 of this Plan.

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5.0 CONTINGENT FUTURE ACTIONS DETERMINED BY TRIGGERS

5.1 TRIGGER LINES

The trigger parameters of maximum TMP temperature and movement of the settlement front will be monitored along three separate lines as shown on Figure 3. These trigger lines, associated mitigative actions, and schedules for implementation are described in the following sections. A schematic diagram of the steps in this process is provided as Table 1 of this Plan.

Trigger Line 1 – Install Additional GIWs, TMPs, and North Phase 1 of Cap and Enhanced GCCS

This line is formed by an arc connecting TMP-6, -14, -13, and -5. When a verified (procedures for reading and verifying readings are provided in Appendix F) maximum TMP temperature at any of these TMPs exceeds 220° F, or when two consecutive months of field-verified settlement front* reaches beyond this line, Bridgeton Landfill must install the additional TMPs and GIWs as well as additional cap and enhanced GCCS (North Phase 1) as shown on Figure 4. The new TMPs will be installed with the same construction details and target depths as the existing TMPs.

New GIWs will be installed between Trigger Line 1 and Trigger Line 2 as shown on Figure 4. A detailed plan for location and construction features of the new GIWs will be submitted by July 26, 2013 along with a set of construction plans for the installation of EVOH geomembrane cap and enhanced gas collection system over the North Quarry area. The plans will include similar details as those contained in the approved cap plans for the South Quarry Area. Approximate location of the proposed cap is shown on Figure 4.

The timeline for constructing the new GIWs, TMPs, and North Phase 1 of cap and enhanced GCCS is presented below:

Event	*GIWs Elapsed Time (after trigger)*	*TMPs and North Phase 1 Cap Elapsed Time (after trigger)*
Initiate Triggers	0 months	0 months
Mobilize Contractor	1 month	1 month
Complete Work	2 months	4 months

Trigger Line 2 – Install North Phase 2 Cap and Enhanced GCCS

This trigger line is formed by the line of TMP-1, -2, -3, and -4, which are located at the “neck” separating the South Quarry from the North Quarry. When a verified maximum TMP temperature at any of these TMPs exceeds 220° F, or two consecutive months of field-verified settlement front* reaches beyond this line, Bridgeton Landfill must install the remainder of the EVOH cap and enhanced gas collection (North Phase 2) over the North Quarry Area.

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By July 26, 2013, Bridgeton Landfill will submit a set of construction plans for the installation of EVOH geomembrane cap and enhanced gas collection system over the North Quarry area. The plans will include similar details as those contained in the approved cap plans for the South Quarry Area. Approximate location of the proposed cap is shown on Figure 4.

The timeline for constructing the cap after trigger criteria are met at Trigger Line 2 is presented below:

Event	*Elapsed Time (after trigger)*
Initiate Triggers	0 months
Mobilize Contractor	2 months
Complete Work	6 months

Trigger Line 3 – Construct Isolation Barrier

This trigger line is formed by the line of contingent TMP-18, -19, -20, -21, -22, and -23 as shown on Figure 4. The trigger line has been positioned in a portion of the North Quarry area that is shallower than the neck area (see 3-D rendering on Figure 2, and cross section on Figure 3). This location was selected because it is unlikely that the SSE could progress into this shallower portion of the fill. The step-up in the quarry bottom would facilitate significant heat absorption into the quarry walls, likely creating an environment that is unfavorable for continued propagation of the SSE. Therefore, it is unlikely that an isolation barrier would ever need to be constructed.

However, if the SSE does progress beyond the step-up, then the position of Trigger Line 3 will allow detection of that and provide over 500 feet of separation between the trigger line and the preliminary contingent isolation barrier location, likely providing several years within which to construct an isolation barrier.

When a verified maximum TMP temperature at any of these TMPs exceeds 220° F, or when two consecutive months of field-verified settlement front* reaches this line, Bridgeton Landfill must construct the isolation barrier between the North Quarry and radiologically-impacted material in West Lake OU-1 Area 1. By July 26, 2013, Bridgeton Landfill will submit an investigation plan and proposed schedule for the investigation, design, and construction of an isolation barrier. The design objective of the barrier will be to effect a complete physical barrier so that propagation of an SSE into the West Lake OU-1 Area 1 radiological disposal area would not be possible. A conceptual location of a contingent isolation barrier is indicated on Figure 4.

* Proposed elapsed timing for installation and construction of contingent isolation, containment, and monitoring features was selected to allow two consecutive months of settlement movement to occur, even at the fastest observed northward settlement front movement rate of 2013, so that the settlement front position could be verified.

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5.2 OTHER TRIGGER CRITERIA

In addition to the discrete trigger lines, conditions will be monitored in the entire North Quarry area using gas wellhead temperature and laboratory-analyzed carbon monoxide (CO) values as appropriate. If any gas extraction well exhibits wellhead temperature greater than 160°F, monthly CO testing will be performed on that gas well. Then, a combination of wellhead temperature greater than 170° F and CO greater than 3,000 ppm, at any GEW gas well in the North Quarry will initiate a verification and further investigation process as indicated below:

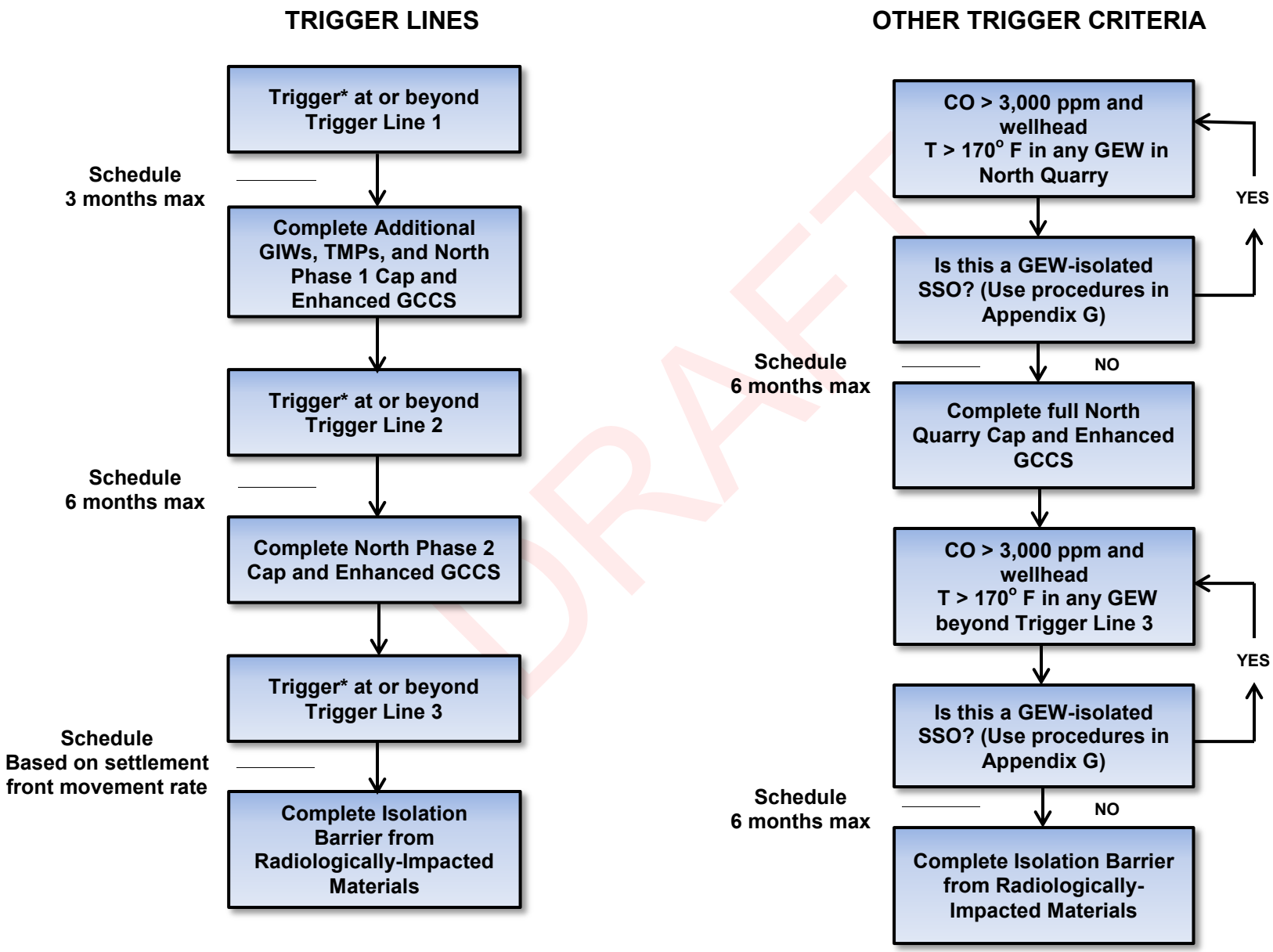
1. Carbon monoxide shall be resampled and sent to a laboratory for expedited testing and results within one week of receipt of the initial CO data that indicated over 3,000 ppm;
2. Daily wellhead temperature readings will be made at the GEW to confirm the initial reading over 170° F and observe trends;
3. Procedures to address the possibility of a common, localized subsurface oxidation (SSO) event will be implemented as set forth in the "Standard Operating Procedure for Management of a Local Subsurface Oxidation Event" which is included in Appendix G of this Plan;
4. If the above steps confirm sustained readings above 170° F and CO greater than 3,000 ppm at the GEW well, <u>and</u> suggest that the readings are not the result of a localized SSO that can be managed and controlled to that specific location, then Bridgeton Landfill shall implement contingency actions, depending on the location of the verified trigger gas well, as indicated below:

    - A confirmed trigger at any gas well in the North Quarry area will require installation of North Quarry cap and enhanced GCCS (Phases 1 and 2) within 6 months of confirmation.
    - A confirmed trigger at any gas well beyond (north) of Trigger Line 3 will require installation of North Quarry cap and enhanced GCCS (Phases 1 and 2) <u>and</u> construction of the Isolation Barrier within 6 months of confirmation.

DRAFT

TABLES

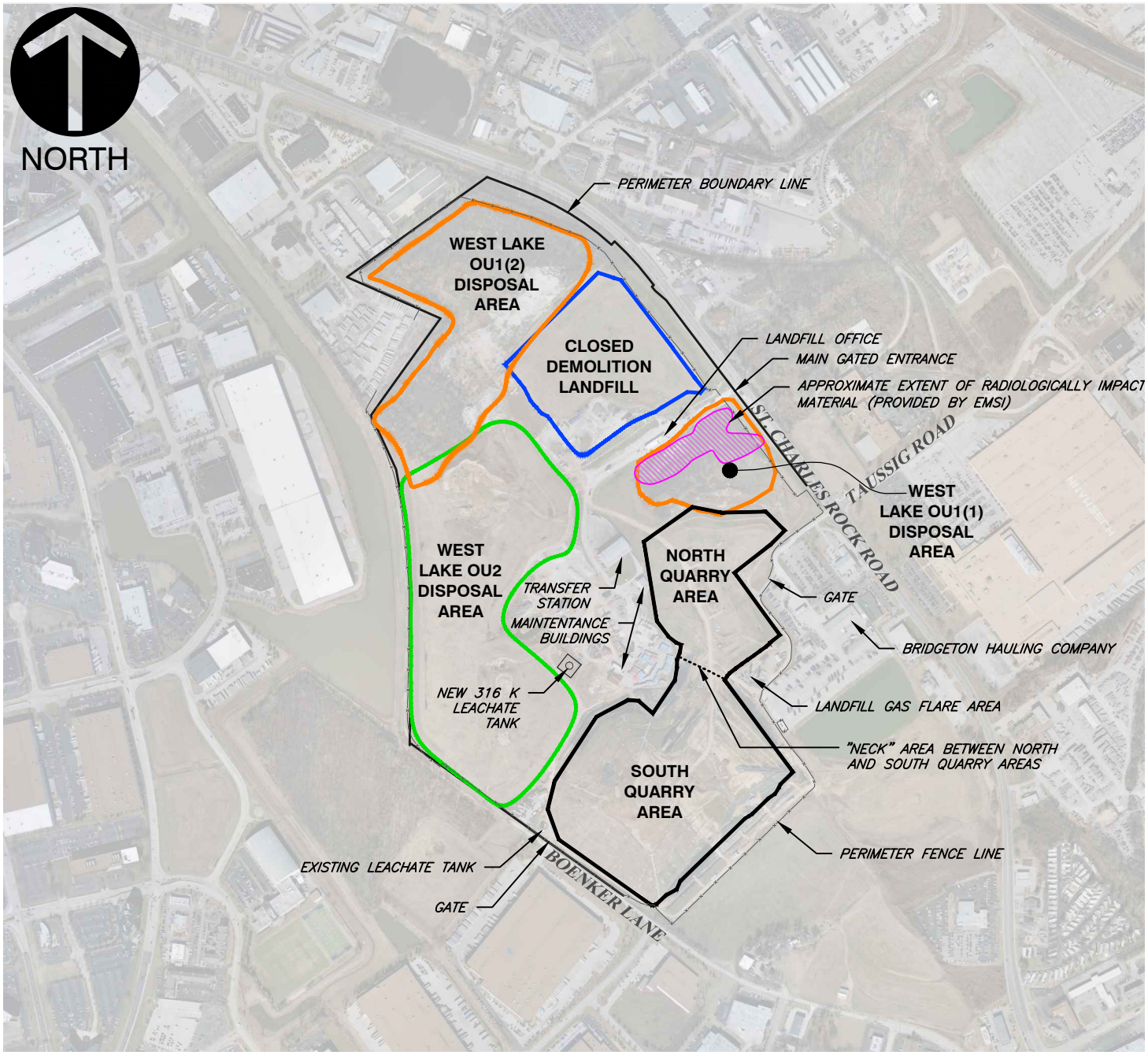
TABLE 1
PATHS FOR NORTH QUARRY CONTINGENCY ACTIONS



*Any verified TMP interval > 220° F, or settlement front reaches beyond trigger line for two consecutive months

DRAFT

FIGURES



REFERENCE

1. AERIAL IMAGERY PROVIDED BY EAST WEST GATEWAY COORDINATING COUNCIL OF MISSOURI AND ILLINOIS, COLLECTED IN LATE FEBRUARY AND EARLY MARCH OF 2012.
2. BOUNDARY INFORMATION PROVIDED BY SHERBUT–CARSON & ASSOCIATES, P.C. DRAWING NAME–1111 LEASE EXHIBIT.DWG RECEIVED ON 03/04/2013

SCALE IN FEET

0 1000 2000

BRIDGETON LANDFILL, LLC
13570 ST. CHARLES ROCK ROAD
BRIDGETON, MISSOURI

FACILITY MAP

DRAWN BY:	MSP	CHECKED BY:	MRB	APPROVED BY:	DRAFT	FIGURE NO.:	1
DATE:	JUN. 2013	DWG SCALE:	1"=1000'	PROJECT NO:	131-178.0001		

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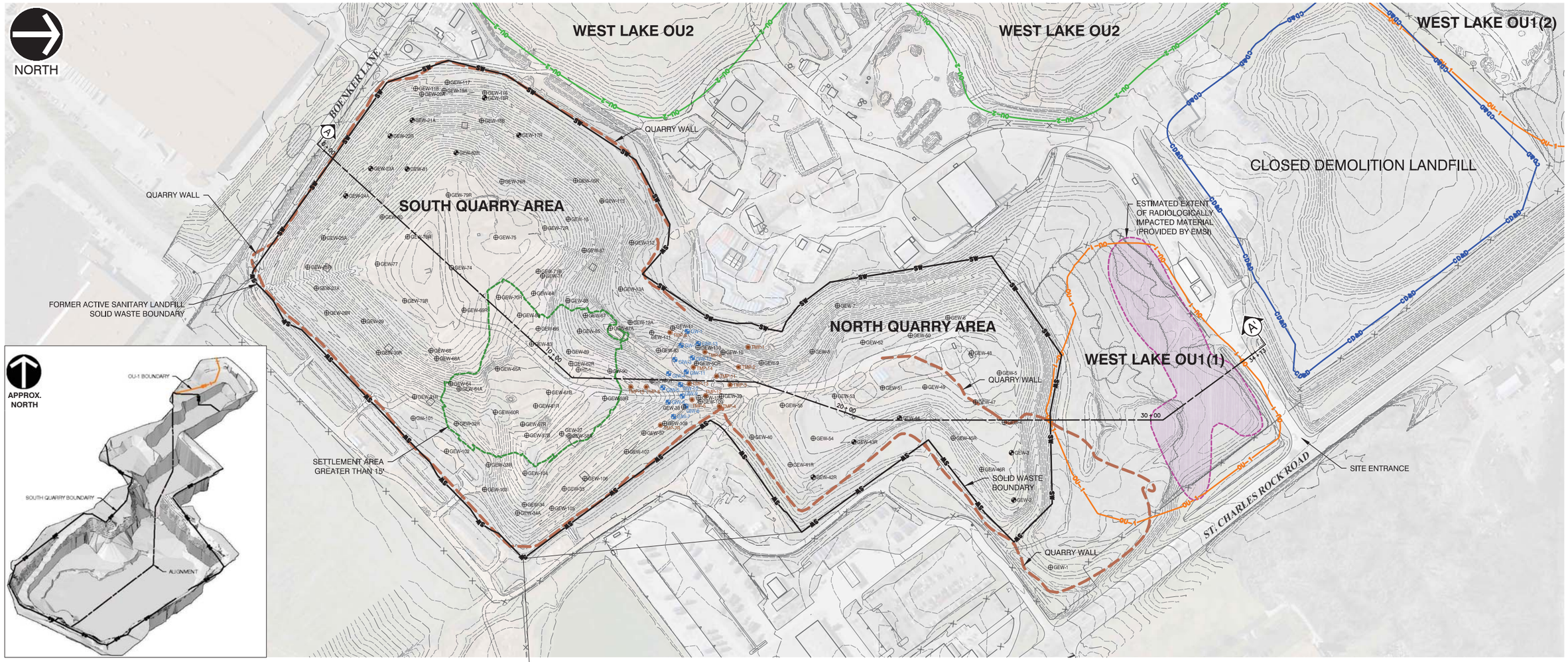
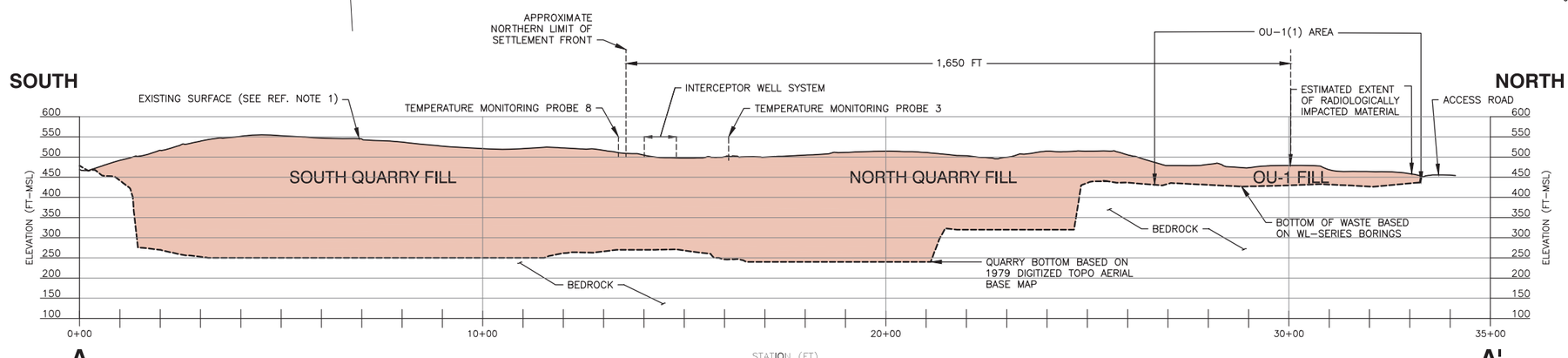


LEGEND

- SW — EXISTING SOLID WASTE BOUNDARY
- OU-1 — EXISTING OU1 BOUNDARY
- OU-2 — EXISTING OU2 BOUNDARY
- CD&D — EXISTING CLOSED DEMOLITION BOUNDARY
- EXISTING QUARRY HIGHWALL
- GEW-81 — EXISTING LFG EXTRACTION WELL
- GEW-2 — EXISTING LFG EXTRACTION WELL (WITH PUMP)
- TMP-6 — EXISTING TEMPERATURE MONITORING PROBE (TMP)
- GIW-10 — GAS INTERCEPTOR WELL (GIW)

REFERENCE

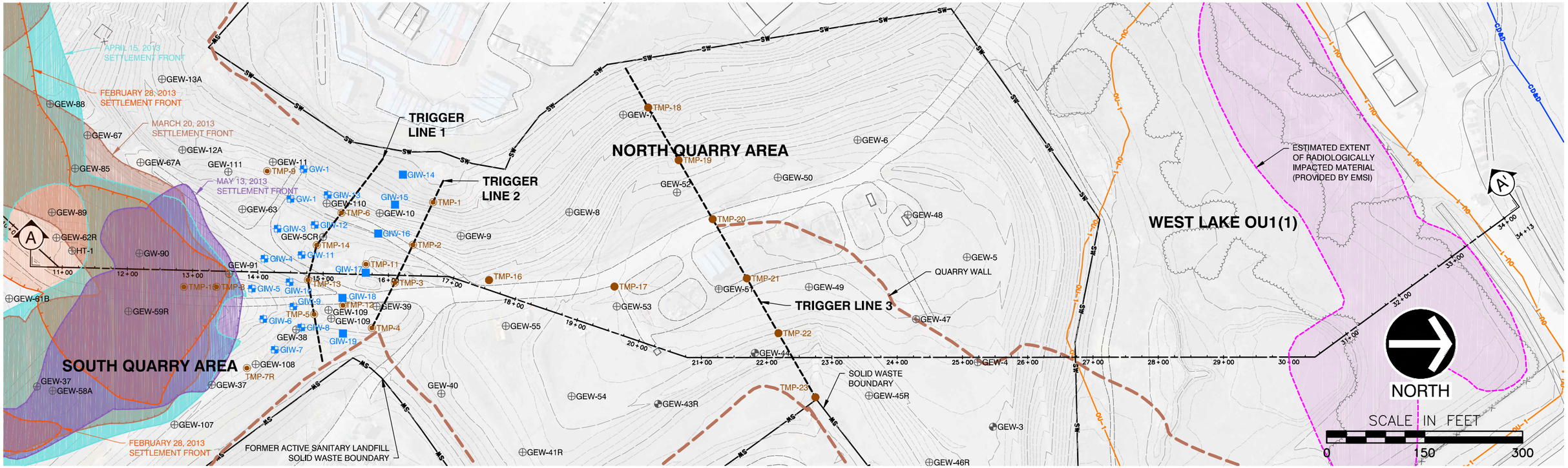
1. TOPOGRAPHIC INFORMATION BASED UPON BRIDGETON LANDFILL–DTM.DWG PROVIDED BY COOPER AERIAL SURVEYS CO., DATED FEB. 2013. SURVEY FIELD SUPPLEMENTED BY WEAVER BOOS CONSULTANTS.
2. AERIAL IMAGERY PROVIDED BY EAST WEST GATEWAY COORDINATING COUNCIL OF MISSOURI AND ILLINOIS, COLLECTED IN LATE FEBRUARY AND EARLY MARCH OF 2012.

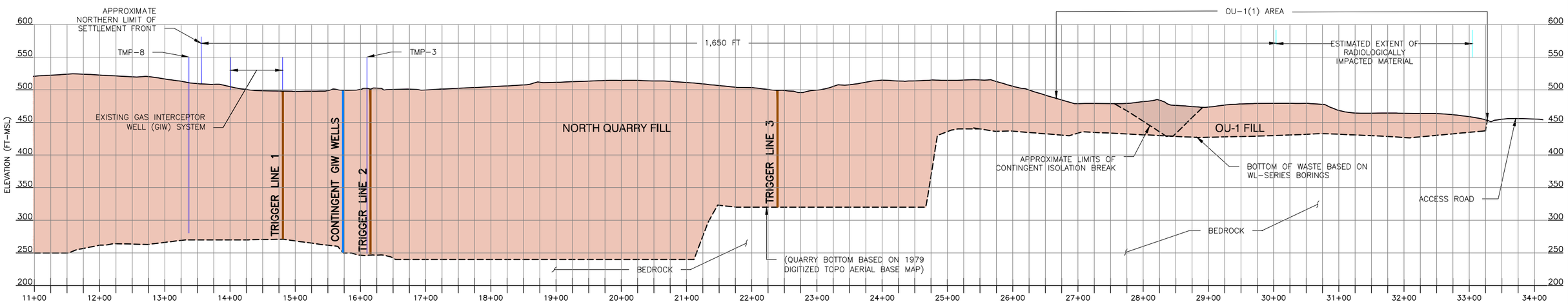


CROSS SECTION A-A'

BRIDGETON LANDFILL - EXISTING CONDITIONS

DRAWN BY:	MSP	CHECKED BY:	MRB	APPROVED BY:	DRAFT	FIGURE NO.:	2
DATE:	JUN. 2013	DWG SCALE:	1"=150'	PROJECT NO:	131-178.0001		





CROSS SECTION A-A'

LEGEND

SW SW	EXISTING SOLID WASTE BOUNDARY	GEW-2	EXISTING LFG EXTRACTION WELL (WITH PUMP)
OU-1 OU-1	EXISTING OU1 BOUNDARY	TMP-6	EXISTING TEMPERATURE MONITORING PROBE (TMP)
CD&D CD&D	EXISTING CLOSED DEMOLITION BOUNDARY	GIW-10	GAS INTERCEPTOR WELL (GIW)
	EXISTING QUARRY HIGHWALL	TMP-16	CONTINGENT TEMPERATURE MONITORING PROBE (TMP)
GEW-81	EXISTING LFG EXTRACTION WELL (GEW)	GIW-14	CONTINGENT GAS INTERCEPTOR WELL (GIW)

REFERENCE

1. TOPOGRAPHIC INFORMATION BASED UPON BRIDGETON LANDFILL–DTM.DWG PROVIDED BY COOPER AERIAL SURVEYS CO., DATED FEB. 2013. SURVEY FIELD SUPPLEMENTED BY WEAVER BOOS CONSULTANTS.
2. AERIAL IMAGERY PROVIDED BY EAST WEST GATEWAY COORDINATING COUNCIL OF MISSOURI AND ILLINOIS, COLLECTED IN LATE FEBRUARY AND EARLY MARCH OF 2012.

NORTH QUARRY TRIGGER CRITERIA

DRAWN BY:	MSP	CHECKED BY:	MRB	APPROVED BY:	DRAFT	FIGURE NO.:
DATE:	JUN. 2013	DWG SCALE:	1"=150'	PROJECT NO:	131-178.0001	3

APPROXIMATE LIMIT OF CONTINGENT NORTH QUARRY EVOH CAP (SEE REFERENCE NOTE 3)

PRELIMINARY CONTINGENT ISOLATION BREAK ALIGNMENT (SEE REFERENCE NOTE 3)

APPROXIMATE LIMIT OF SOUTH QUARRY EVOH CAP AND ENHANCED GCCS TIE IN

TRIGGER LINE 1

TRIGGER LINE 2

TRIGGER LINE 3

NORTH QUARRY AREA

CONTINGENT NORTH PHASE 2 CAP AND ENHANCED GCCS

CONTINGENT NORTH PHASE 1 CAP AND ENHANCED GCCS

QUARRY WALL

SOLID WASTE BOUNDARY

FORMER ACTIVE SANITARY LANDFILL SOLID WASTE BOUNDARY

ESTIMATED EXTENT OF RADIOLOGICALLY IMPACTED MATERIAL (PROVIDED BY EMSI)

WEST LAKE OU1(1)

GIW-13 GIW-14 GIW-15 GIW-16 GIW-17 GIW-18 GIW-19

GEW-110 GEW-10 GEW-5CR GEW-9 GEW-8 GEW-7 GEW-6 GEW-50 GEW-52 GEW-48 GEW-5 GEW-49 GEW-51 GEW-53 GEW-47 GEW-44 GEW-4 GEW-39 GEW-109 GEW-55 GEW-40 GEW-54 GEW-43R GEW-45R GEW-3 GEW-46R GEW-41R GEW-42R GEW-2

TMP-18 TMP-19 TMP-20 TMP-21 TMP-22 TMP-23 TMP-1 TMP-2 TMP-3 TMP-4 TMP-5 TMP-6 TMP-11 TMP-12 TMP-13 TMP-14 TMP-16 TMP-17

15+00 16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00 25+00 26+00 27+00 28+00 29+00 30+00 31+00 32+00 33+00 34+00 34+13

A'

NORTH

SCALE IN FEET

0 120 240

LEGEND

SW SW	EXISTING SOLID WASTE BOUNDARY	GEW-2	EXISTING LFG EXTRACTION WELL (WITH PUMP)
OU-1 OU-1	EXISTING OU1 BOUNDARY	TMP-6	EXISTING TEMPERATURE MONITORING PROBE (TMP)
CD&D CD&D	EXISTING CLOSED DEMOLITION BOUNDARY	GIW-10	GAS INTERCEPTOR WELL (GIW)
	EXISTING QUARRY HIGHWALL	TMP-16	CONTINGENT TEMPERATURE MONITORING PROBE (TMP)
GEW-81	EXISTING LFG EXTRACTION WELL (GEW)	GIW-14	CONTINGENT GAS INTERCEPTOR WELL (GIW)

REFERENCE

1. TOPOGRAPHIC INFORMATION BASED UPON BRIDGETON LANDFILL– DTM.DWG PROVIDED BY COOPER AERIAL SURVEYS CO., DATED FEB. 2013. SURVEY FIELD SUPPLEMENTED BY WEAVER BOOS CONSULTANTS.
2. AERIAL IMAGERY PROVIDED BY EAST WEST GATEWAY COORDINATING COUNCIL OF MISSOURI AND ILLINOIS, COLLECTED IN LATE FEBRUARY AND EARLY MARCH OF 2012.
3. DESIGN OF THE CONTINGENT NORTH QUARRY EVOH CAP AND ENHANCED GCCS, AS WELL AS ADDITIONAL INFORMATION ON PROPOSED ISOLATION BREAK TO BE PROVIDED WITH PART 2 OF THIS PLAN ON JULY 26, 2013.

PLAN VIEW OF CONTINGENT ACTIONS

DRAWN BY:	MSP	CHECKED BY:	MRB	APPROVED BY:	DRAFT	FIGURE NO.:
DATE:	JUN. 2013	DWG SCALE:	1"=120'	PROJECT NO:	131-178.0001	4

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APPENDIX A

PREVIOUS REPORTS ON POTENTIAL MITIGATIVE MEASURES

NORTH QUARRY HEAT BARRIER SYSTEM

BRIDGETON LANDFILL

PREPARED FOR
BRIDGETON LANDFILL, LLC.
12976 St. CHARLES ROCK ROAD
BRIDGETON, MO 60344
1/4/2013

Prepared by
P.J. Carey & Associates P.C.

Draft

EXECUTIVE SUMMARY

This report presents an evaluation of barrier systems that could be employed to prevent the migration of the subsurface heating activity in the South Quarry section of the Bridgeton Landfill (Landfill) from progressing beyond the entry of the North Quarry section of the Landfill. Due to the complexity in assessing and addressing the migration of the underground heat generating reaction, evaluations are ongoing and Bridgeton Landfill, LLC reserves its right to modify or supplement this report as appropriate based upon additional information and evaluation.

Evaluation and Selection of Barrier System

The evaluation considered a number of barrier types including:

- Physical separation using open excavations or structurally supported open space,
- Insertion of significant thicknesses of inert materials,
- Thin barriers of non-combustible materials, and
- Heat dissipation barriers.

The report provides a general description of each type of barrier, a discussion of the design elements required, and the performance goals. Examples of specific design elements are included in the general descriptions. The post installation performance requirement of the barriers is used to evaluate the ability of the barrier types to be successfully employed at the Landfill. In addition to the actual ability of the barrier type to prevent heat migration or combustion progress in theory; the ability to be installed in the required time frame, maintained and remain intact under the anticipated conditions as well as the demands on stormwater, leachate and gas management were considered for each barrier type.

The evaluation of the barrier types concluded that only heat dissipation type barriers were technically feasible and could be installed within a short enough time frame to be effective at achieving the goal with limited impacts. Barriers consisting of removal of significant amounts of waste materials and replacing them with inert fills were evaluated but were not considered due to the inability to construct in a reasonable time frame. Barriers requiring removal and replacement of significant amounts of waste also had significant issues with respect to air emissions, odors, vectors, and traffic that made them highly undesirable.

At this time the heat dissipation/barrier system has been selected as the preferred alternative for use at the Landfill on the basis of the evaluation of all barrier types.

Design of Heat Barrier

The heat barrier system was designed based on an analysis of the advance rate of the heat front, as reflected in settlement of the landfill, and the amount of energy associated with advancing the front. This information was used to develop a range of heat flow in the northern direction in the depth range indicated by the in-waste temperature monitoring to be the heat generating zone. Cooling pipe elements have been designed to maintain temperatures below 170 ºF on the north side of the barrier. Heat is extracted in this system by circulating water in the closed system cooling points at temperatures as low as

a few degrees above the wet bulb ambient air temperature using an evaporative cooler system. The design includes an initial insertion of approximately 42 cooling points across the narrow section of the quarry fill, supply and return headers for the cooling water and a cooler system comprised of a commercially available evaporative cooler.

Based on the current site data, the system has been designed to remove up to 75 Watts/ square meter (W/m^2) of energy across the entire cross section with the initial cooling point installation. The heat barrier can be expanded, if conditions require it, in terms of the number of cooling points used and the total heat energy extracted.

Time of construction of the heat barrier is estimated to be approximately 90 days following notice to proceed. Based on this time frame, an Action Line has been identified approximately 100 feet south of the proposed barrier location. In-waste temperature monitoring probes (TMPs) have been installed along the Action Line. Mobilization for construction of the barrier will occur if temperatures in the waste rise to 200 ºF or gas wellhead temperatures exceed 195 ºF at the Action Line. Based on the current state and movement of the heat front, it is apparent that adequate time is available to finalize the design, get contracts in place and establish the specific critical path item times that may require pre mobilization, purchase, and fabrication of system components.

The design elements are presented in 5 drawings. Final Construction drawings and specifications will be developed on the basis of this draft design.

Draft

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Figure 2 – Open Excavation at Quarry Neck

Figure 3 – Open Excavation in North Quarry

Figure 4 – Filled Excavaton in North Quarry

Figure 5 – Settlement Front Advance

Appendices

Appendix A - Calculations

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1 Introduction

The purpose of this report was to evaluate, select and design a barrier system to prevent the underground heat generating reaction currently present in the South Quarry portion of the Bridgeton Landfill from progressing beyond the entry of the North Quarry portion of the landfill.

The report is based on analysis of measurements that have been obtained at the landfill through historically and recently performed surveys and analysis of waste temperature measurements. The report is arranged to identify the types of barrier systems that could be utilized, identify the design issues, develop an evaluation basis for each barrier type, select a barrier type, and present a design for the selected barrier that will be used to prepare construction specifications and a manual presenting barrier system operation and maintenance requirements.

The report utilizes site information that has been reported by others on behalf of the Landfill. It does not restate this information but focuses on the barrier system selection and design.

Because of the complexity in assessing and addressing the migration of the underground heat generating reaction, evaluations are ongoing and Bridgeton Landfill, LLC reserves its right to modify or supplement this report as appropriate based upon additional information and evaluation.

2 Barrier Types for Consideration

The type of barriers and general configurations that are considered for evaluation are shown below in Table 1. The barriers have been divided into general categories relating primarily to construction and design/performance. The table also includes ways in which the various systems could be combined with other systems within their own category or of other categories. The table is intended to include developed types of technologies that could be reasonably used if they were feasible. The table represents a preliminary identification of technologies, prior to any screening associated with feasibility evaluation.

Figure 1 depicts the Landfill surface grades as of March 2012 and the floor of the quarry. This provides a perspective on the size of potential barriers and depths of the waste column within the limits of the landfill.

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TABLE 1

TYPES OF BARRIERS CONSIDERED – BRIDGETON LANDFILL

General Type	Configuration	Alignment	Geometry	Structure	Materials	Brace Options	Possible Combination of Types
Open Excavation-no structure	Excavation to Quarry Base	Restricted to non radioactive areas and areas without elevated temperatures	Slopes down to quarry bottom Surfaces with 3:1 slopes	NA	NA		
	Partial Excavation	Restricted to non radioactive areas and areas without elevated temperatures	Slopes down to some intermediate elevation with vertical to quarry floor Surfaces with 3:1 slopes	NA	NA		With zone below excavation vertical barrier – with or without heat extraction
Structurally supported open space	Parallel walls with internal bracing extending to quarry bottom	Restricted areas where total length is minimized	Vertical	Beam and Lagging	Steel beams Concrete lagging	Steel bracing	
				Structural Slurry Wall	Reinforced concrete placed in panels by tremie	Structural Slurry wall support panels normal to wall face	
				Tangential concrete caissons	Concrete with steel reinforcement	Steel Bracing	
	Cellular Empty Structures extending to quarry bottom	Restricted areas where total length is minimized	Vertical	Structural slurry wall	Concrete with steel reinforcement	Structural Slurry wall support panels normal to wall face	
Non Open Space Barriers-not structurally supported	Backfilled open sloped excavation extending to quarry floor	Same as open Excavations with no structures	Various slopes – from 3:1 to slopes as steep as 1.5:1 (maybe even 1:1 with safety precautions if shallow)	None	Soil or non-combustible waste materials	NA	Variations in combination open unfilled excavations and structurally supported non open space systems are possible-narrow barriers may require heat removal also
Non Open Space Barriers Structurally supported	Parallel wall internal bracing	Restricted areas where total length is minimized	Vertical	Beam and Lagging	Steel beams Concrete lagging Earthen backfill	Steel bracing	All may be combined with Heat Barrier systems and open excavation (to reduce vertical height of barrier
				Structural Slurry Wall	Concrete walls Earthen fill or cementious backfill	Structural Slurry wall support panels normal to wall face	
				Tangential concrete caissons	Concrete with steel beams Earthen fill or cementious backfill	Steel Bracing	

Draft

General Type	Configuration	Alignment	Geometry	Structure	Materials	Brace Options	Possible Combination of Types
	Parallel slurry walls no internal bracing	Restricted areas where total length is minimized	Vertical	Weak Structural Slurry walls	Cementious backfill with minimal steel	None – excavation under slurry	
Heat Removal	Active heat exchange in wells within waste using lower temperature liquid circulation	Not restricted but most effective with limited alignment length	In drill holes of various diameters with backfill In backfill associated with backfilled barrier option vertical or horizontal In drill holes in front of heated side of barriers	Dual pipe installations in drill holes – header for supply (closed system) with heat removed by air cooling and or chilling	Steel piping with conditioned water	NA	Non open space barriers
	Passive conductive elements	Not restricted but most effective with limited alignment length	Vertical in drill holes or in backfill with any orientation	Closed shapes	Highly conductive but non corroding metals (coated steels)	NA	As part of backfill in non open space barriers
Heat Barrier	Insulation Barrier	NA	Works only as part of non open space barrier	See non open space barriers	Non combustible expanding foams with mineral filler	NA	As part of backfill in non open space barriers
				In combination with all backfill and other heat type barriers			

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3 Post Installation Barrier Performance Requirements

This section of the report discusses and presents the design considerations and performance requirements for the various types of barrier systems that could be installed. This forms the basis for evaluating the technical feasibility of the systems.

3.1 Open Excavation Type Systems - Slopes

This evaluated option refers to open excavation with slopes and not braced or open excavations that are then backfilled following construction. This pertains to cut excavations that are left open until such time as it is deemed unnecessary to maintain the open space.

3.1.1 Excavation Slope Stability

Slopes must be stable for the long term. It is likely the steepest slope meeting this criterion could be 2:1 or 2.5:1, depending on assumptions made regarding the development of seepage/pore pressures proximate to the excavation slopes. On the side that may be exposed to potential heating, a more shallow (3:1) maximum slope is appropriate to account for adverse seepage that would develop as a result of moisture content increases caused by condensation of water vapor as it approaches the locally cooler slope surface.

3.1.2 Slope Cover and Run-off Management

The final slope configuration resulting from the open excavation would require a cover to prevent waste exposure and oxygen intrusion. In addition, rainfall run-off must be directed and managed to prevent erosion.

For any portion of the open excavation barrier that is below the perimeter grades at the site where it is constructed, a pumping system and temporary holding basin at the bottom of the open area would be required. This basin must be lined to prevent intermingling of leachate, seepage, condensate etc. with stormwater.

Portions of the open excavation above the exterior limits of the landfill edge may be drained to a basin in a normal fashion.

The stormwater management system must be designed to accommodate a 100 year rainfall event. Given the short time of concentration, a measure of how long run-off takes to flow from the most remote location in the watershed to the discharge point, peak pumping rates to remove the incident rainwater below the perimeter drain for systems with limited storage would be high. With steeper slopes, the temporary cap is likely to be impervious. Steeper slopes with vegetated cover could be used on the non-heat side of the barrier, but would require 2.5:1 or flatter slopes or specialized systems to keep soils in place. The only reason for using vegetated slopes is to reduce run-off, since in the long term, the slopes are likely to be filled in to at least the gravity drainage level.

3.1.3 Seepage and Leachate Collection management

Seepage collection needs to be provided for the slopes under the temporary capping system. In the event that some leachate seepage were encountered at the base of the excavation a significant drain and pump station could be required at the bottom of the excavation area.

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3.1.4 Gas Emission Management

Gas wells and under cap collectors are required to control emissions, especially on the heated side of the excavation. The need for these types of features has been identified at other sites experiencing similar conditions. Installation of gas collection components in this type of environment is very complex to install and operate. The potential for over-pull of ambient oxygen into the landfill is great as the system is tuned to manage heat, and the steam and pressure front associated with the subsurface heat generating reaction.

3.2 Open Space – Structurally Supported

This type of barrier creates an open zone in the waste that is near vertical on either face in the waste mass. Examples of this type of system would be braced excavations using beam and concrete lagging on both faces or parallel structural slurry walls with open space. Each face of the excavation is braced against each other using a system of whalers and beams.

3.2.1 Stability – Physical Forces

The bracing structures would have to be designed to withstand:

- Lateral earth pressures that will be exerted by the waste mass. These could be computed using standard formulae for active, passive and at-rest pressures based on methods for generally static conditions, presuming no volume destroying phenomena, e.g. reduction in waste volume through pyrolysis, advanced within a critical distance of the barrier. The critical distance is approximately defined as upward projection from the base of such an event at a 45 degree vertical angle toward the barrier. Therefore, if the maximum depth of a volume destroying event were 200 feet, the active, passive and at-rest design pressures would not apply if the event were within a 100 feet of barrier.
- Lateral strains and unbalanced earth pressures for potential volume destroying events within the critical distance discussed in the previous bullet item should be based on a displacement model and utilize large displacement finite element modeling to approximate stresses in the structural elements. Lateral displacements at the ground surface associated with subsidence at other sites experiencing similar conditions have been measured to be as much as 50 percent of the vertical subsidence in non-sloping areas. This requires that the support structure be ductile and maintain its integrity with significant deformation. Design for lateral movements on the order of 15 feet, or more, would have to be considered, based on settlement expectations of greater than 30 feet as being possible.
- Downdrag forces must be considered to fully develop on the surface of both sides (both the heated and unheated) of the barrier. The natural decomposition of the waste results in sufficient settlement to fully develop full downdrag forces.

3.2.2 Heat Resistance

This type of barrier has significant potential for oxygen intrusion through the face of the structure. This could greatly increase the potential for an actual combustion event near the barrier. It would be difficult to eliminate the possibility of oxygen intrusion through the face of the braced wall. As such, the structure should be designed to withstand the elevated temperatures associated with a fire condition. As an

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alternative, flooding the open space if it is deemed likely that such an event is about to occur, could be considered in order to eliminate the need to consider temperatures above the boiling point in the design.

All materials used should be non-combustible. If cementious materials such as plastic concrete, normal reinforced concrete or precast elements are used, they must be designed to maintain integrity at the temperatures anticipated. Some temperature measurement should be included in the installation so decisions regarding flooding or heat exchange in front of the system could be installed and operated to reduce temperatures prior to the barrier structure being impacted.

3.2.3 Corrosion

The structural elements would be required to maintain their integrity under the design loads for the design life. Coatings, cathodic protection, use of special cements (sulfate resistant or fumé of silica based) would all need to be evaluated for inclusion in the design.

3.2.4 Explosive Environment Potential

It is likely that some combustible gas could enter this space creating a potential for explosion. For proper worker safety and environmental protection either the space would need to be well ventilated (which would create complications discussed in 3.2.5), flooded with water, or sealed using a fire resistant insulating material (making this a non-open space barrier discussed in 3.3).

3.2.5 Oxygen Intrusion

Oxygen intrusion through cracks of the facing elements in a beam and lagging system or structural slurry wall panel could allow preconditioned waste (dried, heated or partially pyrolyzed) to actually combust. No oxygen can be allowed to enter the waste on either side of the barrier system of this type. It is not likely that oxygen intrusion can be limited to an insignificant level. The failure to be able to do this is considered a fatal flaw for this type of barrier.

3.2.6 Leachate Seep Management

Leachate seepage through the face (assuming some cracks are present) must be collected and removed if the space is not designed to flood and be treated as leachate contaminated water.

3.3 Non –Open Space Barriers

This category of barrier includes systems that rely on backfill material placed into a space created by excavating, drilling or driving. The materials can be inert soils, structural elements or mixtures of soils, resistant foams or slurries. Cofferdams, filled segmented structural slurry wall bins, braced excavations filled with soils and foams, contiguous augered and backfilled piers would all be considered examples of this type of barrier.

3.3.1 Stability – Structural

The physical forces that non-open space barriers must withstand are similar to those identified in 3.2.1, with the exception that large open excavations that were backfilled would have sloping sides, eliminating the issue with lateral earth pressures and downdrag forces. However, lateral deformations could still be an issue if the open excavation was narrow enough. Excavations with width to depth ratios of 0.4 or less would require the following to be accounted for in the design:

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- Lateral earth pressures exerted by the waste mass. These could be computed using standard formulae for active, passive and at-rest pressures based on methods for generally static conditions presuming no volume destroying phenomena advanced within a critical distance of the barrier. The critical distance is approximately defined upward projection from the base of such an event at a 45 degree vertical angle toward the barrier. For example, if the maximum depth of a volume destroying event were 200 feet, the active, passive and at rest design pressures would not apply if the event were within a 100 feet of barrier. For excavations with temporary structural support, these forces would be applicable for the short term applied to the temporary support without the backfill materials. Longer term calculations would include the backfill material properties.
- Lateral strains and unbalanced earth pressures for potential volume destroying events within the critical distance defined above. Lateral displacements at the ground surface associated with subsidence at other sites experiencing subsurface heating have been measured to be as much as 50 percent of the vertical subsidence in non-sloping areas. This requires that the support structure be ductile and maintain its integrity with significant deformation. Design for lateral movements on the order of 15 feet, or more, would have to be considered, based on settlement expectations of greater than 30 feet being possible. Design methodology would be similar to that described in 3.2.1
- Downdrag forces must be considered to fully develop on the surface of both sides (both the heated and unheated) of the barrier. The natural decomposition of the waste results in sufficient settlement to fully develop downdrag forces. The barrier, including the backfill materials must either resist the forces or allow significant deformation to minimize the forces developed. Coatings and other thin friction reducing layers should not be considered adequate for this application unless proven to remain functional for the expected range of slippage required (as much as 30 foot of vertical deformation) that could occur adjacent to the barrier. Reliance on force resisting structural elements or internal shearing of barrier fill materials would be acceptable.

3.3.2 Heat Transmission

The transmission of heat through the barrier from the heated to the unheated side must be such that the temperatures on the unheated side do not result in either volume reduction (pyrolysis or combustion) or conditioning (drying and heating) of the waste to the point that potential for combustion or triggering of non-combustion driven chemical reactions is elevated to the point that the barrier is not effective.

The critical temperature on the cooler side of barrier would range from of 175 °F to 210 °F depending on the moisture content that can be sustained in the waste. At these temperatures, the landfill gas withdrawal process removes a large amount of water vapor, resulting in the eventual dehydration of the waste mass, which is a significant step in preconditioning the waste for further temperature rise or pyrolysis.

Heat transfer calculations must be performed that are based on observed advance rates of the heat front at the site with some assumptions concerning the dimensions of the actual heat front. Site measurements using the TMPs and gas wellhead temperatures allow the boundary temperature and potential for delivery of heat energy to the barrier from the hot side to be estimated. The thermal properties of the waste and backfill materials may be estimated from the literature, with corrections being applied, as needed, to

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account for pyrolyzed or dried waste. As will be discussed in 3.4, heat removal systems could be incorporated into backfill materials to reduce the transfer of heat across the barrier.

3.3.3 Corrosion

The barrier (including any structural elements that are being relied on for long term function, if any) would be required to maintain its integrity under the design loads and thermal properties for the design life, or be planned to be replaced as needed.

3.3.4 Other

Oxygen infiltration, explosive environments and leachate seep management, while issues for non-filled barriers, are largely eliminated by using fill in the barrier system.

3.4 Heat Barriers (Heat Removal Systems)

The goal of heat removal within a zone is to lower or maintain the temperature within a designated area of waste, to a level that will impede pyrolysis, smolder or other mechanism that could result in the continuation of the heat generating reaction beyond the barrier limits. In addition, creation of a local lower temperature zone will result in the condensing of water vapor in the vicinity of the heat barrier, reducing or eliminating waste dehydration. Systems of this type may be used alone or in conjunction with other filled barrier systems.

3.4.1 Physical Forces

The forces acting on portions of the heat removal system (cooling elements) installed in the waste are the same as those previously described for the other narrow type open and non-open space barriers. These forces are associated with lateral pressure, downdrag, and lateral deformation. As an alternate to long term performance under these forces, the cooling elements can be designed to be replaced as required.

3.4.2 Thermal Performance

The system must be designed to remove heat energy at a rate equal to the maximum rate that is likely to be delivered by the reaction without allowing the temperature on the unheated side of the barrier to exceed the target value. The design must address both total energy removal and the removal of heat at the cooling points, similar to design of an array of dewatering wells. Monitoring the temperature in the waste in the vicinity of the heat removal barrier would allow for additional cooling elements to be installed in areas where the rise rate of temperature indicated that more heat removal was needed. Elements could be active or passive or a combination. However, it's unlikely that passive elements alone can remove heat to a substantial depth while maintaining temperatures at or below target values. Liquid systems should be closed while air cooled systems could be once through.

The rates of transfer and temperature predictions must account for the thermal properties of the waste and backfill materials adjacent to the transfer device.

3.4.3 Corrosion

Pipes, pumps, coolers and other conveyance and cooling elements of the system must resist corrosion from both the coolant and the waste material.

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4 Design Parameters

4.1 Waste Physical Parameters

4.1.1 Strength

The following general parameters may be used for waste strength:

Waste Condition	Effective Stress Friction Angle (φ') deg	Effective Stress Cohesion Intercept (c') psf
Severely Heat Impacted	28	0
Other Waste	34	300

A directional modifier could be added when evaluating potential failure surfaces that are near horizontal are deemed likely within the waste, reducing the φ' to 22 or 24° along horizontal surfaces.

4.1.2 Compressibility

Consolidation, rebound and other one dimensional type behaviors can be computed using typical compression and recompression indices. These same values can be used to model the waste in more complex non-1 dimensional conditions as modified cam clay material. Parameters that could be used are presented below.

4.1.3 Lateral Pressure

Lateral earth pressures use waste strength to compute at rest and active earth pressures for short term conditions of vertical systems.

Longer term earth pressures at-rest should be based on a k_o (ratio of horizontal to vertical effective stress for at-rest conditions) of 0.5. Passive resistance pressures and lateral pressures under subsided conditions will be approximated using finite element simulations

4.1.4 Downdrag Forces

The constant reduction in waste height on both the heat impacted and not heat impacted side of a near vertical barrier, pipes and other vertical elements create downdrag forces. Downdrag forces can be assumed to be fully developed in all cases given the magnitude of movement anticipated from even regular waste decomposition. Interface friction angles used for the calculation are shown below.

Material	δ° (interface friction angle – degrees)
Steel – Pipe, Sheeting, Beams	22 (accounts for corrosion)
Structural Slurry Wall	32 (accounts for roughness)
Lagging Elements	20
Coated Elements (polymer or epoxy)	18

The total downdrag force cannot exceed the full development in waste of downdrag for the elements as a result of group interaction. Piping or other buried vertical structural elements that are used in close proximity should be analyzed for group interaction.

The force could be assumed to be active all the way to bedrock for stiff elements.

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As an example, the downdrag force developed per foot of wall alignment on one side of a slurry wall system (structural) is estimated as 17.5 x tan(δ) x h^2. For a depth of 200 ft this amounts to 430 kips (1 kip is 100,000 lbs) per running foot of wall alignment for each face of barrier. If both sides of the wall are included, this becomes 860 kips per foot. At 230 foot it becomes 580 kips per foot.

4.2 Waste Heat Flow

Estimation of heat flow toward a barrier is dependent on the distance from the heat generating event, the type of event (still to be determined), and the conductivity of the materials between the event and barrier. Alternatively, the estimation of heat flow can be estimated using the rate of advancement of the heat front and overall heat balance associated with warming of the waste, evaporation of moisture and energy consumed in volume reduction. Waste conductivity values can be estimated using published values for dry, damp and wet waste, char and soils.

Table 1 from Yashida and Rowe contains some of the values needed. Ragland, Aerts and Baker cite a wood char conductivity of 0.052 W/m K for dry char at room temp. Table 1 from Yashida and Rowe is included in Appendix A.

4.3 Gas Permeability

Gas permeability values from the literature can be used for modeling heat transfer from the vapor phase if needed. If cold gasses are injected in areas where the waste is saturated or significant condensation would accumulate, this moisture would freeze adjacent to the injection point. This would render further injection impossible unless fracturing occurred. Once freezing of the waste occurred, the heat exchange to the injection point would be limited by the conductivity of the frozen waste and the spacing of the injection points.

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5 Initial Screening of Barrier Types

5.1 Open Excavations

5.1.1 Volume

The volume of material to be removed is computed to be between 2.5 million cubic yards in place for a barrier excavated at the narrowest point of the quarry and 650,000 cubic yards in place for a barrier excavated along the step up location where the quarry becomes shallower. The excavation limits and grading are shown in Figure 2 and Figure 3 for the excavation at the narrow point and along the step up, respectively.

5.1.2 Technical Feasibility

5.1.2.1 Excavation

Excavation of waste is considered technically feasible if the temperature of the waste is below 180 °F. For the purpose of this evaluation, excavation slopes of 3H:1V were assumed.

5.1.2.2 Seepage Controls

Seepage controls are required below the elevation where waste can be presumed saturated. This depth is no less than 30 feet above the base of the quarry (the current permitted level). This suggests that

significant seepage from the excavation faces should be anticipated below this depth. Seepage controls are likely to require rows of wells to depress the level of pore pressure within the waste. In solid waste the use of vacuum well points is not appropriate, given the limited vacuum that can be supported by leachate prior to foaming (about 12 feet of water column). Therefore deep wells spaced at relatively close spacing and seepage drains on the slope would be required. These are time consuming to install but technically feasible. In addition, temporary caps would be required to control odor, vectors and reduce the comingling of leachate and surface waters. Benches for maintenance of the system would have to be included in the design, increasing the excavation volume beyond the theoretical volumes provided in 5.1.1.

5.1.2.3 Stormwater management

The surface of much of the excavation would be below the drainage elevation. The area of the excavations is large, approximately 7 to 8 acres, depending on location and does not include a pond or storage facility for temporary stormwater management. Presuming the slopes are temporarily capped with plastic, this results in a peak run-off rate of 2+ million gallons per minute for a 25 year rainfall event. A very large pump and pond system would be needed to manage this run-off. Such a system would result in higher excavation volumes. The presence of leachate seepage emanating from the waste below an elevation of approximately 30 feet above the quarry floor will increase the risk of contamination of temporarily detained rainwater with landfill leachate.

5.1.3 Time of Construction

Waste excavated from the construction would be disposed of at an off-site facility. The rate of excavation is therefore controlled by the rate of transport off site. Presuming excavation prohibitions at the Landfill are removed and disposal capacity is available, a maximum excavation rate of 3,000 cubic yards per day, requiring 150 complete truck trips per 8 hours (19 per hour or approximately one every 3 minutes) could be achieved. This results in an excavation time of 833 days for a 2.5 million cubic yard excavation if one shift per day is assumed. Completion of the other works involved are likely to add at least 30 days for the completion of capping and connection of infrastructure and 30 days for the activities prior to excavation. This results in a completion time of approximately 900 days if all dewatering and other critical works are done simultaneously. This is reduced proportionally for the smaller excavation to approximately 250 days.

5.1.4 Discussion

5.1.4.1 Advantages

An advantage of an open excavation barrier is the ability to prevent heat transfer or combustion from heat generating reactions in the south area from advancing north.

5.1.4.2 Disadvantages

The following are disadvantages associated with an open excavation barrier:

- Significant air emissions, odors, and vector issues are likely unless enclosed excavation structures are utilized. However, the use of such structures would significantly increase time of completion. Enclosed structures also significantly increase the complexity of the operation and the number of potential health and safety issues for the workers,
- Significant increase in construction traffic on-site and off-site for an extended period,

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- Exposure of unknown materials and potential health and safety risks to workers excavating,
- Complication of stormwater management and leachate management below drainage elevations,
- Significant time of completion (greater than 1 year and up to 3 years) requires triggering action prematurely. It also rules out barrier locations in narrower sections of the quarry fill,
- Excavation at neck area already is problematic given the limits of excavation would extend into the area already settling and with elevated temperatures,
- Does not address possibility that the waste removed and relocated contains materials that are driving the heat generating reaction, and could transfer the problem to the next site, and
- Creates a long term maintenance issue/challenge for maintaining the below exterior grade portions of the excavation.

5.1.5 Conclusion Concerning Feasibility

The long term challenges of leachate and stormwater management in the excavations that are well below the drainage elevation make this type of barrier system infeasible in the long term, even without consideration of time and complexity of construction.

5.2 Filled Excavations

5.2.1 Technical Feasibility

5.2.1.1 Excavation

Filled excavations are similar to the open excavation in technical feasibility with the exception that the use of steeper slopes presents some stability issues for deeper excavations. Steeper slopes in excavations are problematic once saturated waste is encountered. Temporarily stable slopes below the saturated zone will not be safe steeper than 2.5:1 without dewatering. Substantial dewatering would be necessary to lower the head in the waste within limits of potential failures.

Volumes of excavation materials would be less with steeper slopes resulting in excavation volumes of approximately 500,000 cubic yards for the second location, depicted in Figure 4, instead of 650,000 cubic yards for the open excavation. This presumes slopes of 2H:1V are used at all locations, which is likely an overly optimistic presumption. A filled excavation at the narrow point of the quarry was not considered for this option given that portions of the waste to be excavated are already higher than 180 ºF, which was identified as a limitation.

With the steeper slope and use of backfill, sequential backfilling would occur as the excavation progresses from west to east. This limits the amount of equipment that can be used. It would allow shorter exposure at depth reducing instability risk, but complicates the logistics of the excavation system.

5.2.1.2 Seepage Controls

Seepage controls would be similar to those discussed in the open excavation but would be abandoned as backfilling progressed over them. Temporary caps would also likely be employed to control odor and vectors, and to minimize the comingling of surface water and leachate. As the systems would be covered up, the design extraction points for all collection would need to advance with the advancing excavation. This ongoing installation of wells will result in increased complexity, but can be accomplished. The net result will be that steeper excavations can be used to reduce excavation volume if the excavation is

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temporary and will be backfilled within a few months. However, the time frame needed to advance these excavations to the depths required is longer on a per cubic yard basis, compared to shallower sloped excavations. This is due to the increased dewatering and complexity of the cut and backfill operation.

5.2.1.3 Stormwater Management

As with the seepage controls, stormwater management for filled excavations is similar to that required for open excavation but is more complex. Sediment loads would be significant from the slopes of the earthen backfill unless stabilizing sprays are used to control erosion. In addition, the location of temporary sumps/sediment drops is complicated by the sequential backfilling operations. It is likely that limited sump sizes will require outside temporary basin construction and use of large pumps that are generator driven so as to be independent of power outages. While these activities are feasible, they represent a complex operating plan to avoid significant setbacks, such as flooding, large amounts of contaminated water or temporary instability of backfill.

Long term, the backfilled site would be able to drain by gravity.

5.2.2 Time of Construction

The time of construction will be approximately the same as for non-backfilled excavations, given the complexity of the operations and the added time to bring approximately 500,000 cubic yards of backfill to the Landfill and placing it. While some of these operations would be concurrent, the final backfill sequence would be done after excavation was complete and could represent 1/3 of the total fill amount. The filling rate would be controlled by the rate fill can be brought to the Landfill from offsite. This represents approximately 30 days in addition to the excavation completion time. Therefore the minimum time of the work is approximately 1 year if enclosed structures are not used.

5.2.3 Advantages and Disadvantages

5.2.3.1 Advantages

The following are advantages of filled excavations:

- Creates a physical and thermal barrier,
- Removes less waste from the site, and
- Eliminates the need for long term stormwater and seepage controls.

5.2.3.2 Disadvantages

The following are disadvantages of filled excavations:

- Significant air emissions and odors are likely unless enclosed excavation structures are utilized. However, the use of such structures would significantly increase time of completion. Enclosed structures also significantly increase the complexity of the operation and the number of potential health and safety issues for the workers.
- Significant increase in construction traffic on-site and off-site for an extended period Exposure of unknown materials and potential health and safety risks to workers excavating
- Complication of stormwater management and leachate management below drainage elevations

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- Significant time of completion (approximately 1 year) which requires triggering action prematurely.
- Excavation at neck area already is problematic given the limits of excavation extend into the area already settling and with elevated temperatures.
- Does not address the possibility that the waste removed and relocated contains materials that are driving the heat generating reaction relocation could transfer the problem to the next site.
- Increases risk of instability by using steeper slopes and requires greater level of dewatering focus

5.2.4 Conclusion Concerning Feasibility

These types of barriers are technically feasible. However, the overall feasibility is limited due to time of construction and potentially significant issues relating to odor and air emission control issues.

5.3 Thin Vertical Barriers

5.3.1 Technical Feasibility

5.3.1.1 Physical Force Resistance

5.3.1.1.1 Downdrag Forces

Preliminary calculation of downdrag force is 10,000 lbs. per foot of barrier along the alignment or 40,000 lbs. per beam element (assuming a 4-foot center to center beam spacing). The downdrag force is relatively low compared to the compressive strength capacity of potential beams (i.e. H beams) when the forces are acting uniformly around the beam (in the absence of bending loads).

5.3.1.1.2 Lateral Force Imbalance

Thin barriers (those relying on bending capacity to resist lateral load imbalance) cannot meet the requirements for bending stresses that could develop should a volume consuming event occur along on one side of the barrier. If a total settlement of 40 feet were to occur on one side of the barrier the lateral force generated at the low side ground line would be generate bending moments in excess of 5.4×10^5 foot pounds per foot of wall along the profile. This very large bending moment, along with the compressive forces associated with downdrag, would create a beam/column behavior that would require very large and heavy beams to remain stable.

Similar calculations can be performed for concrete walls which must be installed in slurry wall type settings. This limits the strength of the concrete that can be used to a maximum of 3,000 psi. Using an approximate method and ignoring downdrag force influence, a 3 foot thick wall unit would require approximately 1/3 of the cross section of the wall to be reinforcing steel. It is likely that wall sections of at least 5 feet would be needed to incorporate the quantity of reinforcing steel required.

5.3.1.1.3 Ductility with Large Lateral Strains

Steel beam based and concrete based systems could be designed to be ductile; however the magnitude of tilting anticipated would result in requiring much more robust elements than presented above. In the end, the forces could be estimated but not predicted with accuracy.

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5.3.1.1.4 Thermal isolation

All thin vertical barriers would be constructed of materials that have higher heat conduction properties than solid waste. As such, these barriers would transmit heat better than the waste, and would be ineffective in as a temperature barrier. All of these barriers would require substantial heat removal elements to keep temperatures within acceptable levels on the cool side of the barrier.

5.3.2 Thin Vertical Barriers Evaluated

Caisson drilling to install beams as part of a tangent pile system or slurry wall excavation to construct a structural concrete wall are known technologies that could be employed at the Landfill. A beam type wall, encased in concrete piers spaced on 4 foot centers, requires a large number of borings and advancement of the holes under slurry to the base of the quarry. This drilling is deeper than the standard caisson drill rigs are capable of, reducing the number of contractors available to a very few. Given the length of the wall, approximately 100 drilled piles would be needed at the narrowest point, with an average depth of 140 feet and a maximum depth of 250 feet.

Slurry wall excavation would have to be installed in panels but is feasible. Initial grouting or exposure of the upper 60 foot of waste to cement bentonite slurry may be needed to prevent slurry loss followed by re-excavation within 24 hours to the target depths

5.3.3 Conclusion as to Feasibility

The thin vertical barriers are not considered technically feasible to design. This is due to the significant uncertainty in the forces that could develop. The design of such elements to required depths relies on lateral bracing at prescribed interfaces supplied by either braces or tie back anchors. Neither of those bracing options are available at this installation. The wide range of possible force distributions and scenarios result in unacceptably high uncertainty of performance for the barriers of this type for the desired service life. In addition, they fail the thermal performance requirements.

Time of construction issues were not investigated given the technical infeasibility.

5.4 Wider Vertical Barriers

5.4.1 Technical Feasibility

5.4.1.1 Lateral Pressures

A wider vertical barrier resists the lateral loads by acting as a mass. The mass must remain coherent to the depth below which forces can be resolved by lateral pressures on the low side of the wall or non-uniform bearing pressure distributions at the bottom. Using the same example as in the thin barriers, a 40 foot elevation difference across the barrier requires the same overturning moment to be resisted. If the average width of the wall was 20 feet and the backfill was 115 pcf the overturning resistance moment is approximately 3 times the overturning moment. The shear load is approximately 0.25 times the wall weight at 40 feet. This suggests that a gravity wall barrier could sufficiently resist overturning and shear loads with nominal reinforcement.

Greater overturning and shear resistance could be provided by inclusion of reinforcement elements, either installed at the time of backfilling or post backfilling (drill and tension anchorages). If one considers a beam with adequate reinforcement representing the wider barrier, the compressive strength of the material

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required would be on the order of 200 psi if 1 sq in of reinforcing steel per foot was used to resist bending and shear forces.

5.4.1.2 Downdrag

Downdrag forces are small compared to the bearing area of this type of system. This is due to the much increased cross sectional area of the wall compared to its external surface area. As a result, lateral pressures will control the strength of materials used for backfill.

5.4.2 Thermal Performance

The wider wall in this type of barrier would still allow significant heat transfer and would require the insertion of closed pipes for the removal of heat. These pipes would be suspended in the cementious backfill between the external slurry wall segments during its placement. They would not be subjected to downdrag and could be designed for a gradient based on the face of the barrier being the closest heat generation source. This would allow wider spacing of elements than discussed in the thermal barriers section without a wide barrier

5.4.3 Construction Method

The larger gravity type wall could be constructed between slurry walls by excavating the slurry and replacing it with low strength concrete, containing nominal reinforcement. Once the walls were set, the space between the walls (approximately 14 feet) would be excavated under slurry and filled by tremie method with the cementious backfill. The quantity of excavation is large and would be performed in panels using a clam bucket operation. The length of such a barrier, performed at the narrow neck, would be approximately 350 feet. The volume is estimated to be 38,680 cubic feet per foot of thickness, or 29,000 cubic yards for a 20 foot barrier at the narrowest location of the quarry fill.

Excavations using a clam bucket under slurry to the maximum depth anticipated (240 ft) can be made. The work is technically feasible.

5.4.4 Time of Construction

A double wall excavation is estimated to require two cranes approximately 5.5 months to complete. The excavation between the walls would require 139, 8 hr. crane shifts at 6 cubic yards per hour for a mass excavation and no time required for setting reinforcing cages etc. associated with the initial panel construction. Some additional days are required for clean-up and slurry disposal. A total construction time of approximately 9.5 months would be needed once the contractor mobilized if two crane shifts per day were achieved once the walls were completed. The completion times and production rates are based on conversations with slurry wall contractors.

5.4.5 Advantages and Disadvantages

5.4.5.1 Advantages

The following are advantages associated with wide wall barriers:

- The method is technically feasible at the narrow point of the site,
- Design methods can be robust and with small change in the cost,
- Provides a barrier that remains stable,
- Has less total excavation than large open excavations, and

- Results in limited stormwater/leachate run-off management issues following completion of construction.

5.4.5.2 Disadvantages

The following are disadvantages associated with wide wall barriers:

- The time of construction is approximately 10 months,
- Generates waste materials that needs to be moved off site (including a lot of spent slurry mixed with waste),
- Generates some air and odor emission problems, albeit less than open excavation options,
- Requires heat removal elements,
- Method is feasible only at the narrow neck. As the length becomes longer the time of construction is greatly extended,
- Requires significant effort during construction to limit run-off issues, and
- Requires temporary slurry ponds to be constructed over the north area (there is no other place for them).

5.4.6 Conclusion Concerning Feasibility

This type of barrier is technically feasible. However, it is limited in use to the narrowest segment of quarry and its time of construction is longer than acceptable for that location given the apparent northern rate of movement of the heat front.

5.5 Heat Removal Barriers

The heat removal barriers consisting of active heat removal elements (heat transfer pipes) were the only heat removal options evaluated in detail for purposes of this report. It was concluded from initial evaluations that cold gas inert gas injection and passive cooling elements are not feasible at the range of depths required for this project.

5.5.1 Physical Load Resistance

Pipe units are exposed to lateral strains in the direction of settlement events and to downdrag forces. The forces experienced depend on the pipe diameter and length. Based on the experience at other sites it is expected that all normal pipe systems will experience downdrag forces that exceed the ability of the pipes to remain round and passable within the anticipated duration of cooling, unless telescopic units are utilized. Such units are not commercially available and require custom fabrication. The current design presented in Section 7.2.1 provides an option for telescopic units. A decision on whether to use telescopic cooling point units will be made after some additional evaluation of the design.

5.5.2 Thermal Requirements

Preliminary calculations indicate that pipe spaced no closer than 4 foot, center to center, would be successful in keeping the temperatures between the pipes in the waste from exceeding 200 °F for the even if the rate of heat flow toward the barrier were greater than estimated at the present time. Further, the heat barrier can be scaled up to include more elements in a specific area to supply greater heat extraction in locations where monitoring demonstrates a temperatures need to be lowered.

Liquid circulated in this system would be water with anticorrosion additives (nontoxic) at proposed circulation temperatures above freezing.

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5.5.3 Construction

If a barrier were to be constructed across the narrow point, as depicted in Figure 5, of the landfill, the total number of pipes would be approximately 40 with a maximum length of approximately 225 feet. Pipes would be installed to a predetermined height above the quarry floor as necessary, as indicated by the temperature readings. This reduces the possibility that pipes would run into the rock bottom and be damaged by downdrag. The total drilling footage needed for installation is approximately 6,600 ft if the initial installation is performed at 8 foot centers. Installation could be performed with drill rigs or by vibrasonic methods.

Schedule 40 steel pipe without coatings would likely be used or structural tubing for the external pipe, the internal pipes would be 1 ¼ inch diameter.

A chiller and air to air cooler would be installed and temperatures monitored in front of and behind the barrier to identify if added elements are needed or if higher circulation temperatures could be used, minimizing energy consumption. All these technologies are available.

5.5.4 Construction Time

Time of construction for this type of system, assuming 2 standard drill rigs were used is 22 working days for drilling (5 weeks), one day per hole for insertion performed concurrent with drilling, 4 weeks for added temperature monitoring and completion of piping work and some added time for startup. This results in approximately 3 months from start of work to completion provided major elements of the work are pre-arranged for purchase and schedule.

5.5.5 Advantages and Disadvantages

5.5.5.1 Advantages

The following are advantages associated with the heat removal barrier:

- Creates a thermal barrier that stops both heat and smolder driven processes,
- Creates little waste to be disposed off-site,
- Is adaptive to adjust to site conditions,
- Could be tested for efficacy on site in a smaller setting,
- Shorter installation time, and
- Has no temperature at which it cannot be installed.
- Odor and Air Emissions can be minimized by use of vacuum or stuffer boxes at drill head.

5.5.5.2 Disadvantages

The following are disadvantages associated with the heat removal barrier:

- Requires maintenance and replacement of parts and systems and
- Has energy consumption needs.

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6 Evaluation of Screening Barriers

6.1 Feasibility

The feasibility of the various barrier systems was evaluated as discussed above. Based on the technical review, the barriers of the following types were found to be technically feasible:

- Non Open Space Barriers (open excavations filled with inert materials),
- Wide Structurally Supported Barrier (in-filled cellular structural slurry wall shapes), and
- Heat Barrier.

All other barrier systems evaluated were found to be technically infeasible.

Beyond technical feasibility, there are additional complexities that must be considered. Open excavations backfilled with inert materials were found to require considerable time of construction due to the need to excavate large amounts of waste, transport the waste off site and import large amounts of inert materials. This substantial time of construction (years) makes these types of barriers infeasible merely from a time of response, without regard to the very substantial issues associated with air emissions/odors, traffic, leachate handling, vectors issues, etc. The same is true for the wide structurally supported barrier, which is estimated to require approximately 10 months to a year to construct. It also required significant waste excavation, generates slurry wastes and requires some waste regrading in the area of the narrow point of the quarry. Given the potential rate of the heat front migration to the north, the construction time for the wide structurally supported barrier is too long to allow construction at the narrow point. The barrier is infeasible at other locations given the increasing length and depth of the barrier at more northerly locations.

The heat barrier can be installed in approximately 90 days, allowing it to be placed at a location at the narrow point of the quarry in advance of arrival of the heat front. It minimizes the excavation of waste and exposure to air emissions, odors and vectors. Therefore the heat barrier system is considered most feasible.

6.2 Selection of Barrier Systems for Use

Based on both technical and time related factors the heat barrier system has been selected as the preferred method to halt the progress of the heat front into the north quarry if needed. The design and construction of the barrier system is presented in Section 7.

7 Heat Barrier

7.1 Overall Approach

The use of heat removal at the narrow section of the landfill could be used to maintain a temperature within the waste mass, locally within the barrier area, that does not exceed 203 °F (95 C°). This limiting temperature will ensure that the waste materials do no dehydrate and react, causing settlement. Also, the presence of the retained moisture at these temperatures will reduce or eliminate the potential for pyrolysis or combustion at depth, for which dehydration and higher temperatures are a prerequisite. The location

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for the heat barrier has been generally depicted on Drawing 1, which represents the narrowest location between the north and south quarry areas.

The heat removal system would be installed prior to the heat front reaching the proposed location. The location of heat front will be defined by the settlement front, gas well temperatures and TMPs. If constructed, the barrier would be operated until such time as the monitoring at the site indicated it was no longer necessary.

7.1.1 Current Advance Rate of Heat Front

The rate of movement of the heat front to the north, as indicated by abnormal site settlement and gas well temperatures was evaluated, as described below, to provide an estimate of the time frame available prior to the need to initiate installation of the heat barrier. It should be noted, as with all monitoring devices and other items installed vertically into the landfill mass, it is expected that the heat barrier elements will have finite operational lives. Therefore, earlier installation prior to need does not result in any advantage of performance.

It should also be noted that the Landfill intends to install a vapor interceptor barrier prior to (south of) the Action Line. It is believed that this barrier may prevent the movement of heat further north, delaying (permanently or temporarily) the installation of the proposed heat dissipation barrier. The installation of these interceptor wells has been successful in controlling heat front movement in other landfills experiencing a similar situation with a heat generating reaction.

7.1.1.1 Settlement Front

Settlement monitoring performed at the site from May 2012 thru November 2012 in the South Quarry area was analyzed for settlement rate. The data, GPS surveys performed by Aquaterra, were used to create digital terrain models (dtm) for each general date of survey. The surveys were performed at breaks in topography to record northing, easting and elevation. Therefore, the survey shots are not at the same locations each event. A statistical determination of settlement in the South Quarry was used to divide the settlement into two categories: settlement due to the reaction processes; and standard landfill settlement. This was performed by assigning the dtm elevation to grid points on 10 foot centers to each date of survey dtm and directly comparing the data over time at the same grid point. The grid point sets include approximately 15,000 to 16,000 data sets for settlement, with the number depending on the area surveyed. The analysis performed to date shows that a distribution of settlement rates is comprised of two normal type distributions (bi modal). Peaks in the settlement rate histograms were apparent at approximately 0.045 ft per day and 0.01 ft per day (see histograms). The bimodal distribution of settlement rates is most apparent and persists when data is viewed over multi month periods. For shorter periods, it appears that the variations in the dtms along with the variation in GPS data result in a masking of the outcomes. This is clear when looking at histograms for Analysis 1 and 2 versus Analysis 2 and 4 in the calculations presented in Appendix A. Note that in the calculation, settlement is presented as a negative value.

The analysis indicated that a settlement rate of 0.045 ft per day or approximately 1.35 feet per month would indicate the active settlement front zones. Given the bimodal distribution, it is reasonable to assume that some areas of high settlement rate are included down to a settlement rate of 0.035 ft per day. Filtering of the grid points at 0.035 ft per day of settlement was performed and the results plotted in CAD to determine where the zones experiencing this rate existed. It was found that the results appeared meaningful if the comparisons covered a period of three months. Shorter duration periods resulted in

undefined patterns as is expected based on the appearance of the single month settlement rate histograms. Using the 0.035 ft per day settlement rate (which is on the order of 4 to 5% per year vertical strain) to define the location of the settlement front with time, the northern limit of the front was determined for survey dates 7/2/12, 9/6/12, 10/2/12, 11/1/12, 12/11/12. The location of the northern extent of the accelerated settlement defined above is depicted in Figure 5.

The northern rate of movement towards the narrow point varies depending on location. Based upon the area between the lines of advance and along the northern facing edge (approximately 250 foot wide) the average rate of advance has varied as shown in the table below. The settlement monitoring method was recently modified to take readings at fixed locations on a grid, rather than use of survey points at locations that would appear to capture the topography. This should result in reducing the noise in this calculation. The most recent survey, 12/11/2012, was performed using this method. The settlement front for December 2012 is not significantly different than the location identified for previous month. This likely reflects the change in survey technique.

Period (all 2012)	Average Northern Advance Rate (ft/mo.)
July to September	21
September to October	39
October to November	18

7.1.1.2 Gas Well Temperatures and Northern Progress of Heat Front

Gas collection Wells GEW 11, GEW 12A, GEW 56R, GW 58, and GEW 59R, and GEW 63 are all in the general vicinity of the area of the heat front and the TMPs. Examination of the well head temperature records for these wells indicates that the time of occurrence of well head temperatures exceeding 195 to 200 °F and the location of the temperature front defined by settlement passing the area of the well is at approximately the same time. Wells in advance of the settlement front, such as GEW56R and GEW 63 do not exhibit temperature in excess of 170 °F. The exception to this appears to be on the east side of fill, where the November limit of the settlement front included GEW 58, which has yet to exceed a well head temperature of 185 °F (as of 11/15/12). The wellhead temperature graphs near the settlement front are presented in Figure 5.

Based on the examination of the gas well head temperatures, it appears the settlement front and well head temperatures in excess of 195 °F occur at approximately the same time along the northern advance of the heat front. The rate of advancement to the north based on gas well observations is similar to that of the settlement data. This advance rate can be used as an indicator of the physical rate of advance to the north of the heat front.

7.1.1.3 In-Waste Temperature Monitoring Points (TMP)

As of November 30, 2012, all 9 of the TMP's have been installed. A review of the data from the TMPs does not currently indicate any time trends except for some cooling at depth following the installation. With the exception of TMP-8 and TMP-9, which are the closest to the settlement front, the TMPs indicate that temperatures are less than 160 °F at all depths and temperatures are lower both as the ground surface and bottom of the waste are approached. Temperatures within 40 feet of the quarry bottom are typically less than 130 °F, with the exception being TMP-9 where a temperature of 184 °F is measured at depth.

Maximum temperatures measured as of early December are 197 °F in TMP-9 which is one of the nearest TMPs to the settlement front. The maximum temperature in TMP-8 was 183 °F.

A comparison of well head temperature to TMP readings was made at TMP-6 and GEW 56R. The well head temperature in GEW 56R was between 130 and 140 °F in November 2012 while the average TMP-6 and maximum TMP-6 values were 132 to 146 and 161 °F, respectively, during the period from 11/26/12 to 12/3/12, if only the upper 150 feet of waste is considered. The average temperatures are lower if the entire column to the bottom is considered. This comparison suggests that gas wells are good average temperature indicators, as was already expected. A plot of the TMP readings with elevation for the 12/11/12 reading date is presented in Figure 5.

As additional data rounds are collected from the TMPs, they can also be used to supplement estimates of heat front rate movement northward.

7.1.2 Trigger Events

7.1.2.1 General Discussion

Based on the observable rate of movement of settlement front and elevated temperatures toward the quarry narrow point, it would appear that the heat front is approximately 400 feet south of the proposed barrier location. At the maximum estimate of the advance rate, 25 ft per month, this would require 16 months for the heat front to reach the heat barrier location. At the slower rate indicated along the advance lines (5 feet per month) the computed time is 5 times that or approximately 6 years. The heat barrier system is estimated to require 60 days to install following arrival of equipment associated with installation of the cooling points (pipe, insertion rigs etc) on site. The time frame for notice to proceed may require adjustment depending on mobilization time for insertion equipment. Provided contracts are in place in advance for the work, a 90 to 100 day window of time for notice to proceed should be adequate. Delivery times on key components, such as the cooler are approximately 7 weeks, while lead time on Hollow Structural Shape (HSS) shapes for the cooling points (CP) is 8 weeks including purchase, machining and coating. Given that cooling points are installed early in the work and the lead time is longer than the mobilization time for the insertion equipment, the CP material appears to be the critical item for determining the beginning of action. To be conservative, a time of 120 days should be allowed between onset of action and the time for the system to be operational. Based on the current maximum rate of advance, and based on the historic motion of the settlement front, this would accommodate an advancing rate of 25 feet per month if the action limit is 100 feet away from the location of the boundary.

The calculated advance rate variance is affected by the methodology of the prediction and steps should be taken to allow the arrival rate of the front to be monitored with less uncertainty. In addition, the shape of the quarry is likely to result in greater heat conduction to the surrounding rock mass, slowing the advance as the quarry walls and depth move inward and upward. At present, it would appear that use of the maximum rate of advance, based on the October –November survey periods (three month rate ending on the last date) provides a conservative prediction of the time it will take for the heat front to reach the proposed heat barrier location. The location of a line through TMP-1 to TMP-4 is approximately 300 feet from the current settlement front. Temperature levels in TMP-9 indicate that the 200 °F reading will soon occur at this location, 250 feet away from the TMP-1 to TMP-4 alignment. At the maximum measured rate of advance it is estimated that 10 month or more would elapse prior to arrival of temperatures of

200 °F in the waste at the line passing through TMP-1 through TMP-4, or the fall of 2013, if no slowing of the front occurs. This would allow for 6 months of construction time, at the current 18 foot per month advance rate, if the line through TMP-1 through TMP-4 were adopted as the Action Line.

It should be noted that Bridgeton Landfill intends to install a relief well system, as stated in 7.1.1, in the area of the heat front and south of the Action Line that may significantly reduce the rate of advance based on experience at other sites.

As the heat front advances toward the Action Line, better estimates of the rate of movement can be made. On the basis of this added information, the schedule for obtaining quotes, signing contracts and construction can be modified as needed, based on the data making it reasonable to assume that material purchase and construction times can be achieved.

7.1.2.2 Trigger Measurements

A review of available literature has indicated that for low temperature pyrolysis or other pre-conditioning for smolder to occur, the waste materials would have to be dried. No evidence of any low temperature alteration of this type has been observed at this site, or other sites with waste at temperatures less than 200 °F. In addition, no phenomena reported in the available literature indicate significant alteration of material other than dry samples heated in the presence of oxygen. Therefore a this temperature measured in TMP or a gas well head reading in excess of 195 °F at or north of the Action Line, once verified as representative, be considered the trigger for beginning of installation of the heat barrier at the location shown in the attached drawings. The rate that the heat front is migrating north will be measured and reported monthly.

All forms of monitoring, settlement, gas well head, and in-waste temperature monitoring will be used for an overall evaluation of the rate of advance. Given the variability of monitoring results, no one individual measurement should be deemed appropriate in the absence of corroborating data of the others.

7.1.3 Sequential Installation - Monitoring

Monitoring of temperatures will continue once the operation of the heat barrier (full or partial) begins, including monitoring of the temperatures south and north of the barrier. The performance of the system will be adjusted to maintain waste temperatures below 200 °F within the barrier area and below 170 °F north of the installed system. The monitoring system within the barrier and any additional monitoring points will be installed as a part of the barrier construction. Should the monitoring data show the temperatures within the waste are exceeding the target levels the system will be adjusted by increasing the rate of heat transfer, e.g. increasing coolant circulation rates, lowering coolant temperatures, etc. Should the modification of operational parameters be insufficient to achieve the desired target levels, additional heat exchange elements would be installed in the waste where needed. A total of 20 additional TMPs are proposed to be installed as part of the barrier system to aid in monitoring the progression of heat removal form the area. These are shown on Sheet 3 of the drawings.

In-waste temperature monitoring will occur daily. The data will be compiled and reported monthly. Details as to how decisions would be made to change operations and add additional elements will be documented in the operations and maintenance manual for the heat barrier system.

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7.2 Heat Dissipation / Barrier Design

7.2.1 Design Methodology

The heat dissipation / barrier system is designed to remove heat energy in the waste at a rate sufficient to achieve a temperature of not greater than 170 °F on the north side of the barrier. The actual method of heat removal is via cooling points (CPs) consisting of pipes inserted into the waste through which liquid is circulated. The temperature difference between the waste mass and the lower temperature circulating liquid creates a removal of heat energy. The amount of energy removed by a CP is a function of the temperature difference, the heat conductivity of the materials (in this case waste and the steel tubing) and the diameter of the surface maintaining the lower temperature and the temperature gradient. The extraction of energy per CP and the rate of energy delivered by the landfill mass will be equal when the temperature front does not progress past the heat barrier.

The amount of energy being delivered to the heat front was estimated based on the rate of advance of the front with time, using rate of movement of the settlement front northward as described in 7.1.1.1. Using the information from the TMP readings, it was noted that the hotter portions of the waste mass appeared to be approximately 40 feet thick as the heat front approaches, with the remainder of the waste column apparently being heated from this zone. The energy required to advance the front a distance of 18 feet in 30 days (using the October/November period data) for a unit width was calculated for a condition where residual moisture is driven from the waste and for a condition of dry waste. The calculations, provided in Appendix A, show that the energy required to advance the front a minimum of approximately 11W/m^2, if the waste is dry and 145 W/m^2 if the residual moisture content is approximately 3%. Higher energy flow would be associated with higher moisture contents in the waste. However, it should be noted that the heat of evaporation of the moisture in the waste is transferred to the waste on the cool side of heat front when hot vapor moves into the waste and condenses. Once the waste temperature is raised the majority of liquid in the waste in the areas of rising temperature is evaporated into landfill gas at temperatures below the boiling point due to significant rise in the partial pressure of water vapor in landfill gas with increasing temperature. This accounts for the observations of gas well and TMP installation drilling finding nearly dry waste in areas beyond the heated zones in the waste.

Based on the above, it appears that a good portion of the energy associated with vaporization is recycled at locations near the heat front and that the energy flow to the front is likely higher than 11 W/m^2 but much less than 145 W/m^2. For the purpose of design of the system a 30 W/m^2 was adopted for the initial installation configuration with evaporative cooling only. A maximum value of 145 W/m^2 was adopted for a maximum for the design if a second row of units is installed and for the cooler and header system of liquid supply. It should be noted that additional heat transfer using the same configurations would be possible if chilling of the liquid below the wet bulb temperature was performed. This feature could be added to the operation if more heat transfer is needed once the operation begins.

Based on the calculations, vapor transmission appears to be a significant means of energy transfer in the areas with rising temperatures, exceeding conduction as a major mode of heating at the damp/dry waste interfaces. It also results in the general dehydration of the waste mass. This suggests that steps should be taken to limit the development of positive pressure differences between the hot and cold side of the advancing front. As previously mentioned, Bridgeton will be installing a “relief well” system in the early

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part of 2013 in the vicinity of the heat front to accomplish this goal. This information will be submitted separate from this report.

7.2.1.1 Description on Elements and Design Features

The individual elements of the heat barrier system designed to remove the heat from the waste mass are referred to in this report as cooling points. The points will consist of a closed end pipe inserted into the landfill mass. Water with some corrosion inhibitor will be forced to the bottom of the pipe using an inner supply pipe. The water will then flow up the annular space between the smaller supply pipe and absorb energy from the warmer landfill mass outside the pipe. Flow rates in the pipes have been chosen to ensure the circulation rate is sufficient to allow the water to reach the bottom without substantial warming and the total rise in temperature limited to maintain good heat exchange capability in the entire column. A detail of the cooling points is depicted on Sheet 4 of the drawings.

At the top of the cooling points a well head will provide the ability to monitor temperature and pressure. Connection to the supply and return headers will have valving that allows the flow rates to be modulated to maintain desired operating temperatures as well as to isolate cooling points that need maintenance.

Currently, it is proposed that the external pipes will be made of coated carbon steel. The coating is intended to reduce the rate of corrosion. In addition, two options are under consideration, one of solid exterior pipe and a second of an exterior pipe, comprised of alternating larger and smaller pipes to allow significant settlement of the pipe to occur without crimping or other problems caused by downdrag. Details for both are provided on Drawing 4. A decision on what system to use has yet to be made, but both of these methods are workable and others are under consideration. Changes to the cooling point details may change based on further consideration. Any changes would be submitted to the Missouri Department of Natural Resources (MDNR) prior use in the barrier system. Internal supply pipes are currently proposed to be PEX, PVC or steel and are designed to deliver at least 10 gpm (gallons per minute) circulation flow in each cooling point with limited head loss. Higher flows can be achieved if needed using the proposed 1.25 in diameter internal pipe.

7.2.1.2 Overall Heat Removal Capacity

The overall heat removal capacity of the system is approximately 1.5 million BTU per hour. This would be achievable on warm days in St. Louis using an evaporative cooler. A circulation rate of approximately 250 gpm would be used to achieve this removal rate. Higher heat removal rates would be achieved, if required by installing either a chiller unit or an additional cooler unit in addition to adding cooling points, either on the hot or cold side of the heat barrier. This system can be expanded as required either locally or along the entire line based on the site behavior. A catalog cut for a typical cooler system is provided in Appendix A.

7.3 System Layout

The layout of the system is shown on Drawing 1 and Drawing 3 in plan view. A profile along the Heat Barrier is shown in Drawing 2 along with the individual cooling points. The cooling points for the initial installation will be spaced at 8 foot center to center along the proposed alignment. Supply and return headers will run parallel to the cooling point alignment and convey fluids to the west where pumps, controls and the cooler unit will be located, as shown on Drawing 1. The offset distances from the quarry floor and walls, limiting the cooling point depths as described in 7.2, are shown in Drawing 2.

7.4 Installation Description

Experience during the sonic drilling for construction of the TMPs has shown that vibrasonic methods are effective in advancing a mandrel with a point through the waste. Issues of size and total hydraulic fluid cooling capacity were experienced with a sonic rig. A larger vibratory hammer set up similar to a large pile driving system is being considered as a means to overcome these limitations. That could allow use of a mandrel with a sacrificial point and a large enough inner diameter to accommodate the proposed cooling points. Once the mandrel reaches the design depth, the cooling pipe is inserted and the annulus filled with a weak grout mixture of fine sand, bentonite and a small amount of cement to allow set to occur. The mandrel is withdrawn as backfill is added. This is quite similar only on a larger scale, to the sonic drilling performed at the site to date. Should this intended method prove to be ineffective, cooling points could be installed using specially constructed bucket auger rigs or rotary or modified mud rotary drilling methods.

7.5 Operations

Operation of the heat removal system would be continuous until such time as the temperatures in the vicinity of the barrier are less than 150 F°. The system could be operated intermittently or portions of the system may be operated. The specifics of the duration and the use of intermittent operations versus continuous at much lower flow rates would be developed once temperatures begin to subside in the barrier area. Initially, the system will be operated to lower the temperature of the waste along the barrier alignment as low as possible given the limits of the ambient air cooling mechanisms proposed and flow rates lower than 250 gpm total. Lowering the temperature to as low as possible while the ambient air temperatures are low will allow a some buffer in the event the heat flow toward the boundary increases. There are no adverse impacts from the lowering of the temperature to below the normal landfill temperature in this limited area. Positive impacts would be the generation of added moisture content of the waste due to localized condensation. This moisture will increase the heat conduction and heat capacity of the waste locally, which would positively impact the performance of the heat barrier.

7.6 Additional Monitoring

TMPs to be used for monitoring and adjusting operations are depicted in Drawing 3. A total of 20 additional TMPs are proposed. The detail for the TMPs is provided in Drawing 5. The proposed design is the same used to for the 9 existing TMPs. In addition, the settlement monitoring and ongoing gas well monitoring will be continued. Also records of flow rates and temperatures for the cooling system will be kept to allow the quantification of heat removal to be made.

The major elements of monitoring and record keeping and data submittal will be submitted together with the final construction plans and specifications. This will ensure the monitoring and reporting aspects of the work are incorporated into the design and equipment.

7.7 Operations Manual

An operations manual will be developed and submitted that outlines the specific items associated with safety, operations, monitoring, record keeping, reporting and maintenance of the system. This manual will be completed in draft form at the initiation of operations. Given the uniqueness of the operations, the manual would be finalized by the end of the first quarter of operations and submitted to the MDNR 30 days following the first quarter of operations.

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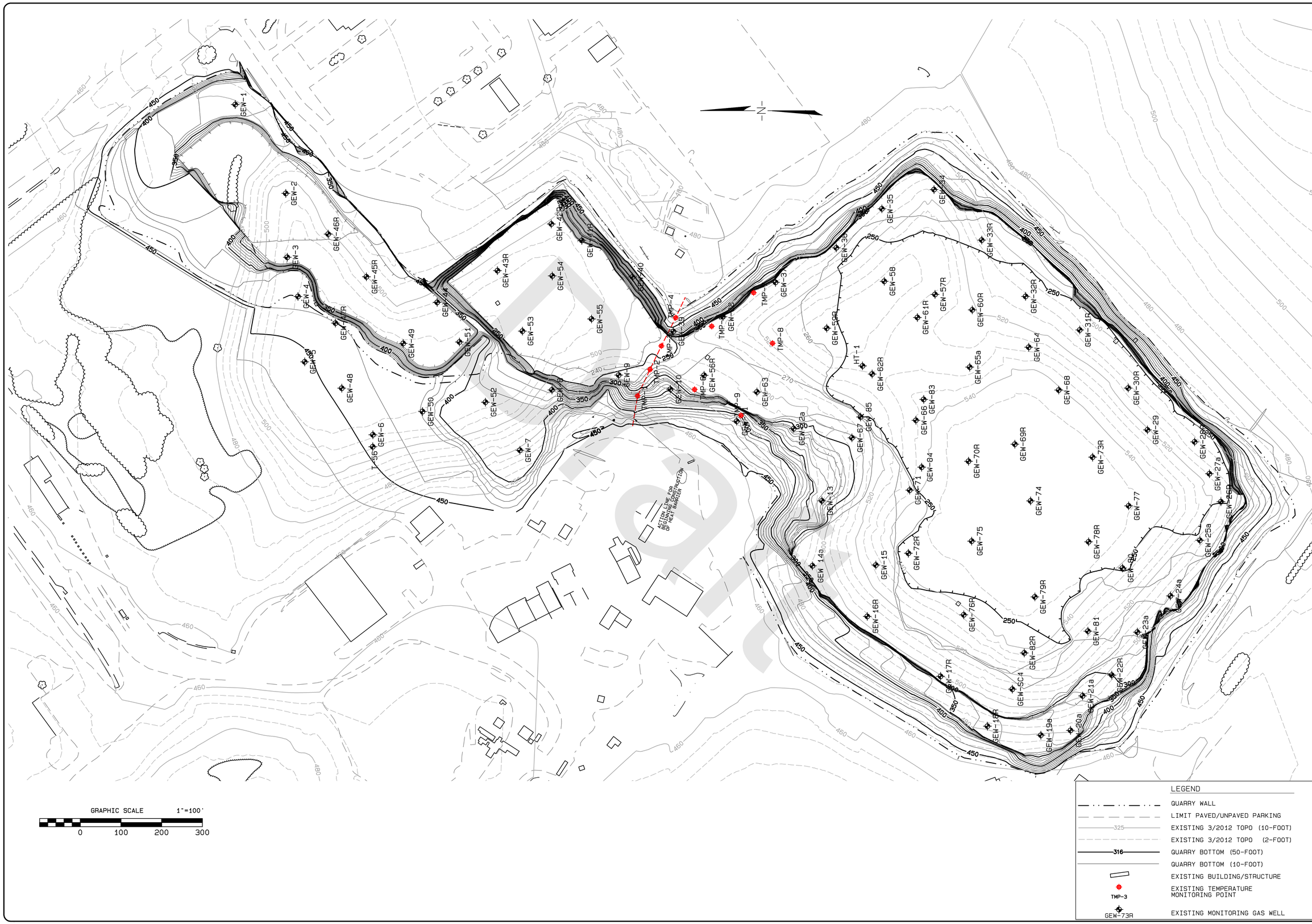

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REVISION	DATE
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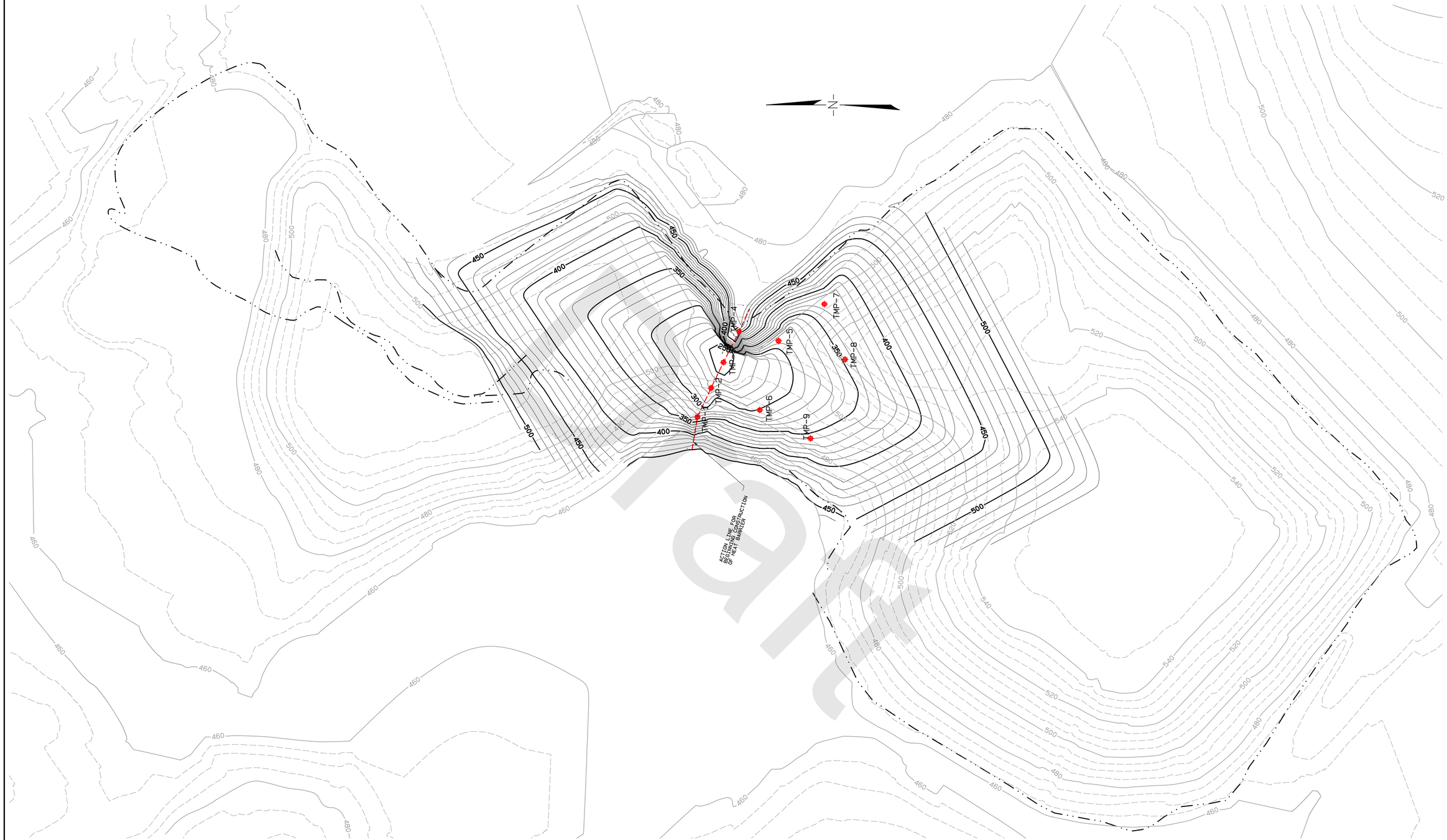
PROJ. NO.: 179.001
DATE: 1/3/2013
DESIGNED BY: PJC
DRAWN BY: PJC/KLOH
CHECKED BY: PJC
APPROVED BY: PJC

FIGURE 1
OVERALL SITE PLAN

HEAT DISSIPATON / BARRIER PLAN
BRIDGETON LANDFILL

DRAWING
FIG-1



GRAPHIC SCALE 1"=100'

0 100 200 300

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Where the second surface is above the first the volume is reported as fill.
Where the second surface is below the first the volume is reported as excavation.

Shrinkage/swell factors:	Excavation 1.0000	Fill 1.0000	
First Surface Layer Name	Number of Points	Second Surface Layer Name	Number of Points
3DTOPO_12	44,828	EV_1-OPEX3: 1	804
Excavation Volume (Cu. Yd.)		Fill Volume (Cu. Yd.)	
2,505,663.2		226.9	

Net Difference: 2,505,436.3 Cu. Yd. Waste

LEGEND

- QUARRY WALL
- 325 — EXISTING 3/2012 TOPO (10-FOOT)
- EXISTING 3/2012 TOPO (2-FOOT)
- 316 — EXCAVATION BOTTOM (25-FOOT)
- EXCAVATION BOTTOM (5-FOOT)
- TMP-3 — EXISTING TEMPERATURE MONITORING POINT

BRIDGETON LANDFILL, LLC
12976 ST. CHARLES ROCK RD.
BRIDGETON, MO

REVISION	DATE
1	
2	
3	
4	
5	

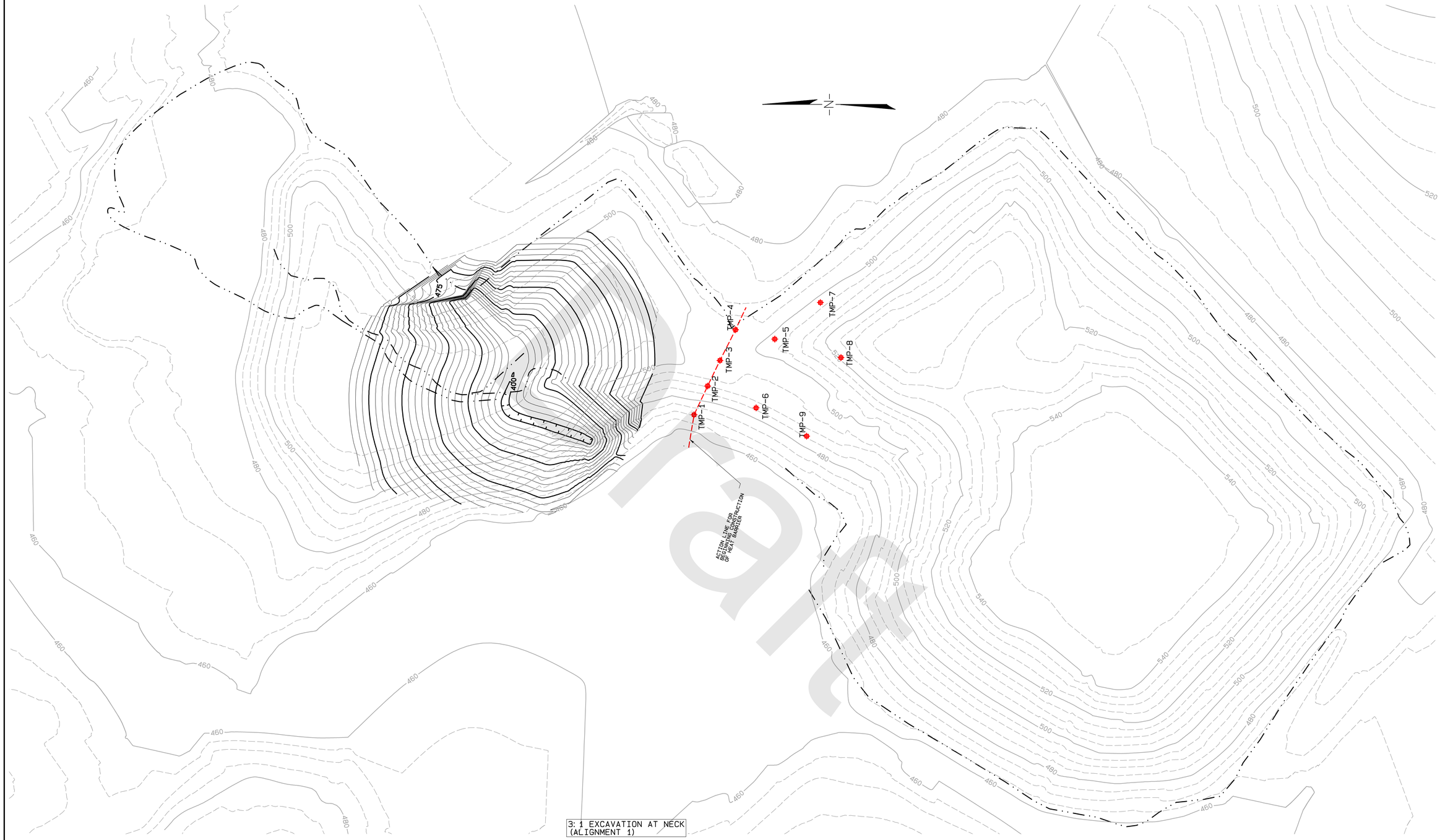
P. J. CAREY & ASSOCIATES, P.C.
5979 VALINE WAY, SUGAR HILL, GA. 30518

PROJ. NO.: 179.001
DATE: 1/9/2013
DESIGNED BY: PJC
DRAWN BY: PJC/KLCH
CHECKED BY: PJC
APPROVED BY: PJC

FIGURE 2
OPEN EXCAVATION AT QUARRY NECK

HEAT DISSIPATON / BARRIER PLAN
BRIDGETON LANDFILL

DRAWING
FIG-2



EXCAVATION AT 3:1 NOT EXTENDING TO BOTTOM OF DEEP SECTION OF QUARRY BUT USING A BARRIER ALONG THE DEEP SECTION THAT IS EITHER HEAT ROBBING OR WIDE FILLED BARRIER (OR BOTH) (ALIGNMENT 2)

Project: N:\Briggeton\drawings\PJCA\briggeton Tmps.pro
Report Generated: Wednesday, October 31, 2012 11:38:09 AM

Where the second surface is above the first the volume is reported as fill.
Where the second surface is below the first the volume is reported as excavation.

Shrinkage/swell factors: Excavation 1.0000 Fill 1.0000

First Surface Layer Name	Number of Points	Second Surface Layer Name	Number of Points
3DTOPO_12	44,828	EV_2_OPEX3:1	473

Excavation Volume (Cu. Yd.)	Fill Volume (Cu. Yd.)
641,397.2	1,381.0

Net Difference: 640,016.1 Cu. Yd. Waste

LEGEND

- QUARRY WALL
- 325 — EXISTING 3/2012 TOPO (10-FOOT)
- EXISTING 3/2012 TOPO (2-FOOT)
- 316 — EXCAVATION BOTTOM (25-FOOT)
- EXCAVATION BOTTOM (5-FOOT)
- TMP-3 — EXISTING TEMPERATURE MONITORING POINT

BRIDGETON LANDFILL, LLC
12976 ST. CHARLES ROCK RD.
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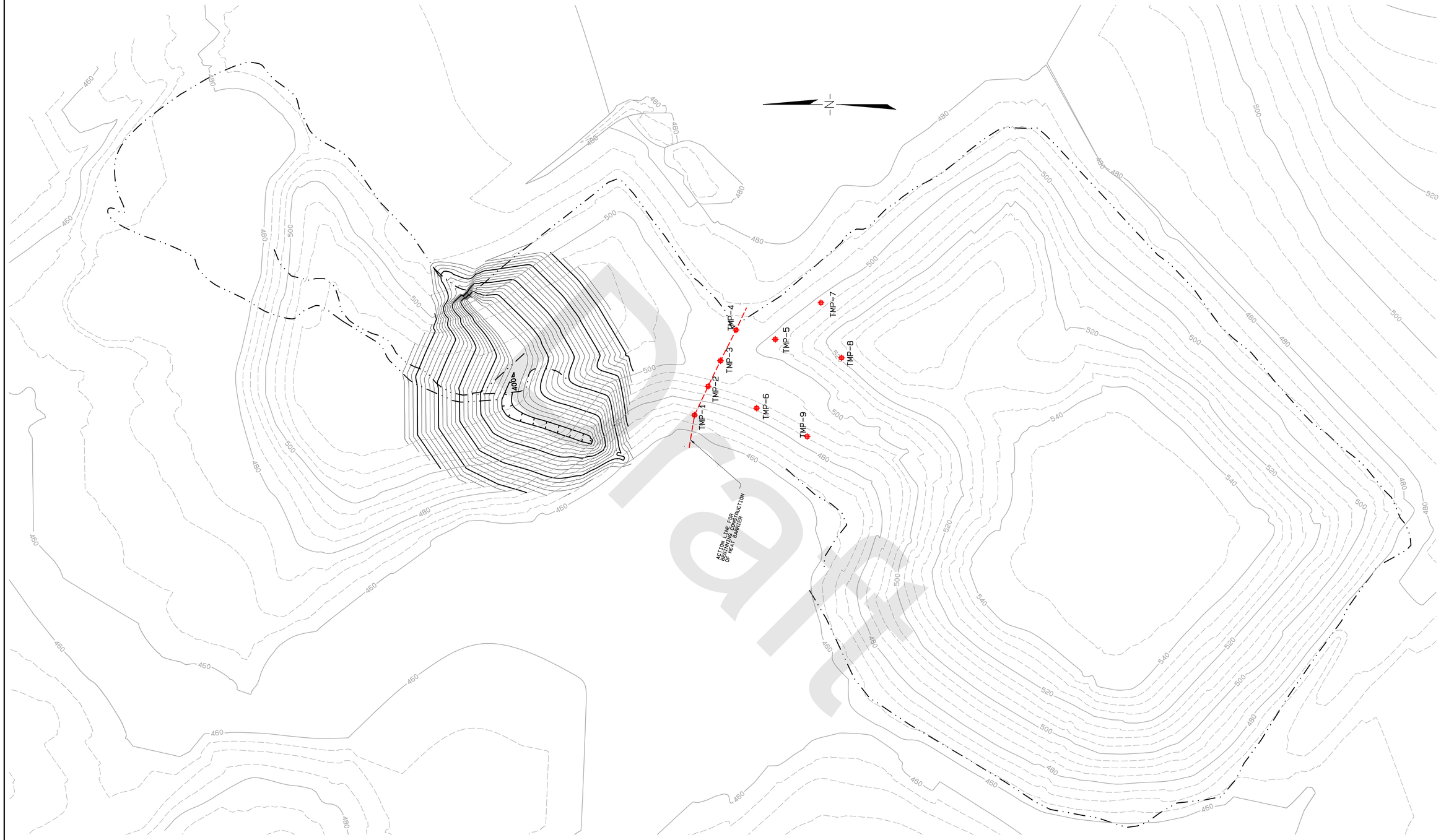
P. J. CAREY & ASSOCIATES, P.C.
5878 VALINE WAY, SUGAR HILL, GA. 30518

PROJ. NO.: 179.001
DATE: 1/3/2013
DESIGNED BY: PJC
DRAWN BY: PJC/KLCH
CHECKED BY: PJC
APPROVED BY: PJC

FIGURE 3
OPEN EXCAVATION IN NORTH QUARRY

HEAT DISSIPATON / BARRIER PLAN
BRIDGETON LANDFILL

DRAWING
FIG-3



GRAPHIC SCALE 1"=100'

0 100 200 300

EXCAVATION AT 2: 1 NOT EXTENDING TO BOTTOM OF DEEP SECTION OF QUARRY BUT USING A BARRIER ALONG THE DEEP SECTION THAT IS EITHER HEAT ROBBING OR WIDE FILLED BARRIER (OR BOTH) EXCAVATION TO BE BACKFILLED TO DRAIN WITH EARTH (ALIGNMENT 2)

Project: N:\Bridgeton\drawings\PJCA\bridgeton Tmps.pro
Report Generated: Wednesday, October 31, 2012 11:53:52 AM

Where the second surface is above the first the volume is reported as fill.
Where the second surface is below the first the volume is reported as excavation.

Shrinkage/swell factors: Excavation 1.0000 Fill 1.0000

First Surface Layer Name	Number of Points	Second Surface Layer Name	Number of Points
3DTOPO_12	44,828	EV_2OPEX: 2: 1	444

Excavation Volume (Cu. Yd.)	Fill Volume (Cu. Yd.)
459,147.1	71.5

Net Difference: 459,075.5 Cu. Yd. Waste

LEGEND

- QUARRY WALL
- 325 — EXISTING 3/2012 TOPO (10-FOOT)
- EXISTING 3/2012 TOPO (2-FOOT)
- 316 — EXCAVATION BOTTOM (25-FOOT)
- EXCAVATION BOTTOM (5-FOOT)
- TMP-3 — EXISTING TEMPERATURE MONITORING POINT

BRIDGETON LANDFILL, LLC
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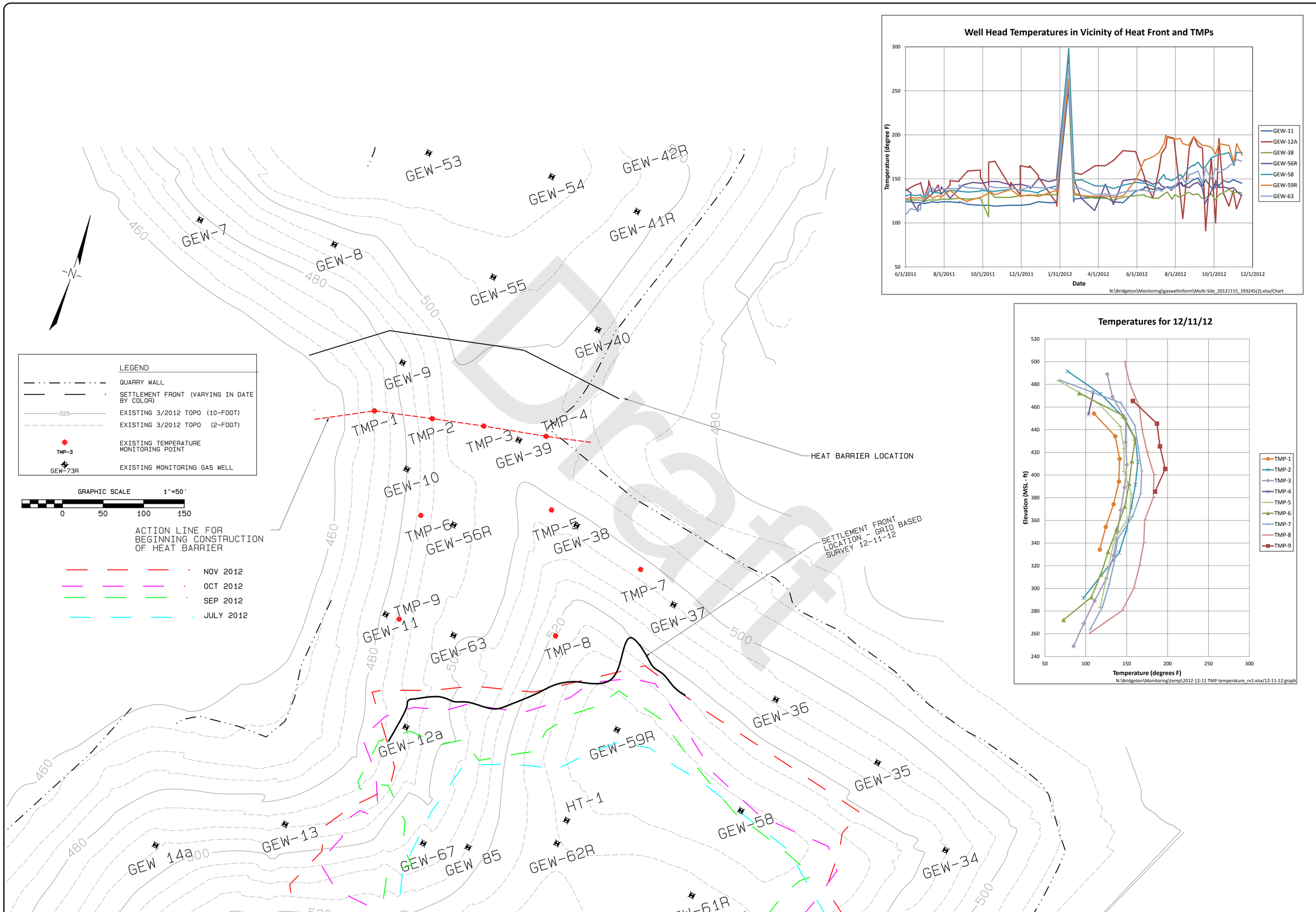
P. J. CAREY & ASSOCIATES, P.C.
5878 VALINE WAY, SUGAR HILL, GA. 30518

PROJ. NO.: 179.001
DATE: 1/3/2013
DESIGNED BY: PJC
DRAWN BY: PJC/KLCH
CHECKED BY: PJC
APPROVED BY: PJC

FIGURE 4
FILLED EXCAVATION IN NORTH QUARRY

HEAT DISSIPATON / BARRIER PLAN
BRIDGETON LANDFILL

DRAWING
FIG-4



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5878 VALINE WAY, SUGAR HILL, GA. 30518

PROJ. NO.: 179.001
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DRAWN BY: PJC/KLCH
CHECKED BY: PJC
APPROVED BY: PJC

FIGURE 5
SETTLEMENT FRONT ADVANCEMENT WITH TIME

HEAT DISSIPATON / BARRIER PLAN
BRIDGETON LANDFILL

DRAWING
FIG-5

APPENDIX A

Draft

Subject/Calcution: **Determination of Settlement Rates**

P.J.Carey & Associates, P.C.

Client: Bridgeton Landfill, LLC Project: Bridgeton
Project No. : 179.001
Performed by: Peter Carey Checked by: KH

$ORIGIN = 1$

Object: To analyze settlement rates for different time intervals in order to identify standard landfill settlement versus settlement due to subsurface heat generating reaction.

Below are four different time intervals denoted as 1 through 4. The settlement is compiled on an excel sheet for gridded points in the south quarry area (38 acres) and analyzed below. The gridded points were created by PJCA at regular 10 foot spacing and then assigned the change of elevation (settlement) for each respective time interval.

INTERVAL 1 : May 14 2012 to July 2 2012

Read excel compiled data for settlement:

$$\Delta el := \mathrm{READEXCEL}(\text{"..\drawings\settsurveypts\settlementanalysis.xlsx"}, \text{"Sheet1!T5:T16592"})$$

$j := 1 .. \mathrm{rows}(\Delta el)$ counts to the number of data points

$\Delta T_1 := 49\ day$ Time during interval

Filter data for points without data for this interval:

$Settle_j := \mathrm{if}(\Delta el_j = \text{"\#N/A"}, NaN, \Delta el_j)$ $filterSettle := \mathrm{filterNaN}(Settle)$

$i := 1 .. \mathrm{rows}(filterSettle)$

Calculate the rate of settlement for the data set:

$$Rate_i := \frac{filterSettle_i \cdot day}{\Delta T_1}$$

To analyze the data, define the histogram bin size and intervals:

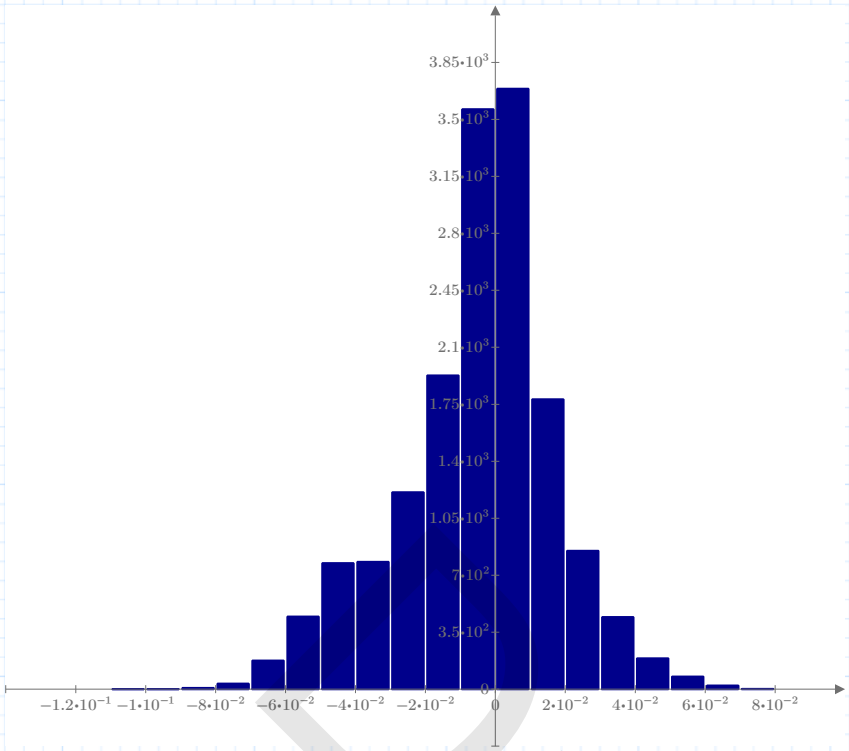
$Interval_1 := -.11$ $m := 1 .. 19$

$Interval_{m+1} := -.11 + .01 \cdot m$

Draft

$Analysis_1 := \text{histogram}(Interval, Rate)$

Interval 1 Histogram



This histogram shows a possible shape which suggests secondary settlement due to heat generating reaction rate of approximatley -0.040 ft per day.
Note that this is just a raw settlement rate analysis and not a vertical strain rate.

<u>INTERVAL 2 : July 2 2012 to August 7, 2012</u>

Read excel compiled data for settlement:

$\Delta el := \text{READEXCEL}(\text{“..\drawings\settsurveypts\settlementanalysis.xlsx”}, \text{“Sheet1!U5:U16592”})$

$j := 1 .. \text{rows}(\Delta el)$ counts to the number of data points

$\Delta T_2 := 36\ day$ Time during interval

Filter data for points without data for this interval:

$Settle_j := \text{if}\left(\Delta el_j = \text{“\#N/A”}, NaN, \Delta el_j\right)$ $filterSettle := \text{filterNaN}(Settle)$

$i := 1 .. \text{rows}(filterSettle)$

Calculate the rate of settlement for the data set:

$$Rate_i := \frac{filterSettle_i \cdot day}{\Delta T_2}$$

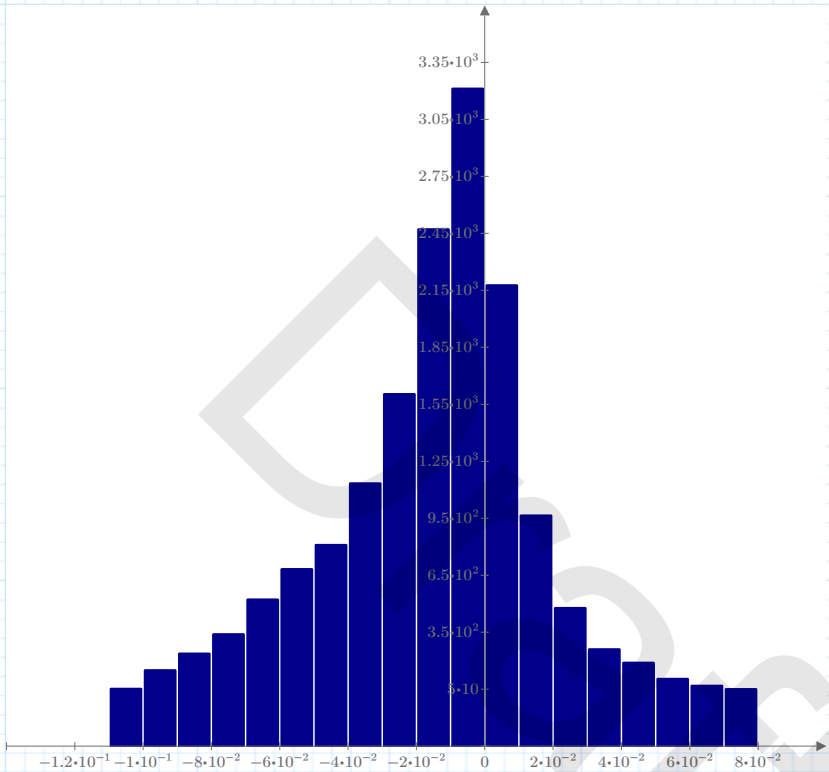
To analyze the data, define the histogram bin size and intervals:

$$Interval_1 := -.11 \qquad m := 1..19$$

$$Interval_{m+1} := -.11 + .01 \cdot m$$

$$Analysis_2 := \text{histogram}(Interval, Rate)$$

Interval 2 Histogram



There is no difinitive bimodal shape to this histogram, therefore no real conclusion can be drawn about the secondary settlement rate due to subsurface heat generating reaction. The lack of bimodal shape can be due to the accuracy of the survey during this period versus the magnitude of settlements measured over a month period. Using greater time periods may be better.

<u>INTERVAL 3 : May 14, 2012 to August 7, 2012</u>

Read excel compiled data for settlement:

$$El_1 := \text{READEXCEL}(\text{“..\drawings\settsurveypts\settlementanalysis.xlsx”}, \text{“Sheet1!C5:C16592”})$$

$$El_3 := \text{READEXCEL}(\text{“..\drawings\settsurveypts\settlementanalysis.xlsx”}, \text{“Sheet1!I5:I16592”})$$

$\Delta el := El_3 - El_1$	calculate change in elevation
$j := 1..\text{rows}(\Delta el)$	counts to the number of data points
$\Delta T_3 := (49 + 36)\ day$	Time during interval

Filter data for points without data for this interval:

$$Settle_j := \text{if}\left(\Delta el_j < -999 \vee \Delta el_j > 999, NaN, \Delta el_j\right) \quad filterSettle := \text{filterNaN}(Settle)$$

$$i := 1 .. \text{rows}(filterSettle)$$

Calculate the rate of settlement for the data set:

$$Rate_i := \frac{filterSettle_i \cdot day}{\Delta T_3}$$

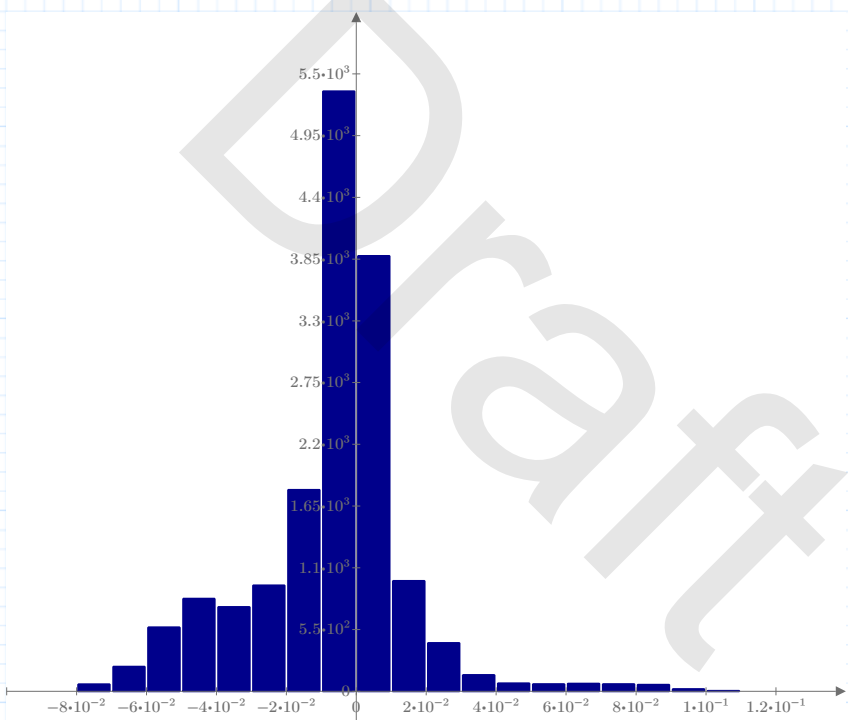
To analyze the data, define the histogram bin size and intervals:

$$Interval_1 := -.08 \qquad m := 1 .. 19$$

$$Interval_{m+1} := Interval_1 + .01 \cdot m$$

$$Analysis_3 := \text{histogram}(Interval, Rate)$$

Interval 3 Histogram



There is a slight bimodal shape to this histogram. This indicates a secondary settlement rate between -0.05 and -0.04 ft/day due to subsurface heat generating reaction.

<u>INTERVAL 3 : May 14, 2012 to September 6, 2012</u>

Read excel compiled data for settlement:

$$El_1 := \text{READEXCEL}(\text{“..\drawings\settsurveypts\settlementanalysis.xlsx”}, \text{“Sheet1!C5:C16592”})$$

$$El_4 := \text{READEXCEL}(\text{“..\drawings\settsurveypts\settlementanalysis.xlsx”}, \text{“Sheet1!L5:L16592”})$$

$\Delta el := El_4 - El_1$ calculate change in elevation

$j := 1 .. \text{rows}(\Delta el)$ counts to the number of data points

$\Delta T_4 := (49 + 36 + 30)\ day$ Time during interval

Filter data for points without data for this interval:

$$Settle_j := \text{if}\left(\Delta el_j < -999 \vee \Delta el_j > 999, NaN, \Delta el_j\right) \quad filterSettle := \text{filterNaN}\left(Settle\right)$$

$$i := 1 .. \text{rows}\left(filterSettle\right)$$

Calculate the rate of settlement for the data set:

$$Rate_i := \frac{filterSettle_i \cdot day}{\Delta T_4}$$

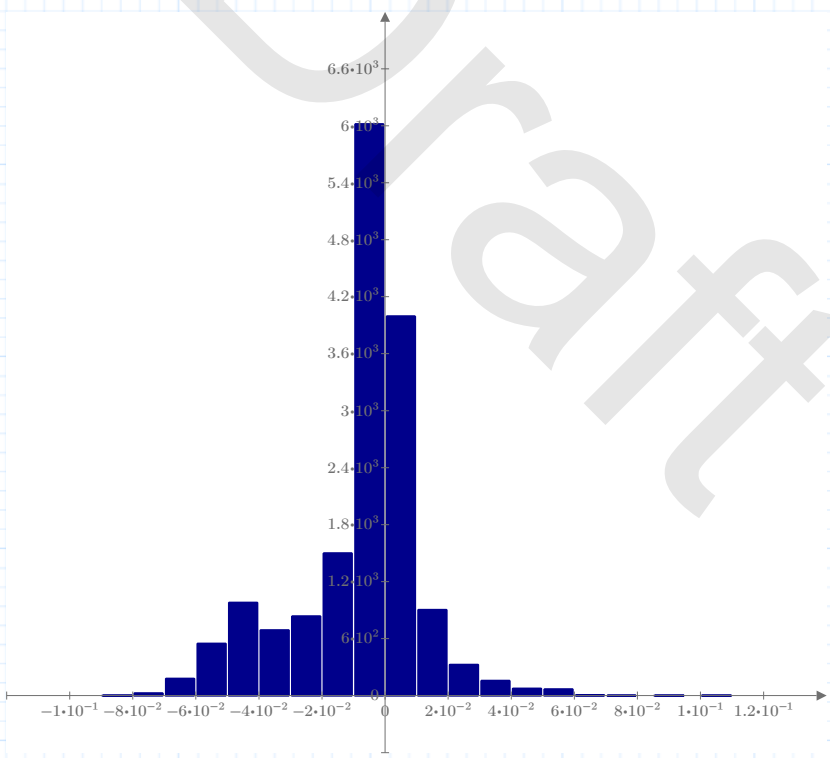
To analyze the data, define the histogram bin size and intervals:

$$Interval_1 := -.09 \qquad m := 1 .. 17$$

$$Interval_{m+1} := Interval_1 + .01 \cdot m$$

$$Analysis_4 := \text{histogram}\left(Interval, Rate\right)$$

Interval 4 Histogram



As with Interval 3, there is a slight bimodal shape to this histogram. This indicates a secondary settlement rate between -0.05 and -0.04 ft/day due to subsurface heat generating reaction.

Draft

Subject/Calcution: **Heat Barrier Calcs - Thermo**

P.J.Carey & Associates, P.C.

Client: Bridgeton Project: Bridgeton
Project No. 179.001
Performed by: PJC Checked by: KH

Purpose:
To compute approximate heat flow in the waste mass per unit area assuming a range of temperature gradients and heat conductivity values. Calculation assumes steady state one dimensional conditions. The intent is to compute the possible demands on a cooling system. For this calculation, gradients are assumed to be reflective of a heat gradient consistent with measurements in the field as opposed to a combusition event. In the event gradients are found to be much higher, added rows of piping could be installed.

Definition of variables:

$A := 1\ m^2$ A = Unit Area

$k_e := \begin{bmatrix} 0.35 \\ 0.45 \\ 0.65 \\ 0.96 \end{bmatrix} \frac{J}{m \cdot s \cdot K}$ ke = the heat condution coefficient from Yoshida and Rowe

$i := 1..6$ i = number of temperature intervals

$\Delta T_i := [50\ \ 30\ \ 50\ \ 60\ \ 80\ \ 120]\ \Delta°F$ ΔT = temperature difference (assumed)

$j := 1..6$ j = number of distance intervals

$\Delta X_j := [3\ \ 6\ \ 9\ \ 12\ \ 15\ \ 30]\ ft$ ΔX = distance interval (assumed)

$$Gradient_{i,j} := \frac{\Delta T_i}{\Delta X_j}$$

$$Gradient_{1,1} = [30.378\ \ 9.113\ \ 10.126\ \ 9.113\ \ 9.721\ \ 7.291]\ \frac{K}{m}$$

Heat flow (q) per square meter based on gradient maximum and minimums:

$$q_{min} := A \cdot k_e \cdot 6\ \frac{K}{m} = \begin{bmatrix} 2.1 \\ 2.7 \\ 3.9 \\ 5.76 \end{bmatrix} W \qquad q_{max} := A \cdot k_e \cdot 30\ \frac{K}{m} = \begin{bmatrix} 10.5 \\ 13.5 \\ 19.5 \\ 28.8 \end{bmatrix} W$$

Removal devices :
Compute the ability of a pipe array, spaced relatively uniformly, to remove heat.
Assume no special antifreeze or solution, so the minimum temperature within the pipe is 35 degrees F.

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Definition of additional variables:

T = Temperature, initial and final
r1 = pipe radius
r2 = pipe spacing divided by 2 (furthest particle from pipe distance)
q = heatflow, conductivity

Scenario 1:

$T_1 := 80\ °F$ $\qquad T_2 := 160\ °F$ (Initial Guess)

$r_1 := \frac{4\ in}{2} = 0.167\ ft$ $\qquad r_2 := 4\ ft$

$$q(T_2) := A \cdot 2 \cdot \pi \cdot k_{e_4} \frac{(T_1 - T_2)}{\ln\left(\frac{r_2}{r_1}\right)}$$

Guess Values

$T_2 = 160\ °F$

Constraints

$q(T_2) = -30\ W \cdot 2\ r_2$

$T_2 > T_1$

Solver

$\text{find}(T_2) = 149.376\ °F$

SOLUTION WORKS IF CONDUCTIVITY OF BACKFILL IS > or =1 W/mK . - about that of wet waste

suggests that water to air radiator in the summer is adequate

Scenario 2:

$T_1 := 100\ °F$

$r_1 := \frac{3.5\ in}{2} = 0.146\ ft$ $\qquad r_2 := 6\ ft$

$$q(T_2) := A \cdot 2 \cdot \pi \cdot k_{e_4} \frac{(T_1 - T_2)}{\ln\left(\frac{r_2}{r_1}\right)}$$

Guess Values

$T_2 = 160\ °F$

Constraints

$q(T_2) = -12\ W \cdot 2\ r_2$

$T_2 > T_1$

Solver

$\text{find}(T_2) = 148.685\ °F$

$$q(T_2) = -54.092\ \frac{kg \cdot m^3}{s^3}$$

Draft

the calculation above suggests that a scenerio assuming the projected heat does not include the heat of vapor transmission would be able to be captured with a spacing of 12 feet on center and 3.5" od transfer pipe

Scenario 3:

$T_1 := 80\ °F$

$r_1 := \frac{4\ in}{2} = 0.167\ ft \qquad r_2 := 2\ ft$

$$q(T_2) := A \cdot 2 \cdot \pi \cdot k_{e_4} \frac{(T_1 - T_2)}{\ln\left(\frac{r_2}{r_1}\right)}$$

Guess Values

$T_2 = 160\ °F$

Constraints

$q(T_2) = -150\ W \cdot 2\ r_2$

$T_2 > T_1$

Solver

$\text{find}(T_2) = 215.612\ °F$

note the W assumes maximum based on current heat front movement rates and assumes a rate of rise of temperature and waste drying and suggests that a 4 foot spacing with a cooler could manage 150 Watts per sq meter flux rate if a 4 inch od exchanger is used

Draft

Heat Flux vs. Heat Front Movement

Check the heat flux against the rate of movement of the heat front.
Assumptions:
Assume approximately a 40 foot thick layer that is being dried from 3% moisture to near zero moisture. This would be consistent with observations of nearly dry waste in the borings near the heat front.
The total evaporated liquid per meter width per month can be estimated by assuming a total density of 65 pcf and an advance rate of about 15 to 20 feet per month. The heated water vapor moving in advance of the front, once liberated from the waste in the front, warms the waste in the advancing area. Therefore it is not necessary to include this value in the energy balance. The energy does need to be continued to be delivered to the advancing front to evaporate the water at the front edge, assuming it is not taken away via gas collection.

Based on the calculations below, the energy required is very dependant on the moisture content in the waste at the front zone.

Definition of additional variables:

$L := 18\ ft$	Length (average heat front advancement during the month)
$H := 40\ ft$	Height (layer thickness)
$W := 1\ m$	Width (per unit meter)
$\Delta T := 10\ \Delta°C = 10\ K$	Approximate (observed) increase in temperature during the month
$\Delta t := 30\ day$	Time (month of observation)
$\gamma_{waste} := 65\ \frac{lb}{ft^3}$	Total density of waste in warmed zone

$LHV_{h2o} := 2260 \ \frac{J}{gm}$ Latent heat of vaporization for water (assumed to be close to that of the landfill liquid)

$C_{e_drywaste} := 500 \cdot \frac{J}{kg \cdot K}$ Heat capacity of dry waste per degree (K or degrees C)

$mc_{liquid} := 3\%$ Moisture content of the waste in warmed zone as a percent of dry waste

$V := L \cdot H \cdot W = 66.89 \ m^3$ Volume of assuming per unit meter width

$W_{liquid} := \gamma_{waste} \cdot \left(1 - \frac{1}{1 + mc_{liquid}}\right) = 1.893 \ \frac{lb}{ft^3}$ Calculate weight (mass) of liquid

$E_{vap} := W_{liquid} \cdot LHV_{h2o} \cdot V = \left(4.584 \cdot 10^9\right) \ J$ Energy required to vaporize the volume of landfill liquid

$E_{temp} := V \cdot C_{e_drywaste} \cdot \gamma_{waste} = \left(3.482 \cdot 10^7\right) \ \frac{J}{K}$ Energy required to increase the waste temperature one degree (K or oC)

Calculate the range of flux for the heat advancement to travel 18 ft over the 30 days.

Assuming vaporization (upper bound):

$flux_{vap} := \frac{E_{vap}}{W \cdot H \cdot \Delta t} = 145.071 \ \frac{W}{m^2}$ this value requires a gradient that is higher than any measured on site

Assuming no residual moisture present and 10 degree temperature increase (lower bound):

$flux_{nrmoist} := \frac{E_{temp}}{W \cdot H \cdot \Delta t} \cdot \Delta T = 11.019 \ \frac{W}{m^2}$ this is more consistent with the gradient of temp at site and suggests that heat transmission laterally by conduction is more in the dry areas - in the wetter zones its mostly heat transfer with steam, where the energy is reused and works to dry out the waste

The flux translates into heat removed (exchanged) per device (cooling point).

This value translates into the heat removed per device as the spacing c-c times the depth . Note that this is much higher than assumed by only using the gradient as the measure of energy flux. This is consistent with slower rate of rise of well temps and temps prior to reaching close to the boiling point that has been observed at the site.

$x_{space} := 8 \ ft$ C-C spacing of heat removal devices

$A_{barrier} := 52613 \ ft^2$ Cross-sectional area along profile of heat barrier

$L_{barrier} := 360 \ ft$ Length of barrier line

$n_{pipe} := 42$ Number of pipes

$L_{pipe} := \frac{A_{barrier}}{L_{barrier}} = 146.147 \ ft$ Averager pipe length, determined by area divided by length of barrier line

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Calculate rate of heat exchange assuming no residual moisture present and 10 degree temperature increase (lower bound):

$$ExchangeRate_{nrmoist} := flux_{nrmoist} \cdot \frac{1}{2} \cdot A_{barrier} = \left(2.693 \cdot 10^4\right) W$$

Assume 1/2 of the pipe experiences the full flux (which was measured from the hotest zones)

$$ExchangeRate_{nrmoist} = \left(9.189 \cdot 10^4\right) \frac{Btu}{hr}$$

Check this lower bound of heat exchange and check a circulation rate to verify that the average temperature of the liquid doesn't rise too much (i.e. less than 20 degree F). Assume the heat capacity of water.

$Q := 50\ gpm$ Assumed flow/circulation rate

$C_\rho := 1.88 \cdot 10^3 \cdot \frac{J}{kg \cdot K}$ Heat capacity of water

$$\Delta T := \frac{ExchangeRate_{nrmoist}}{C_\rho \cdot Q \cdot 1 \frac{gm}{cm^3}} = 4.541\ \Delta°C$$

$\Delta T = 8.174\ \Delta°F$

Flow/circulation is OK because less than 20 degree F

Calculate rate of heat exchange assuming vaporization (upper bound):

$$ExchangeRate_{vap} := flux_{vap} \cdot \frac{1}{2} \cdot A_{barrier} = \left(3.545 \cdot 10^5\right) W$$

Assume 1/2 of the pipe experiences the full flux (which was measured from the hotest zones)

$$ExchangeRate_{vap} = \left(1.21 \cdot 10^6\right) \frac{Btu}{hr}$$

Check the upper bound of heat exchange and check a circulation rate to verify that the average temperature of the liquid doesn't rise too much (i.e. less than 20 degree F). Assume the heat capacity of water.

$Q := 270\ gpm$ Assumed flow/circulation rate

$C_\rho := 1.88 \cdot 10^3 \cdot \frac{J}{kg \cdot K}$ Heat capacity of water

$$\Delta T := \frac{ExchangeRate_{vap}}{C_\rho \cdot Q \cdot 1 \frac{gm}{cm^3}} = 11.071\ \Delta°C$$

$\Delta T = 19.928\ \Delta°F$

Flow/circulation is OK because less than 20 degree F

This suggests that a 1.5 M BTU exchange device would likely be sufficient for up to 150 watts/sq m flux.

If a higher energy flux rate were assumed, consistent with significant moisture evaporation energy included a greater number of cooling points would be required and a larger exchange rate would occur. Point spacings could be decreased to 4 foot c-c by installation of a second row of points parallel to the existing barrier. The total exchange rate could then be increased by coupling these additional points with a larger cooling device.

Based on the above calculations, the initial design should be 8 ft c-c spacings and a second row offset at 8 ft away at the same spacing or closer depending on site observations. Reduce the possibility of vapor phase heat transfer by installing gas extraction to the south of the advance front prior to it getting within 100 ft of the barrier location, to limit vapor transmission to the barrier area. The ability to add a chiller to the liquid circulation would allow for increased heat extraction without addition of more points .

Draft

Table 1 Properties used in simulation of Tokyo landfill case

Parameters	sign	units	value
Landfill layer(unsaturated)			
Water content	w	[%]	28.9
Apparent density	ρ_e	[kg/m^3]	1157
Specific heat	C_e	[J/(kg)]	1939
Effective thermal conductivity	k_e	[J/(ms)]	0.35
Landfill layer(saturated)			
Water content	w	[%]	42.3
Apparent density	ρ_e	[kg/m^3]	1424
Specific heat	C_e	[J/(kg)]	2363
Effective thermal conductivity	k_e	[J/(ms)]	0.96
Natural soil layer			
Water content	w	[%]	9.1
Apparent density	ρ_e	[kg/m^3]	1800
Specific heat	C_e	[J/(kg)]	1109
Effective thermal conductivity	k_e	[J/(ms)]	0.86
Aerobic decomposition			
Depth of aerobic zone	H_{ae}	[m]	1.0
Rate of methane production	Ro	[mol-O_2/(m^{3}s)]	10^{-5}
heat generation	ΔH_o	[kJ/(mol-O_2)]	460×10^3
Rate of heat generation	Q_{ae}	[J/(m^{3}s)]	4.67
Anaerobic decomposition			
Rate of methane production	R_m	[mol-CH_4/(m^{3}s)]	5×10^{-6}
heat generation	ΔH_m	[J/(mol-CH_4)]	43.5×10^3
Rate of heat generation	Q_{an}	[J/(m^{3}s)]	0.218
Total gas generation	V_m	[mol-CH_4/m^3]	1298
Duration of decomposition	$t_{an}=V_m/R_m$	[year]	8.2
The depth of landfill	H	[m]	33.5
The depth of natural soil layer	H_{soil}	[m]	30
Air annual average temperature	θ_a	[° C]	15
Natural soil temperature	θ_o	[° C]	15
Initial temperature of waste cell	θ_o	[° C]	15
Infiltrated water flux	v_z	[mm/d]	2.0
Excessive drainage flux of leachate	v_e	[mm/d]	0.05-0.08
Heat transfer coefficient	h	[J/(m^{2}s)]	10

Draft

P.J.Carey & Associates, P.C.

CLIENT	Bridgeton	CALCULATION BY	PJC
PROJECT	Bridgeton	CHECKED BY	KH
JOB No	179.001	APPROVED BY	PJC
DATE	12/20/12		

OBJECT To estimate the friction flow losses in the various pipes.
1. Central supply pipe of the cooling point
2. Annulus pipe of the cooling point
3. Supply header

CENTRAL SUPPLY PIPE

Using Hazen Williams formula

$C_1 := 150$ Hazen Williams flow coeffictient (for english units), where 1 corresponds to a clean system and 2 a degraded one with age and scale formation

$L_{central} := 225ft$ Length of central supply pipe

$Q := 10gpm$ estimated flow

$D_i := 1.38in$ inner diameter for 1 1/4 sch 40 pipe

Calculate Friction Flow Loss

$$h_f := \left[\frac{.002083 \cdot \frac{L_{central}}{ft}}{\left(\frac{D_i}{in}\right)^{4.8655}} \cdot \left(\frac{100 \cdot \frac{Q}{gpm}}{C_1}\right)^{1.85}\right] ft$$

$h_f = 3.27\,ft$ Minor friction flow loss

THE ANNULUS PIPE

Using Darcy's equation

The annulus flow is between a 3.5" OD structural shape with a 3" ID and a 1.66" OD 1 1/4 pipe inside

$D_1 := 3.0in$

$D_2 := 1.66in$

$L_{central} = 225\,ft$ Same length as Central Pipe

$Q = 10\,gpm$ Same flow as Central Pipe

$$WettedPerimeter := (D_1 + D_2) \cdot \pi = 1.22\,ft$$

Draft

$$A_{flow} := \left[\left(\frac{D_1}{2}\right)^2 - \left(\frac{D_2}{2}\right)^2\right]\cdot\pi = 0.034\ ft^2$$ Flow area

$$hydraulicdiameter := \frac{4A_{flow}}{WettedPerimeter} = 0.112\ ft$$ Effective hydraulic diameter

$$v := \frac{Q}{A_{flow}} = 0.654\ \frac{ft}{s}$$ Velocity

$$\nu := .000001004\ \frac{m^2}{sec}$$ kinematic viscosity of water

$$R_e := \frac{v\cdot hydraulicdiameter}{\nu} = 6.76\times 10^3$$ Reynolds number

$$f := \frac{64}{R_e} = 9.468\times 10^{-3}$$ laminar friction factor

Calculate Friction Flow Loss

$$h_f := f\cdot\frac{L_{central}}{hydraulicdiameter}\cdot\frac{v^2}{2g} = 0.127\ ft$$ Minor friction flow loss

Losses in the supply header

Using Hazen Williams formula the supply header has two sections with different diameters.

Friction head loss in the first section of the supply header (6" pipe):

$C_1 := 150$ Hazen Williams flow coeffictient (for english units), where 1 corresponds to a clean system and 2 a degraded one with age and scale formation

$L_{supply1} := 320ft$ Length of supply header pipe that is 6" (cooler to station 2+00)

$Q := 350gpm$ estimated flow

$D_i := 6in$ inner diameter for 1 1/4 sch 40 pipe

Calculate Friction Flow Loss

$$h_{f1} := \left[\frac{.002083\cdot\frac{L_{supply1}}{ft}}{\left(\frac{D_i}{in}\right)^{4.8655}}\cdot\left(\frac{100\cdot\frac{Q}{gpm}}{C_1}\right)^{1.85}\right]ft = 2.621\ ft$$

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Friction head loss in the second section of the supply header (4" pipe):

$C_1 := 150$	Hazen Williams flow coeffictient (for english units), where 1 corresponds to a clean system and 2 a degraded one with age and scale formation
$L_{supply2} := 160ft$	Length of supply header pipe that is 4" (station 2+00 to 3+50)
$Q := 200gpm$	estimated flow
$D_i := 4in$	inner diameter for 1 1/4 sch 40 pipe

Calculate Friction Flow Loss

$$h_{f2} := \left[\frac{.002083 \cdot \frac{L_{supply2}}{ft}}{\left(\frac{D_i}{in}\right)^{4.8655}} \cdot \left(\frac{100 \cdot \frac{Q}{gpm}}{C_1} \right)^{1.85} \right] ft = 3.347\ ft$$

$h_f := h_{f1} + h_{f2} = 5.968\ ft$ Minor friction flow loss

Draft

Industrial

Cooling Systems

Draft

- Reduce or Eliminate Water Use
- Winter Heat Recovery
- Free Cooling Economizers

motivair™

COOLING SOLUTIONS

www.motivaircorp.com

Motivair closed-loop fluid cooling systems dramatically cut utility and maintenance costs when applied to water-cooled industrial equipment including molding machines, air compressors, furnaces, and hydraulic systems. They are also ideal for “Free-Cooling” economizers on chillers, when used to pre-cool the return chilled water during winter operation.

Draft

MFC CLOSED LOOP (DRY) FLUID COOLING SYSTEMS

MOTIVAIR MFC FLUID COOLERS, CLEAN & EFFICIENT COOLING FOR YOUR PROCESS.

Designed for simple installation, these pre-engineered systems continuously cool and circulate a solution of water and ethylene glycol without any evaporation loss, freeze-ups, water treatment or routine maintenance. Internal scaling and corrosion are virtually eliminated because air is automatically removed and the same fluid is re-circulated continuously. In contrast to cooling towers or city water systems, water or sewer charges are eliminated.

Motivair MFC systems are shipped in two sections, an air-cooled heat exchanger and a pumping station. Both are completely factory assembled and tested before shipment. The heat exchanger features a galvanized housing for indoor or outdoor use. Copper tubes and aluminum fins provide superior heat transfer. Fans are compartmentalized for efficient fan cycling. Solid-state fan sequencer is standard on multiple fan units. All heat exchangers are tested to 400 PSIG and multiple fan units are shipped with a pre-wired control panel.

The pumping station may be installed anywhere between the heat source and the heat exchanger. Included are single or duplex close-coupled pumps, TEFC motors, NEMA 4 panel, temperature and pressure gauges, pressure differential switch (duplex systems) isolation and check valves, expansion tank, purger, vent and fill valve. The control panel includes starters, indicating lights, auto changeover (duplex systems) lead/lag selector switch and pump failure visual and audible alarms. All pump stations are sized per application ensuring adequate flow and pressure for each individual system.

AVAILABLE OPTIONS INCLUDE:

- Shell and tube trim cooler
- Copper fins
- Coil coating for corrosive environments
- Stainless steel construction

MFC SPECIFICATIONS

FLUID COOLER MODEL	FLOW RATE (GPM)	HEAT REJECTION CAPACITY* (BTU/HR)	NO. OF FANS	TOTAL AIRFLOW (SCFM)	OVERALL DMENSIONS(IN.) L	W	H	INT VOL. (GAL.)	EMPTY WEIGHT (LBS.)
MFC0200	22	200,000	2	21,000	90	43	50	6	580
MFC0250	28	250,000	2	20,600	90	43	50	9	630
MFC0300	34	300,000	2	19,800	90	43	50	9	650
MFC0350	39	350,000	2	18,500	76	43	50	12	730
MFC0400	45	400,000	3	30,900	130	43	50	17	900
MFC0450	51	450,000	3	29,700	130	43	50	17	930
MFC0500	56	500,000	3	28,600	130	43	50	22	1010
MFC0550	62	550,000	4	41,200	231/121**	88	50	18	1580
MFC0600	68	600,000	4	39,600	231/121**	88	50	18	1620
MFC0700	79	700,000	4	37,000	231/121**	88	50	24	1760
MFC0800	90	800,000	6	61,000	341/176**	88	50	27	1810
MFC0900	101	900,000	6	60,600	341/176**	88	50	27	2390
MFC0950	107	950,000	6	59,400	341/176**	88	50	27	2440
MFC1000	113	1,000,000	6	57,200	341/176**	88	50	36	2550
MFC1100	124	1,100,000	6	55,500	341/176**	88	50	36	2610
MFC1200	135	1,200,000	8	79,200	231	88	50	36	3140
MFC1300	146	1,300,000	8	76,300	231	88	50	48	3200
MFC1400	158	1,400,000	8	74,000	231	88	50	48	3510
MFC1500	169	1,500,000	10	99,000	286	88	50	45	3990
MFC1600	180	1,600,000	10	98,200	286	88	50	60	4000
MFC1700	191	1,700,000	10	95,300	286	88	50	60	4150
MFC1800	203	1,800,000	10	92,500	286	88	50	60	4380
MFC1900	214	1,900,000	12	117,900	341	88	50	72	4710
MFC2000	225	2,000,000	12	114,400	341	88	50	72	4890
MFC2100	236	2,100,000	12	111,000	341	88	50	72	5230

**Performance based on 40% glycol entering the cooler @ 125° F, leaving the cooler @ 105° F, & 95° F ambient.*
***These coolers are available in eiher a 1-fan or 2-fan-wide configuration.*
Contact Motivair for Economizer (Free-Cooling) applications!

Draft

MEC CLOSED LOOP EVAPORATIVE COOLING TOWERS

DESIGN FEATURES

The Motivair MEC closed loop evaporative towers combine the advantages or our MFC closed loop dry fluid coolers with the lower water temperatures available from an open draft evaporative cooling tower. Rugged construction, and optional hot dipped galvanizing after fabrication make these towers suitable for the most demanding industrial applications.

The spray pump continuously drenches the tubular heat exchanger surface with a spray of re-circulated water, while the fan forces ambient air across the coil. The evaporation of the spray water removes heat from the closed loop fluid at temperatures below the ambient "dry bulb" temperature. The evaporative cooling effect is based on the prevailing "wet bulb" temperature, which is a measurement of moisture in the air. (A lower wet bulb temperature increases evaporation from the cooler, and directly increases capacity.)

COMPONENTS

The MEC Series Closed Loop Evaporative Towers consist of four main components: (1) the cooling coil; (2) the spray system; (3) the fan system; and (4) the discharge mist eliminators.

- **THE COOLING COIL** separates the closed loop fluid from the spray water thereby eliminating the possibility of contaminated cooling water. This also allows the use of glycol as the closed loop fluid for winter operation.
- **THE SPRAY SYSTEM** includes a sump, spray pump, riser, distribution pipes, and spray nozzles designed to circulate spray water from the basin and continuously drench the cooling coil surface.
- **THE FAN SYSTEM** moves the correct amount of air over the wet cooling coil surface to maximize the heat transfer. This air carries away the heat from the closed loop fluid in the form of increased temperature and evaporated spray water (latent heat of vaporization).
- **THE DISCHARGE MIST** eliminators keep spray water droplets inside the cooler, to reduce water consumption, drift losses and vapor "plumes."

In most areas of North America the maximum ambient "wet bulb" temperature is below 78°F, and it rarely exceeds 80°F. In general, this makes Evaporative Closed Loop Systems ideally suited for use when the maximum required cooling water temperature is around 85°F.

Water consumption is approximately 2 GPM per million Btu/h for evaporation losses, plus occasional blow downs to clean the sump.

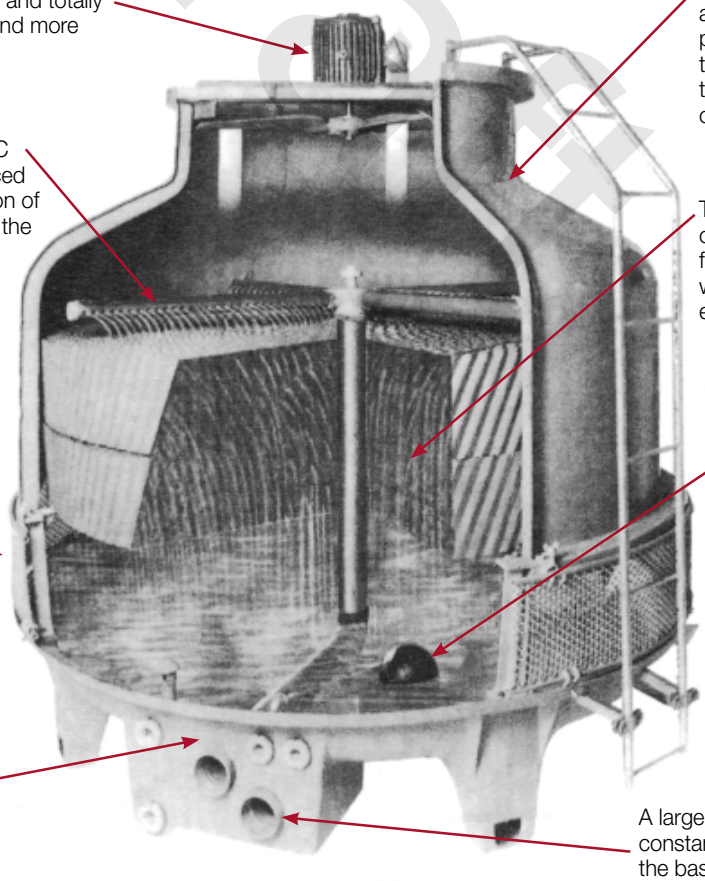
Draft

MEC SPECIFICATIONS

FLUID COOLER MODEL	FLOW RATE (GPM)†	HEAT REJECTION CAPACITY* (BTU/HR)	TOTAL AIRFLOW (SCFM)	FAN MOTOR HP	SPRAY PUMP HP	PAN HEATER KW	OVERALL DMENSIONS(IN.) A	B	C	OPER. WEIGHT (LBS.)
MEC0300	27	300,000	6,400	3	0.5	3	70	67	114	2,790
MEC0400	`36	400,000	9,300	5	0.75	3	70	78	107	3,630
MEC0500	45	500,000	9,200	5	0.75	3	70	78	114	3,895
MEC0700	63	700,000	14,700	7.5	1	4.5	130	73	100	4,520
MEC0900	81	900,000	14,400	7.5	1	4.5	130	73	114	5,455
MEC1100	99	1,100,000	20,500	15	1.5	6	130	84	107	6,580
MEC1300	117	1,300,000	20,500	15	1.5	6	130	84	114	6,990
MEC1600	144	1,600,000	29,400	15	1	4.5	135	103	107	8,670
MEC1800	162	1,800,000	29,400	15	1	4.5	135	103	114	8,910
MEC2000	180	2,000,000	40,500	20	1.5	6	135	126	100	11,020
MEC2200	198	2,200,000	40,200	20	1.5	6	135	126	107	11,270
MEC2400	216	2,400,000	40,100	20	1.5	6	135	126	114	11,600
MEC2800	252	2,800,000	61,200	30	3	9	195	126	100	14,880
MEC3400	306	3,400,000	61,000	30	3	9	195	126	107	15,870
MEC3800	342	3,800,000	60,000	30	3	9	195	126	114	17,410

**Performance based on 40% glycol entering the cooler @ 115° F, leaving the cooler @ 90° F, & 78° F ambient.*
***See Closed Loop Water Cooling Systems brochure for pump station details.*

MOT OPEN DRAFT EVAPORATIVE COOLING TOWERS



The fan motor is weather-proofed and totally enclosed allowing for less noise and more efficient long-term performance.

Housing panels and water basin are built of fiberglass reinforced plastic ensuring rust-free long term performance even under the most severe environmental conditions.

The sprinkler pipes are sturdy PVC material pierced with closely-spaced holes allowing thorough distribution of water in a rotating spray covering the entire surface of the filler.

The efficiently designed PVC filler creates a surface area that allows for maximum dispersion of water which creates a superior cooling effect.

A large-capacity, durable water basin constructed from rust-proof fiberglass rein-forced platic gurantees low maintenance and long-term operation.

The round design permits maximum air intake regardless of wind direction.

Efficiency is enhanced by a low internal pressure drop.

A large diameter outlet pipe draws a constant supply of cooled water from the basin to serve the facility.

RELIABLE, COST EFFECTIVE EVAPORATIVE COOLING

DESIGN FEATURES:

Lightweight and compact, the Motivair open draft cooling towers provide evaporative cooling at the lowest cost, combined with quick and easy installation. On-site assembly is simplified by the modular design of all components. Smaller models are shipped pre-assembled while larger units can be either customer assembled on site, or factory assembled on site for a reasonable fee. Prevailing wind directions will not affect cooling tower performance due to the unique circular design of the basin and casing.

CASING: Easy access simplifies cleaning. Individual fiberglass panels are fastened together with stainless steel bolts for periodic wash down and general clean up. The Motivair MOT cooling tower is designed for durability and long life, even under the most severe environmental weather conditions.

FAN BLADES: Aerodynamically designed propeller type fans are used to conserve power and assure quiet operation. Models MOT-3 through 50 feature a factory balanced ABS plastic blade. Models MOT-60 and above feature an all aluminum alloy, adjustable blade fan.

FAN MOTOR: Models M0T-3 through 200 feature direct drive motors. Models, MOT-225 and larger feature a unique belt drive, designed to reduce noise levels to a minimum.

WATER DISTRIBUTION SYSTEM: Models MOT-3 through 60 feature an ABS plastic sprinkler with stainless steel shaft. Models MOT-70 and above feature an aluminum alloy sprinkler head. Both types of sprinkler head cause very low-pressure loss, and require minimum maintenance.

INLET LOUVERS: Non-rusting PVC plastic mesh provides easy access to the sump, while preventing foreign objects from entering.

LADDER: A ladder is provided for maintenance and inspection accessibility to fan and sprinkler systems on models MOT-40 and above.

FILL MATERIAL: Honeycomb heat embossed PVC is formed to permit high heat transfer efficiency. The Motivair fill is suitable for operation with inlet water temperatures up to 115°F. If higher temperatures are required, please contact factory.

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MOT SPECIFICATIONS

Water IN Water OUT Wet Bulb	90°F 80°F 65°F	90°F 80°F 70°F	95°F 85°F 70°F	92°F 82°F 72°F	95°F 85°F 75°F	97°F 87°F 75°F	95°F 85°F 77°F	95°F 85°F 78°F	96°F 86°F 80°F	98°F 88°F 82°F	90°F 83°F 75°F	94°F 85°F 75°F	MOT
	9	6	9	7	8	9	6	6	5	6	8	9	3
	15	10	15	11	12	15	10	10	9	10	13	14	5
	24	18	24	19	20	24	18	16	14	15	22	23	8
	30	21	30	23	26	30	21	20	18	20	28	29	10
	46	33	47	35	40	47	33	30	28	30	41	43	15
	61	44	62	48	52	62	44	40	37	40	56	58	20
	77	56	78	60	66	78	56	50	47	50	70	72	25
	91	68	93	72	80	93	68	61	57	61	84	87	30
	122	90	124	97	107	124	91	83	77	82	112	116	40
	152	114	156	121	134	156	115	105	98	104	140	145	50
	183	137	187	146	160	187	137	125	116	124	169	174	60
GPM	214	160	218	170	187	218	160	145	135	144	197	203	70
	244	183	250	195	214	250	183	168	156	167	225	232	80
	306	228	311	243	268	311	229	208	193	207	281	290	100
	381	287	390	305	335	390	288	262	245	261	352	362	125
	456	346	468	368	403	468	348	318	297	318	422	435	150
	533	401	546	428	470	546	403	369	344	367	493	508	175
	608	461	624	490	539	624	464	426	398	425	563	580	200
	691	509	702	543	600	702	508	460	427	457	633	652	225
	765	570	780	608	670	780	571	520	484	518	704	725	250
	920	681	936	727	801	936	682	620	575	616	845	871	300
	1065	808	1092	859	942	1092	812	744	695	742	986	1016	350
	1220	920	1249	979	1075	1249	924	845	788	842	1127	1161	400
	1502	1182	1560	1250	1363	1560	1200	1113	1053	1119	1408	1453	500
	1825	1386	1873	1473	1616	1873	1394	1278	1194	1275	1690	1742	600
	2108	1648	2185	1745	1904	2185	1670	1546	1459	1551	1971	2035	700
	2433	1848	2498	1965	2155	2498	1860	1703	1592	1700	2255	2323	800
	2994	2379	3121	2514	2735	3121	2421	2253	2139	2270	2815	2908	1000
	3740	2977	3902	3146	3421	3902	3032	2824	2683	2846	3519	3635	1250
	4491	3568	4683	3771	4102	4683	3632	3380	3209	3404	4223	4361	1500

MPF PLATE & FRAME CLOSED LOOP COOLING SYSTEMS

These systems utilize a plate & frame heat exchanger to cool closed loop, re-circulated water, using a raw water supply, (open draft cooling tower, river or pond water) without contaminating the closed loop. This is particularly useful for air compressors or other water-cooled machinery, which have high water side maintenance costs; where avoidance of down time is critical; or when the available cooling water quality is unacceptable.

The high efficiency of the stainless steel plate design enables Motivair systems to cool the closed loop fluid to within 5°F of the raw cooling water. This efficiency also permits an extremely compact design, and occupies minimal floor space. Clip-in Nitrile rubber gaskets allow simple dismantling and re-assembly for cleaning.

Available as a complete package, or a split system, the Motivair system includes a plate and frame exchanger, process pump, NEMA 4 control & alarm panel, piping, isolation valves and temperature & pressure gauges. Piping and electrical connections are the only on-site requirements, before the system is fully operational. Optional strainer packages are available when the cooling water has an unacceptable level of suspended solids. Occasional maintenance is easily performed by back-flushing the exchanger, or by loosening the “follower” plate and removing the stainless steel plates. They are easily cleaned with a pressure hose, then re-assembled with the Nitrile rubber, clip-in gaskets and re-tightened, before resuming operation (see operation and maintenance manual).

REQUIRED DATA FOR SYSTEM DESIGN:

- Application description
- Fluid to be cooled & flow rate
- Fluid temperature entering exchanger
- Required leaving fluid temperature
- Available cooling water flow and temperature
- Allowable pressure drops
- Process fluid pump available pressure (PSI)

OPTIONAL REDUNDANT COMPONENTS

For critical applications, a complete standby exchanger is recommended, with isolation valves, so one may be cleaned while the other is in service. Motivair offers a pressure differential option, which continuously monitors the cooling water pressure differential across the exchanger(s). At a pre-determined, adjustable differential, visible and audible alarms are activated, signaling the operator to clean the exchanger or switch to the standby. Optional strainer assemblies can also be fitted with a similar indicator, to warn the operator to clean the strainer. Also available is an automatic standby pump, with associated piping, valves & controls. In the event of a pump failure, the standby pump starts automatically, while the visible & audible alarms are activated.

Draft

PUMP/TANK STATIONS

Every open and closed loop cooling tower requires a pumping package in order to circulate the cooled water or glycol to and from the designated process. Motivair designs and builds a full range of pump stations and pump/tank station packages that can be customized to suit any application (See Pump Station brochure for further details).

Available options include:

- Simplex, duplex or triplex pumps
- Stainless steel water circuit
- Automatic pump change over
- Visible & audible alarms
- Flow meters
- Baffled tanks
- Automatic water make-up
- Pressure & temperature gauges
- Isolation & check valves
- NEMA 4 control box
- VFD pump speed control
- High pressure pump option
- Redundant pump packages

APPLICATION, INTEGRATION & SOLUTIONS FOR ALL YOUR COOLING NEEDS:

MPC
1/2-50 ton packaged air-cooled or water-cooled chillers for Industrial cooling, Medical cooling or custom HVAC applications. Includes integrated microprocessor, pump station, and storage reservoir.

MLC
70-240 ton air-cooled, water-cooled & split system chillers for central plant operation, industrial processes or HVAC applications. Integrated “Free-Cooling” option

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motivair™

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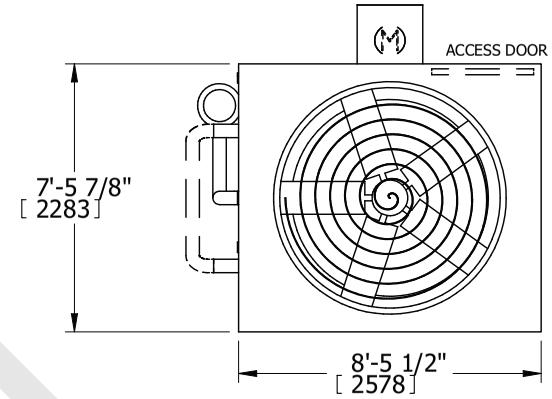
UNIT	MODEL #	SCALE	DWG. #	REV.	DATE	SERIAL #
CLOSED CIRCUIT COOLER	MEC-1800					

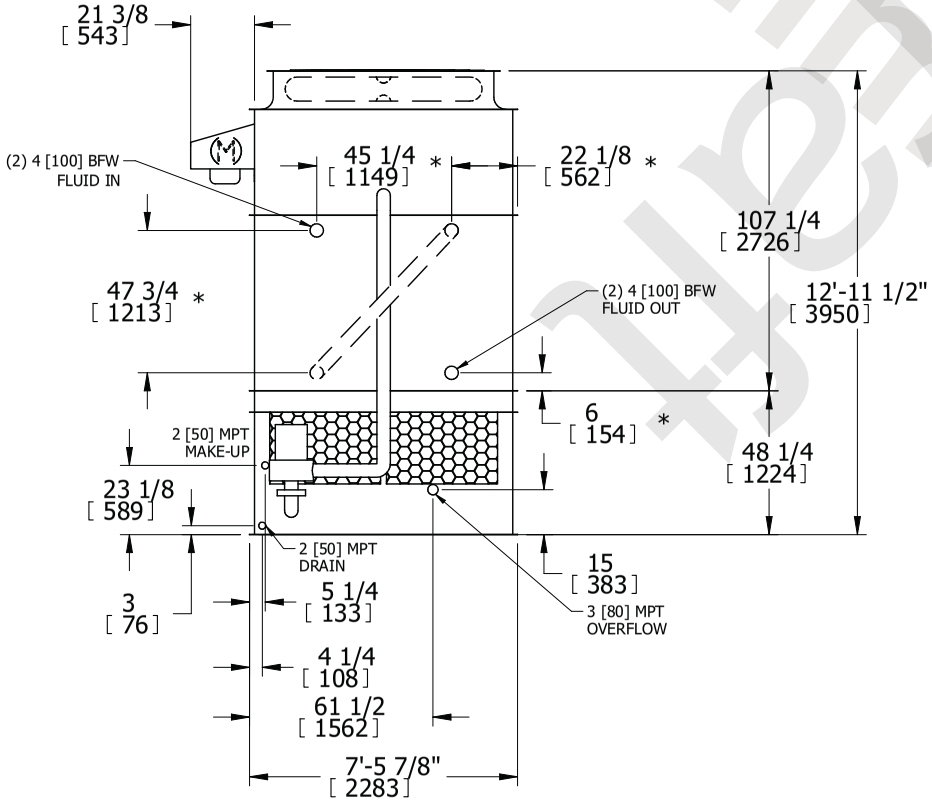
NOTES:
1. (M)- FAN MOTOR LOCATION
2. HEAVIEST SECTION IS UPPER SECTION
3. MPT DENOTES MALE PIPE THREAD
   FPT DENOTES FEMALE PIPE THREAD
   BFW DENOTES BEVELED FOR WELDING
4. +UNIT WEIGHT DOES NOT INCLUDE ACCESSORIES (SEE ACCESSORY DRAWINGS)
5. MAKE-UP WATER PRESSURE 20 psi MIN [137 kPa], 50 psi MAX [344 kPa]
6. *-APPROXIMATE DIMENSIONS DO NOT USE FOR PRE-FABRICATION OF CONNECTING PIPING
7. SERIES FLOW PIPING AND AUX. CROSSOVER DRAIN BY OTHERS.

Preliminary

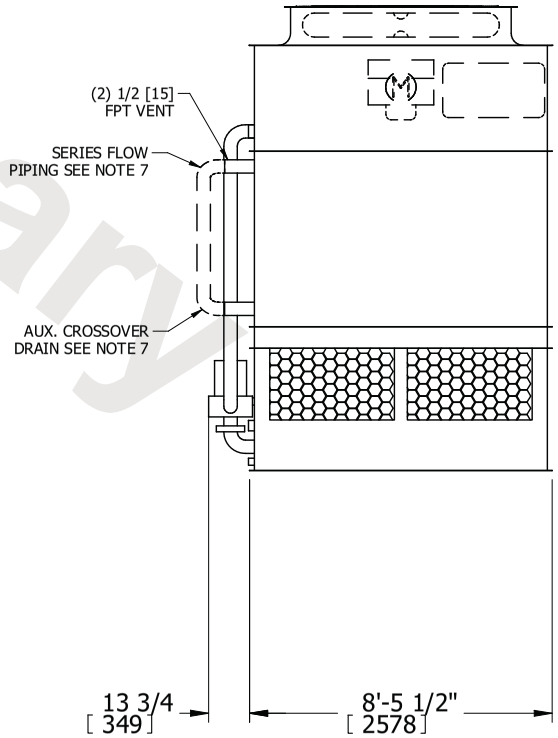
FACE 2
PLAN VIEW



FACE 1



FACE 2



FACE 1

SHIPPING WEIGHT	OPERATING WEIGHT	HEAVIEST SECTION WEIGHT	NO. OF SHIPPING SECTIONS
11100 lbs+ [5035] kg+	15980 lbs+ [7248] kg+	9800 lbs+ [4445] kg+	2

HEAT DISSIPATON / BARRIER PLAN

FOR

BRIDGETON LANDFILL

DATE OF ISSUE:12/29/2012

BRIDGETON LANDFILL, LLC
12976 ST. CHARLES ROCK RD.
BRIDGETON, MO 60344

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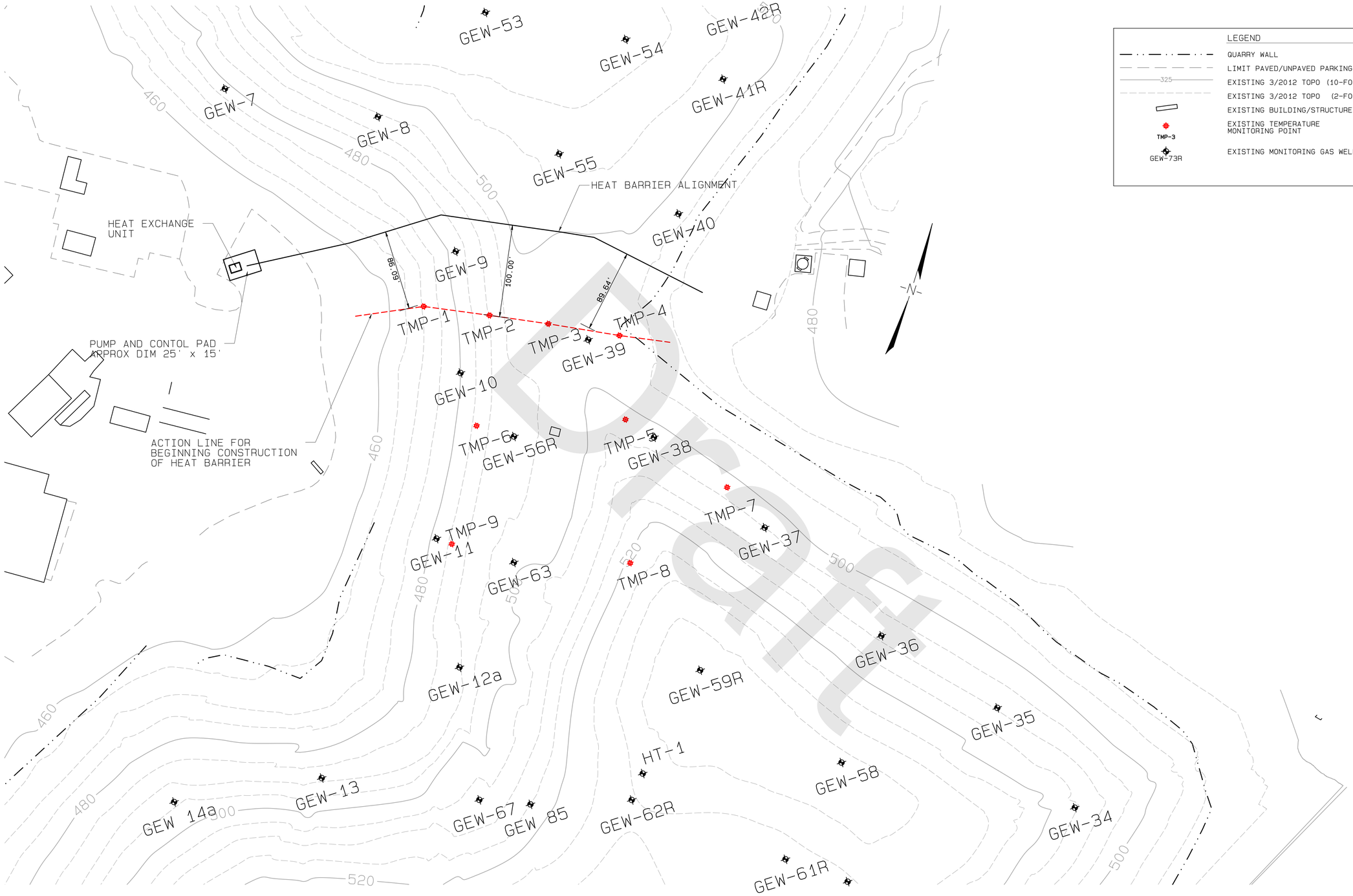


LEGEND

- QUARRY WALL
- LIMIT PAVED/UNPAVED PARKING
- 325 EXISTING 3/2012 TOPO (10-FOOT)
- EXISTING 3/2012 TOPO (2-FOOT)
- EXISTING BUILDING/STRUCTURE
- TMP-3 EXISTING TEMPERATURE MONITORING POINT
- GEW-73R EXISTING MONITORING GAS WELL

GRAPHIC SCALE 1"=50'

0 50 100 150

BRIDGETON LANDFILL, LLC
12976 ST. CHARLES ROCK RD.
BRIDGETON, MO

REVISION	DATE
1	
2	
3	
4	
5	

P. J. CAREY & ASSOCIATES, P.C.
5978 VALDNE WAY, SUGAR HILL, GA. 30518

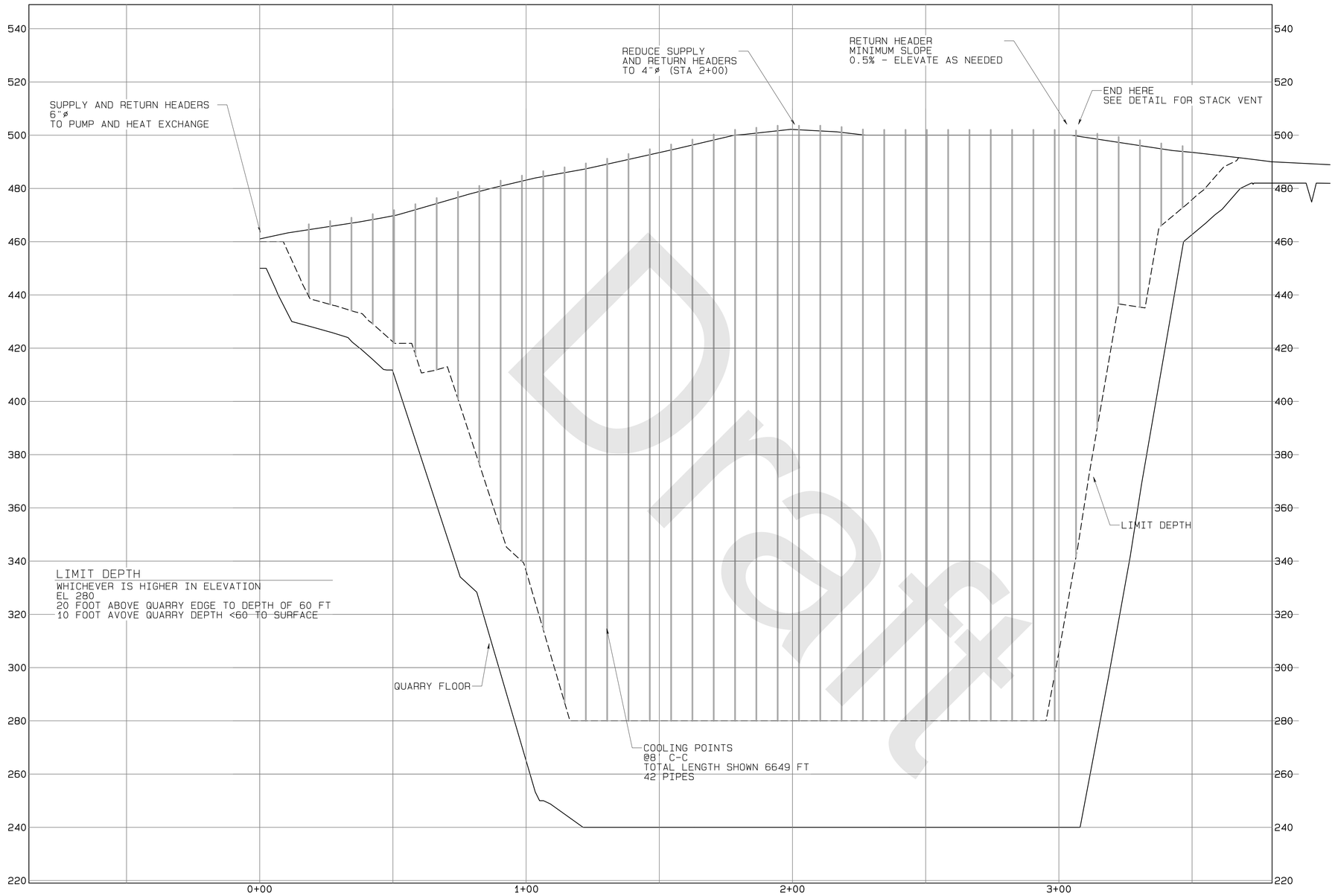
PROJ. NO.: 179.001
DATE: 12/28/2012
DESIGNED BY: PJC
DRAWN BY: PJC/KLCH
CHECKED BY: PJC
APPROVED BY: PJC

SITE PLAN

HEAT DISSIPATON / BARRIER PLAN
BRIDGETON LANDFILL

DRAWING 1

SHEET 1 OF 5



PROFILE ALONG HEAT BARRIER ALIGNMENT

Draft

BRIDGETON LANDFILL, LLC
12976 ST. CHARLES ROCK RD.
BRIDGETON, MO

REVISION	DATE
1	
2	
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P. J. CAREY & ASSOCIATES, P.C.
5978 VALDNE WAY, SUGAR HILL, GA. 30518

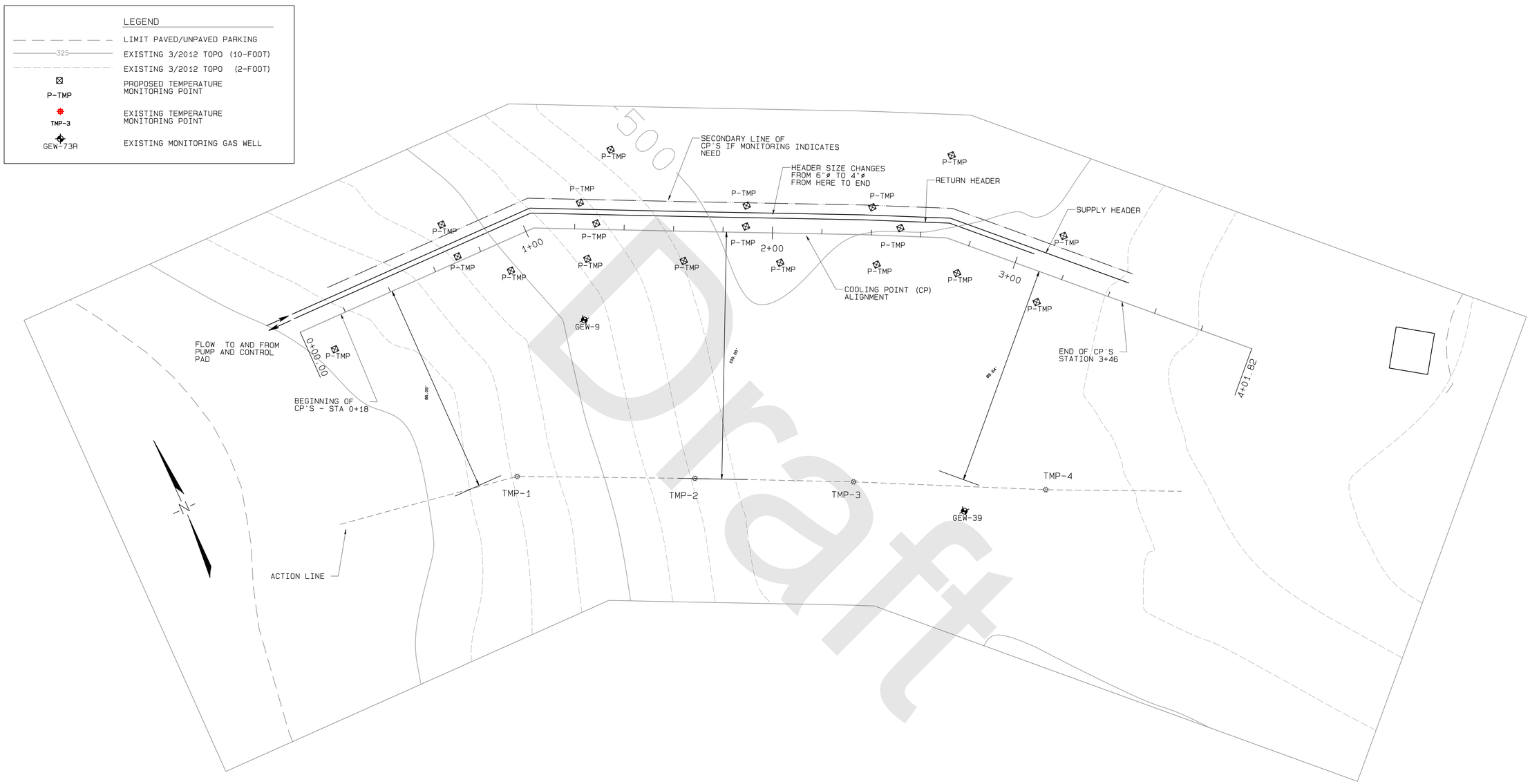
PROJ. NO.: 179.001
DATE: 12/29/2012
DESIGNED BY: PJC
DRAWN BY: PJC/KLOH
CHECKED BY: PJC
APPROVED BY: PJC

PROFILE ALONG BARRIER
WITH COOLING POINTS

HEAT DISSIPATON / BARRIER PLAN
BRIDGETON LANDFILL

DRAWING
2

SHEET 2
OF 5



PLAN VIEW IN HEAT DISSIPATION / BARRIER AREA

GRAPHIC SCALE 1"=20'

0 20 40 60

BRIDGETON LANDFILL, LLC
12976 ST. CHARLES ROCK RD.
BRIDGETON, MO

REVISION	DATE
1	
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P. J. CAREY & ASSOCIATES, P.C.
5078 VALDINE WAY, SUGAR HILL, GA. 30518

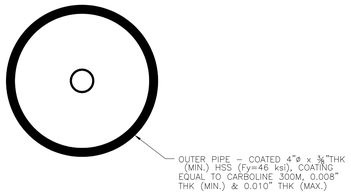
PROJ. NO.: 179.001
DATE: 12/29/2012
DESIGNED BY: PJC
DRAWN BY: PJC/KLCH
CHECKED BY: PJC
APPROVED BY: PJC

BARRIER AREA
PLAN VIEW

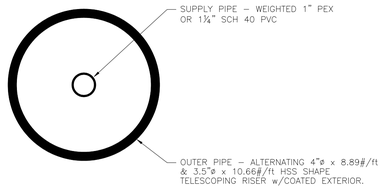
HEAT DISSIPATON / BARRIER PLAN
BRIDGETON LANDFILL

DRAWING
3

SHEET 3
OF 5



OPTION 1 - SOLID COATED OR UNCOATED PIPE

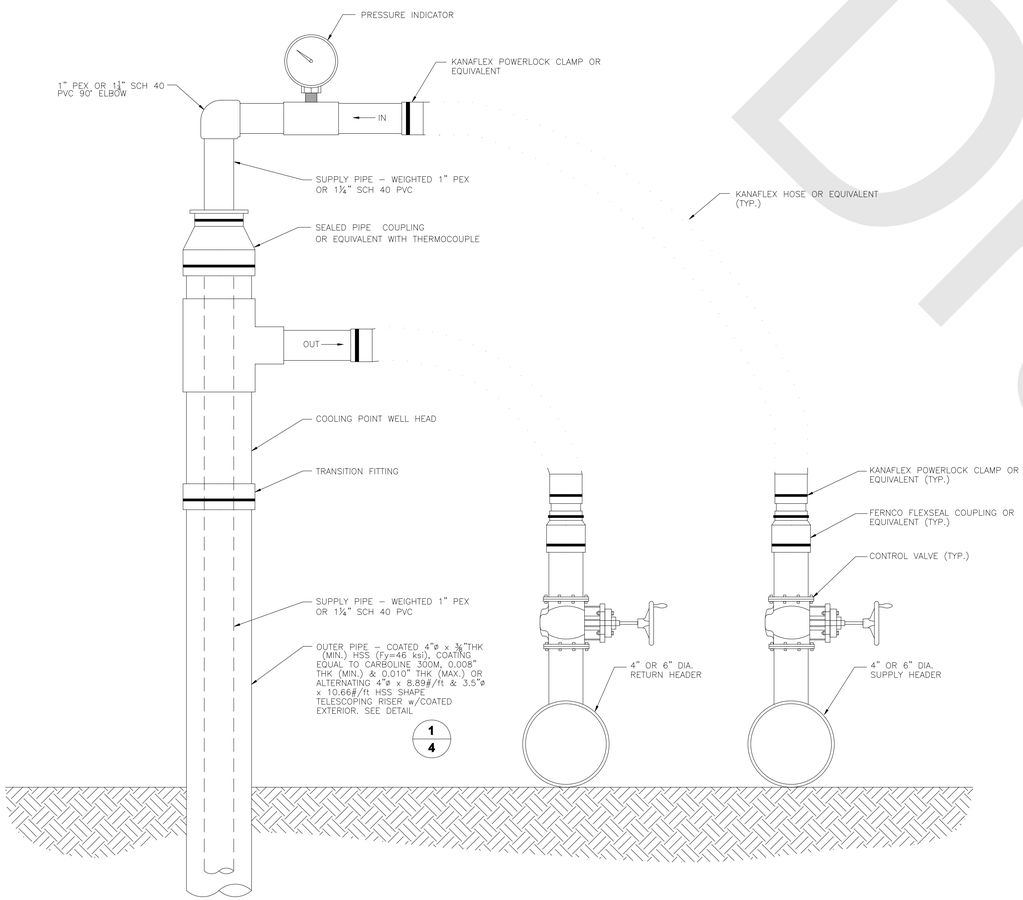


OPTION 2 - TELESCOPING RISER

HEAT EXCHANGE TUBES (COOLING POINTS (CP))

DETAIL 1/4

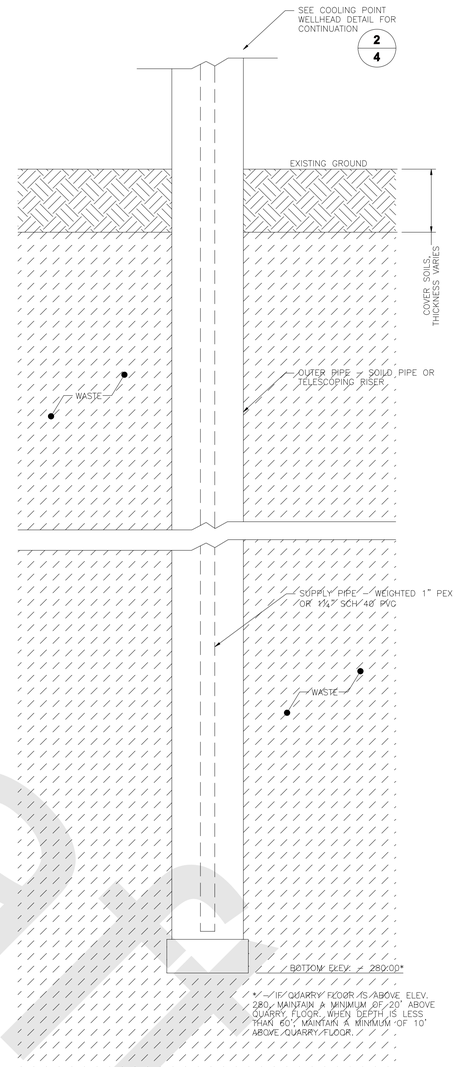
SCALE: NOT TO SCALE



COOLING POINT WELLHEAD

DETAIL 2/4

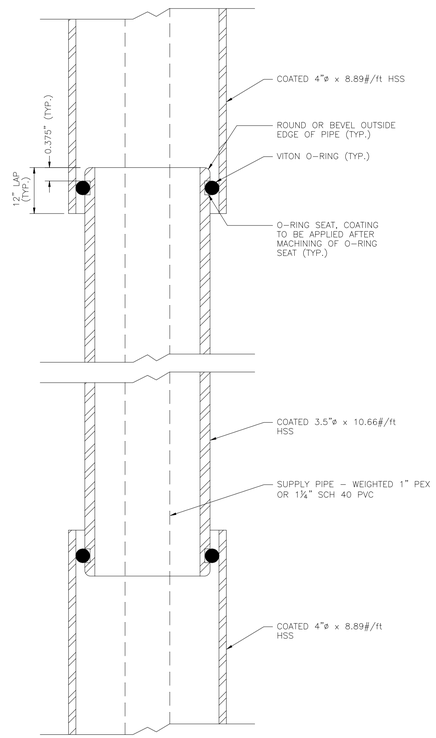
SCALE: NOT TO SCALE



TYPICAL COOLING POINT DOWNHOLE (SOLID PIPE OR TELESCOPING RISER)

DETAIL 3/4

SCALE: NOT TO SCALE



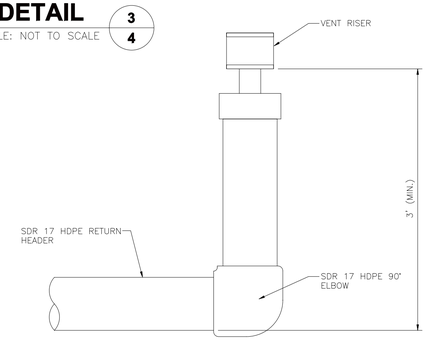
TYPICAL TELESCOPING RISER

DETAIL 4/4

SCALE: NOT TO SCALE

PIPE SEGMENT NOTES

1. THE LOWEST PIPE SEGMENT IS THE SMALLER DIAMETER
2. BELOW A DEPTH OF 180' THE MAXIMUM EXPOSED LENGHT IS 25' PER SEGMENT. FROM 140' TO 180' THE MAXIMUM EXPOSED LENGTH IS 30'. FOR DEPTHS < 140' MAXIMUM EXPOSED LENGTH IS 40'
3. MINIMUM STICK UP AT GROUND SURFACE IS 2'.



TYPICAL RETURN HEADER VENT

DETAIL 5/4

SCALE: NOT TO SCALE

Draft

BRIDGETON LANDFILL, LLC.
12976 ST. CHARLES ROCK RD.
BRIDGETON, MO

REVISION	DATE
1	
2	
3	
4	
5	

P. J. CAREY & ASSOCIATES, P.C.

5878 VALINE WAY, SUGAR HILL, GA 30518

PROJ. NO: 179.001
DATE: 12/18/2012
DESIGNED BY: P.J.C.
DRAWN BY: BWS & DET
CHECKED BY: P.J.C.
APPROVED BY: P.J.C.

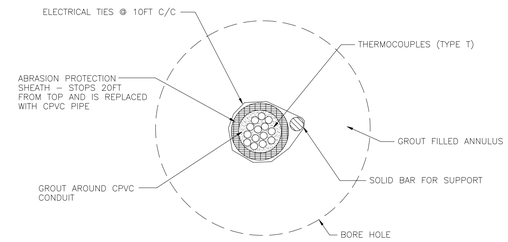
DETAILS

HEAT DISSIPATION/BARRIER PLAN
BRIDGETON LANDFILL

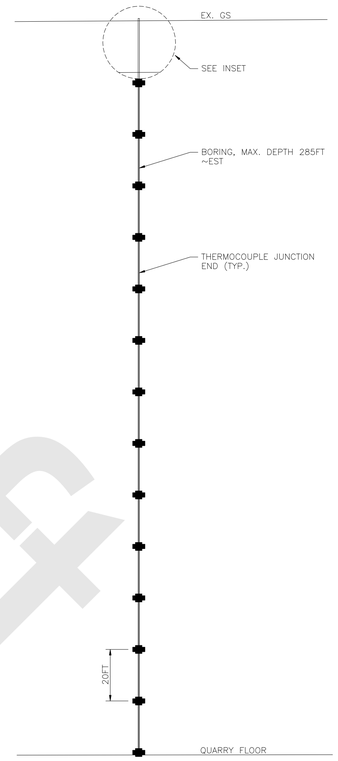
DRAWING 4

SHEET 4 OF 5

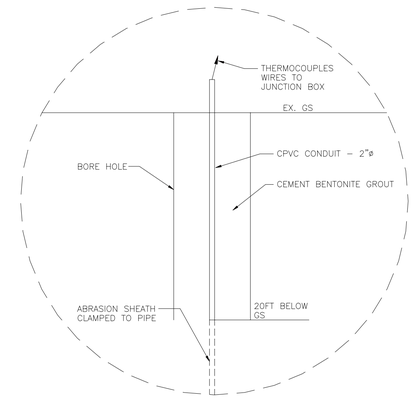
Project Desc: Path: N:\Bridgeton\drawings\PJCA\bridgeton hearrier.pro Plot Date/Time: Mon Dec 17,2012 / 131701



PLAN VIEW



SECTION



INSET

TEMPERATURE MONITORING POINT (TMP)

DETAIL 1/5

SCALE: NOT TO SCALE

Draft

BRIDGETON LANDFILL, LLC.
12976 ST. CHARLES ROCK RD.
BRIDGETON, MO

REVISION	DATE
1	
2	
3	
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P. J. CAREY & ASSOCIATES, P.C.
5878 VALINE WAY, SUGAR HILL, GA 30518

PROJ. NO. 179.001
DATE: 12/18/2012
DESIGNED BY: PJC
DRAWN BY: BJG & JET
CHECKED BY: PJC
APPROVED BY: PJC

DETAILS

HEAT DISSIPATION/BARRIER PLAN
BRIDGETON LANDFILL

DRAWING 5

SHEET 1 OF 1

Project Desc: Path: N:\Bridgeton\drawings\PJCA\bridgeton Hourrier.pro Plot Date/Time: Mon Dec 17,2012 / 13:17:01

January 10, 2013
File No. 23211003.00

MEMORANDUM

TO:	Chris Nagel, Missouri Department of Natural Resources
FROM:	Craig Almanza, Bridgeton Landfill, LLC
	Dan Brennan, SCS Engineers
SUBJECT:	Bridgeton Landfill - Gas Interceptor Well Design

1 INTRODUCTION

In an effort to minimize or stop movement of subsurface heat from the south quarry to the north quarry, additional special purpose, interceptor gas wells are being proposed. These wells are planned to be located approximately 50 feet north of the first line of temperature monitoring probes (TMPs 7R, 8, and 9) installed at the facility. A description of the design approach and contingencies are described below.

2 DESIGN APPROACH

The location of the interceptor wells are 50 feet north of a theoretical line that would run from TMP-7R through TMP-8 and then to TMP-9.

The Gas Interceptor Wells (GIWs) have been planned so the first well is located approximately 75 feet from the west edge of the quarry (south quarry). The remaining wells begin 50 feet from the first well and are spaced 50 feet from one another along the line described above (50 feet north of the theoretical TMP line). The GIWs are labeled on the Site Map – GIW-1 through GIW-7. The wells are grouped into two separate collection lines – four wells in one group and three wells in the other group. Each well group has a common header manifold that is then connected to the existing 16-inch header which runs east and west at the narrow part of the landfill at the North and South Quarry boundaries. Each well group has a main header valve, the potential for a bypass to a cooling device if needed, and each well has a control valve. Additionally, each well has a 6” Tee which has been designed to accommodate the use of a phase separation tank, if required.

The well spacing design will provide heavy vacuum overlap from well to well. This will create a low pressure area “wall” (vacuum curtain) that will allow heated and pressurized gas a controlled means of escape where it can be safely destructed in the current GCCS.

3 WELL DESIGN

The wells are designed to be drilled a maximum depth of 150 feet below ground surface. However, due to the bottom surface grades, GIW-1 can only achieve a depth of approximately 57 feet below ground surface. A well schedule has been provided on the detail sheet drawing.

The wells will be constructed of carbon steel and be 6-inch in diameter. The wells will have 25 feet of solid pipe and the rest will be perforated pipe, as shown on the well detail (Detail 3 on Sheet 3). Each well will have a flanged cast iron knife valve (McMaster-Carr Model #6312T35 or equivalent) for control of heated gas and potential liquids that may be collected. This knife provides maximum flexibility in adjusting to actual conditions that may be encountered. The top of each well will be a steel flange that can either accept a custom steel wellhead or a Landtec wellhead. Each well head will be approximately 4-5 feet above ground when completely constructed.

4 WELL DESIGN CONTINGENCIES

Due to the nature of the heat generating reaction at the Bridgeton Landfill, it is possible that the collected gas may be heated above normal operating temperatures or may be heated gas along with liquids. Both of these situations have been identified and worked into the design of the system.

If the collected gas is a heated gas with the extra liquids, each GIW had been design with a tee and blind flange that can be utilized to direct the collected gas to a phase separation device and then be re-inserted into the header piping. If the collected gas is only a heated gas (without the extra liquids) then a bypass line has been designed into each well group header that can direct the gas into a cooling device before continuing to the blower/flare station.

5 HEADER SYSTEM

The header system of the proposed GIW collection system will be tied into the existing 16-inch diameter header located approximately at the North/South Quarry boundary. The existing header is located approximately 4 feet below ground surface and slopes both to the east and the west from the high point approximately at the midpoint of the header. The headers from the new well groups will be sloped downhill to the existing header, running above ground until it gets close to the tie-in with the existing header, where it will go below ground to make the connection to the existing header.

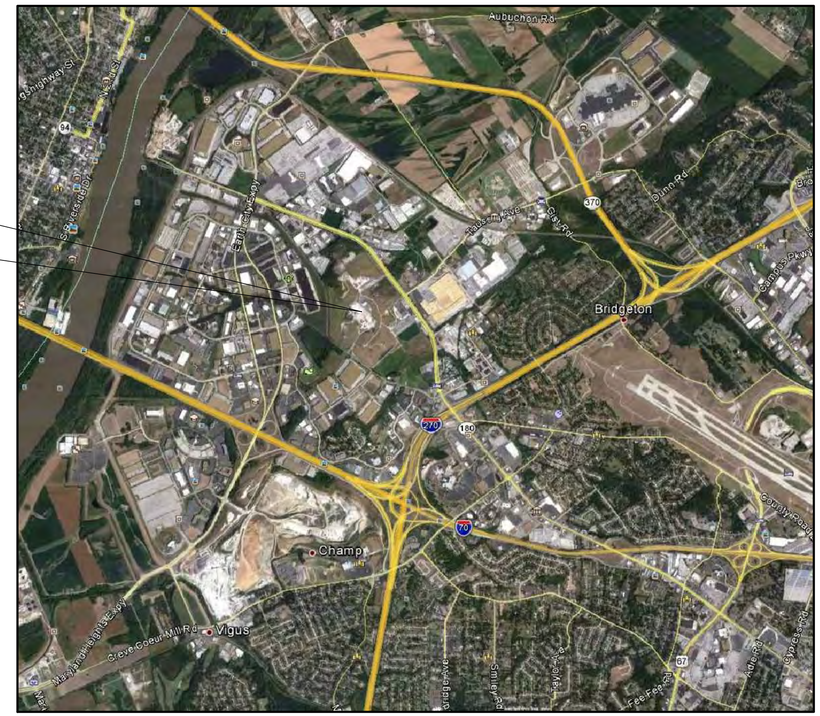
The main header and from each well group as well as the common collector pipe for each well group is a 10-inch diameter pipe. The lateral to each GIW is a 4-inch diameter pipe. Steel piping

for the header and the common collection manifolds will be used on the well side of the contingency cooling device flange. HDPE pipe will be used from this flange north to the 16" header tie-in. The 4" lateral lines will also be constructed of steel (See detail drawing).

2013 GAS INTERCEPTOR WELL DESIGN
BRIDGETON LANDFILL
BRIDGETON, ST. LOUIS COUNTY, MISSOURI

DRAWING INDEX

DRAWING NO.		DRAWING TITLE
1	–	COVER SHEET
2	–	WELL LAYOUT SHEET
3	–	CARBON STEEL INTERCEPTOR WELL DETAILS



LOCATION MAP

0.5 mi. 0 0.5 mi. 1 mi.
SCALE FEET

PREPARED FOR:

BRIDGETON LANDFILL, LLC
13570 ST. CHARLES ROCK ROAD
BRIDGETON, MO 63044

PREPARED BY:

SCS ENGINEERS
2060 READING ROAD
SUITE #200
CINCINNATI, OHIO 45202–1497
PHONE (513) 421–5353
FAX (513) 421–2847

JANUARY 10, 2013

REV.	DATE	DESCRIPTION	CK. BY
△			
△			
△			
△			
△			
△			

SHEET TITLE: COVER SHEET

PROJECT TITLE: BRIDGETON LANDFILL 2013 GAS INTERCEPTOR WELL DESIGN

CLIENT: BRIDGETON LANDFILL, LLC
BRIDGETON LANDFILL
13570 ST. CHARLES ROCK ROAD
BRIDGETON, MO 63044

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
2060 READING ROAD, SUITE #200, CINCINNATI, OHIO 45202
PH. (513) 421–5353 FAX NO. (513) 421–2847

PROJ. NO. 23211003.00 | DWN. BY: FDB | Q/A RVW BY: DAE
DSN. BY: FDB | CHK. BY: JJW

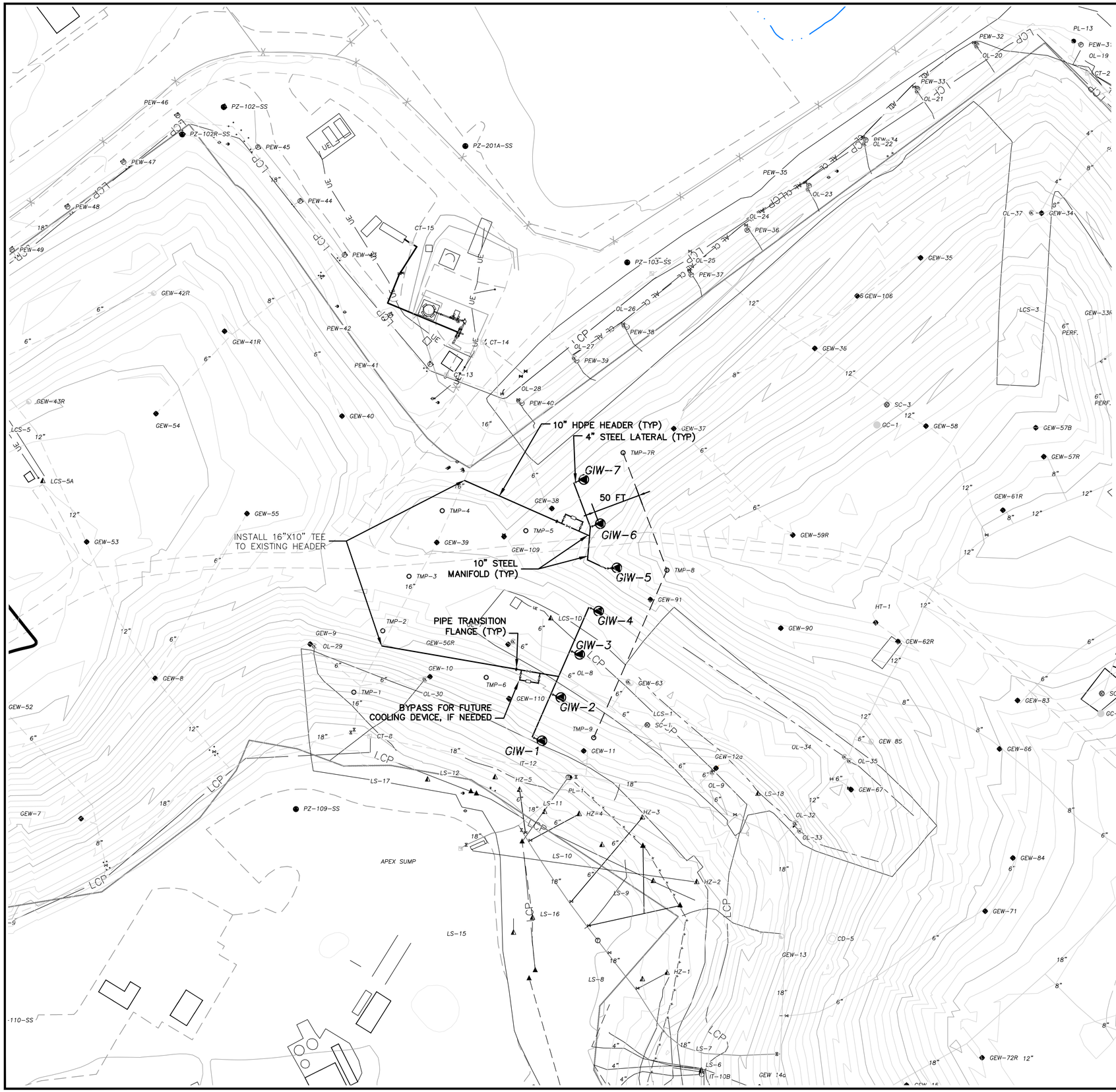
CADD FILE: COVER SHEET

DATE: 1/10/2013

SCALE: NONE

DRAWING NO. 1 of 3

C:\WORK\23211003 BRIDGETON LF ENG ASSISTANCE\DELIVERABLES-REPORTS\INTERCEPTOR WELLS\COVER SHEET.DWG



LEGEND

320	EXISTING 10' CONTOURS
	EXISTING 2' CONTOURS
	BUILDING
	FENCE
	WATER
	PAVED ROAD
	UNPAVED ROAD
	PERMITTED WASTE LIMITS
	LFG COLLECTION PIPE
GEW-34	LFG COLLECTION WELL
GEW-2	LFG DUAL-EXTRACTION WELL
VALVE	VALVE
SC-1	SURFACE COLLECTOR
OL-1	OVER LINER TIE-IN POINT
WB-1	WELL BORE BOOT
	CLEANOUT
	STORM WATER OUTFALL
PL	PL
	ELECTRIC LINE
CT-4	CONDENSATE SUMP
	2012 HEADER PIPE
GEW-100	2012 PROPOSED WELLS
	LEACHATE COLLECTION PIPE
	LEACHATE DISCHARGE
LCS-1D	LEACHATE COLLECTION SUMP
GMP-12	LFG MONITORING PROBE
PGW-39	PERIMETER LFG COLLECTION WELL
	PERIMETER CONNECTION PIPE
	LFG INTERCEPTION TRENCH WELL
100-SD	GROUNDWATER WELL
	LFG INTERCEPTION TRENCH
	PROPERTY LINE
	POWERPOLE

NOTES:

1. EXISTING GRADE CONTOURS SHOWN ARE FROM AERIAL SURVEY COMPLETED BY THE SANBORN MAPPING COMPANY ON FEBRUARY 19, 2009. CONTOURS WITHIN THE WASTE BOUNDARY ON THE SOUTH END ARE TAKEN FROM A GROUND SURVEY COMPLETED BY SHERBUT-CARSON-CLAXTON, LLC IN MAY 2011.
2. LOCATION OF LANDFILL GAS COLLECTION AND CONTROL SYSTEM COMPONENTS IS BASED ON AS-BUILT INFORMATION, WHERE AVAILABLE, AND APPROXIMATED OTHERWISE.
3. CONSTRUCTED COMPONENT TYPES, DIMENSIONS, AND LOCATIONS ARE BASED ON AS-BUILT INFORMATION, WHERE AVAILABLE, OTHERWISE THEY ARE APPROXIMATE.
4. BASE MAP PROVIDED BY AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

REV.	DATE	DESCRIPTION	CK. BY

SHEET TITLE: WELL LAYOUT PLAN

PROJECT TITLE: BRIDGETON LANDFILL 2013 GAS INTERCEPTOR WELL DESIGN

CLIENT: BRIDGETON LANDFILL, LLC
BRIDGETON LANDFILL
13570 ST. CHARLES ROCK ROAD
BRIDGETON, MO 63044

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
2060 READING ROAD, SUITE #200, CINCINNATI, OHIO 45202
PH. (513) 421-5353 FAX NO. (513) 421-2847

PROJ. NO. 23211003.00 | DWN. BY: FDB | Q/A RVW BY: DAE
DSN. BY: FDB | CHK. BY: JJW

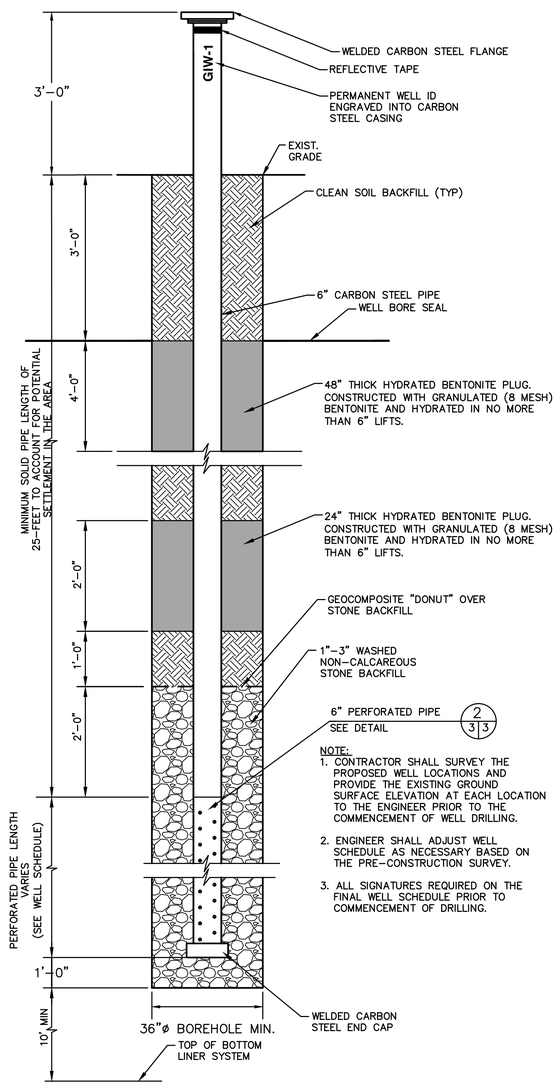
CADD FILE: SITE MAP

DATE: 1/10/2013

SCALE: AS SHOWN

DRAWING NO. 2 of 3

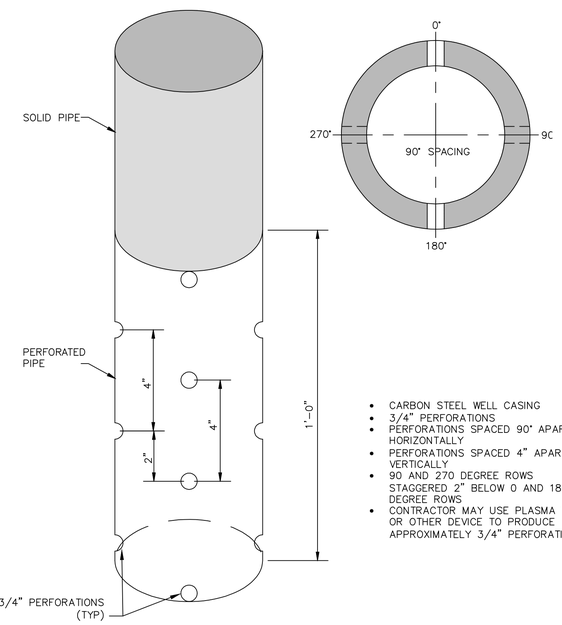
C:\WORK\23211003 BRIDGETON LF ENG ASSISTANCE\DELIVERABLES-REPORTS\INTERCEPTOR WELLS\SITE MAP 1-9-13.DWG



NOTE:
1. CONTRACTOR SHALL SURVEY THE PROPOSED WELL LOCATIONS AND PROVIDE THE EXISTING GROUND SURFACE ELEVATION AT EACH LOCATION TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF WELL DRILLING.
2. ENGINEER SHALL ADJUST WELL SCHEDULE AS NECESSARY BASED ON THE PRE-CONSTRUCTION SURVEY.
3. ALL SIGNATURES REQUIRED ON THE FINAL WELL SCHEDULE PRIOR TO COMMENCEMENT OF DRILLING.

NOTE:
1. CARBON STEEL WELL SECTIONS CAN BE CONNECTED USING OUTSIDE THREADED COUPLERS, OR WELDED STEEL FLANGES.

GAS INTERCEPTOR WELL DETAIL (1 / 2 3)
NOT TO SCALE



- CARBON STEEL WELL CASING
- 3/4" PERFORATIONS
- PERFORATIONS SPACED 90° APART HORIZONTALLY
- PERFORATIONS SPACED 4" APART VERTICALLY
- 90 AND 270 DEGREE ROWS STAGGERED 2" BELOW 0 AND 180 DEGREE ROWS
- CONTRACTOR MAY USE PLASMA TORCH OR OTHER DEVICE TO PRODUCE APPROXIMATELY 3/4" PERFORATIONS

PERFORATION DETAIL (2 / 3 3)
NOT TO SCALE

WELL SCHEDULE

LANDFILL GAS COLLECTION SYSTEM
WELL FIELD SCHEDULE

Well No.	Location Coordinates N-S	Location Coordinates E-W	Surface Elevation (ft MSL)	Waste Bottom Elevation (ft MSL)	Landfill Depth (ft)	Borehole Depth (ft)	Well Pipe Depth (ft)	Slotted Pipe Depth (ft)	Solid Pipe Depth (ft)	Above Grade Riser (ft)	Thickness of Gravel Pack (ft)
GIW-1	1,067,752	516,216	477.4	420.4	57	57	56	31	25	5	34
GIW-2	1,067,732	516,261	490.6	280.0	211	150	149	124	25	5	127
GIW-3	1,067,712	516,307	495.9	275.9	220	150	149	124	25	5	127
GIW-4	1,067,692	516,353	501.1	270.2	231	150	149	124	25	5	127
GIW-5	1,067,672	516,399	511.8	270.0	242	150	149	124	25	5	127
GIW-6	1,067,690	516,446	510.0	270.0	240	150	149	124	25	5	127
GIW-7	1,067,707	516,493	501.9	329.1	173	150	149	124	25	5	127
Total						957	950	775	175	35	796

NOTES:

1. THIS DRAFT WELL SCHEDULE IS NOT INTENDED FOR CONSTRUCTION UNTIL ACTUAL SURVEY DATA IS OBTAINED AND THE WELL SCHEDULE IS REVISED BY THE ENGINEER.
2. SURVEYOR SHALL LOCATE WELLS AND VERIFY SURFACE ELEVATIONS BEFORE CONSTRUCTION. A PRE-CONSTRUCTION SURVEY (NORTHING/EASTING/ELEVATION DATA) SHALL BE PROVIDED TO THE ENGINEER A MINIMUM OF 2 WEEKS PRIOR TO CONSTRUCTION. ENGINEER SHALL VERIFY THE WELL SCHEDULE BASED ON THE PRE-CONSTRUCTION SURVEY.
3. FOLLOWING REVIEW OF SURVEY DATA, CONTRACTOR SHALL GET AUTHORIZATION FROM OWNER AND ENGINEER PRIOR TO DRILLING.
4. WELL DEPTHS BASED ON TOPOGRAPHIC SURVEYED BY SHERBERT-CARSON-CLAXTON, DATED MAY 2011, AND BASE GRADES OBTAINED FROM MIDWEST ENVIRONMENTAL CONSULTANTS APRIL 1998 LANDFILL GAS RECOVERY SYSTEM DESIGN.

DESIGN FIRM QA/QC REVIEWER ACKNOWLEDGEMENT: _____ DATE

DESIGN FIRM PROJECT MANAGER ACKNOWLEDGEMENT: _____ DATE

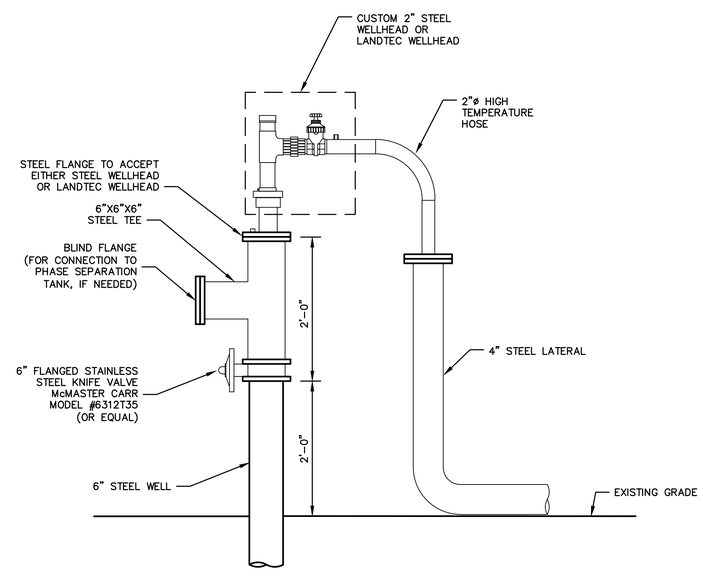
ENVIRONMENTAL MANAGER: _____ DATE

CQA INSPECTOR: _____ DATE

SURVEYOR ACKNOWLEDGEMENT: _____ DATE

DRILLER ACKNOWLEDGEMENT: _____ DATE

UNDER NO CIRCUMSTANCES SHALL DRILLING ACTIVITIES BEGIN WITHOUT PROVIDING THE ABOVE SIGNATURES. ANY CHANGES TO WELL LOCATIONS OR DEPTHS SHALL REQUIRE THESE SIGNATURES TO BE OBTAINED AGAIN.



WELLHEAD DETAIL (3 / 3 3)
NOT TO SCALE

REV.	DATE	DESCRIPTION	CK. BY
1	7/27/12	RESPONSE TO MDNR COMMENTS	

SHEET TITLE: CARBON STEEL INTERCEPTOR WELL DETAILS

PROJECT TITLE: BRIDGETON LANDFILL 2013 GAS INTERCEPTOR WELL DESIGN

CLIENT: BRIDGETON LANDFILL, LLC. BRIDGETON LANDFILL 13570 ST. CHARLES ROCK ROAD BRIDGETON, MO 63044

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
2060 READING ROAD, SUITE #200, CINCINNATI, OHIO 45202
PH. (513) 421-5353 FAX NO. (513) 421-2847

PROJ. NO. 23211003.00 | DWN. BY: FDB | Q/A RVW BY: DAE | DSN. BY: FDB | CHK. BY: JJW

CADD FILE: SHEET 3

DATE: 1/10/2013

SCALE: NONE

DRAWING NO. 3 of 3

C:\WORK\23211003 BRIDGETON LF ENG ASSISTANCE\DELIVERABLES-REPORTS\INTERCEPTOR WELLS\SHEET 34 - DETAILS 01-09-13.DWG

Environmental Consultants
and Contractors

2060 Reading Road
Suite 200
Cincinnati, OH 45202-1497

513 421-5353
FAX 513 421-2847
www.scsengineers.com

SCS ENGINEERS

February 6, 2013
File No. 23211003.00

Ms. Charlene S. Fitch, P.E.
Chief, Engineering Section
Solid Waste Management Program
Missouri Department of Natural Resources
1730 East Elm Street
Jefferson City, MO 65101

Subject: Gas Interceptor Well Expanded Design (Permit #0118912) at Bridgeton Landfill
Bridgeton Landfill, Bridgeton, Missouri

Dear Ms. Fitch:

Attached please find our Gas Interceptor Well System Expanded Design. This Design Plan is a revision of the permit approved on January 11, 2013, and represents additional Temperature Monitoring Probes (TMPs) as well as additional Gas Interceptor Wells (GIWs).

1 INTRODUCTION

This Design Plan describes the Gas Interceptor Well System originally submitted to Missouri Department of Natural Resources (MDNR) on January 10, 2013 and approved on January 11, 2013, as well as the additions made for this expanded design.

In an effort to minimize or stop movement of subsurface heat from the south quarry to the north quarry, additional special purpose, interceptor gas wells are being proposed. There are two rows of wells being proposed. The first row of wells is planned approximately 50 feet north of the first line of temperature monitoring probes (TMPs 7R, 8, and 9) installed at the facility. The second row of wells is proposed to be installed 50 feet north of the first row of wells, and staggered in between the first row of wells. In addition to the gas interceptor well installations, six additional temperature monitoring probes (TMPs) are being proposed (See Drawing 2 – Well Layout Plan). A description of the design approach and contingencies is described below.

2 DESIGN APPROACH

The location of the first row of interceptor wells is 50 feet north of a theoretical line that would run from TMP-7R through TMP-8 and then to TMP-9. The location of the second row of interceptor wells is 50 feet north of a theoretical line that would run from GIW-1 through GIW-7 (inclusive).

The first row Gas Interceptor Wells (GIWs) has been planned so the first well is located approximately 75 feet from the west edge of the quarry (south quarry). The remaining wells in this row begin 50 feet from the first well and are spaced 50 feet from one another along the line described above (50 feet north of the theoretical TMP line). The GIWs are labeled on the Site Map – GIW-1 through GIW-7. The wells are grouped into two separate collection lines – four wells in one group and three wells in the other group. Each well group has a common header manifold that connects all the wells of that group and then connects to the existing header system. The western group of wells (group of four wells) connects into the existing 18-inch header along the western perimeter of the landfill, in the amphitheater area. The eastern group of wells connects to the existing 16-inch header, which runs east and west at the narrow part of the landfill at the North and South Quarry boundaries. Each well group has a main header valve and the potential for a bypass to a cooling device if needed, and each well has a control valve. Additionally, each well has a 6-inch Tee which has been designed to accommodate the use of a phase separation tank, if required.

The second row of wells has their own manifolds and is also broken into two groups – one manifold connects four wells and the other manifold connects two wells. Each of these manifolds connects to the other manifolds before the by-pass loops, which then connects to the existing headers (west manifold connects to first row west header and east manifold connects to east header)

The well spacing design will provide heavy vacuum overlap from well to well. This will create a low pressure area “wall” (vacuum curtain) that will allow heated and pressurized gas a controlled means of escape where it can be safely destructed in the current GCCS.

3 WELL DESIGN

The wells are designed to be drilled a maximum depth of 150 feet below ground surface. However, due to the bottom surface grades, GIW-1 can only achieve a depth of approximately 57 feet below ground surface. A well schedule has been provided on the detail sheet drawing.

The wells will be constructed of carbon steel and be 6-inch in diameter. The wells will have 25 feet of solid pipe and the rest will be perforated pipe, as shown on the well detail (Detail 3 on Sheet 3). Each well will have a flanged cast iron knife valve (McMaster-Carr Model #6312T35 or equivalent) for control of heated gas and potential liquids that may be collected. This knife provides maximum flexibility in adjusting to actual conditions that may be encountered. The top of each well will be a steel flange that can either accept a custom steel wellhead or a Landtec wellhead. Each well head will be approximately 4-5 feet above ground when completely constructed.

The new gas interceptor wells will be constructed using the same configuration and well components that were previously approved by MDNR on January 11, 2013.

4 WELL DESIGN CONTINGENCIES

Due to the nature of the heat generating reaction at the Bridgeton Landfill, it is possible that the collected gas may be heated above normal operating temperatures or may be heated gas along with liquids. Both of these situations have been identified and worked into the design of the system.

If the collected gas is a heated gas with the extra liquids, each GIW had been design with a tee and blind flange that can be utilized to direct the collected gas to a phase separation device and then be re-inserted into the header piping. If the collected gas is only a heated gas (without the extra liquids) then a bypass line has been designed into each well group header that can direct the gas into a cooling device before continuing to the blower/flare station.

5 HEADER SYSTEM

The header system of the proposed GIW collection system will be tied into the existing 16-inch diameter header located approximately at the North/South Quarry boundary and the 18-inch header along the western perimeter in the amphitheater area. The existing header is located approximately 4 feet below ground surface and slopes both to the east and the west from the high point approximately at the midpoint of the header. The header from each new well group will be sloped downhill to the existing header, running above ground until it gets close to the tie-in with the existing header, where it will go below ground to make the connection to the existing header.

The main header from each well group, as well as the common collector pipe for each well group, is a 10-inch diameter pipe. The lateral to each GIW is a 4-inch diameter pipe. Steel piping for the header and the common collection manifolds will be used on the well side of the contingency cooling device flange. HDPE pipe will be used from this flange north to the 16-inch header tie-in. The 4-inchlateral lines will also be constructed of steel (See detail drawing).

6 TEMPERATURE MONITORING PROBES

In addition to the six new gas interceptor wells, six new temperature monitoring probes (TMPs) are being proposed. The TMPs will be constructed in the same configuration and using the same method as previously approved plan, approved by MDNR on September 27, 2012. The proposed location of the new TMPs is south of a line that goes from existing TMP-1 through TMP-4. A new TMP (TMP-15) will be installed 50-feet south of TMP-8.

The existing TMPs are located on the site map (Sheet 2 of 3) and highlighted in yellow. The proposed six additional TMPs are shown on the plan sheet highlighted in a light purple.

Sincerely,

F. Daniel Brennan

Deb A English

F. Daniel Brennan, P.E.
Ohio PE#57,293
Senior Project Engineer
SCS ENGINEERS

Deborah A. English, P.E.
Missouri PE#2005-006304
Project Director
SCS ENGINEERS

cc Craig Almanza, Bridgeton Landfill, LLC

STATE OF MISSOURI
DEBORAH ENGLISH
NUMBER
PE-2005006304
PROFESSIONAL ENGINEER

Deb A English
2/7/13

MDNR APPROVAL LETTER

ORIGINAL GAS INTERCEPTOR WELL DESIGN

JANUARY 11, 2013

STATE OF MISSOURI
Jeremiah W. (Jay) Nixon, Governor • Sara Parker Pauley, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov

JAN 11 2013

Mr. Craig Almanza
Area Environmental Manager
Republic Services, Inc.
13570 St. Charles Rock Road
Bridgeton, MO 63044

RE: Gas Interceptor Well Design, Bridgeton Landfill LLC, Permit Number 0118912, St. Louis County

Dear Mr. Almanza:

This letter is in response to your email submittal dated January 10, 2013, to the Missouri Department of Natural Resources' (Department) Solid Waste Management Program (SWMP). The submittal included a narrative and a set of plan sheets entitled "2013 Gas Interceptor Well Design Bridgeton Landfill." The submittal proposed the installation of seven Gas Interceptor Wells (GIW) in order to remove heated and pressurized gas near the neck of the landfill. The GIWs are located approximately 50' north of TMPs 7, 8, and 9 and will be connected to the existing gas collection and control system.

The SWMP has reviewed the submittal and hereby approves the proposed design as being in substantial compliance with the Missouri Solid Waste Management Law and regulations. The following conditions are integral to this approval. Compliance with these conditions shall, in part, determine compliance with Permit Number 0118912.

CONDITIONS:

1. The submittal and individual plan sheets need to be signed and sealed by a professional engineer. In addition, please verify the scale on Drawing 2. Please submit two (2) hard copies to the SWMP for our records.

2. A Construction Quality Assurance (CQA) Report should be submitted when the installation is completed. It shall include Daily Logs, Boring Logs, Construction Diagrams, and signed and sealed as-built drawings.

3. Drawing 2 indicates that the proposed location of GIW-3 is on the temporary liner. In the CQA Report, please detail the procedures used to maintain the integrity of the liner during the drilling and installation. In addition, please provide the necessary records that the flexible membrane liner is properly repaired around the well.

4. The Gas Interceptor Well Detail on Drawing 3 shows a 36 inch borehole, but the submittal did not indicate what type of drilling method will be used. Please specify this information in the CQA Report.

5. The Well Schedule on Drawing 3 indicates proposed well depths of 150' for GIWs 2 through 7. Prior approval from the SWMP is required to deviate from these depths.

6. The plan states "each well has a 6" Tee which has been designed to accommodate the use of a phase separation tank, if required." Please specify if this tank will be operational at the same time as well installation or provide the projected timeframe for the tank to be installed and operational if ejected liquid is encountered.

This approval should not be construed as compliance with any existing federal or state laws other than the Missouri Solid Waste Management Law; nor should this be construed as a waiver for any other regulatory requirements. This approval is not to be construed as compliance with any existing local permitting or zoning ordinances; nor does it supersede any local permitting and/or zoning requirements.

The Department reserves the right to revoke, suspend, or modify Permit Number 0118912 after due notice, if the permit holder fails to operate the facility in compliance with the Missouri Solid Waste Management Law and regulations, terms and conditions of the permit, and the approved engineering plans and specifications.

If you have any questions or comments regarding this letter, please contact Mr. J P Boessen of my staff at (573) 526-3940 or P.O. Box 176, Jefferson City, Missouri 65102-0176.

Sincerely,

SOLID WASTE MANAGEMENT PROGRAM

Charlene S. Fitch

Charlene S. Fitch, P.E.
Chief, Engineering Section

CSF:brl

c: Mr. Larry Lehman, Chief, Compliance/Enforcement Section, SWMP
Ms. Brenda Ardrey, Chief, Operations Section, SWMP
Ms. Laura Yates, St. Louis County Department of Health
St. Louis Regional Office

ORIGINAL TMP PLAN

SUBMITTED TO MDNR SEPTEMBER 14, 2012

MDNR APPROVAL LETTER

ORIGINAL TMP INSTALLATION PLAN

SEPTEMBER 27, 2012

Ms. Charlene S. Fitch, P.E.
Missouri Department of Natural Resources
Solid Waste Management Program
1738 East Elm Street
Jefferson City, Missouri 65101

September 14, 2012

Dear Ms. Fitch:

Temperature Monitoring Point Installation Plan
Bridgeton Landfill, LLC – Permit #118912
Bridgeton, Missouri

Attached please find the Temperature Monitoring Point (TMP) Plan (Plan) which demonstrates how Bridgeton Landfill intends to construct the TMP's within the waste mass to observe temperatures at a consistent frequency down to the waste/quarry floor interface. The Plan was developed by P.J. Carey & Associates, PC (P.J. Carey) in conjunction with Bridgeton Landfill management. P.J. Carey has extensive experience designing, engineering, and overseeing the installation of systems such as is proposed in the Plan at other solid waste landfills throughout the United States.

The Plan proposes 9 TMP's set up along a primary and secondary line with intermediate TMP's in between to establish a rate of temperature advance through the waste mass to (or regression from) the north quarry near the boundary of the north and south quarries. It also includes details of the construction of each monitoring point and a proposed schedule for installation.

This submittal is intended to partially address Action Item #2 of the July 23rd, 2012 MDNR letter responding to the Contingency Plan and Summary Report submitted by the Bridgeton Landfill on April 6th, 2012. As was discussed and agreed upon in the August 29th, 2012 meeting at the Jefferson City, MO MDNR-SWMP office, a plan proposing the design, locations, and installation schedule of the TMP's was to be submitted by September 14, 2012.

13570 St. Charles Rock Road
Bridgeton, MO 63044
314.744.8166 - Office
Dvasbinder@republicservices.com

As is described in the Plan, Bridgeton Landfill is diligently working towards initiating the installation of these monitoring points within the next three weeks. That said, it is requested that an expedited review of this Plan be completed so that installation is not delayed. If additional information or clarifications are needed, please feel free to contact me at 314-744-8166 at your earliest convenience.

Sincerely,

Bridgeton Landfill, LLC.

David Vasbinder
Environmental Manager

Cc: John Haasis – St. Louis County Department of Health

Enclosures

STATE OF MISSOURI
Jeremiah W. (Jay) Nixon, Governor • Sara Parker Pauley, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov

SEP 27 2012

CERTIFIED MAIL #7009 3410 0001 9190 5805
RETURN RECEIPT REQUESTED

Mr. David Vasbinder
Environmental Manager
Republic Services, Inc.
13570 St. Charles Rock Road
Bridgeton, MO 63044

RE: Temperature Monitoring Point Installation Plan, Bridgeton Landfill, L.L.C., Permit Number 0118912, St. Louis County

Dear Mr. Vasbinder:

This letter is in response to a submittal, "Temperature Monitoring Point Installation Plan for Bridgeton Landfill L.L.C.", dated September 14, 2012, received September 17, 2012, by the Missouri Department of Natural Resources' (Department) Solid Waste Management Program (SWMP). The submittal consisted of a two (2) page cover letter from you, addressed to Ms. Charlene S. Fitch, P.E. and a TMP Installations proposal for Bridgeton Landfill, LLC attached, prepared by P.J. Carey & Associates, P.C., Sugar Hill, Georgia, dated September 13, 2012.

The submittal is proposing the installation of nine (9) thermocouple string probes in the saddle area of the landfill to document any advancement of the Subsurface Smoldering Event (SSE). The thermocouples will start at a depth of no more than 285 feet, be placed in 20 foot increments to the top of the landfill. They will be drilled using roto-sonic drilling technique, installed in a sheath and grouted in place. The proposed locations are shown on Figure 1.

The SWMP has reviewed this report in accordance with the Missouri Solid Waste Management Law and regulations. The SWMP hereby **approves** the location and installation of the Temperature Monitoring Points at the Bridgeton Sanitary Landfill with the following conditions. Compliance with these conditions will, in part, determine compliance with Solid Waste Disposal Area Permit Number 0118912.

CONDITIONS:

1. Within 15 days, submit action levels/trigger values for future actions. These levels and/or triggers are to be established before the sensors are placed to ensure that all parties are in agreement with the established value that represents a problem or an impact.

2. Within 15 days submit a plan stating how the monitoring data will be collected and reported to SWMP. Explain whether the thermocouples will be connected to a real-time system that records the data or if it will be a manual read system? Explain what the monitoring frequency will be, along with the timeframe for reporting the results to the SWMP.

3. Within 15 days submit a proposal to define the temperatures of the waste in the south edge of the SSE, so that both edges of the event are characterized as discussed during our August 29, 2012, meeting.

4. Submit a list of SSE isolation break options that will be considered if the action levels/trigger values are exceeded with the Isolation Break Implementation Plan.

5. Submit a list of contractors that would be able to construct the different kinds of SSE breaks that may be used with the Isolation Break Implementation Plan.

6. Provide an estimate for the amount of time it will take from the action level/trigger value being reached, to notifying and getting contractor on site and the amount of time it will take to construct the different isolation breaks with the Isolation Break Implementation Plan.

7. You must contact the SWMP five (5) days before installation of the Temperature Monitoring Points begins.

DOCUMENT:

"Temperature Monitoring Point Installation Plan for Bridgeton Landfill L.L.C.", dated September 14, 2012, received September 17, 2012, by the Missouri Department of Natural Resources' Solid Waste Management Program. The submittal consisted of a two (2) page cover letter addressed to Ms. Charlene S. Fitch, P.E. and a TMP Installations proposal for Bridgeton Landfill, LLC attached, prepared by P.J. Carey & Associates, P.C., Sugar Hill, Georgia, dated September 13, 2012.

This approval is not to be construed as compliance with any existing federal or state environmental laws other than the Missouri Solid Waste Management law; nor should this be construed as a waiver for any other regulatory requirements. This approval is not to be construed as compliance with any existing local permitting or zoning ordinances; nor does supercede any local permitting and/or zoning requirement.

The Department reserves the right to revoke, suspend, or modify this approval and /or Permit Number 0118912 after due notice, if the permit holder fails to maintain the facility in compliance with the Missouri Solid Waste Management Law and regulations, the terms and conditions of the permit, and the approved engineering plans and specifications.

We appreciate your continued efforts toward environmentally sound solid waste management practices. If you have any questions or comments, please contact Mr. J. P. Boessen of my staff at (573) 526-3940 or at P.O. Box 176, Jefferson City, Missouri 65102-0176.

Sincerely,

SOLID WASTE MANAGEMENT PROGRAM

Charlene S. Fitch

Charlene S. Fitch, P.E.
Chief, Engineering Section

CSF:jpj

c: Mr. John Haasis, P.E., St. Louis County Department of Health
Mr. Larry Lehman, Chief, Compliance/Enforcement Section, SWMP
Mr. Joe Trunko, St. Louis Regional Office

DRAWINGS

2013 GAS INTERCEPTOR WELL SYSTEM - EXPANDED DESIGN
BRIDGETON LANDFILL
BRIDGETON, ST. LOUIS COUNTY, MISSOURI

DRAWING INDEX

DRAWING NO.		DRAWING TITLE
1	–	COVER SHEET
2	–	WELL LAYOUT PLAN
3	–	CARBON STEEL INTERCEPTOR WELL DETAILS

LOCATION MAP

0.5 mi. 0 0.5 mi. 1 mi.
SCALE FEET

PREPARED FOR:

BRIDGETON LANDFILL, LLC
13570 ST. CHARLES ROCK ROAD
BRIDGETON, MO 63044

PREPARED BY:

SCS ENGINEERS
2060 READING ROAD
SUITE #200
CINCINNATI, OHIO 45202–1497
PHONE (513) 421–5353
FAX (513) 421–2847

JANUARY 3, 2013
REVISED: JANUARY 30, 2013

REV.	DATE	DESCRIPTION	CK. BY
1	1/30/13	Added Proposed GWs and TMPs	CES
2			
3			
4			
5			

STATE OF MISSOURI DEBORAH FRIGLEN NUMBER PE-2004020024 PROFESSIONAL ENGINEER 1/30/13

SHEET TITLE: COVER SHEET

PROJECT TITLE: BRIDGETON LANDFILL 2013 GAS INTERCEPTOR WELL SYSTEM – EXPANDED DESIGN

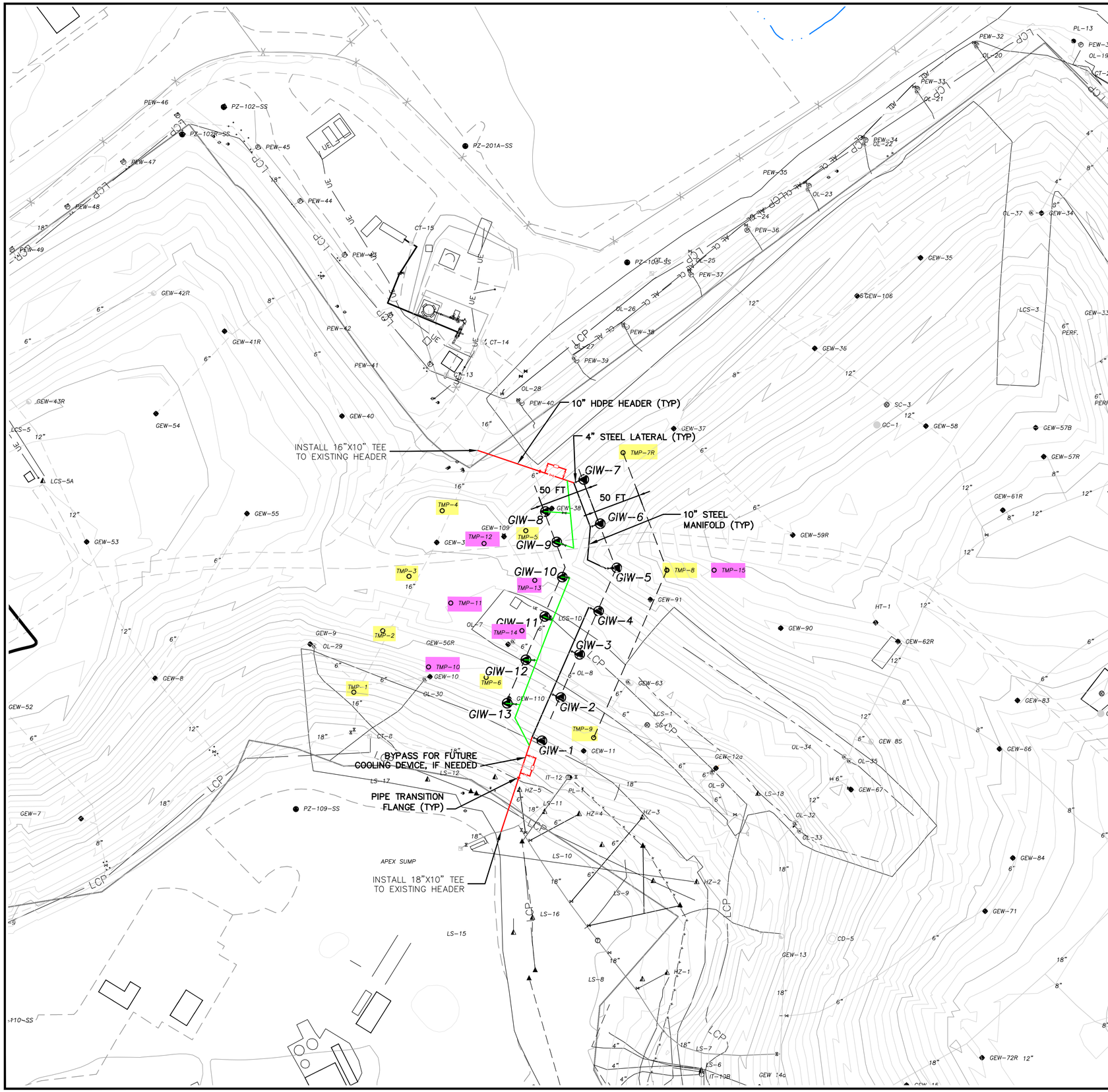
CLIENT: BRIDGETON LANDFILL, LLC
BRIDGETON LANDFILL
13570 ST. CHARLES ROCK ROAD
BRIDGETON, MO 63044

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
2060 READING ROAD, SUITE #200, CINCINNATI, OHIO 45202
PH. (513) 421–5353 FAX NO. (513) 421–2847

PROJ. NO: 23211003.00 | DWN. BY: FDB | Q/A RVW BY: DJE
DSN. BY: FDB | CHK. BY: JJW

CADD FILE: COVER SHEET
DATE: 1/3/2013
SCALE: NONE
DRAWING NO. 1 of 3

I:\PROJECT\2011 PROJECTS\23211003 BRIDGETON LF ENG ASSISTANCE\DELIVERABLES-REPORTS\INTERCEPTOR WELLS\COVER SHEET 1-30-13.DWG



LEGEND

320	EXISTING 10' CONTOURS
	EXISTING 2' CONTOURS
	BUILDING
	FENCE
	WATER
	PAVED ROAD
	UNPAVED ROAD
	PERMITTED WASTE LIMITS
	LFG COLLECTION PIPE
GEW-34	LFG COLLECTION WELL
GEW-2	LFG DUAL-EXTRACTION WELL
VALVE	VALVE
SC-1	SURFACE COLLECTOR
OL-1	OVER LINER TIE-IN POINT
WB-1	WELL BORE BOOT
	CLEANOUT
	STORM WATER OUTFALL
PL	PL
	ELECTRIC LINE
CT-4	CONDENSATE SUMP
	2012 HEADER PIPE
GEW-100	2012 PROPOSED WELLS
	LEACHATE COLLECTION PIPE
	LEACHATE DISCHARGE
LCS-1D	LEACHATE COLLECTION SUMP
GMP-12	LFG MONITORING PROBE
PGW-39	PERIMETER LFG COLLECTION WELL
	PERIMETER CONNECTION PIPE
	LFG INTERCEPTION TRENCH WELL
100-SD	GROUNDWATER WELL
	LFG INTERCEPTION TRENCH
	PROPERTY LINE
	POWERPOLE

GIW-x ORIGINAL PROPOSED GAS INTERCEPTOR WELLS (GIW-1 THRU GIW-7)

GIW-x NEW PROPOSED GAS INTERCEPTOR WELLS (GIW-8 THRU GIW-13)

TMP-x EXISTING TEMPERATURE MONITORING PROBE

TMP-xA NEW TEMPERATURE MONITORING PROBE

ORIGINAL MANIFOLD HEADER

REVISED MANIFOLD HEADER FROM ORIGINAL SUBMITTAL

NEW MANIFOLD HEADER

NOTES:

1. EXISTING GRADE CONTOURS SHOWN ARE FROM AERIAL SURVEY COMPLETED BY THE SANBORN MAPPING COMPANY ON FEBRUARY 19, 2009. CONTOURS WITHIN THE WASTE BOUNDARY ON THE SOUTH END ARE TAKEN FROM A GROUND SURVEY COMPLETED BY SHERBUT-CARSON-CLAXTON, LLC IN MAY 2011.
2. LOCATION OF LANDFILL GAS COLLECTION AND CONTROL SYSTEM COMPONENTS IS BASED ON AS-BUILT INFORMATION, WHERE AVAILABLE, AND APPROXIMATED OTHERWISE.
3. CONSTRUCTED COMPONENT TYPES, DIMENSIONS, AND LOCATIONS ARE BASED ON AS-BUILT INFORMATION, WHERE AVAILABLE, OTHERWISE THEY ARE APPROXIMATE.
4. BASE MAP PROVIDED BY AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

REV.	DATE	DESCRIPTION	CK. BY
1	1/30/13	Added Proposed GIWs and TMPs	CES
2			
3			
4			
5			
6			

SHEET TITLE: WELL LAYOUT PLAN

PROJECT TITLE: BRIDGETON LANDFILL 2013 GAS INTERCEPTOR WELL SYSTEM – EXPANDED DESIGN

CLIENT: BRIDGETON LANDFILL, LLC
BRIDGETON LANDFILL
13570 ST. CHARLES ROCK ROAD
BRIDGETON, MO 63044

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
2060 READING ROAD, SUITE #200, CINCINNATI, OHIO 45202
PH. (513) 421-3553 FAX NO. (513) 421-2847

PROJ. NO. 23211003.00 | DWN. BY: FDB | Q/A RVW BY: DAE
DSN. BY: FDB | CHK. BY: JJW

CADD FILE: SITE MAP

DATE: 1/10/2013

SCALE: AS SHOWN

DRAWING NO. 2 of 3

E:\PROJECT\2011 PROJECTS\23211003 BRIDGETON LF ENG ASSISTANCE\DELIVERABLES-REPORTS\INTERCEPTOR WELLS\SITE MAP 2-06-13.DWG

TMP SCHEDULE

Well No.	Location Coordinates N-S	Location Coordinates E-W	Surface Elevation (ft MSL)	Waste Bottom Elevation (ft MSL)	Landfill Depth (ft)	TMP Target Depth (ft)
TMP-10	1,067,871	516,294	482.7	328.9	154	154
TMP-11	1,067,847	516,362	498.2	262.3	236	210
TMP-12	1,067,812	516,425	500.2	272.1	228	210
TMP-13	1,067,758	516,386	498.9	270.2	229	210
TMP-14	1,067,772	516,332	496.0	274.9	221	210
TMP-15	1,067,568	516,396	520.3	263.8	256	210

TMP drill depth equals landfill bottom or 210 feet maximum

WELL SCHEDULE

Well No.	Location Coordinates N-S	Location Coordinates E-W	Surface Elevation (ft MSL)	Waste Bottom Elevation (ft MSL)	Landfill Depth (ft)	Borehole Depth (ft)	Well Pipe Depth (ft)	Slotted Pipe Depth (ft)	Solid Pipe Depth (ft)	Above Grade Riser (ft)	Thickness of Gravel Pack (ft)
GIW-1	1,067,752	516,216	477.4	420.4	57	57	56	31	25	5	34
GIW-2	1,067,732	516,261	490.6	280.0	211	150	149	124	25	5	127
GIW-3	1,067,712	516,307	495.9	275.9	220	150	149	124	25	5	127
GIW-4	1,067,692	516,353	501.1	270.2	231	150	149	124	25	5	127
GIW-5	1,067,672	516,399	511.8	270.0	242	150	149	124	25	5	127
GIW-6	1,067,690	516,446	510.0	270.0	240	150	149	124	25	5	127
GIW-7	1,067,707	516,493	501.9	329.1	173	150	149	124	25	5	127
GIW-8	1,067,748	516,459	502.2	270.0	232	150	149	124	25	5	127
GIW-9	1,067,736	516,426	507.4	270.0	237	150	149	124	25	5	127
GIW-10	1,067,730	516,389	503.2	270.0	233	150	149	124	25	5	127
GIW-11	1,067,749	516,347	496.8	273.4	224	150	149	124	25	5	127
GIW-12	1,067,769	516,301	495.2	277.6	219	150	149	124	25	5	127
GIW-13	1,067,789	516,255	481.8	335.8	146	146	145	120	25	5	123
Total						1,853	1,840	1,515	325	65	1,554

NOTES:

1. THIS DRAFT WELL SCHEDULE IS NOT INTENDED FOR CONSTRUCTION UNTIL ACTUAL SURVEY DATA IS OBTAINED AND THE WELL SCHEDULE IS REVISED BY THE ENGINEER.
2. SURVEYOR SHALL LOCATE WELLS AND VERIFY SURFACE ELEVATIONS BEFORE CONSTRUCTION. A PRE-CONSTRUCTION SURVEY (NORTHING/EASTING/ELEVATION DATA) SHALL BE PROVIDED TO THE ENGINEER A MINIMUM OF 2 WEEKS PRIOR TO CONSTRUCTION. ENGINEER SHALL VERIFY THE WELL SCHEDULE BASED ON THE PRE-CONSTRUCTION SURVEY.
3. FOLLOWING REVIEW OF SURVEY DATA, CONTRACTOR SHALL GET AUTHORIZATION FROM OWNER AND ENGINEER PRIOR TO DRILLING.
4. WELL DEPTHS BASED ON TOPOGRAPHIC SURVEYED BY SHERBERT-CARSON-CLAXTON, DATED MAY 2011, AND BASE GRADES OBTAINED FROM MIDWEST ENVIRONMENTAL CONSULTANTS APRIL 1998 LANDFILL GAS RECOVERY SYSTEM DESIGN.

DESIGN FIRM QA/QC REVIEWER ACKNOWLEDGEMENT: _____ DATE

DESIGN FIRM PROJECT MANAGER ACKNOWLEDGEMENT: _____ DATE

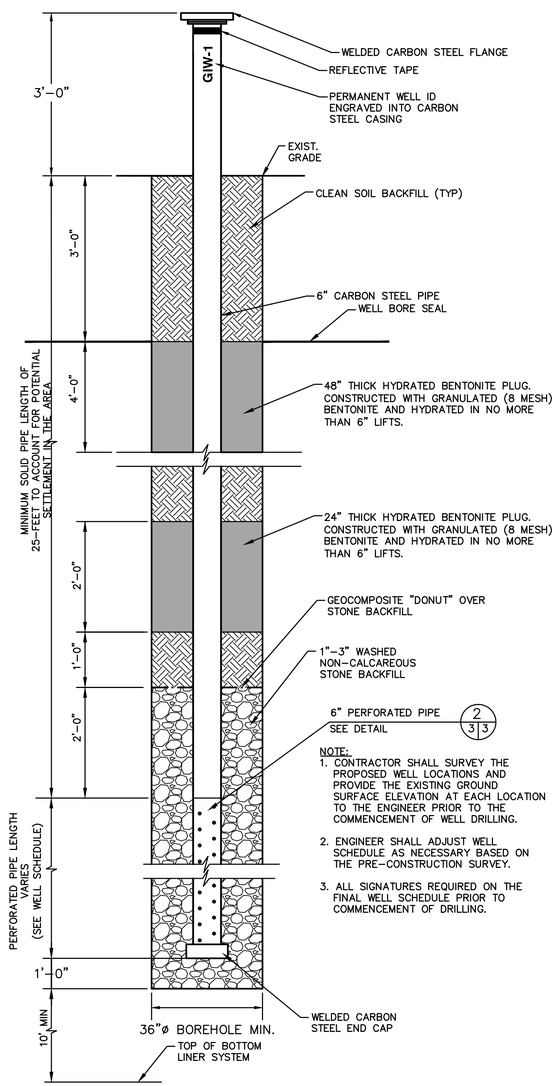
ENVIRONMENTAL MANAGER: _____ DATE

CQA INSPECTOR: _____ DATE

SURVEYOR ACKNOWLEDGEMENT: _____ DATE

DRILLER ACKNOWLEDGEMENT: _____ DATE

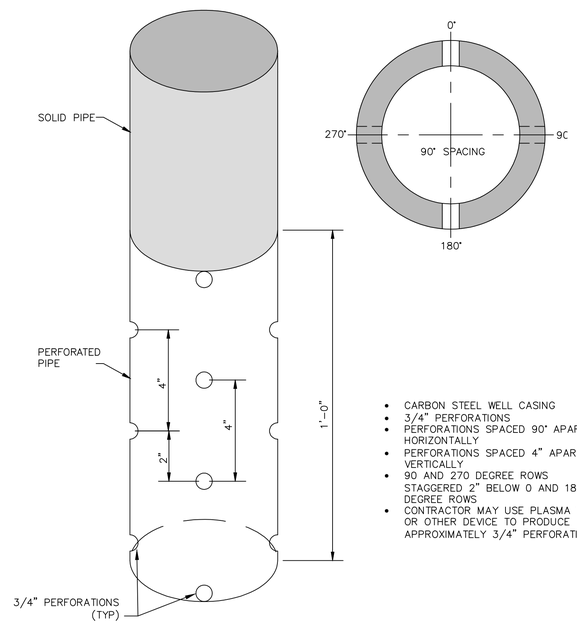
UNDER NO CIRCUMSTANCES SHALL DRILLING ACTIVITIES BEGIN WITHOUT PROVIDING THE ABOVE SIGNATURES. ANY CHANGES TO WELL LOCATIONS OR DEPTHS SHALL REQUIRE THESE SIGNATURES TO BE OBTAINED AGAIN.



NOTE:
1. CARBON STEEL WELL SECTIONS CAN BE CONNECTED USING OUTSIDE THREADED COUPLERS, OR WELDED STEEL FLANGES.

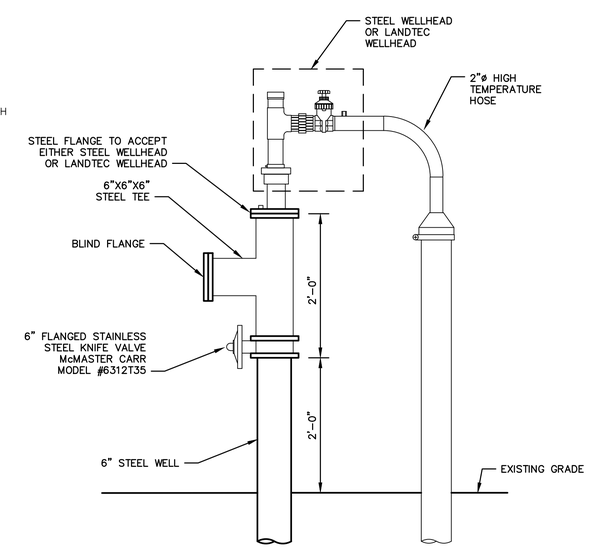
GAS INTERCEPTOR WELL DETAIL 1/2 3
NOT TO SCALE

NOTE:
1. CONTRACTOR SHALL SURVEY THE PROPOSED WELL LOCATIONS AND PROVIDE THE EXISTING GROUND SURFACE ELEVATION AT EACH LOCATION TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF WELL DRILLING.
2. ENGINEER SHALL ADJUST WELL SCHEDULE AS NECESSARY BASED ON THE PRE-CONSTRUCTION SURVEY.
3. ALL SIGNATURES REQUIRED ON THE FINAL WELL SCHEDULE PRIOR TO COMMENCEMENT OF DRILLING.



- CARBON STEEL WELL CASING
- 3/4" PERFORATIONS
- PERFORATIONS SPACED 90° APART HORIZONTALLY
- PERFORATIONS SPACED 4" APART VERTICALLY
- 90 AND 270 DEGREE ROWS STAGGERED 2" BELOW 0 AND 180 DEGREE ROWS
- CONTRACTOR MAY USE PLASMA TORCH OR OTHER DEVICE TO PRODUCE APPROXIMATELY 3/4" PERFORATIONS

PERFORATION DETAIL 2/3 3
NOT TO SCALE



WELLHEAD DETAIL 3/3 3
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REV.	DATE	DESCRIPTION	CK. BY
1	1/30/13	Added Proposed GIWs and TMPs	CES
2			
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STATE OF MISSOURI DEBORAH ENGLISH NUMBER PE-2004020234 PROFESSIONAL ENGINEER 2/14/13

SHEET TITLE: CARBON STEEL INTERCEPTOR WELL DETAILS

PROJECT TITLE: BRIDGETON LANDFILL 2013 GAS INTERCEPTOR WELL SYSTEM – EXPANDED DESIGN

CLIENT: BRIDGETON LANDFILL, LLC. BRIDGETON LANDFILL 13570 ST. CHARLES ROCK ROAD BRIDGETON, MO 63044

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
2060 READING ROAD, SUITE #200, CINCINNATI, OHIO 45202
PH: (513) 421-5353 FAX NO. (513) 421-2847

PROJ. NO. 23211003.00 | DSN. BY: FDB | DWN. BY: FDB | CHK. BY: JJW | Q/A RVW. BY: DAE

CADD FILE: SHEET 3

DATE: 1/9/2013

SCALE: NONE

DRAWING NO. 3 of 3

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March 29, 2013

Ms. Charlene S. Fitch, Chief, Engineering Section
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, Missouri 65102-0176

SUBJECT: BRIDGETON LANDFILL, LLC
SW PERMIT NUMBER 0118912
BRIDGETON LANDFILL FACILITY
BRIDGETON, MISSOURI 63044

Dear Ms. Fitch:

This Letter Report has been prepared in support of Solid Waste Permit Number 0118912 issued to Bridgeton Landfill, LLC by the Missouri Department of Natural Resources (MDNR), and in follow up to the *February 27, 2013* meeting between Bridgeton Landfill, LLC representatives and MDNR, the *February 8, 2013* "Gas Interceptor Well Expanded Design Conditional Approval" letter, the *February 6, 2013* "2013 Gas Interceptor Well System-Expanded Design Bridgeton Landfill", the *January 11, 2013* "Gas Interceptor Well Design Approval" letter, the *January 4, 2013* "North Quarry Heat Barrier System" report, and the *September 14, 2012* "Temperature Monitoring Point Installation Plan". Specifically, the work is related to subsurface smoldering event (SSE) at Bridgeton Landfill in Bridgeton, Missouri.

We appreciate your consideration of the enclosed materials and look forward to continuing working with MDNR regarding the management plan and systematic monitoring, response and planning activities for the Bridgeton Landfill. Specifically, we are available at your convenience to review the updated data and discuss the technical merits of the potential contingencies with representatives from MDNR.

As you are aware from our ongoing work on this matter since the SSE began, this is a complex event that has required careful evaluation and management. Our continuing investigation and evaluation of the SSE have revealed a wealth of information about the event, and will provide a solid basis for assessing contingency options now and in the future. We look forward to continue working with MDNR to gather additional data and prepare plans that are appropriate and responsive to the situation, while ensuring ongoing protection of human health and the environment.

Executive Summary

This Letter Report is intended to provide an update of the subsurface smoldering event, together with an engineering feasibility evaluation of existing and potential future contingency containment systems. The report will address the following key elements:

1. Overview of the Current Management and Monitoring System

Bridgeton Landfill installed and proposed to expand its temperature monitoring system, per the approved *September 14, 2012* "TMP Installation Plan." Utilizing the temperature monitoring system, Bridgeton Landfill can monitor the effectiveness of the interceptor well system and continue to develop data regarding the extent and migration of the SSE.

Bridgeton Landfill has also installed the gas interceptor well system. This system is intended to facilitate more rapid heat removal, limiting the progression of heat past the interceptor well system. While we expect the interceptor well system to be an effective, permanent first line of defense, we have created and continue to refine contingency strategies to ensure that the radiologically impacted materials in the West Lake OU-1 are not impacted by the SSE.

We agree with MDNR that this evaluation of appropriate contingency planning is of critical importance, but the available data indicates that continued monitoring and study is appropriate before undertaking the invasive work of any barrier system, which carries risk. If this event follows the current pattern of development, as witnessed at other similar hydrogen gas producing sites, the reaction will not spread to shallower portions of the landfill. In these shallower zones, significant losses of energy occur and lead to rapid cooling. Additionally, energy can be lost to the underlying ground surface (i.e. rock surfaces or other native material).

Currently, the limited northward migration of the event is moving primarily east - towards the quarry wall, rather than the neck at the northwest. However, even if the current rate of migration is presumed to not only be directly in the direction of the radiologically impacted materials, but also continue migration in that direction at that rate consistently moving forward (neither of which is an assumption supported by current facts), it would take more than seven years to reach the buffer area outside of the radiologically impacted materials. Based on the data, it is clear that there is sufficient time to monitor the effectiveness of the interceptor well system, when activated, while improving upon our existing understanding of the SSE extent and impact.

2. Update on the Evaluation of the Extent of the Settlement and Heat Impact

Bridgton Landfill implemented an improved system for detecting settlement in a way that can accurately document the rate, extent and direction of settlement movement. The new additional data reveals that settlement is focused in a relatively localized location beneath the wells GEW-60R, GEW-61R, and GEW-62R. Visual settlement on the surface is primarily a product of the lateral spreading of settlement due to the depth at which volume is reducing. The energy spreads laterally from this localized reaction spot, resulting in settlement in areas beyond the location of the actual SSE. Any remedial measures must take this type of settlement into account, since settlement in one location is not necessarily indicative of an ongoing reaction at that location or of a spreading heat event

The modest rates of heat rise and lack of movement of heat fronts support the concept that hydrogen liberation is the only significant heat producing event ongoing at the Bridgeton Landfill. This is based on temperature evaluation and heat calculations. If other waste oxidation events were occurring and responsible for any significant amount of the volume reduction at the Bridgeton Landfill, they would add a large amount of energy to the Bridgeton Landfill and temperature rises would be much greater than those seen to date.

3. Evaluation of Additional Containment Contingencies

This Letter Report revisited several physical barrier evaluations reviewed in depth as part of the January 4, 2013 “North Quarry Heat Barrier System” heat dissipation approach. Evaluating potential displacement and resulting settlement issues makes it clear that many alternative barrier systems are not feasible. Thin barrier systems would all rely on some heat removing component to function. Additionally, and depending on the type physical barrier, construction timelines range from one to two years. Lengthy construction obviously makes rapid deployment difficult, and it also increases the challenges relative to managing odors, nuisance issues like vectors and truck traffic. Physical barrier construction in the “neck area of the landfill” is also complicated by the need to abide by certain airport covenants. Therefore, the heat removal identified by Bridgeton Landfill in the "North Quarry Heat Barrier System" report is preferable to other physical barrier systems located in the “neck area of the landfill” because it offers superior protection with reduced construction time that can be organized to possibly comply with the airport easement and covenants.

In response to MDNR’s direction, this Letter Report also considered the viability of an injection system. There are no reported uses of inert gas in landfills other than at fires that are quite shallow (less than 50 feet) and isolated in nature. There is no evidence that such injections could occur at the depths of this SSE. Since there is currently no evidence of free oxygen at depth, the only possible purpose of gas injection is to remove heat. This is much more efficiently accomplished by the proposed heat barrier system presented in the January 4 “North Quarry Heat Barrier System” report.

Finally, Bridgeton Landfill has evaluated other possible contingencies to prevent the heat reaction from advancing into the West Lake OU-1 area. This Letter Report evaluates the excavation of waste to create an isolation barrier south of the southern limit of where no radioactive material above background was found. The shallower depth and ability to anchor the barrier prevents many of the feasibility concerns seen in deeper excavations. Such an approach would also limit the volume of waste excavation, consistent with concerns raised by the Airport Authority. Finally the relative speed of construction, just three months, allows such a system to be implemented quickly. This isolation barrier located south of the southern limit of where no radioactive material will provide the physical barrier that MDNR has requested, it just requires that we must locate it further north of the requested “neck area of the landfill” in order to make it technically competent should it need to arrest an advancement of heat, and make it constructable.

4. Conclusion

The onsite monitoring systems continues to reveal that any detectable rate of movement toward the north is relatively slight and is slowing over time. Bridgeton Landfill requests that data from

the monitoring systems that MDNR and Bridgeton Landfill mutually established should continue to be watched closely in order to keep current data and expand understanding of the extent and impact of the SSE. This data can be monitored while the first line of defense gas interceptor well system is activated and used to effectively and efficiently remove energy from the SSE. The data and monitored performance of the gas interceptor well system can be utilized to more effectively evaluate and plan any contingency to ensure that there is no impact to the radiologically impacted materials at the West Lake OU-1 site without undue increases in odor and complications with the airport easement and covenants.

Summary Table of Containment Evaluation:

The following summary table was created in effort to help Bridgeton Landfill and MDNR track the various systems and broadly compare and contrast their relative strengths and weaknesses.

		Current Systems			**Contingency Barrier Approaches at Neck**			**Contingency Barrier Approaches at North Limits of the North Quarry Fill**
Criteria		Interceptor Wells – First Line of Defense	Temperature Monitoring Probes (TMPs)	Settlement Assessment	North Quarry Heat Barrier System	Alternative Barrier Plan	Alternative Injection System	North Excavation and Barrier
	Technically feasible	Yes	Yes	Yes	Yes	No	Yes	Yes
	Previously proven technology	Yes	Yes	Yes	No	No	No	Yes
	Secure approval from MDNR	Yes	Yes	Yes	Not currently approved	Suggested by MDNR	Suggested by MDNR	Pending
	Complies with Airport restrictions and covenants	Yes	Yes	Yes	Yes	No	Yes	Pending
	Reasonable timeline	Yes	Yes	Yes	Yes	No	Yes	Yes
	Length of construction implementation	Current	Current	Current	1 year	2 years	2 years	3 months

Through the implementation and expansion of our temperature monitoring system and improvements in our settlement data collection, Bridgeton Landfill has developed, when coupled with landfill gas collection wellhead temperatures, strong, reliable data which can be used to analyze and understand the subsurface smoldering event (SSE). Further, this data, which is collected weekly and monthly, respectively, provides us with a system to promptly detect any changes in the SSE (including both the direction and the rate of movement) and provide an early warning system as any changes might arise. Based on a review of the most recent data available, it appears that to the extent the SSE is moving, it is moving for the most part in a southwestern direction, away from the radiologically impacted materials.

While these data indicates that the progression of the reaction may not necessitate any physical barrier, we have nonetheless continued evaluation of potential contingency plans. In response to MDNR's request, this Letter Report provides an updated assessment of potential physical barrier systems installed at the neck. Unfortunately, similar to the conclusions reached in the January 4, 2013, North Quarry Heat Barrier System report, we have not identified any physical systems for the "neck area of the landfill" that will adequately meet the mutual needs of the MDNR and Bridgeton Landfill due to technical inadequacies and unsuitable construction schedules.

Finally, this Letter Report presents an additional contingency plan that would create a physical barrier between the Bridgeton Sanitary Landfill and the West Lake site where radiological wastes are located. We welcome the opportunity to meet with MDNR to discuss this additional contingency plan and the findings and evaluations using the most current data detailed in this Letter Report.

Update on Current Management and Monitoring System

MDNR has requested that Bridgeton Landfill design a system to prevent the spread of the SSE to the northern section of the quarry fill. Bridgeton Landfill provided MDNR an evaluation of possible measures of achieving this goal in the North Quarry Heat Barrier System report (dated January 4, 2013). In that report a heat removal system was identified as being most suitable for achieving the goal. Other means of arresting the spread of heat were assessed and rated as unfeasible, with the exception of a wide cementious barrier fill placed under slurry conditions and reinforced. This system was identified as technically feasible but not able to be constructed in short enough time periods and still susceptible to failure due to uncertainty as to how much settlement may occur.

Subsequent to the submittal of the North Quarry Heat Barrier System report, Bridgeton Landfill requested approval to install a series of interceptor wells along with additional TMPs. MDNR provided approval of the proposed installation but required that Bridgeton Landfill begin designing and installing a system at the quarry narrow point "neck" that would act as a temporary barrier to resist thermal transfer of heat from one side to the other. The February 8, 2013 letter required "*that the design must include a rationale for and calculations supporting the thickness of the barrier, depth of the barrier and thermal modeling for heat transfer. The goal is for the barrier to maintain its integrity for a 3-6 month window of time once the reaction reaches the barrier.*"

In the same letter the Solid Waste Management Program (SWMP) requested *"that Bridgeton begin designing and selecting an injection system backup plan for the barrier system in case the gas interceptor well system and the barrier systems do not stop the advance of the SSE."*

Bridgeton Landfill does not believe that measures designed to only last a few months of performance are reasonable to install given the time and effort required to install any barrier system at all. It is the opinion of Bridgeton Landfill that a suitable system was presented, along with the rationale for design, in the aforementioned report dated January 4, 2013. In that report the heat barrier system based on heat removal was identified as the most feasible system. A rationale for design was presented.

MDNR cited the increased temperatures at the southernmost TMPs (8 and 9) as part of the basis for the demand for immediate action. It should be mentioned that Bridgeton Landfill specifically placed the southernmost row of TMPs, including TMPs 8 and 9, in areas they expected to have the heat front pass through, for the purpose of gaining information. These were not intended to act as a trigger mechanism for additional action. Based on the March 11th measurements at the Bridgeton Landfill and an evaluation by our Consultants of progression rates, the expected arrival date for the heat/settlement front is further away than earlier estimated (approximately 16 months) from reaching the TMP 1-4 line where the North Quarry Heat Barrier System report identified the trigger. This is based on a 13 ft/month advance rate (February 2013) versus the 18 ft/month (November 2012) in the report. This slowing of the advance rate will allow for more time for evaluation and to let the impact of the gas interceptor well system be assessed.

In an effort to minimize or stop movement of subsurface heat from the south quarry to the north quarry, additional special purpose, gas interceptor wells were installed, consistent with MDNR approved plans. The gas interceptor well system consists of two rows of wells. The first row of wells was installed approximately 50 feet north of the first line of temperature monitoring probes (TMPs 7R, 8, and 9). The second row of wells was installed 50 feet north of the first row of wells, and staggered in between the first row of wells. The gas interceptor well system is designed to allow for more rapid removal of heated gas allowing a release point for heat generated by and emanating from the SSE, which will effectively and efficiently remove energy.. The gas interceptor wells are spaced more closely together than traditional gas extraction wells to allow for more heat removal from any heat front. When activated, it is expected that the gas interceptor wells will initially draw the heat towards them. But the combined rows of wells will remove heat, reducing the energy and heat, limiting the migration of heat past the gas interceptor well system, as has been effectively used at other similar sites experiencing subsurface smoldering events. Additionally, because these wells are relatively fast to install, this system can continue to be added upon as needed in order to increase its effectiveness. These wells also conform to the existing airport easements and covenants, and are installed with methods that manage construction-generated odors better than can be managed in other forms of invasive construction.

Building upon the current TMP system, six additional TMPs are currently being installed in between the gas interceptor well system and the TMPs located at the narrow point "neck" of the landfill. This will allow for more extensive monitoring of any heat that might move past the gas interceptor well system in order to evaluate the effectiveness of the system on a more timely basis and provide us the ability to respond with additional and precisely targeted gas interceptor

wells.

Additionally, continued monitoring of the expanded TMP system will improve any design rationale of a heat removal barrier, or selected barrier approach, should MDNR continue to believe that such a barrier is warranted. The added data will be useful in the determination of heat energy flowing toward the proposed heat removal and/or barrier location that needs to be removed. Our Consultants' estimated heat energy rate, as presented in the North Quarry Heat Barrier System report, was 12 watts per square meter. Using the information currently available this appears to be an overestimate, meaning that the heat front would actually place less demand on the heat removal system than previously calculated.

Update on the Extent of Reaction and Associated Characteristics

Bridgeton Landfill engineers have implemented an extensive monitoring systems (TMP and settlement assessment) to more accurately, when coupled with landfill gas collection wellhead temperatures, document and monitor the extent of the heat and settlement impact from the SSE. A robust system for settlement assessment was developed by creating a more detailed grid in order to consistently gather equivalent data during each monitoring event. Over the last several months the Bridgeton Landfill has expanded the TMP system to include the installation of probes directly into the center of the reaction, the installation of probes proximate to the reaction, and installation of probes both in advance of and beyond the installed gas interceptor well system. These expanded monitoring systems have provided significantly more data regarding the SSE, its extent, and its changes. As of February 2013, two complete monthly settlement monitoring events using the grid method have been completed and a third will occur at the end of March 2013. The results have been, and will continue to be, shared with MDNR.

Settlement (Volume Reduction / Zone of Accelerated Settlement)

Analysis of the waste settlement data by our Consultants indicates that the volume reduction associated with the SSE continues. Settlement continues to occur at an elevated rate in the areas that have already settled substantially. For example, in locations where the total settlement since March 2011 is approximately 30 feet, the rate of settlement was 1.0 ft/month or more. This indicates that the waste in this area is still actively settling. The North Quarry Heat Barrier System report) identified a vertical settlement rate of 1.35 ft/month as indicative of accelerated, as compared to typical, settlement. The location of the vertical settlement rate of 1.35 ft/month has continued to expand outwardly. This expansion is referred to as the zone of accelerated settlement and is shown on Drawing 1.

The northern movement of the zone of accelerated settlement has slowed from the average rate of 18 ft/month in November 2012, to 13 ft/month in February 2013 (assuming a 30 day month). However, the expansion of the zone of accelerated settlement in the southern direction, defined by the same current rate of 13 ft/month, has increased during this same time period. Also evident in the zone of the accelerated settlement is that the northern movement is more towards the east at present, instead of heading toward the narrow point (neck) of the quarry. The southern acceleration combined with this eastern movement on the north part results in an overall rounding of the zone of accelerated settlement, which is discussed in greater detail below.

Analysis of the Shape of the Zone of Accelerated Settlement

Analysis of settlement shapes, by our Consultants, based on the settlement that has occurred since March 2011 suggests that settlement shape to the east from the low area near GEW-60R is consistent with the subsidence shape associated with volume reduction of the waste occurring only under the zone of accelerated settlement, as revealed in Drawing 1.

The surface manifestation of reduction in waste volume occurring centered at depths of 140 feet, which is consistent with elevated temperatures measured in TMP-8, was used by our Consultant to analyze the extent of the zone of accelerated settlement. Our Consultant's comparative analysis suggests a volume reduction of approximately 38 feet has occurred near points of maximum observed settlement since March, 2011. (Note that we acknowledge that certain quantities of soil were placed across many portions of the landfill prior to March 2011. The shape manifested by the settlement that has occurred since March 2011 is still valid for purposes of this particular evaluation, however Bridgeton Landfill can investigate soil depths in interest of continued full cooperation if MDNR prefers to incorporate settlement that could be masked by the soil placed prior to March 2011.) Based on mine subsidence literature, (reported settlements associated with tunnel collapse and finite element simulations) volume reduction sufficient to cause 30 feet or more of surface settlement would have wide spread effects. This is the case near GEW-61R and GEW-62R, as illustrated in Drawing 2

Based on the analysis by our Consultants of the settlement shapes and predictions using either mine subsidence, tunnel collapse or finite element simulation methods, settlements occurring at depths of 135 feet bgs will result in settlement at locations greater than 150 feet laterally. The vertical settlement at a distance of 150 feet laterally from a significant settlement event occurring at 135 feet below the ground surface (bgs) is still 5% of the total vertical settlement of the event. The settlement directly over the event is approximately 85% of the volume reduction. This suggests an "angle of draw", to use a mine subsidence term, approximately equivalent to slightly more than 50 degrees measured from the vertical, or 40 degrees or less measured from the horizontal. Significant ground motions toward the settlement locations occur at a significant distance from the SSE, since the settlement from this reaction appears to be occurring at depths that average more than 135 ft bgs.

As a result of the analysis of the zone of accelerated settlement, it is clear that volume reduction of the waste at depth results in very significant lateral spreading of settlement. Therefore, settlement at any given location is not, by itself, indicative that a volume reducing activity is occurring directly underneath that location, thus accelerated rate of settlement alone cannot be used as indicative of the extent of the SSE. This needs to be included in the conclusions drawn about the ongoing reactions at the Bridgeton Landfill and the design of any remedial measures.

TMP Observations

Since the fall of 2012, the Bridgeton Landfill has installed and monitored nine temperature monitoring points (TMP). These TMPs collect data spanning the full vertical depth of the waste at 85 points using thermocouples. Seventy five of the original thermocouples are functioning to date. In addition, six more TMPs are being installed south of the quarry narrow point to allow further definition of temperature gradients in both the vertical and horizontal directions.

As of March 19, 2013, the temperature front has moved north of TMP 8 and 9. This front is characterized by the increase in temperature from < 185 °F to temperatures > 210 °F. Examination of the TMPs that have experienced temperature rise shows the temperatures are typically elevated within a certain depth range, and that above and below this depth range the temperature is reducing. Using the average value with the range that is elevated, and not dissipating in the upward or downward direction, provides some detail as to how the heat front is progressing. These average temperatures, depicted in the attached Average Temperature plots generated by our Consultant, show increases in temperature typically into January 2013, followed by a period of nearly constant temperatures or slight rises in temperature. The more rapid rises in temperature associated with the heat front are apparent in TMP 8 and TMP 9, presented in the attached Average Temperature plots. TMPs 1, 3 and 4 showed no upward trends as is apparent in the weekly temperature readings. It should be noted that in the above presentation, the non-functioning thermocouplings were not used in the average calculation. Given the depth of the zones used for the temperature average, the behavior is not affected significantly by ambient temperature trends. Based on the average temperature values the heat front is progressing at a slowing rate to the north.

Additional information on gradients of temperature surrounding TMPs will be provided to MDNR in subsequent reports on TMP results as evidence of SSE.

Overall Heat Balance and Correlation to Collected Hydrogen

An overall approximate heat balance calculation was performed by our Consultants. This analysis utilized the premise that the hydrogen being generated at the Bridgeton Landfill is indicative of a metal oxidation process, whether from metal hydroxides, or metal oxides, and whereby the hydrogen is liberated from water molecules as a product of the reaction with metals. At present, Bridgeton Landfill has not identified other sources of hydrogen generation at the temperature ranges measured within the landfill.

The elevated temperature of the landfill results in heat losses to the landfill surface, heat removal in the form of landfill gas, heat removal in the form of water vapor in the landfill gas (originating as liquid and being vaporized), heat being used to warm the waste as the heat front advances, general warming of the waste and liquid, and heat losses to the ground at the perimeter and bottom of the landfill.

Using the temperature gradients measured at the TMPs, total hydrogen collected at the flare station, flow rates and temperatures of the gasses, estimates of water vapor generated contained in the gas, and the zone of accelerated settlement rate in February 2013; an approximate heat accounting was performed by our Consultants. A total heat energy rate of 2.16×10^6W was determined, based on the calculations ignoring the average rise in temperature of the landfill that has occurred in general. This calculated value should be considered a lower range estimate, given that some of the warm wells in the south quarry area do not have measured flow rates which results in the underestimation the energy used in vaporizing water. This is contrasted with a heat energy value of approximately 4.58×10^6W indicated by the 11% of the average flow rate of 3800 scfm of gas processed at the flare. The excess rate of energy production would account for raising the average temperature of the waste. A rough calculation shows the excess energy

would raise the temperature of a waste mass 200 ft thick over twenty acres approximately 20 °F per year.

Based on our Consultants' calculations, and acknowledging the total hydrogen is likely higher than being collected, it does not appear that rates of heat rise or movement of heat fronts support the concept that significant heat producing events (i.e. a combustion event) are ongoing at the Bridgeton Landfill, other than those associated with the hydrogen liberation. If such waste oxidation events were occurring and responsible for any significant amount of the volume reduction at the Bridgeton Landfill, they would add a large amount of energy to the Bridgeton Landfill and temperature rises would be much greater than those seen to date. This is consistent with Bridgeton Landfill's data that do not indicate free oxygen at depth, where the volume reduction is occurring, and the overall lack of any fire type behavior or residues encountered in the sampled TMPs. At the present time the pyrolyzation of the waste, occurring at low temperature was assumed to be energy neutral so no energy loss or gain is associated with the volume reduction in the calculations.

According to our Consultants, this suggests that current energy production (assuming just metal oxide reactions are occurring) accounts for all the excess temperature at the Bridgeton Landfill and that remedial measures should be focused on the behaviors associated with this type of heat producing event.

Conclusions Based on Data Gathered to Date

The current monitoring systems at the Bridgeton Landfill show the settlement and temperature fronts continue to expand from a centralized deep settlement point. However, this is not revealing since the spreading of both settlement and elevated temperature would be expected to continue even if the actual heat generation was declining, given the significant storage of heat energy in the landfill.

As addressed in the discussion of Settlement, the rate of the expansion of the zone of accelerated settlement to the north is slowing, even without the installed first line of defense of gas interceptor wells being activated and in a state of full operation whereby they will remove heat energy from the SSE.

Settlement at any location is influenced by settlements occurring at depth in other locations. As this Letter Report has demonstrated, the temperature levels and rates of advance are consistent with a non-combustion based metal oxidation reaction that liberates hydrogen. The rates of hydrogen collection would account for all elevated temperature behaviors seen at the landfill

Notably, no evidence of smolder has been observed in the samples from the TMP borings, including those installed in the warmest area of the Bridgeton Landfill.

Evaluation of Contingency Options

Evaluation of Physical Thermal Barriers

Notwithstanding the slowing of the zone of accelerated settlement northward or the mounting evidence that the reaction causing heat at the Bridgeton Landfill is not related to the combustion of waste, Bridgeton Landfill has evaluated physical barriers that could be installed at the entry to the north quarry to prevent advancement of the temperature front. The types of barriers evaluated were identified in Table 1 of the North Quarry Heat Barrier System report. They included some of those that MDNR or its advisors have proposed as well as others. In response to the request of MDNR, Bridgeton Landfill has further considered physical barriers beyond the level presented in the North Quarry Heat Barrier System report.

Structural Barriers

Conductivity

Specifically, non-open space barriers structurally supported barriers, which included tangent pile walls, sheet barriers and structural slurry walls were considered. The thinner barriers, e.g. tangent piles, sheet pile, thin structural slurry walls, were identified as being technically unfeasible due to the uncertainty as to the development of bending moments and shear forces associated with advance of settlement fronts. In addition these thinner type systems are thermally more conductive than waste material. Heat energy arriving at a concrete barrier will pass directly through it, thus, the system composed of concrete would require it be made of insulating concrete, which is too weak, or that heat exchanging devices be embedded in the concrete to remove the heat, which makes this type of barrier a very expensive version of the heat removal system already proposed but with additional problems because it is has structural issues as well.

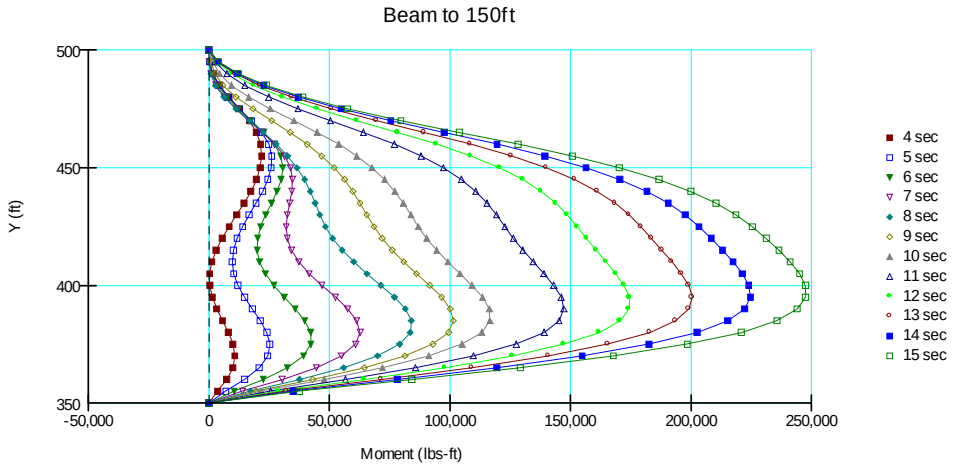
Stiffness

Approximation of the lower limit of settlement induced stresses was performed using finite element methods (FEM). A settlement varying from 2 to 10 ft/month occurring at 135 feet bgs and at a distance 75 foot in south of the barrier was simulated. The waste was assumed to be a homogeneous elastic/plastic media. It was found that significant displacements were predicted and bending moments were, as expected, a function of the stiffness of the wall section used. Ideally the design moment for vertical barrier wall of minimal stiffness would still be in excess of 250,000 ft lbs (unfactored) even with the settlement front 75 feet away. As the settlement front approached the barrier this would worsen. In addition, moments were based on the assumption that a rectangular wall section was used. If a tangent pile system was used, and steel included in the piles, the overall stiffness of the cracked sections would increase and the moments would be higher. It should be noted that the deflections at the wall were on the order of feet and the depth of the wall stopped at 150 feet below grade.

Bending moments

A bending moment diagram is presented below from the simulation. The settlement at each time step to 10 sec is 0.5 ft, after 10 sec the step was increased to 1 ft sec. The total settlement at 75 foot away is 10 foot at 135 feet and 8.5 feet at the ground surface over the maximum settlement. The original ground surface is at elevation 500 in the simulation. Surface settlement at the

barrier beam were only 1.5 ft for the 15 sec time step. (note the times are not material in the duration but just a calculation step)



The required reinforcing to remain intact for this type of installation is approximately 3 square inches per foot of wall length for the depth of the wall if the average distance of the reinforcing steel is 3 feet from the average wall face. This requires large diameter wall elements if concrete tangent piles were used and a double structural row. This type of system would also need follow up jetting and grouting to remove all waste between piles or initial special low strength caisson filler piles with large diameter 48 inch piles and a single row of structural caissons nearly touching to create a seal. In any case the number of piles would be approximately equivalent of 1 -36 inch diameter pile every 24 inches. Given the width of the quarry at the narrowest point this would result in approximately 140 piles to a depth of 150 feet. Holes would have to be drilled under slurry or cased in order to remain open and alignment would be challenging, likely requiring additional piles. The result of such work would not reduce the need to install thermal extraction units. These could presumably be included in the design. This system would take significant time to install and have little to no advantage over the heat removal barrier system. The system could also be done using a narrow structural slurry wall with the same issues relative to the time and uncertainty in performance as well as also requiring heat removal elements.

Insulating Barrier

Barrier systems that would be non-structural in nature, for example creating a continuous or nearly continuous disruption in the waste mass and filling it with an insulation material, such as a urethane based mineral grout, are technically possible. It should be mentioned that all insulating systems would use some gas entraining method within a cementious matrix and mineral fillers for strength. As such they are all subject to crushing and possess limited shear strengths. Increasing the strength is done at the expense of the insulation quality.

The placement of the material would require a large number of holes be drilled (approximately 200) to depths of greater than 150 foot and filled with a mixture of urethane foam and inert mineral to act as insulation. This would require a greater drilling period than for a structural barrier or a similar slurry excavation period. In addition, the grout is subject to crushing and displacement, making it doubtful that it would remain intact since settlements and subgrade movements would be non-uniform. It is possible that insulating materials could be installed

between or behind structural elements, such as a structural slurry wall with an insulation zone on the warm or cool face. Combining structural and insulating materials complicates the barrier construction, significantly increasing the time. Insertion of insulating panels in the slurry filled trench is not possible given their light weight relative to the slurry. For the depths being considered the buoyancy force per 1 foot wide panel 2 feet thick and 150 foot deep is approximately 8 tons. This would require a steel case approximately 1.25 inches thick fully encasing the foam panel to sink it in the slurry. It also requires panels of this dimension to pre-assembled over the trench and inserted. This is not practically feasible and identifies that insulation construction in the ground would require a second excavation, doubling the time of construction. This would also be true of tangent pile systems.

Conclusions on Barriers

The evaluation of displacements and forces resulting from settlement events occurring at depth and distance from a barrier show the forces generated by structural requirements are significant even when the event is 75 feet away from the wall and with favorable assumptions concerning homogeneity. The barriers of this type can be made wide enough to resist forces but, as noted in the North Quarry Heat Barrier System report (see Sec. 5.4.4) they would take approximately 1 year to construct and would still require heat removal systems to be installed.

Structural systems do not represent thermal barriers as they are made of materials that are no less than 2 to 5 times more conductive than the solid waste. As such, all require heat removal elements that are equivalent to those needed for the system Bridgeton Landfill has already identified as feasible in the North Quarry Heat Barrier System report.

Insulation systems could be constructed but would take significantly more time since they would require a structural component to prevent crushing or the loss of integrity. The increase in construction time is approximately twice the time associated with a structural system.

Thin barrier systems in the end would all rely on some heat removing component to function. Therefore, they do not offer any improvement over the system of heat removal identified in the North Quarry Heat Barrier System report while at the same time increasing the time of construction.

Injection Systems

Bridgeton Landfill is not aware of any injection systems that would have any significant impact on the advance of a heat front. It is our understanding that MDNR is referring to systems that would inject cool inert gasses into the waste, although the request does not provide any reference to the types of systems MDNR would like to consider. Other possible injection materials may include water.

The injection of gasses into the landfill at depth is theoretically possible. However, the injection of gas at depths of interest, 80 to 150 ft or deeper, is problematic. At these depths the average pore spaces in the waste are small, as is evidenced by the specific yield of or drainable porosity dropping to only a few at 60 ft (200kPa) and zero at 120 ft (400 kPa). This is based upon the unit weight of waste. At these low pore space sizes and in the presence of a moist environment,

the liquid within the waste is continuous and injection of gas is controlled by the permeability of waste for a liquid permeant. The permeability of solid waste at vertical stresses of 200 to 400 kPa are reported in the literature to be in the range of the low 1E-6 to 1E-7 cm/sec (Beaven et al ASCE GSP #209, 2008). Under these conditions the rate of injection would be similar to the rate of injection into a clay of water in piezometer, very low. The only method of injection that would yield a significant injection volume would involve hydro-fracture. As hydro-fracturing occurred the gas flow would increase, but only in narrow zones and along unknown pathways. The gas fracturing would propagate upward, as the minor principal stresses would decrease in this direction. Flow would exit at the surface or possibly be collected partially in nearby wells. If a significant number of wells in an area were to be injected simultaneously along a line or within a limited area, the fracture systems would likely combine and increase the gas flow within a limited fracture system.

The cooling impact of gas is limited to the heat capacity of gas injected. For example CO_2 has a heat capacity of approximately 860 joules per kilogram per degree K. Across the narrow of the quarry this would require injecting approximately 550 to 1000 cu ft per minute equivalent scfm of gas continuously just to hold the temperature constant at 130 degrees or 100,000 to 180,000 lbs per day of gas, depending on the heat flux rate assumed. This is not a feasible method for controlling temperatures.

There are no reported uses of inert gas in landfills other than at fires that are quite shallow (less than 50 feet) and isolated in nature. There is no evidence that such injections could occur at the depths at issue here. Further, if it were possible to inject that amount of dry gas through the waste it would dehydrate the existing waste creating a dry waste mass and conditions that are favorable to combustion, presenting an additional risk not currently present.

Since there is currently no evidence of free oxygen at depth, the only possible purpose of gas injection is to remove heat. This is much more efficiently accomplished by the proposed heat barrier system presented in the North Quarry Heat Barrier System report.

Other Possible Location Actions

Bridgeton Landfill has evaluated other possible actions that may be taken to prevent the heat SSE from advancing into the areas where the radioactive materials have been documented at above background levels. The studies that have been performed for the West Lake facility have identified a southern limit of where no radioactive material above background was found. Excavation of waste south of this limit to create an isolation barrier was evaluated on a conceptual basis. The results of the evaluation are described subsequently.

Conceptual Barrier Types at the North Limits of the North Quarry Fill

The barrier types at the North Limits of the North Quarry Fill for the isolation barrier all involve the removal of waste material and replacement with inert materials to the base of the waste. The removal methods considered included: open excavation without support; partial open excavation down to within 15 feet of the bottom of waste where a digging box could be used to finish the waste removal; and a slurry wall excavation with vertical sides to the bottom of waste.

The inert material would consist of earthen, cementious backfill. All barrier systems would include the installation of heat removing devices that would prevent elevated temperatures from passing through the barrier. All open excavations at the North Limits of the North Quarry Fill would be backfilled to near existing grade so that drainage patterns could be maintained.

With the exception of the slurry wall sections, a significant portion of the excavated waste is placed back in the excavation area, with the inert barrier on the north side. This significantly reduces the amount of material that will have to be taken off site which should improve the construction time for the operation, while having no impact on the performance of the barrier.

Excavation Location and Quantities

The approximate bottom of waste materials was estimated by our Consultants utilizing results of the WL series borings from the West Lake Area 1 evaluation, along with the quarry mapping dated 1979 provided by Aquaterra. The depth to waste varies in the area with location and ground surface elevation. The approximate bottom of waste and quarry bottom contours are depicted in Drawing C-0, along with the ground surface base and WL boring locations. This information demonstrates that the average depth to the bottom of waste materials is between 25 to 70 feet in the area of interest, as opposed to more than 200 feet at the quarry narrow point to the south. This decreased excavation depth allows for faster construction time, and minimizes the volume of excavated materials, which is relevant to concerns raised by the Airport Authority regarding the excavation of waste materials.

In general the thickness of waste material is lower the further north the excavation is. However, it is critical to ensure that the extent of the excavation can occur outside the boundary previously identified as having no radiological material. Along the east side the quarry bottom is encountered and the waste becomes deeper as the quarry deepens and the existing grades increase. This places practical limits on moving the barrier to the south to increase the buffer from waste that contains radioactive materials above background levels. Therefore, it is beneficial to insert the barrier as far north as possible without encountering radioactive materials.

Excavations on the shallow side (north) were assumed to be at 1H:1V, for open excavations down to the bottom of waste. This temporary slope of limited depth is considered safe for short periods. The longer excavations on the south, where possible leachate seepage may be encountered were assigned a 1.5H:1V slope.

When a digging box was assumed to be used, the slopes on both sides of the excavation were assumed to be 1.5H:1V to reflect the fact that the excavation and backfilling would require more personnel time outside the excavation vehicles and the free open areas at the bottom of the excavation would be of limited size. The digging box was assumed to have a minimum width of 4 feet.

Slurry wall excavations were assumed to be near vertical.

Three alignments for excavation were analyzed as part of the work. They are shown in plan and profile views on drawing C-0 through C-4.

The excavation volumes are summarized below.

Alignment	Excavation Section	Volume of Excavation
		(cubic yards)
NE-1	Open Excavation to Waste Bottom	140,600
NE-1	Excavation with 15 ft Digging box	97,300
NE-2	Excavation with 15 ft Digging box to Sta 6+00 then Slurry wall to end (Sta 11+39)	38900 of which 4000 is within slurry wall
NE-3	Excavation with 15 ft Digging Box	119,000
NE-3	Open Excavation to Waste Bottom	180,750

As can be seen on drawings C-2 through C-4 the NE-1 alignment resulted in some incursion beyond the southern limit of the defined non-radiological area. Alignment NE-2 is essentially the same as NE-1 but curves were introduced to allow slurry wall type construction. The limits of the slurry wall section were selected to maintain a significant buffer from the aforementioned southern limit (approximately 50 foot). No assessment of the other options was made along this alignment. However the volume associated with open cut to waste to Sta. 6+00 is 66,600 yd^3 so the total would be 70,000 if the open excavation and slurry wall combination were chosen along NE-2.

The NE-3 alignment provides a minimum buffer of 40 feet from the southern limit and the option with the 15 foot digging box reduces the minimum buffer to approximately 20 feet.

Engineering Features of the Possible Barriers at the North Limits of the North Quarry Fill

The open excavation with and without the digging box utilize earth or cementious backfill materials to create a non-combustible barrier. The thermal isolation is provided by the heat extraction system that is installed as the backfill material is placed and possibly drilled in once the barrier is finished. Because the proposed backfills are inclined against the north side of the excavation or cementious at the base, they do not have stability issues associated with settlement of the waste on the south side. Backfilling the entire system to grade removes surface water management and long term stability issues.

The slurry wall sections can be designed assuming complete elimination of material support on the south side. The placement of permanent anchorage into the upper section of the barrier wall and pinning some amount of reinforcing tendons into the underlying bedrock or alluvium allows a stable wall section to be made. The wall sections could be done in panels using standard slurry panel construction techniques but with weaker concrete and low levels of reinforcement. Thicker wall sections are imagined (approximately 10 feet) to create a better thermal mass and to

counteract stresses. Calculations at this conceptual stage have shown that stability can be achieved for a 65 foot high wall with no waste on the south side.

Conclusions Concerning Barrier Feasibility at the North Limits of the North Quarry Fill

All of these options are technically feasible, within the confines of the airport easements and covenants and are quickly implemented for odor and vector control, but would require further definition and approval/agreement of parties involved at the Bridgeton Landfill or with whom the Bridgeton Landfill has pre-existing agreements.

It should be noted that at the present time the heat front is more than 1200 feet south of the closest point along the limit of excavation depicted in Drawing C-4. At current rates of progress, even if it were assumed that the heat even would migrate into the North Quarry, this distance would require more than 7 years for the heat front to traverse.

In order to monitor any movement of an SSE heat front across the north quarry, a continued system of TMPs could be deployed. The final set of TMPS that would trigger the start of construction of this barrier north of the north quarry should be selected at a distance approximately one year away from the limit of excavation on the south side. This would be a sufficient distance for completion of construction. The location of this is dependent on the rate of front advance and whether or not it appears to be increasing in rate of slowing, all of which can be observed through on-going monitoring of settlement and temperature monitoring. .

It should be pointed out that if the SSE follows the current pattern of development, and as witnessed at other hydrogen gas producing site, it will not spread to the shallower portions of the fill to the west. It is also possible the SSE would not be able to supply heat sufficiently after the fill elevations drop to below 480 feet to the northwest side, given the fill depth is only heat losses occur along the top and bottom surfaces with an average width of quarry of only 200 feet.

An agreed upon location where gas well temperatures would exceed 170 °F measured at the well head or TMP temperatures would exceed 185 °F could be determined based on the history of movement that would be observable in the monitoring systems along with overall heat balance considerations and collected hydrogen amounts. Because gas monitoring wells are already present within the North Quarry and because TMPs may be installed quickly, the monitoring systems can continue to be expanded as appropriate if the reaction reaches the North Quarry.

A work plan has been prepared that identifies the steps for designing permitting and procuring the contractors needed for the barrierwork at the North Limits of the North Quarry Fill. The plan is provided in Attachment A. Included in the plan are steps to identify permitting issues, fully define the bottom of waste along proposed alignment areas, verification of the absence of radioactive materials in the excavation areas, and documentation of liquid levels along the proposed alignment areas. The outline contains a listing of all tasks.

The time to perform the work as outlined is dependent on several triggers but should be able to be completed in approximately 3 months, following agreement to proceed, to finished documents for procurement purposes. The intended field work is likely to consist of use of piezocone

soundings coupled with gamma detectors as opposed to borings in order to confirm that the locations for excavation are not impacted by radiological materials above background.

In addition to the field work associated with the design and construction of the barrier system at the North Limits of the North Quarry Fill, settlement monitoring data would be gathered at grid locations across the northern quarry zone to represent baseline elevation data. Baseline hydrogen content readings should be obtained from gas wells in the northern area also to identify any SSE activity in the area north of the entry to the north quarry section. In the event that isolated hydrogen generation is detected, it may be appropriate to install heat removal systems, like the gas interceptor well system, in the area to prevent the initiation of larger events.

Conclusion

In conclusion, Bridgeton Landfill, LLC continues to develop and refine contingency strategies to ensure that the radiologically impacted materials in the West Lake OU-1 are not impacted by the SSE. While we agree with MDNR that this evaluation is of critical importance, the available data indicates that more monitoring and study is appropriate before undertaking the invasive work of any barrier system.

It should be pointed out that if the SSE follows the current pattern of development, and as witnessed at other hydrogen gas producing site, it will not spread to the shallower portions of the fill to the west. It is also possible the SSE would not be able to supply heat sufficiently after the fill elevations drop to below 480 to the northwest side, given the fill depth is only heat losses occur along the top and bottom surfaces with an average width of quarry of only 200 feet.

Further, even if the current rate of migration is presumed toward the radiologically impacted material, , it would take seven years to reach the outer limit of the proposed barrier system at the North Limits of the North Quarry Fill, several hundred feet outside the radiologically impacted materials.

It is clear that there is sufficient time to gather results from the monitoring systems in place and improve upon our collective understanding of the SSE's extent and impact, while evaluating the effect of the interceptor well system.

If you have any questions or comments regarding this Letter Report, please contact me at 314-744-8195 or calmanza@republicservices.com.

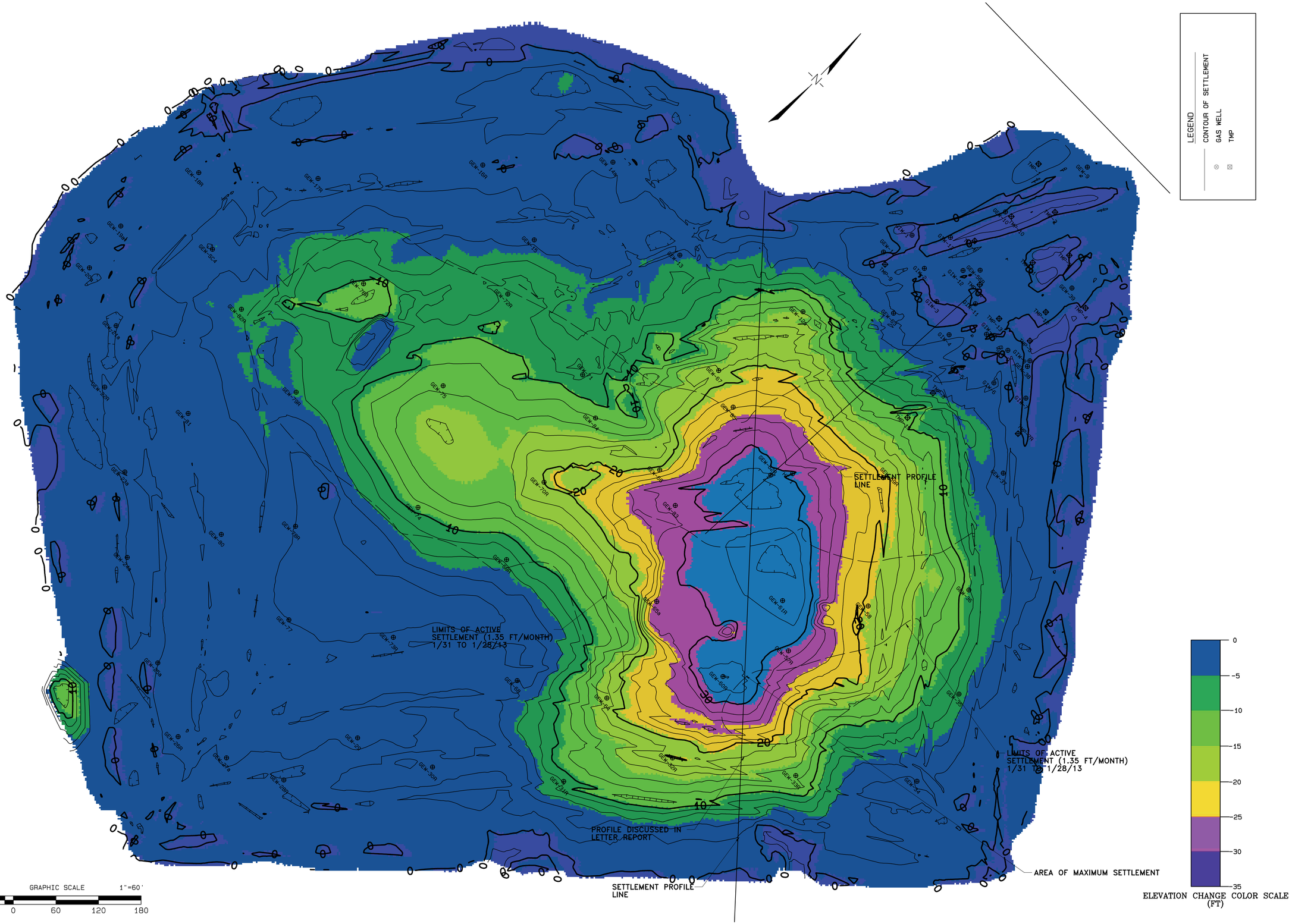
Sincerely,

Craig Almanza
Area Environmental Manager
Bridgeton Landfill, LLC

Attachment A – Scope of Work
Enclosures:

- Drawing 1 – Zone of accelerated settlement
- Drawing 2 – Surface elevation change
- Hydrogen Data Map February 2013
- Average Temperature Plots (TMP 2, 5, 6, 7, 8, 9)
- Drawing C0-C5 – Plan and profile views

Attachment A



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P. J. CAREY & ASSOCIATES, P.C.
5878 VALLINE WAY, SUGAR HILL, GA. 30518

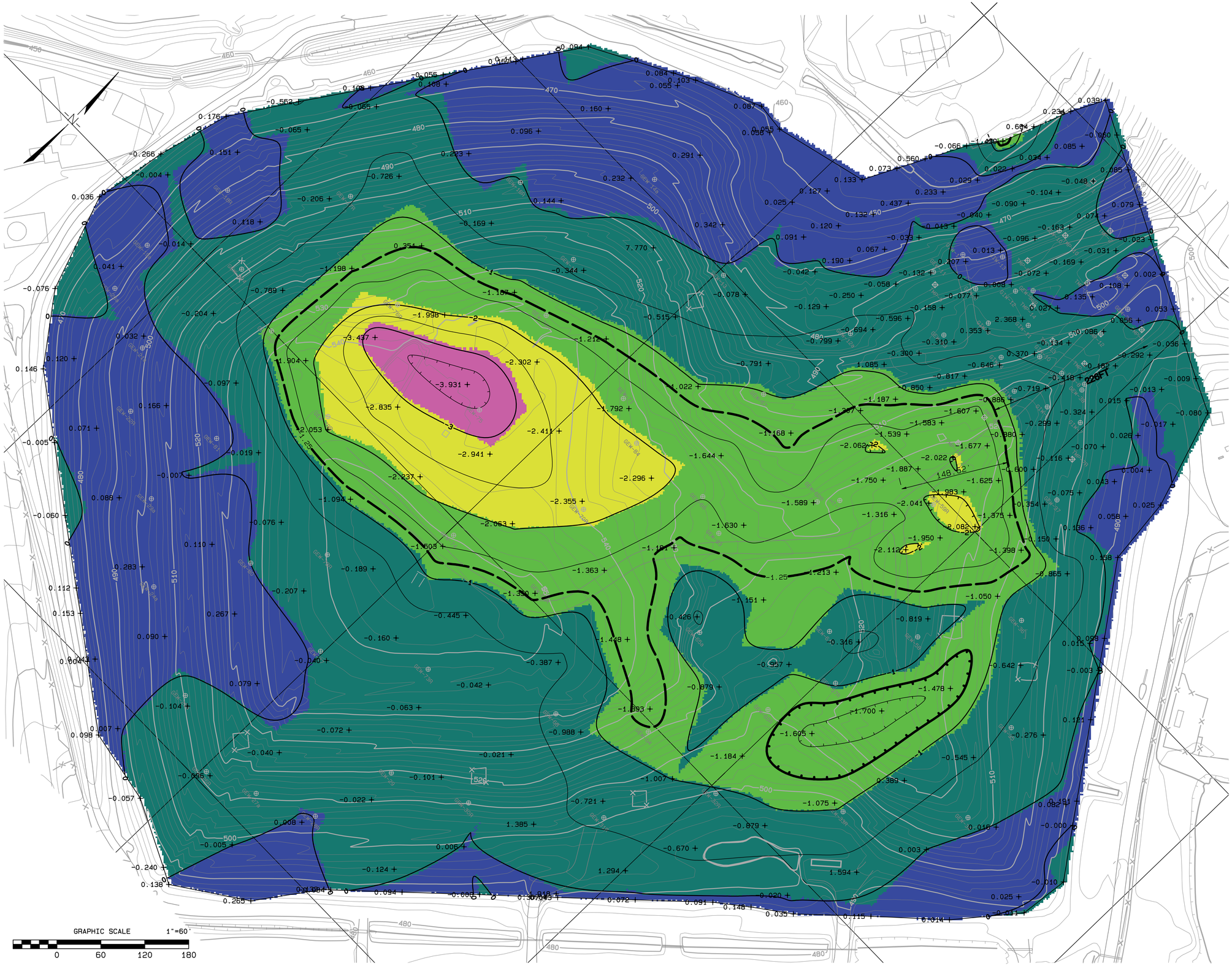
PROJ. NO.: project no
DATE: 3/29/2013
DESIGNED BY: PJC
DRAWN BY: PJC/KLCH
CHECKED BY: PJC
APPROVED BY: PJC

SETTLEMENT 3/2011 TO 2/13/13

BRIDGETON LANDFILL BRIDGETON, MO.

DRAWING 1

SHEET 1 OF 1



LEGEND

- EXISTING TOPOGRAPHIC CONTOUR
- GAS WELL
- TMP
- SETTLEMENT GRID SURVEY POINT

GENERAL NOTES
TOPOGRAPHY SHOWN BASED ON PHOTOGRAPHY DATED 2-23-2013

SETTLEMENT NOTES
CONTOURS ARE OF CHANGE IN ELEVATION FROM 1-31-2013 TO 2-28 & 3-1 2013 PERFORMED AT GRID POINTS USING GPS METHODS

POINTS HAVING POSITIVE ELEVATION CHANGES >0.3 FT WERE EXCLUDED FROM CONTOURING AS THEY REFLECT SOIL PLACEMENT

SETTLEMENT IS REPORTED AS A NEGATIVE CHANGE IN ELEVATION

COUNTOUR AT -1.25 FT
IS SHOWN AS APPROXIMATE BOUNDARY
OF SETTLEMENT FRONT AS OF 2/28/2013

ELEVATION CHANGE COLOR SCALE
(FT)

BRIDGETON LANDFILL, LLC

REVISION	DATE
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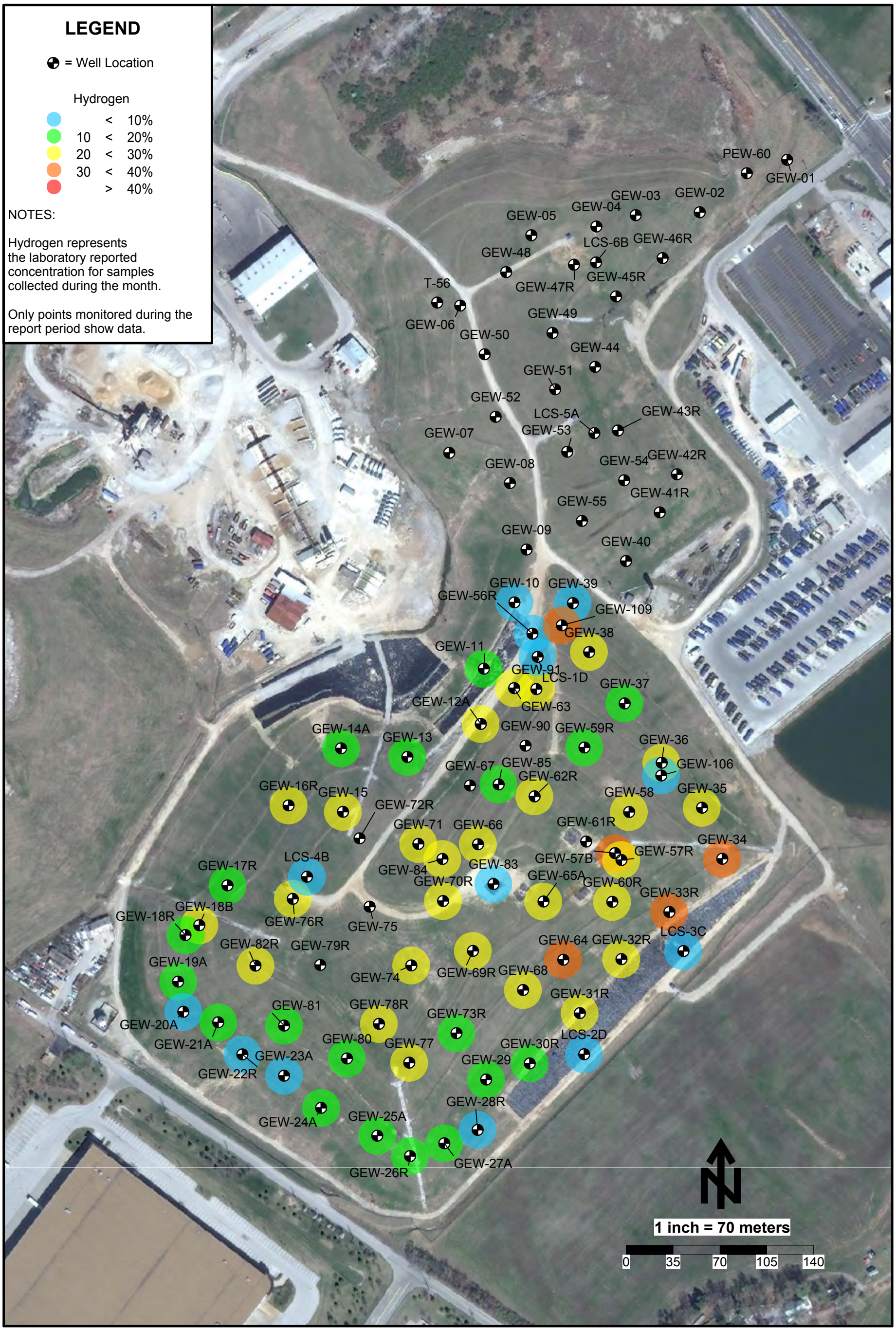
P. J. CAREY & ASSOCIATES, P.C.
5979 VALDNE WAY, SUGAR HILL, GA. 30518

PROJ. NO.: 179.002
DATE: 3/29/2013
DESIGNED BY: PJC
DRAWN BY: PJC/KLCH
CHECKED BY: PJC
APPROVED BY: PJC

PLOT OF ELEVATION CHANGE BETWEEN 1/31/13 & 2/28/13

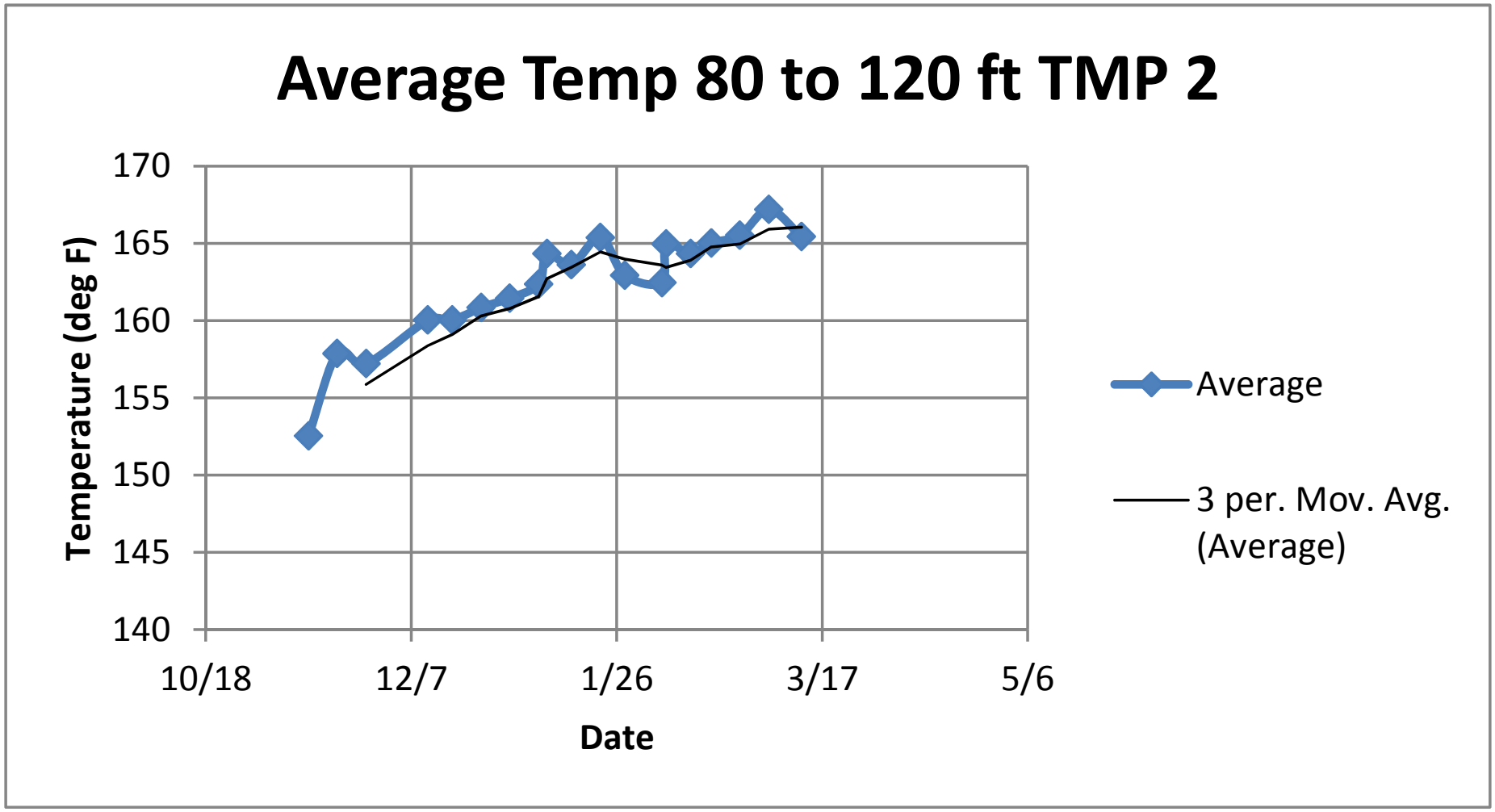
BRIDGETON LANDFILL
SETTLEMONITORING

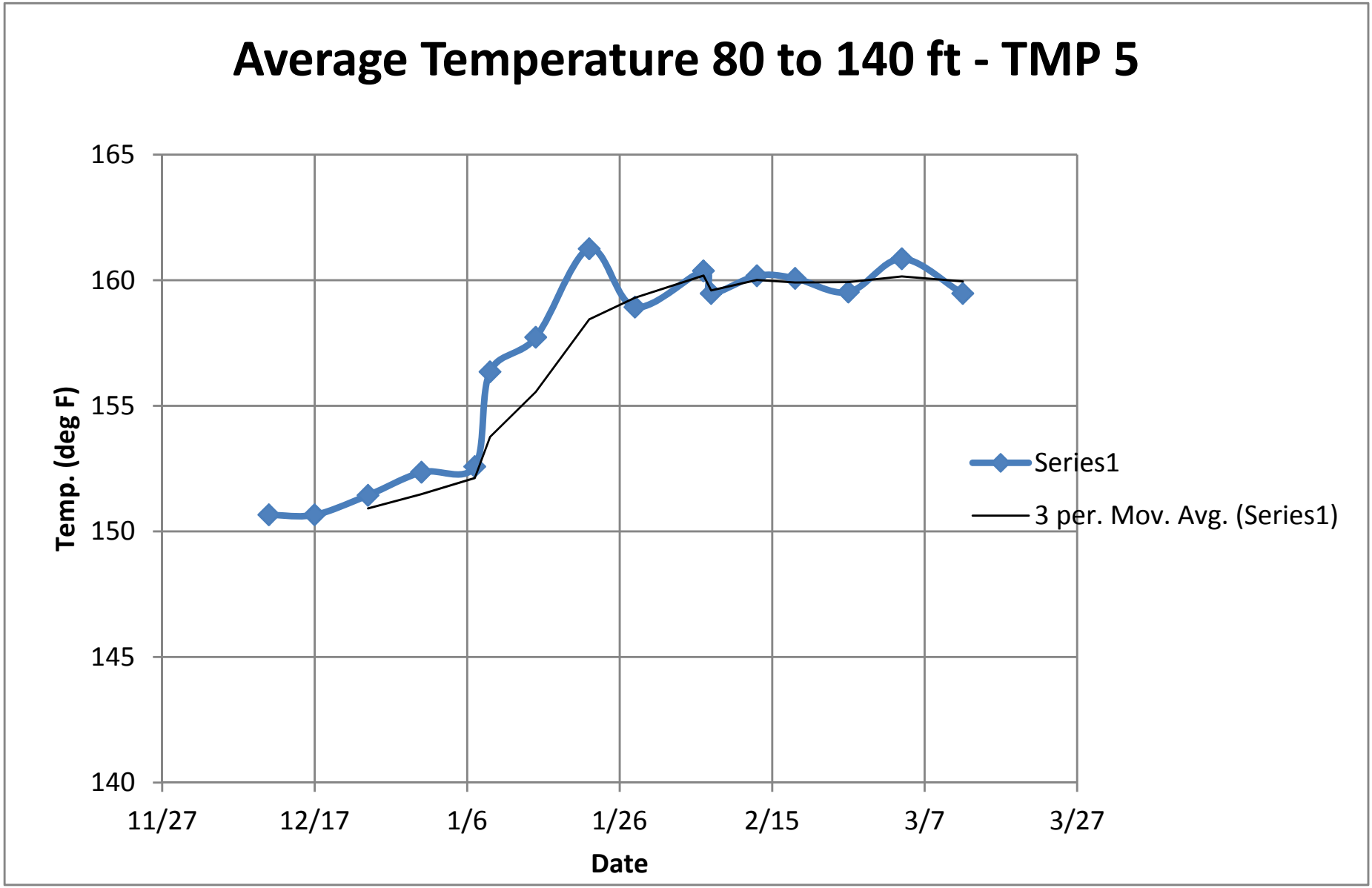
DRAWING 2
SHEET 2 OF 3

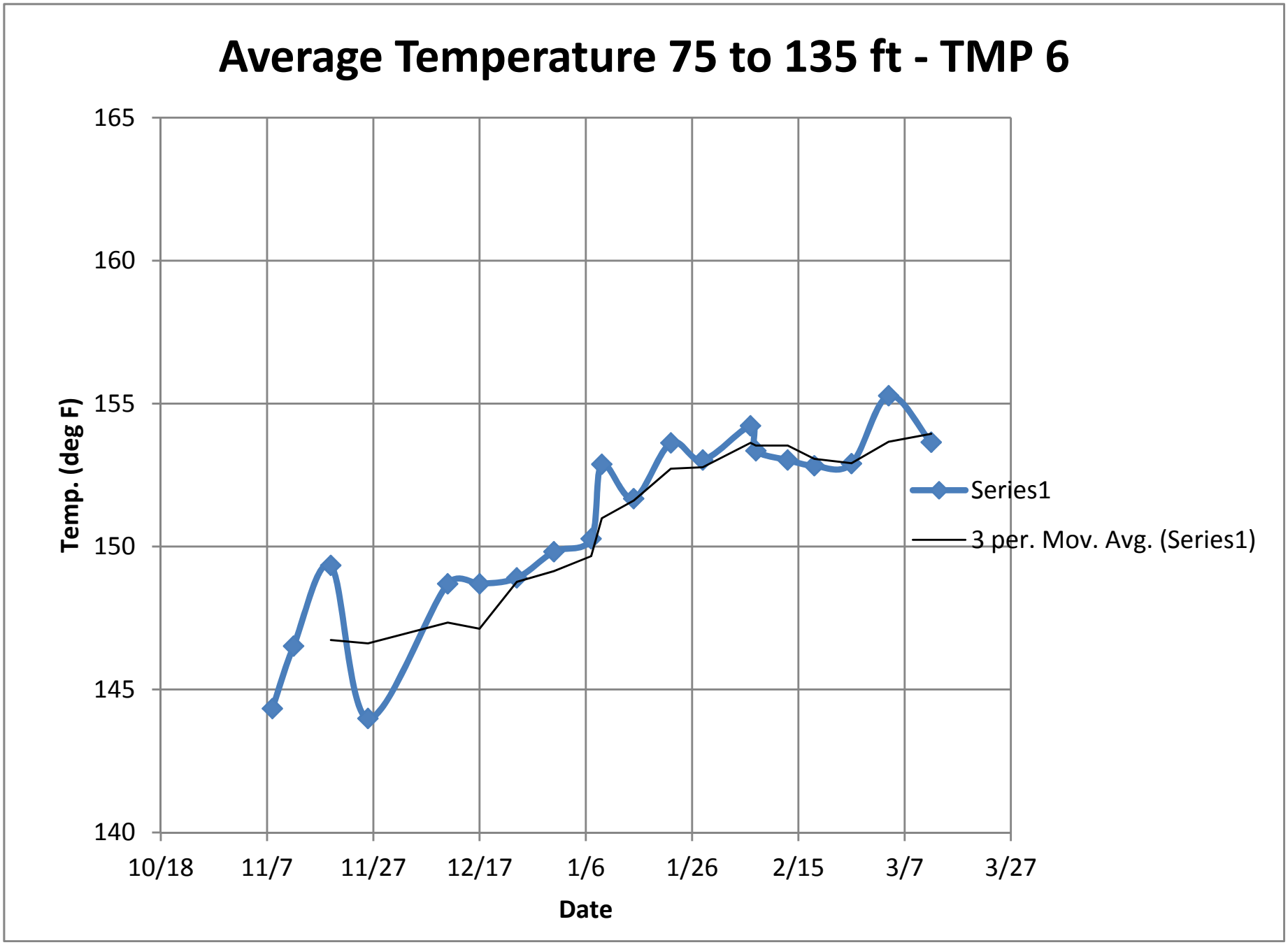


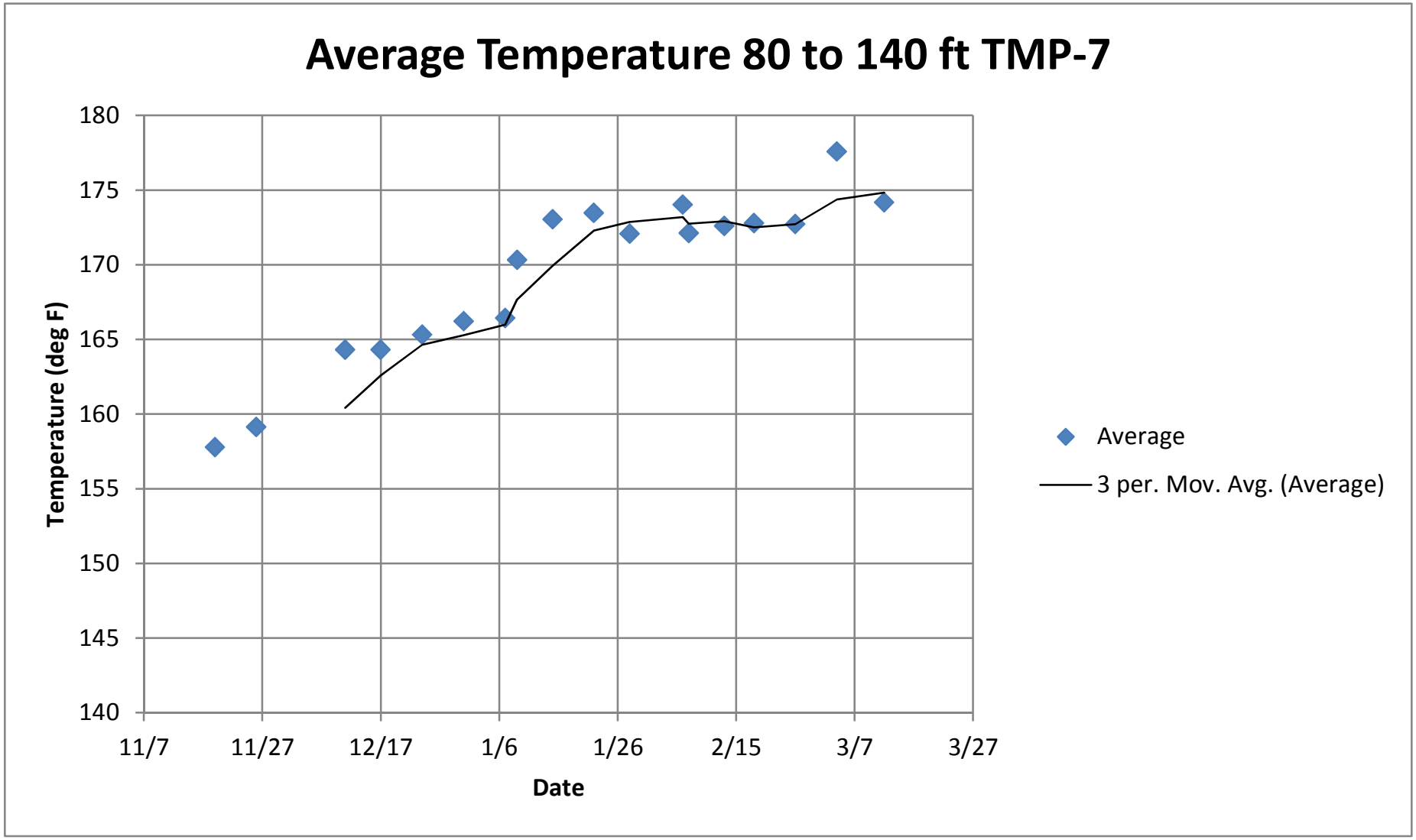
Hydrogen Data Map - February 2013 - Bridgeton Landfill

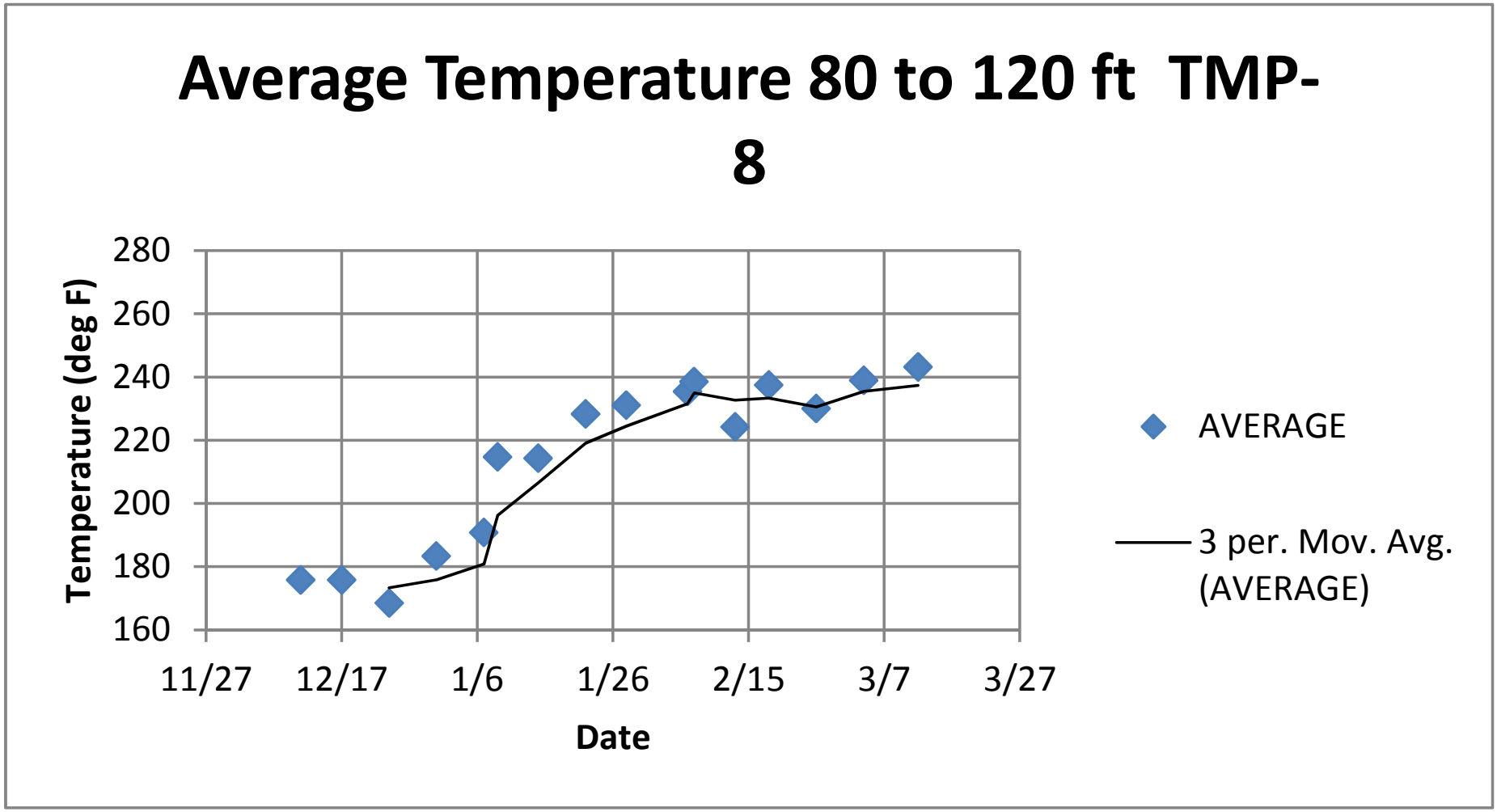
SCS ENGINEERS

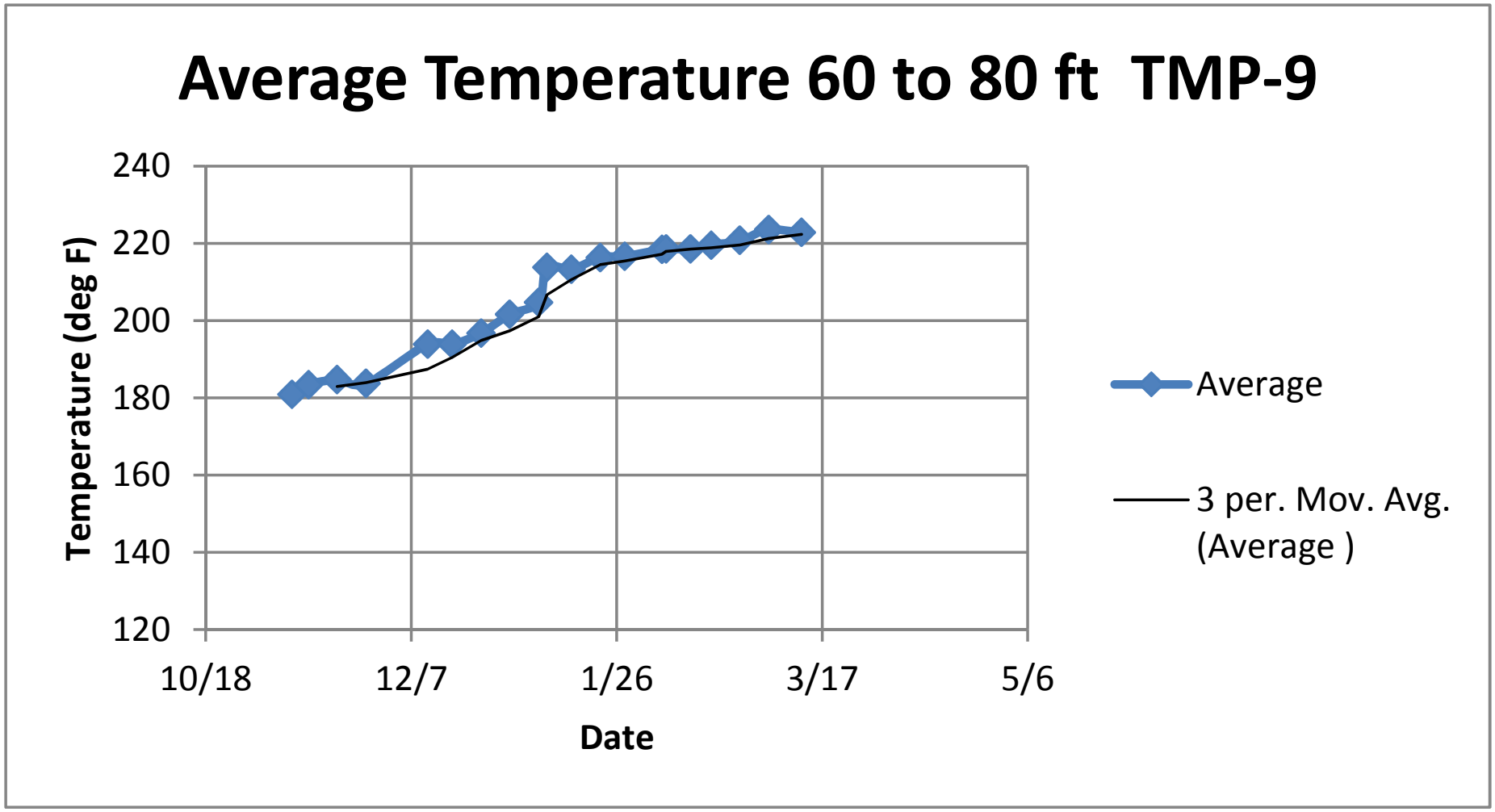

Average Temp 80 to 120 ft TMP 2
170
165
160
155
150
145
140
Temperature (deg F)
10/18
12/7
1/26
3/17
5/6
Date
Average
3 per. Mov. Avg. (Average)


Average Temperature 80 to 140 ft - TMP 5
165
160
155
150
145
140
Temp. (deg F)
11/27
12/17
1/6
1/26
2/15
3/7
3/27
Date
Series1
3 per. Mov. Avg. (Series1)


Average Temperature 75 to 135 ft - TMP 6
165
160
155
150
145
140
Temp. (deg F)
10/18
11/7
11/27
12/17
1/6
1/26
2/15
3/7
3/27
Date
Series1
3 per. Mov. Avg. (Series1)


Average Temperature 80 to 140 ft TMP-7
180
175
170
165
160
155
150
145
140
Temperature (deg F)
11/7
11/27
12/17
1/6
1/26
2/15
3/7
3/27
Date
Average
3 per. Mov. Avg. (Average)


Average Temperature 80 to 120 ft TMP-8
Temperature (deg F)
280
260
240
220
200
180
160
11/27
12/17
1/6
1/26
2/15
3/7
3/27
Date
AVERAGE
3 per. Mov. Avg. (AVERAGE)


Average Temperature 60 to 80 ft TMP-9
240
220
200
180
160
140
120
Temperature (deg F)
10/18
12/7
1/26
3/17
5/6
Date
Average
3 per. Mov. Avg. (Average)

AREA 1 LIMITS (RAD AREA) Based on Non-RIM Limit
from 004 page 241(pdf page)
Area 1-RIM 2 Development
Draft Supplemental Feasibilty Study
dated 7-23-2010 by EMS Inc.

Limit of RAD area generally
shown the Draft Feasibility Study

ALIGNMENT N-1

ALIGNMENT N-2

ALIGNMENT N-3

QUARRY BOTTOM
CONTOURS BASED ON
1979 TOPO (FROM AQUATERRA)
(10 FT INCREMENTS)

LEGEND

EXISTING GROUND CONTOUR

QUARRY BOTTOM BASED ON '79 MAPPING

ESTIMATED BOTTOM OF WASTE

BOTTOM OF WASTE OBSERVATIONS
OR ESTIMATES

ELEVATION 430.00
OBSERVATION NAME WL-115

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BRIDGETON, MC

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P. J. CAREY & ASSOCIATES, P.C.
5879 VALINE WAY, SUGAR HILL, GA. 30518

PROJ. NO.: Set by PRJINFO command 4
DATE: 3/28/2013
DESIGNED BY:
DRAWN BY:
CHECKED BY: PRJCLNT 6
APPROVED BY: PRJCLNT 7

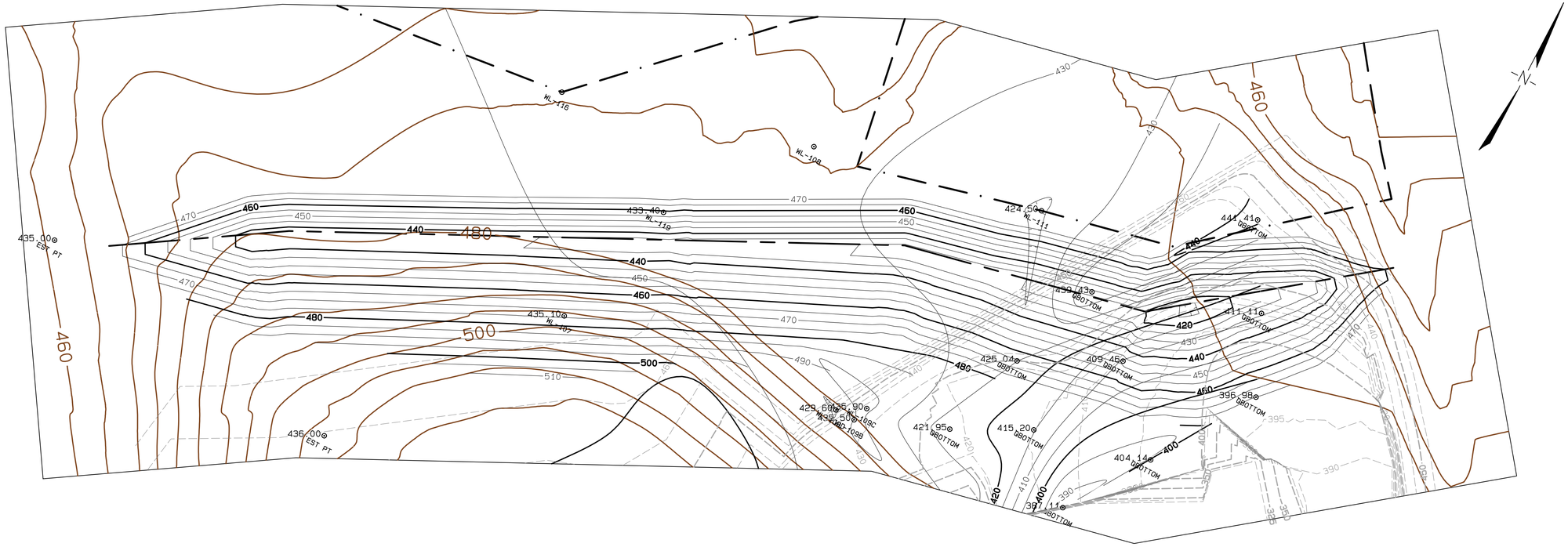
NORTH BARRIER CONCEPT
PLAN VIEW

NORTH QUARRY BARRIER
CONCEPTUAL PLANNING
BRIDGETON LF

DRAWING
C-0

SHEET 1
OF 6

Project Desc.: Path: N:\RADWBarrier\bridgeton hbarrier1.prp Plot Date/Time: Thu Mar 28,2013 / 15:47:00



EXCAVATION QUANTITY FOR GRADING SHOWN
IS 140,600 CU YDS

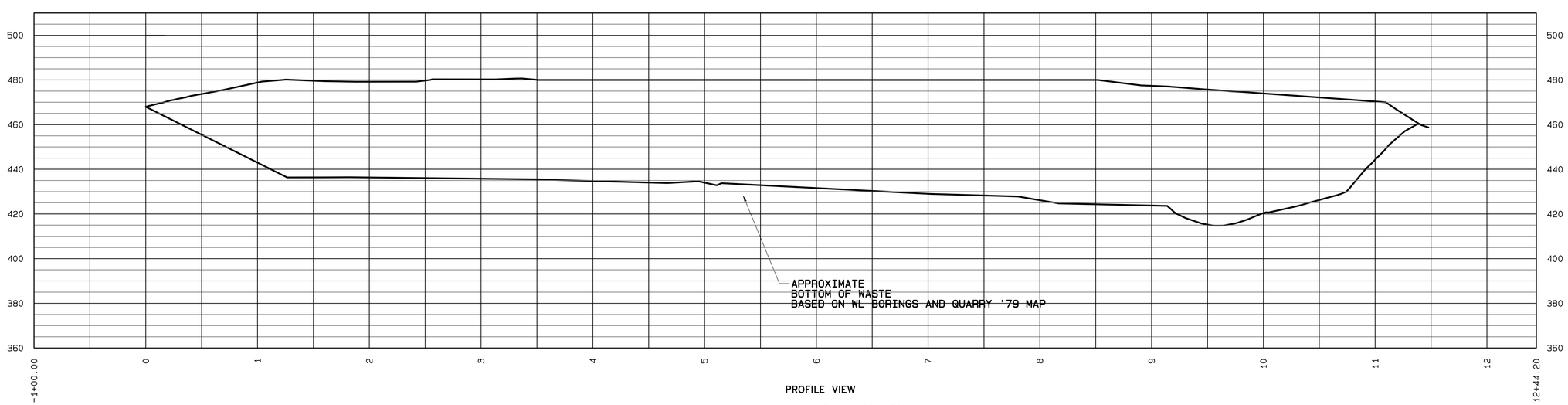
ALIGNMENT N-1

PLAN VIEW

Scale: 1" = 50'

GRAPHIC SCALE 1"=50'

0 50 100 150



PROFILE VIEW

Horz. Scale: 1" = 50'

BRIDGETON LANDI
BRIDGETON, MO

DATE

REVISION

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P. J. CAREY & ASSOCIATES, P.C.

5979 VALINE WAY, SUGAR HILL, GA. 30518

PROJ. NO.: Set by PRJINFO command 4
DATE: 3/28/2013
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DRAWN BY:
CHECKED BY: PRJCLNT 6
APPROVED BY: PRJCLNT 7

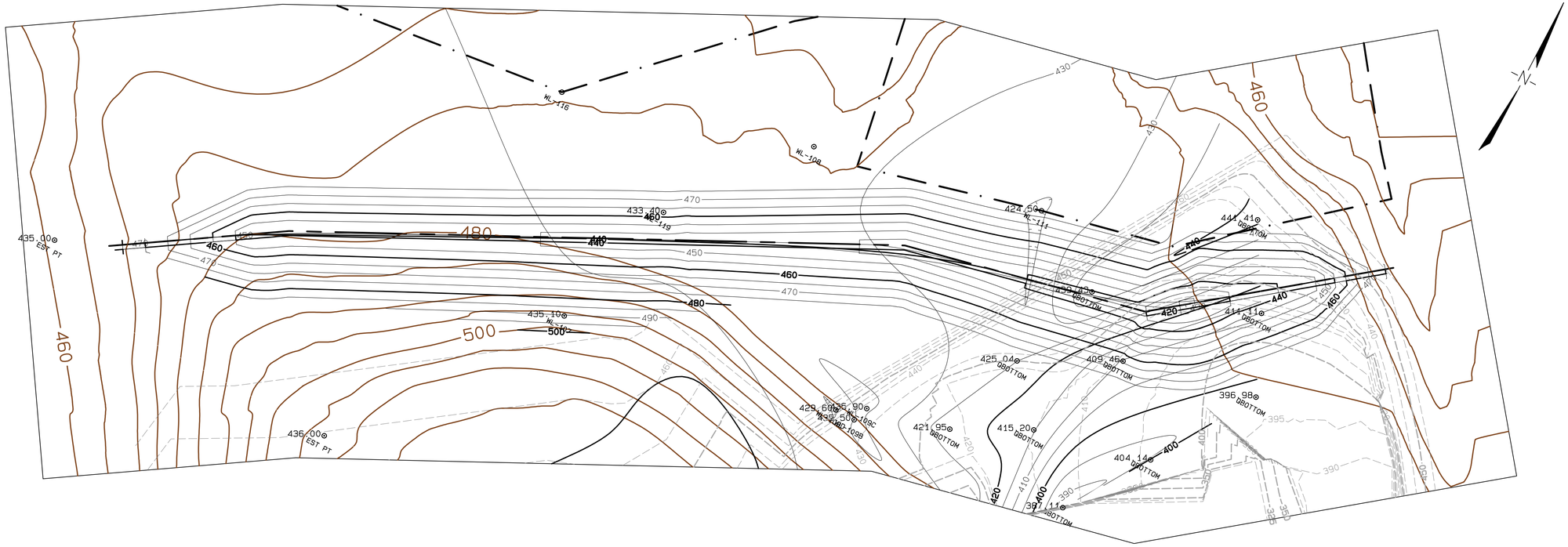
EXCAVATION TO BOTTOM
OF WASTE
1:1 ON NORTH, 1.5:1 ON SOUTH

NORTH QUARRY BARRIER
CONCEPTUAL PLANNING
BRIDGETON LF

DRAWING
C-1

SHEET 2
OF 6

Project Desc.: Path: N:\RAOMBarrier\bridgeton nbarrier1.pro Plot Date/Time: Thu Mar 28,2013 / 15:47:25



EXCAVATION QUANTITY FOR GRADING SHOWN
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ALIGNMENT N-1

PLAN VIEW

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GRAPHIC SCALE 1"=50'

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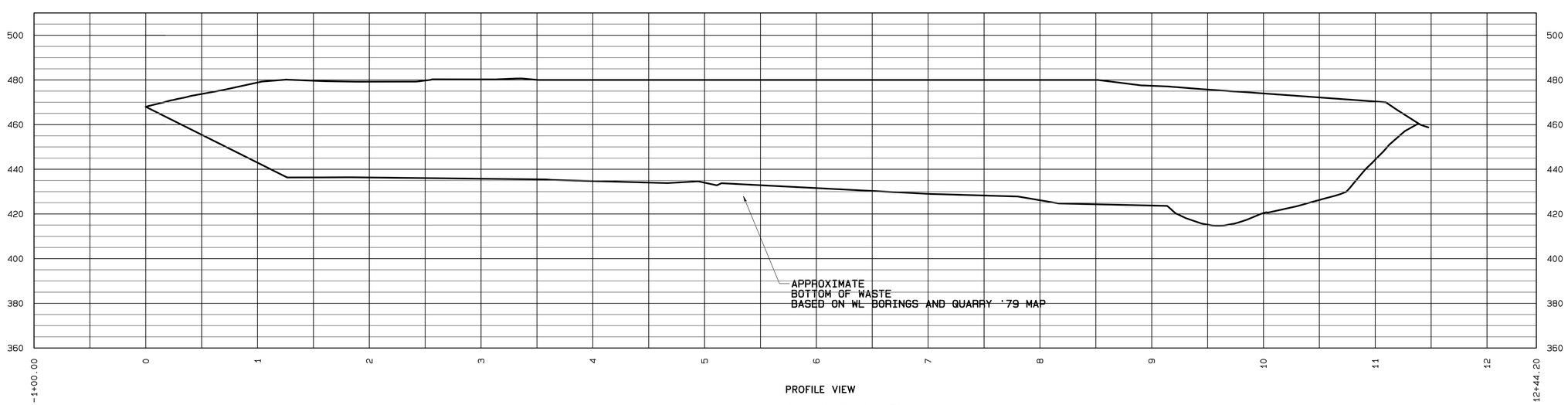

PROFILE VIEW

Horz. Scale: 1" = 50'

Project Desc.: Path: N:\RAOMBarrier\Bridgeton hbarrier1.pro Plot Date/Time: Thu Mar 28,2013 / 15:47:32

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BRIDGETON, MO

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P. J. CAREY & ASSOCIATES, P.C.
5979 VALINE WAY, SUGAR HILL, GA. 30518

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DATE: 3/28/2013
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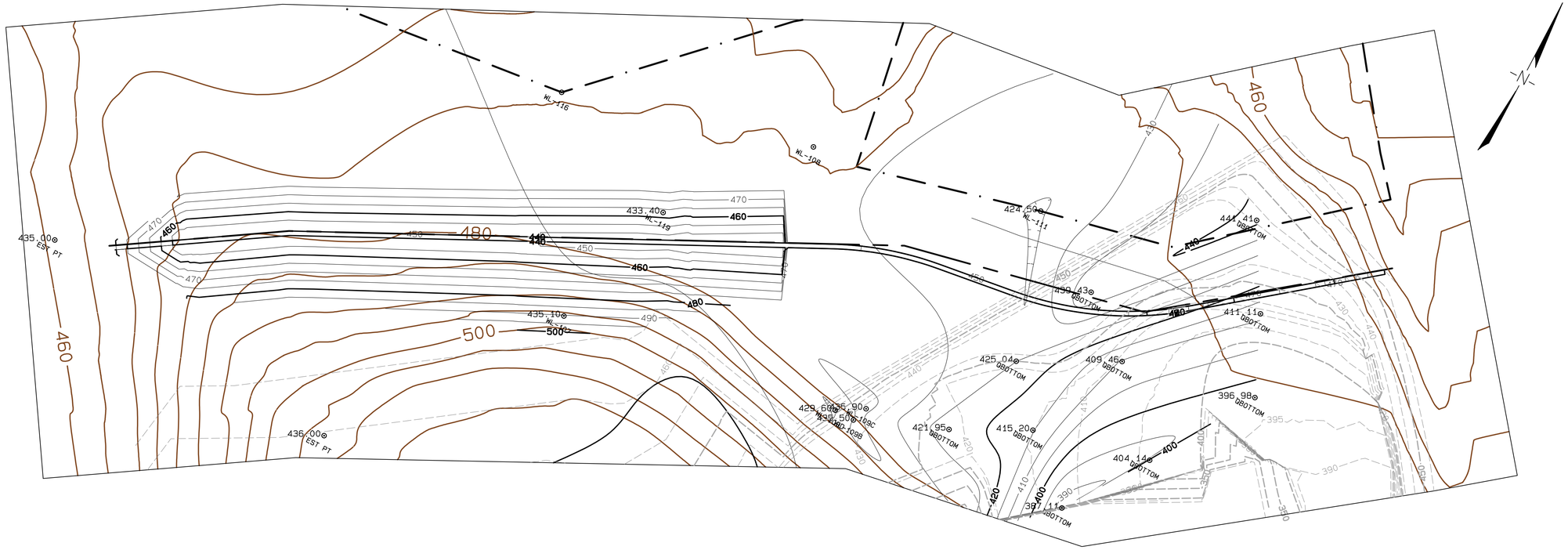
DRAWN BY:
CHECKED BY: PAVCLNT 6
APPROVED BY: PAVCLNT 7

EXCAVATION ON N-1
USING 15 FT D. BOX
1.5:1 SLOPES

NORTH QUARRY BARRIER
CONCEPTUAL PLANNING
BRIDGETON LF

DRAWING
C-2

SHEET 3
OF 6



EXCAVATION QUANTITY FOR GRADING SHOWN
IS 38,900 CU YDS

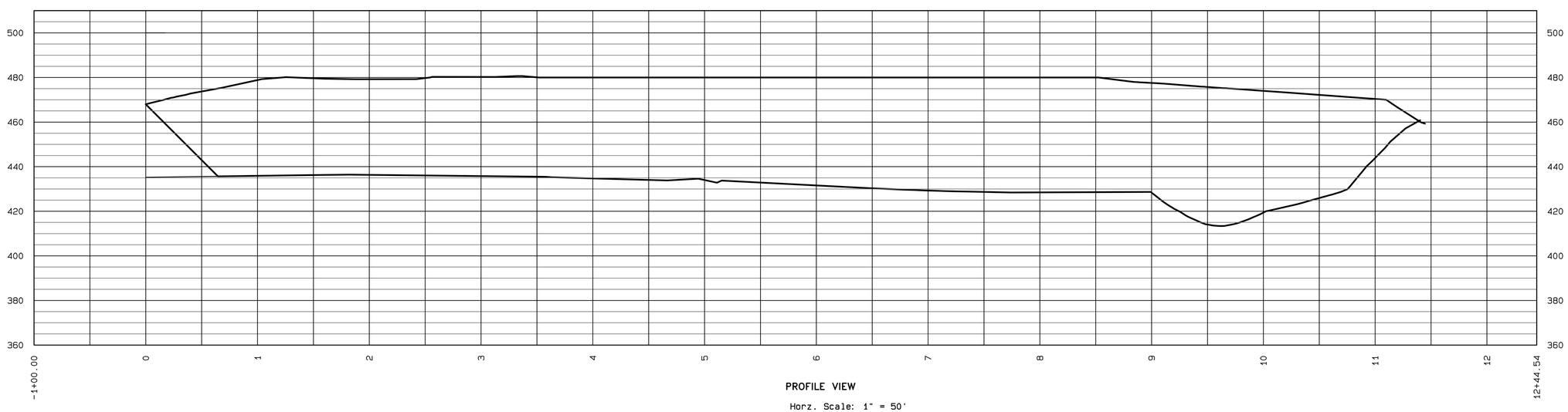
ALIGNMENT N-2

PLAN VIEW

Scale: 1" = 50'

GRAPHIC SCALE 1"=50'

0 50 100 150



PROFILE VIEW

Horz. Scale: 1" = 50'

BRIDGETON LANDI
BRIDGETON, MC

REVISION	DATE
1	
2	
3	
4	
5	

P. J. CAREY & ASSOCIATES, P.C.
5979 VALINE WAY, SUGAR HILL, GA. 30518

PROJ. NO.: Set by PRJINFO command 4
DATE: 3/28/2013
DESIGNED BY:
DRAWN BY:
CHECKED BY: PRJCLNT 6
APPROVED BY: PRJCLNT 7

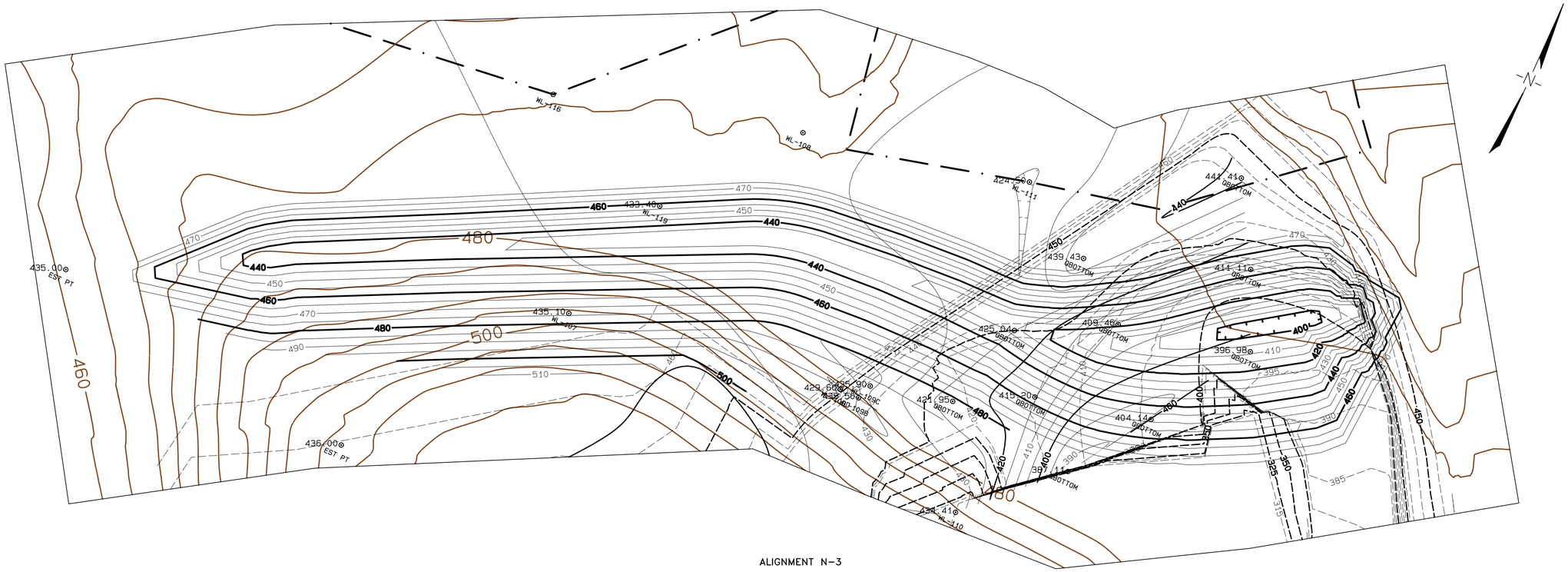
EXCAVATION TO BOTTOM
OF WASTE
USING 15 FT D.BOX TO STA 6
THEN SLURRY WALL

NORTH QUARRY BARRIER
CONCEPTUAL PLANNING
BRIDGETON LF

DRAWING
C-3

SHEET 4
OF 6

Project Desc.: Path: N:\RADWBarrier\bridgeton hbarrier1.prp Plot Date/Time: Thu Mar 28,2013 / 15:47:41



ALIGNMENT N-3

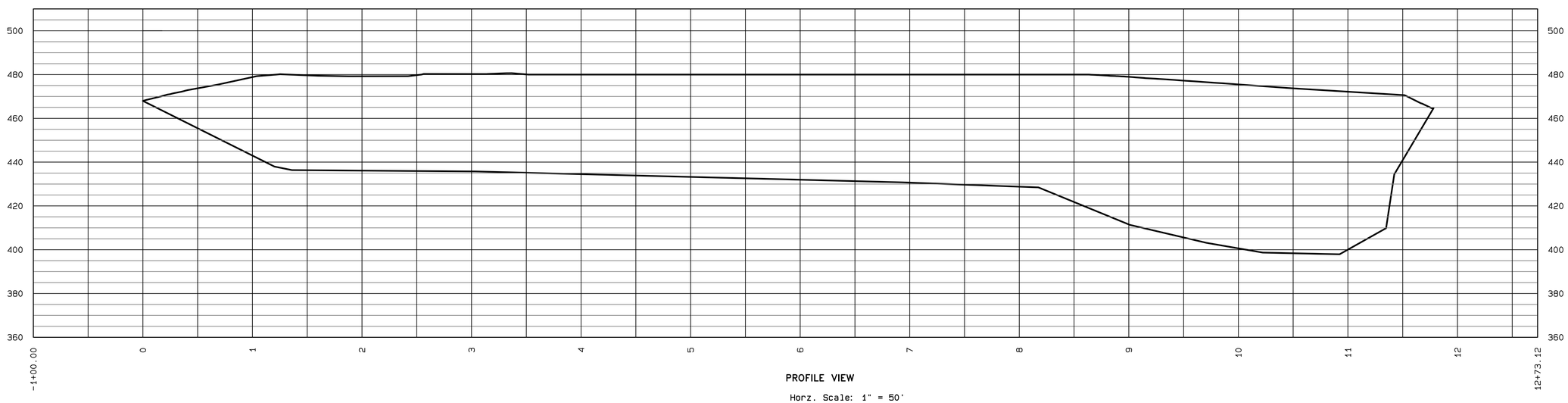
PLAN VIEW

Scale: 1" = 50'

EXCAVATION QUANTITY FOR GRADING SHOWN
IS 180,750 CU YDS

GRAPHIC SCALE 1"=50'

0 50 100 150



PROFILE VIEW

Horz. Scale: 1" = 50'

Project Desc.: Path: N:\RADWBarrier\bridgeton hbarrier1.pro Plot Date/Time: Thu Mar 28,2013 / 15:47:48

BRIDGETON LANDI
BRIDGETON, MO

REVISION	DATE
1	
2	
3	
4	
5	

P. J. CAREY & ASSOCIATES, P.C.
5879 VALINE WAY, SUGAR HILL, GA. 30518

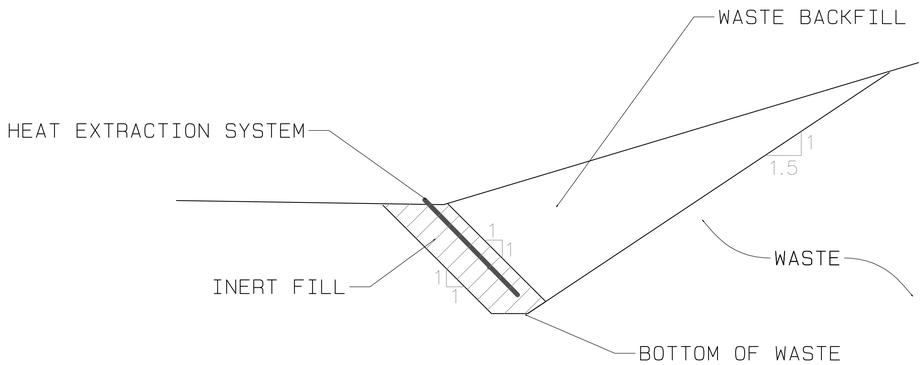
PROJ. NO.: Set by PRJINFO command 4
DATE: 3/28/2013
DESIGNED BY:
DRAWN BY:
CHECKED BY: PRJCLNT 6
APPROVED BY: PRJCLNT 7

EXCAVATION N-3
1:1 ON NORTH
15:1 ON SOUTH

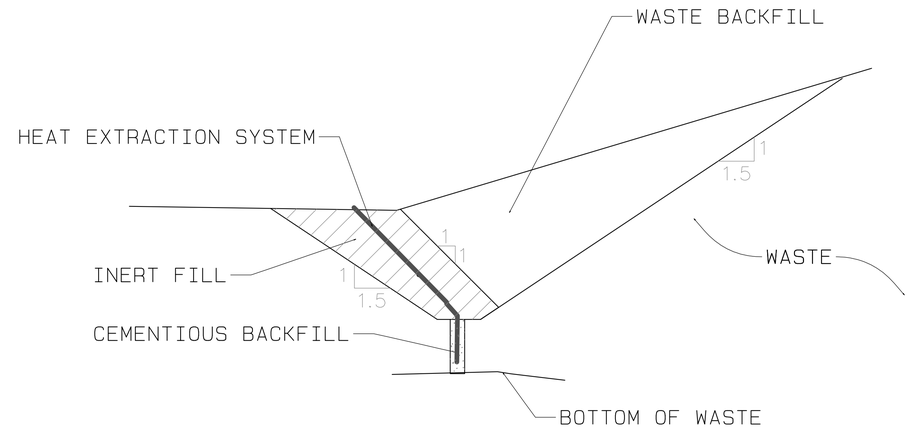
NORTH QUARRY BARRIER
CONCEPTUAL PLANNING
BRIDGETON LF

DRAWING
C-4

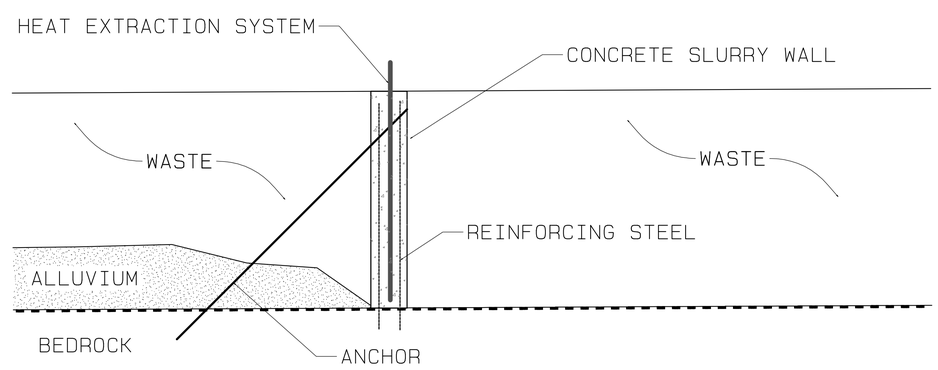
SHEET 5
OF 5



OPEN EXCAVATION



OPEN EXCAVATION
WITH 15 FOOT TRENCH BOX



SLURRY WALL
AT MAXIMUM DEPTH

BRIDGETON LANDI
BRIDGETON, MC

REVISION	DATE
1	
2	
3	
4	
5	

P. J. CAREY & ASSOCIATES, P.C.
5879 VALINE WAY, SUGAR HILL, GA. 30518

PROJ. NO.: Set by PRJINFO command 4
DATE: 3/28/2013
DESIGNED BY:
DRAWN BY:
CHECKED BY: PRJCLNT 6
APPROVED BY: PRJCLNT 7

CONCEPTUAL
CROSS SECTIONS

NORTH QUARRY BARRIER
CONCEPTUAL PLANNING
BRIDGETON LF

DRAWING
C-5

SHEET 6
OF 6

Project Desc.: Path: N:\RADWBarrier\bridgeton hbarrier1.prc Plot Date/Time: Thu Mar 28,2013 / 15:47:55

Work Plan for the Barrier at the North Limits of the North Quarry Fill

1 Tasks

1.1 Preliminary Layout and Concept

1.2 Confirmation of No Rad Waste in Excavation Area –

1.2.1 Evaluate current knowledge base

1.2.2 Determine if added information is needed to insure no RIM is encountered in the excavation

1.2.3 Develop plan (if required) for Gathering Supplemental RIM information

1.2.4 Perform Supplemental RIM Identification Field Work (if needed)

1.2.5 Finalize southernmost Limits of RIM waste to use for project

1.2.6 Perform any Field work needed to finalize concept (borings, test pits etc)

1.3 Finalization of Alignment and Concept

1.3.1 Modify Alignment and Concept to Avoid All RAD waste

1.3.1.1 Adjust alignment and slopes/excavation methods as required

1.3.1.2 Identify locations for access, staging and stormwater management

1.3.1.3 Deposition of waste materials (on site of off site)

1.3.1.4 Identification of permits required and time frames needed for approvals from regulatory agencies

1.3.2 Obtain Approval of Finalized Concept

1.4 Detailed Design

1.4.1 Preliminary Design Work

1.4.1.1 Develop design details for anticipated support system on NE end of work

1.4.1.2 Develop sequence of operations

1.4.1.3 Stormwater management integration for temporary excavation work

1.4.1.4 Air(dust and odor) management practices

1.4.1.5 Decon Area requirements

1.4.1.6 Heat Exchange System and Earthen fill requirements

1.4.1.7 Excavated waste disposition

1.4.1.8 Preparation of permit packages if needed

1.4.2 Final Design

1.4.2.1 Plans clearly identifying work need

1.4.2.2 Finalize Analyses

1.4.2.3 Finalize Monitoring and QA/QC requirements

1.4.2.4 Complete permit application packages

1.5 Construction Package Development

1.5.1 Plans

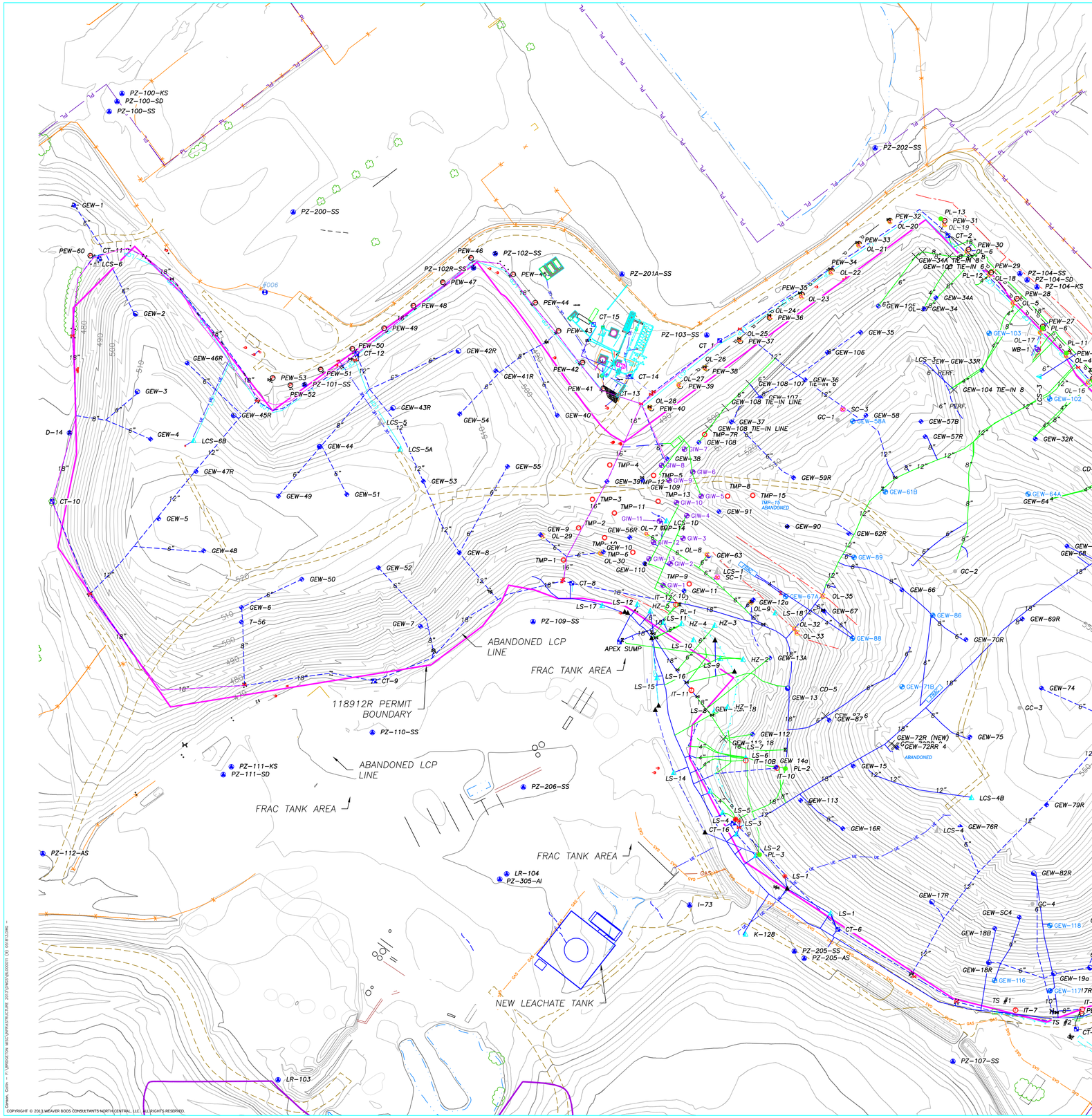
1.5.2 Specifications

1.5.3 Quantities

1.5.4 Bid Documents

APPENDIX B

EXCERPTS FROM DRAWINGS OF EXISTING MITIGATIVE MEASURES



NOTES:

1. EXISTING GRADE CONTOURS OBTAINED FROM THE FOLLOWING SOURCES:

   1.1. AERIAL SURVEY COMPLETED BY THE SANBORN MAPPING COMPANY ON JULY 20, 2011; AND

   1.2. TOPOGRAPHIC SURVEYS COMPLETED BY AQUATERRA ENVIRONMENTAL SOLUTIONS ON AUGUST 7, 2012, NOVEMBER 1, 2012, AND NOVEMBER 15, 2012.

2. THE LOCATION OF LANDFILL GAS COLLECTION AND CONTROL SYSTEM COMPONENTS ARE BASED ON ONGOING SURVEYS COMPLETED BY AQUATERRA, WHERE AVAILABLE, AND APPROXIMATE OTHERWISE.

3. CONSTRUCTED COMPONENT TYPES, DIMENSIONS AND LOCATIONS ARE BASED ON AS-BUILT INFORMATION, WHERE AVAILABLE, AND APPROXIMATE OTHERWISE.

4. THE LOCATION OF THE 118912R WASTE BOUNDARY OBTAINED FROM "WASTE LIMITS INVESTIGATION SUMMARY REPORT", AQUATERRA ENVIRONMENTAL SOLUTIONS, INC. DATED AUGUST 29, 2011.

LEGEND:

- EXISTING 10' CONTOURS
- BUILDING OR STRUCTURE
- FENCE
- POWER POLE
- BOLLARDS
- GUY POLE
- ELECTRIC BOX/PANEL
- TREE LINE
- PAVED ROAD
- UNPAVED ROAD
- ABOVEGROUND LFG COLLECTION PIPE
- UNDERGROUND LFG COLLECTION PIPE
- GEW-34 LFG COLLECTION WELL
- GEW-2 LFG DUAL EXTRACTION WELL
- GEW-100 2013 LFG EXTRACTION WELL
- GIW-12 2013 LFG INTERCEPTOR WELL
- PERIMETER LFG COLLECTION PIPE
- PGW-1 PERIMETER LFG COLLECTION WELL
- CT-4 CONDENSATE SUMP
- VALVE
- MAIN VALVE
- AIR LINE
- CONDENSATE FORCEMAIN
- COMBINED AIR & FORCEMAIN
- HZ-2 HORIZONTAL COLLECTION SUMP
- LCS-6B LEACHATE COLLECTION SUMP
- LCP LEACHATE COLLECTION PIPE
- LEACHATE DISCHARGE
- GMP-8 LFG MONITORING PROBE
- GMP-12 PUBLIC SAFETY MON. PROBE
- TMP-1 TEMPORARY LFG MONITORING PROBE
- TMP-1 THERMOCOUPLE MONITORING PROBE
- PZ-204-SS GROUNDWATER WELL
- UE ELECTRIC LINE
- GAS GAS LINE
- #006 STORMWATER OUTFALL
- SC-2 SURFACE COLLECTOR
- OL-1 OVER LINER TIE-IN POINT
- WB-1 WELL BORE BOOT
- PL-1 PERIMETER LINE COLLECTION
- CLEANOUT
- TS #1 TRENCH SUMP
- IT-1 INTERCEPTION TRENCH WELL
- PERIMETER SWALE GATE VALVE
- INTERCEPTION TRENCH
- GEOMEMBRANE
- 118912R PERMIT BOUNDARY
- BUBBLE SUCKER
- PL PROPERTY LINE
- GAS GAS LINE

SCALE: 1" = 100'
0 50' 100' 200'

WEAVER BOOS CONSULTANTS

1823 N WILLE ST, SUITE A
NAPERVILLE, ILLINOIS
(630) 717-4488

CHICAGO, IL
NAPERVILLE, IL
FORT WORTH, TX
GRAND RAPIDS, MI

CLEVELAND, OH
DENVER, CO
ORLANDO, FL

F:\LAGCAP CORE CWI MSC MODELS\BP

No.	DATE	REVISION DESCRIPTION

PREPARED FOR REPUBLIC SERVICES, INC.

SITE LAYOUT
GCCS LOCATIONS
BRIDGETON LANDFILL, LLC

REUSE OF DOCUM
This document, and the designs herein, as an instrument of pr service, is the property of Wea Consultants North Central, LLC. be used in whole or in part, witho authorization of Weaver Boos C North Central, LLC.

DRAWN BY:
DESIGNED BY:
REVIEWED BY:
DATE: 05/1
FILE: 0120-13
BL0000011 (9) 051813

SHEET 1

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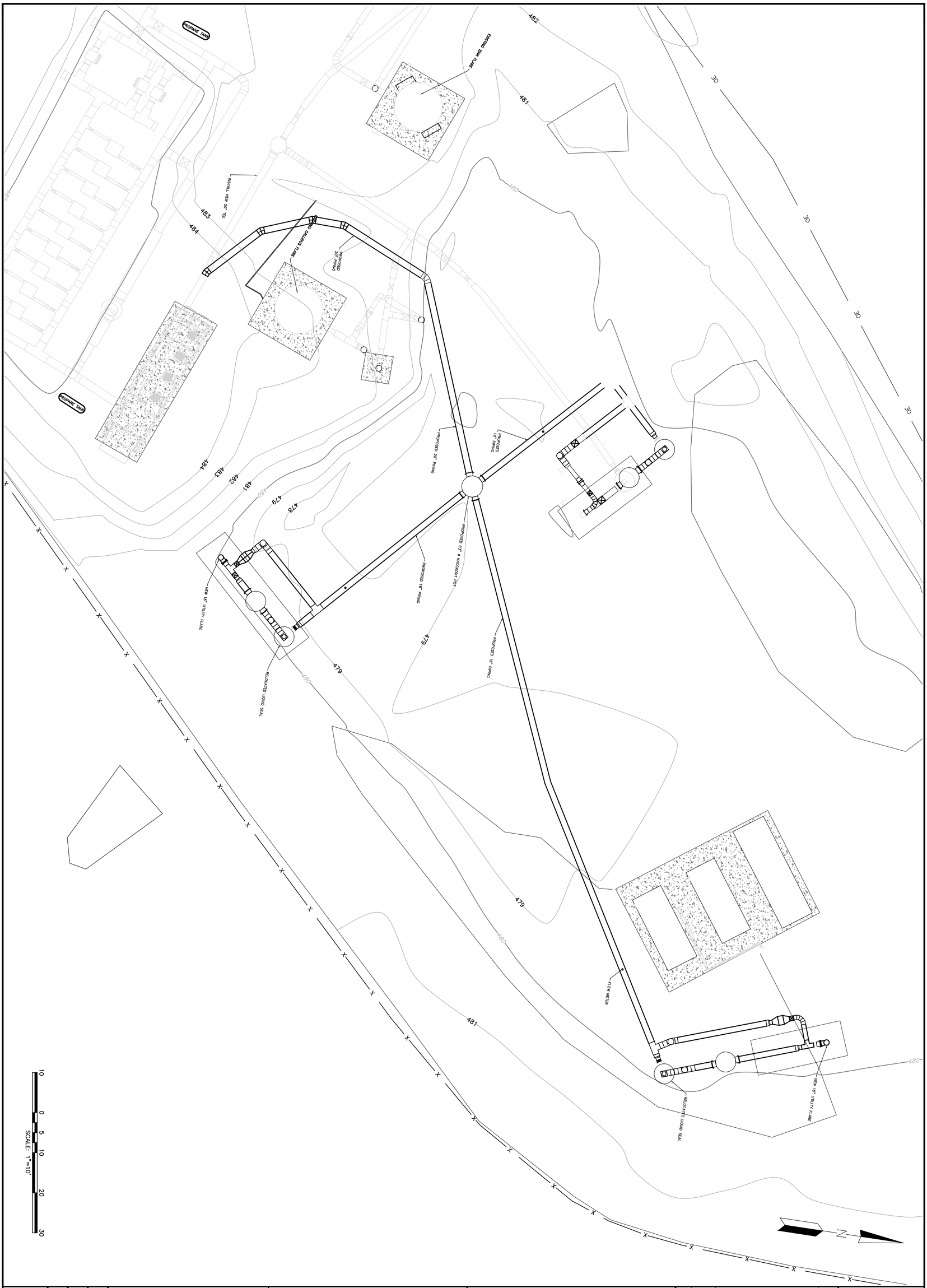
I:\PROJECT\2011 PROJECTS\23211003.01 BRIDGETON LF B-F REDESIGN\DELIVERABLES\BLOWER FLARE MODIFICATIONS 2013\BRIDGETON SCS AS-BUILTS V3.DWG



SCALE: 1"=10'

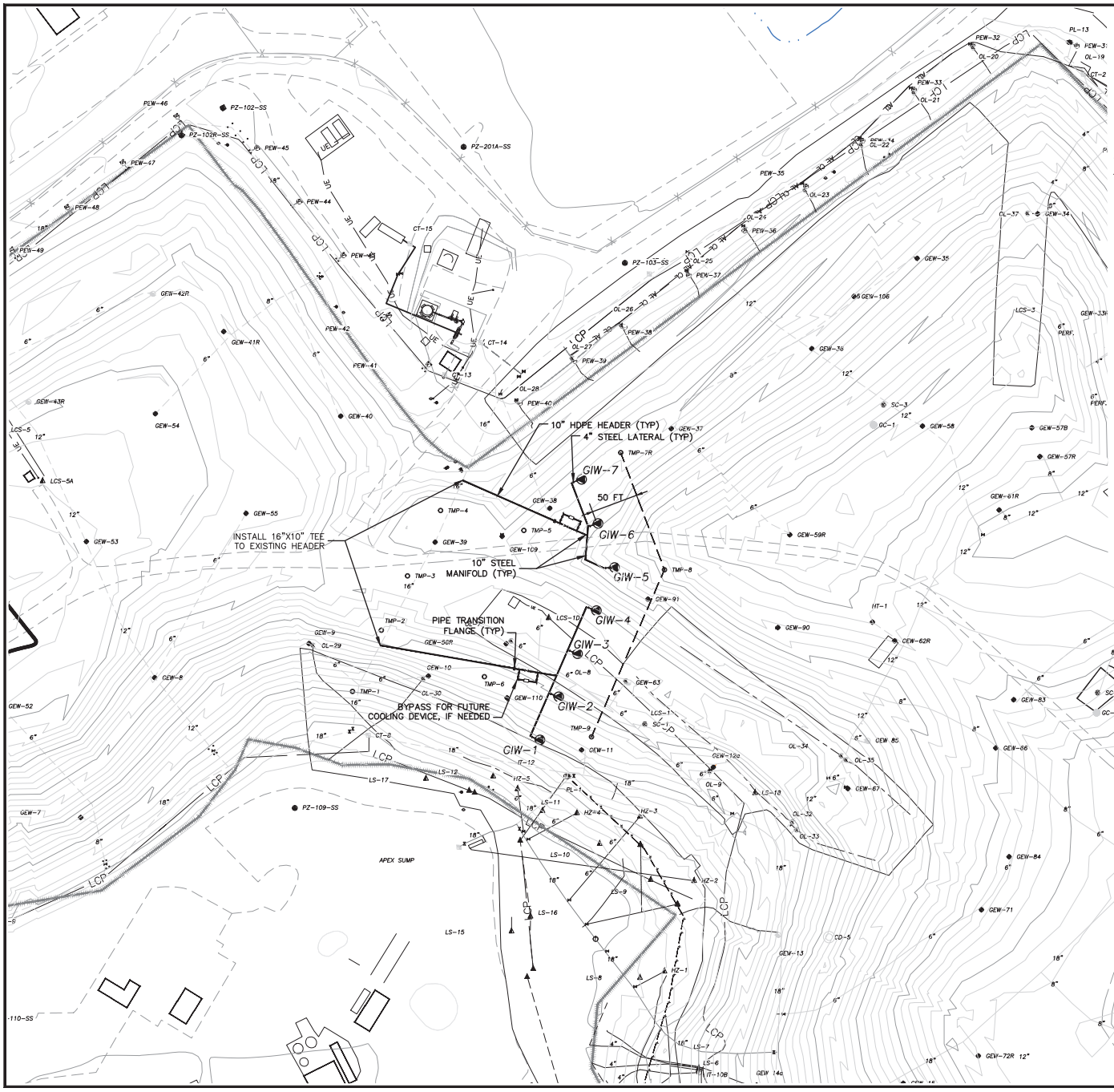
5 of 12	DRAWING NO.	SCALE: AS SHOWN	DATE: 6/4/13	CADD FILE: AS-BUILTS V2	**SCS ENGINEERS** **STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.** 2060 READING ROAD, SUITE #200, CINCINNATI, OHIO 45202 PH. (513) 421-5353 FAX NO. (513) 421-2847	PROJ. NO. 23211003.01	DWN. BY: FDB	Q/A RVW BY: MSB	DSN. BY: FDB	CHK. BY: CES/MSB

CLIENT:
BRIDGETON LANDFILL, LLC.
13570 ST. CHARLES ROCK ROAD
BRIDGETON, MO 63044

SHEET TITLE
PROPOSED FLARE AND PIPING LAYOUT

PROJECT TITLE
BRIDGETON LANDFILL
2013 BLOWER/FLARE STATION MODIFICATIONS

REV.	DATE	DESCRIPTION	CK. BY



LEGEND

- EXISTING 10' CONTOURS
- EXISTING 2' CONTOURS
- BUILDING
- FENCE
- WATER
- PAVED ROAD
- UNPAVED ROAD
- PERMITTED WASTE LIMITS
- LFG COLLECTION PIPE
- GEW-34 LFG COLLECTION WELL
- GEW-2 LFG DUAL-EXTRACTION WELL
- VALVE
- SC-1 SURFACE COLLECTOR
- OL-1 OVER LINER TIE-IN POINT
- WB-1 WELL BORE BOOT
- CLEANOUT
- STORM WATER OUTFALL
- PL
- ELECTRIC LINE
- CT-4 CONDENSATE SUMP
- 2012 HEADER PIPE
- GEW-100 2012 PROPOSED WELLS
- LEACHATE COLLECTION PIPE
- LEACHATE DISCHARGE
- LCS-1D LEACHATE COLLECTION SUMP
- GMP-12 LFG MONITORING PROBE
- PGW-39 PERIMETER LFG COLLECTION WELL
- PERIMETER CONNECTION PIPE
- LFG INTERCEPTION TRENCH WELL
- 100-SD GROUNDWATER WELL
- LFG INTERCEPTION TRENCH
- PROPERTY LINE
- POWERPOLE

NOTES:

1. EXISTING GRADE CONTOURS SHOWN ARE FROM AERIAL SURVEY COMPLETED BY THE SANBORN MAPPING COMPANY ON FEBRUARY 19, 2009. CONTOURS WITHIN THE WASTE BOUNDARY ON THE SOUTH END ARE TAKEN FROM A GROUND SURVEY COMPLETED BY SHERBUT-CARSON-CLAXTON, LLC IN MAY 2011.
2. LOCATION OF LANDFILL GAS COLLECTION AND CONTROL SYSTEM COMPONENTS IS BASED ON AS-BUILT INFORMATION, WHERE AVAILABLE, AND APPROXIMATED OTHERWISE.
3. CONSTRUCTED COMPONENT TYPES, DIMENSIONS, AND LOCATIONS ARE BASED ON AS-BUILT INFORMATION, WHERE AVAILABLE, OTHERWISE THEY ARE APPROXIMATE.
4. BASE MAP PROVIDED BY AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

REV.	DATE	DESCRIPTION	CK. BY

SHEET TITLE: WELL LAYOUT PLAN

PROJECT TITLE: BRIDGETON LANDFILL 2013 GAS INTERCEPTOR WELL DESIGN

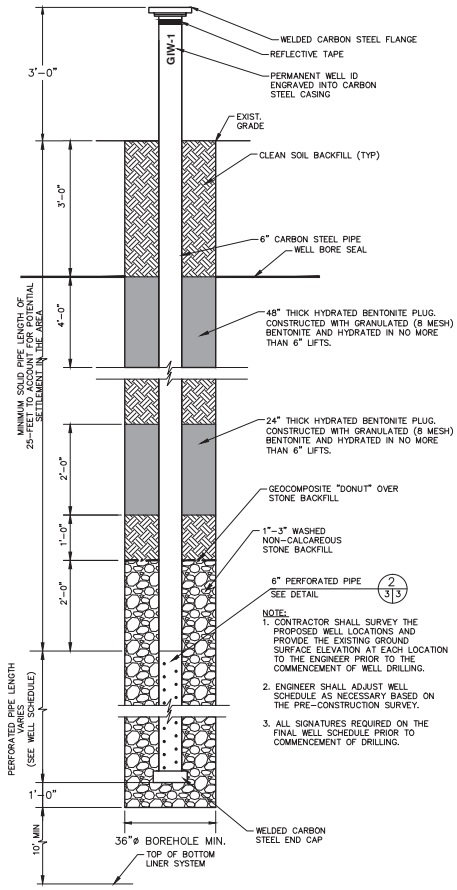
CLIENT: BRIDGETON LANDFILL, LLC
BRIDGETON LANDFILL
13570 ST. CHARLES ROCK ROAD
BRIDGETON, MO 63044

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
3900 KORNER ROAD, SUITE 100, CINCINNATI, OHIO 45202
PH. (513) 421-5353 FAX NO. (513) 421-2847

PROJ. NO. 23211003.00 | DWN. BY: FDB | Q/A CHK BY: DAE
SBK. NO. FDB | CHK. BY: JJW

CADD FILE: SITE MAP
DATE: 1/10/2013
SCALE: AS SHOWN
DRAWING NO. 2 of 3

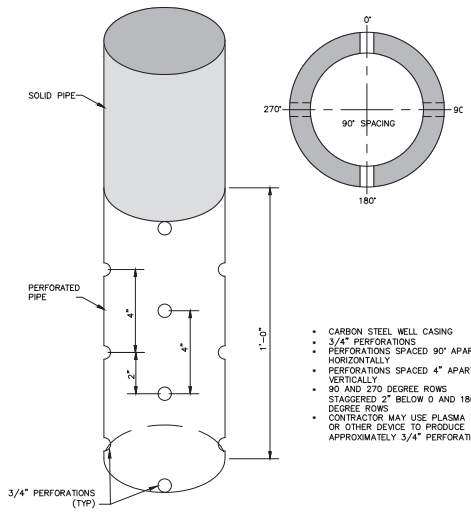
C:\WORK\23211003 BRIDGETON LF ENG ASSISTANCE\DELIVERABLES-REPORTS\INTERCEPTOR WELLS\SITE MAP 1-9-13.DWG



NOTE:
1. CONTRACTOR SHALL SURVEY THE PROPOSED WELL LOCATIONS AND PROVIDE THE EXISTING GROUND SURFACE ELEVATION AT EACH LOCATION TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF WELL DRILLING.
2. ENGINEER SHALL ADJUST WELL SCHEDULE AS NECESSARY BASED ON THE PRE-CONSTRUCTION SURVEY.
3. ALL SIGNATURES REQUIRED ON THE FINAL WELL SCHEDULE PRIOR TO COMMENCEMENT OF DRILLING.

NOTE:
1. CARBON STEEL WELL SECTIONS CAN BE CONNECTED USING OUTSIDE THREADED COUPLERS, OR WELDED STEEL FLANGES.

GAS INTERCEPTOR WELL DETAIL 1/2|3
NOT TO SCALE



- CARBON STEEL WELL CASING
- 3/4" PERFORATIONS
- PERFORATIONS SPACED 90° APART HORIZONTALLY
- PERFORATIONS SPACED 4" APART VERTICALLY
- 90 AND 270 DEGREE ROWS STAGGERED 2" BELOW 0 AND 180 DEGREE ROWS
- CONTRACTOR MAY USE PLASMA TORCH OR OTHER DEVICE TO PRODUCE APPROXIMATELY 3/4" PERFORATIONS

PERFORATION DETAIL 2/3|3
NOT TO SCALE

WELL SCHEDULE

LANDFILL GAS COLLECTION SYSTEM
WELL FIELD SCHEDULE

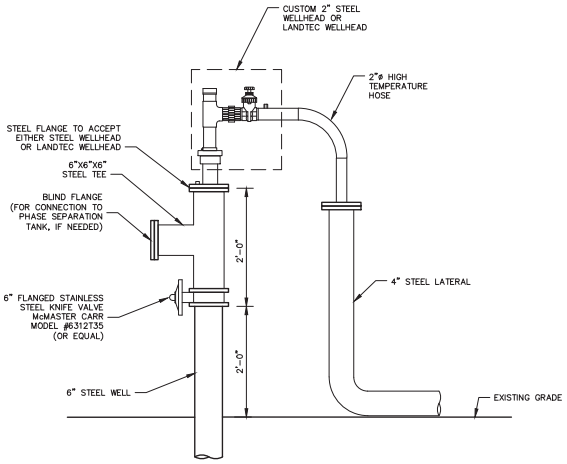
Well No.	Location Coordinates N-S	Location Coordinates E-W	Surface Elevation (ft MSL)	Waste Bottom Elevation (ft MSL)	Landfill Depth (ft)	Borehole Depth (ft)	Well Pipe Depth (ft)	Slotted Pipe Depth (ft)	Solid Pipe Depth (ft)	Above Grade Riser (ft)	Thickness of Gravel Pack (ft)
GIW-1	1,067,752	516,216	477.4	420.4	57	57	56	31	25	5	34
GIW-2	1,067,732	516,261	490.6	280.0	211	150	149	124	25	5	127
GIW-3	1,067,712	516,307	495.9	275.9	220	150	149	124	25	5	127
GIW-4	1,067,692	516,353	501.1	270.2	231	150	149	124	25	5	127
GIW-5	1,067,672	516,399	511.8	270.0	242	150	149	124	25	5	127
GIW-6	1,067,690	516,446	510.0	270.0	240	150	149	124	25	5	127
GIW-7	1,067,707	516,493	501.9	329.1	173	150	149	124	25	5	127
Total						957	950	775	175	35	796

NOTES:

1. THIS DRAFT WELL SCHEDULE IS NOT INTENDED FOR CONSTRUCTION UNTIL ACTUAL SURVEY DATA IS OBTAINED AND THE WELL SCHEDULE IS REVISED BY THE ENGINEER.
2. SURVEYOR SHALL LOCATE WELLS AND VERIFY SURFACE ELEVATIONS BEFORE CONSTRUCTION. A PRE-CONSTRUCTION SURVEY (NORTHING/EASTING/ELEVATION DATA) SHALL BE PROVIDED TO THE ENGINEER A MINIMUM OF 2 WEEKS PRIOR TO CONSTRUCTION. ENGINEER SHALL VERIFY THE WELL SCHEDULE BASED ON THE PRE-CONSTRUCTION SURVEY.
3. FOLLOWING REVIEW OF SURVEY DATA, CONTRACTOR SHALL GET AUTHORIZATION FROM OWNER AND ENGINEER PRIOR TO DRILLING.
4. WELL DEPTHS BASED ON TOPOGRAPHIC SURVEYED BY SHERBERT-CARSON-CLAXTON, DATED MAY 2011, AND BASE GRADES OBTAINED FROM MIDWEST ENVIRONMENTAL CONSULTANTS APRIL 1998 LANDFILL GAS RECOVERY SYSTEM DESIGN.

DESIGN FIRM QA/QC REVIEWER ACKNOWLEDGEMENT: _____ DATE
DESIGN FIRM PROJECT MANAGER ACKNOWLEDGEMENT: _____ DATE
ENVIRONMENTAL MANAGER: _____ DATE
CQA INSPECTOR: _____ DATE
SURVEYOR ACKNOWLEDGEMENT: _____ DATE
DRILLER ACKNOWLEDGEMENT: _____ DATE

UNDER NO CIRCUMSTANCES SHALL DRILLING ACTIVITIES BEGIN WITHOUT PROVIDING THE ABOVE SIGNATURES. ANY CHANGES TO WELL LOCATIONS OR DEPTHS SHALL REQUIRE THESE SIGNATURES TO BE OBTAINED AGAIN.



WELLHEAD DETAIL 3/3|3
NOT TO SCALE

REV.	DATE	DESCRIPTION	CK. BY
1	7/27/12	RESPONSE TO MDNR COMMENTS	

SHEET TITLE: CARBON STEEL INTERCEPTOR WELL DETAILS
PROJECT TITLE: BRIDGETON LANDFILL 2013 GAS INTERCEPTOR WELL DESIGN

CLIENT: BRIDGETON LANDFILL, LLC. BRIDGETON LANDFILL 13570 ST. CHARLES ROCK ROAD BRIDGETON, MO 63044

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
200 SCHMIDT BLVD., SUITE 200, DAYTON, OHIO 45202
PH. (513) 231-5300 FAX NO. (513) 231-2847

PROJ. NO. 23211003.00 | DWG. BY: FDB | Q/A RVW BY: DAE
DSN. BY: FDB | CHK. BY: JJW

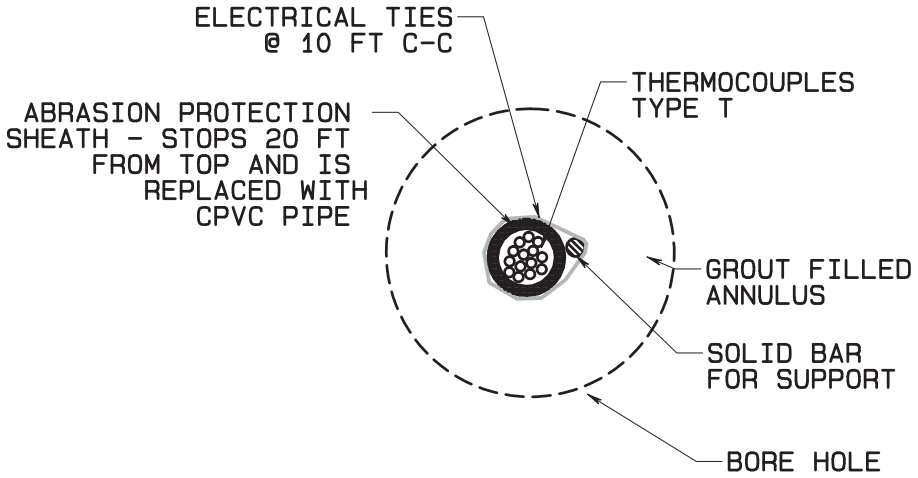
CADD FILE: SHEET 3
DATE: 1/10/2013
SCALE: NONE
DRAWING NO. 3 of 3

C:\WORK\23211003 BRIDGETON LF ENG ASSISTANCE\DELIVERABLES-REPORTS\WITERCEPTOR WELLS\SHEET 34 - DETAILS 01-09-13.DWG

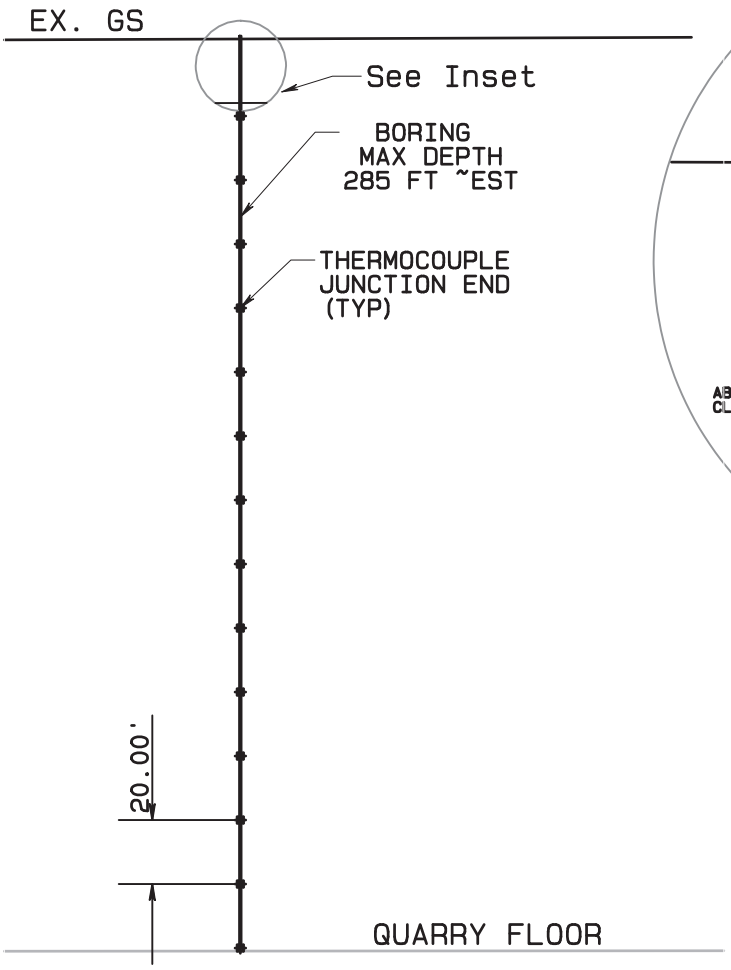
FIGURE 1

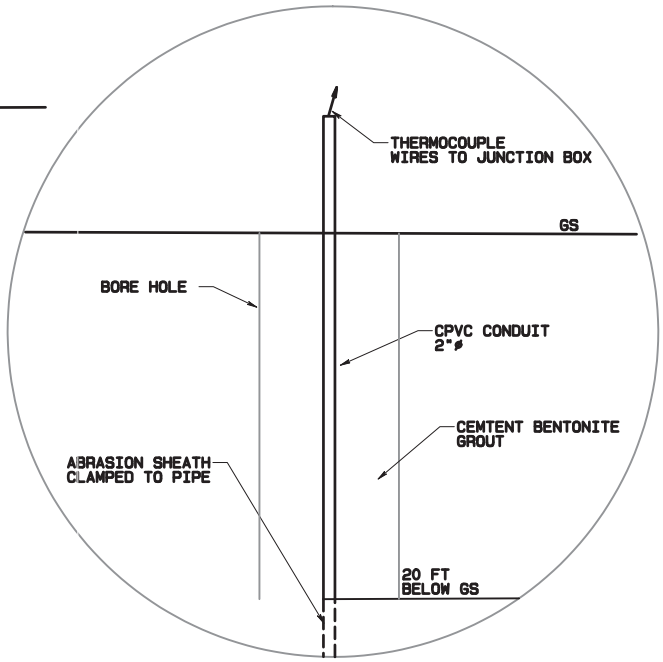
TMP LOCATION PLAN

PREPARED BY: P. J. CAREY & ASSOCIATES, PC



TMP
SECTION VIEW
1"= 4"





INSET

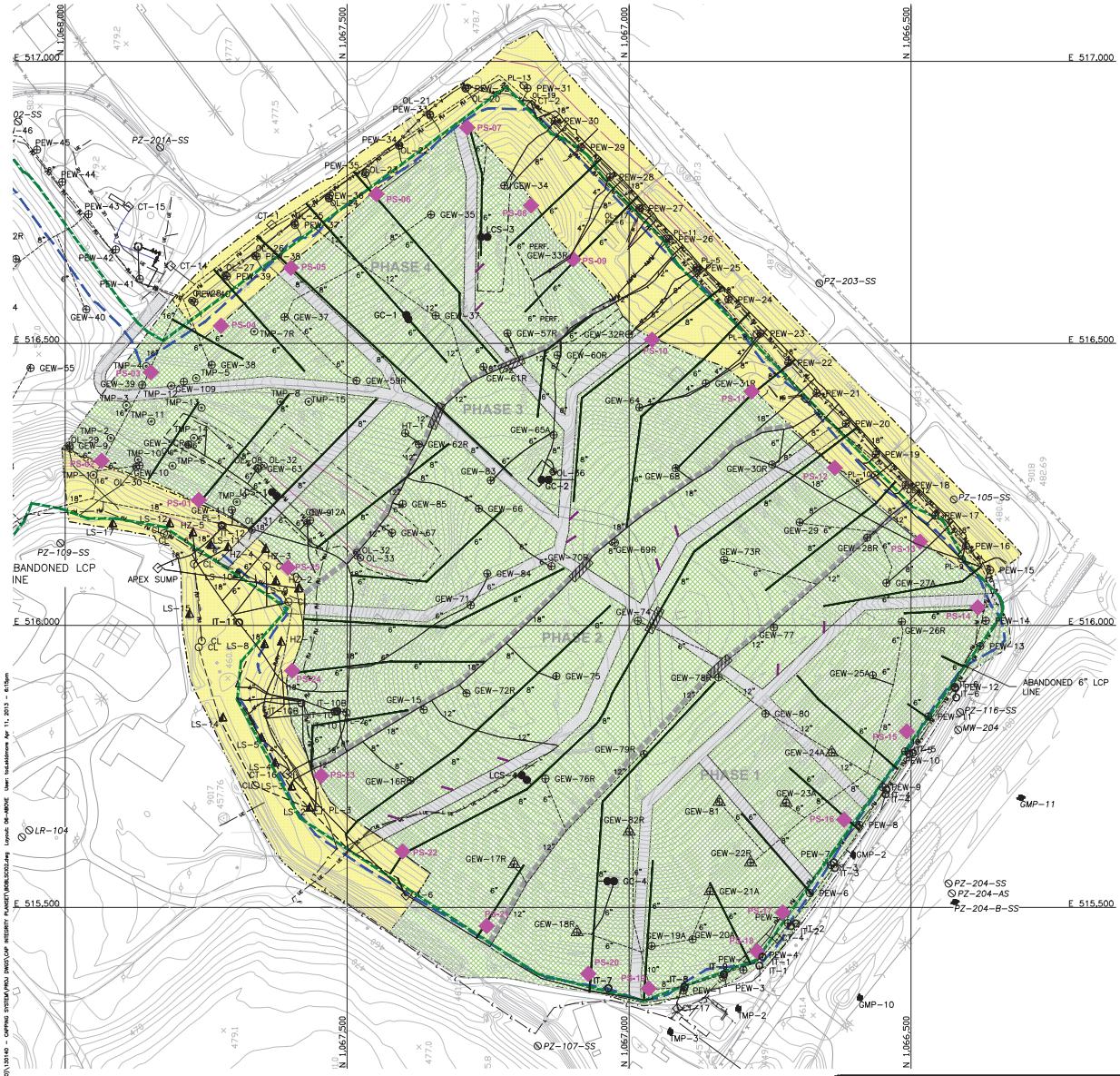
FIGURE 2
TMP INSTALLATION

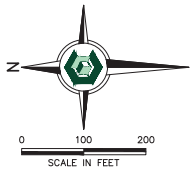
BRIDGETON LANDFILL
TEMPERATURE MONITORING

DESIGNED BY	P.J.C	CHECKED BY	
DRAWN BY	P.J.C	DATE	9/13/2012
SCALE: AS SHOWN	Drawing No. DRAWING	SHEET No. FIGURE 2	Revision No. 0

P. J. Carey & Associates, P.C.

Project Desc.: Path: N:\Bridgeton\Bridgeton Temp.prp Plot Date/Time: Thu Sep 13,2012 / 16:06:57





LEGEND

	EXISTING SOLID WASTE BOUNDARY
	PHASE BOUNDARY
	EXISTING QUARRY HIGH WALL
1400	EXISTING 10' CONTOUR
	EXISTING 2' CONTOUR
12"	EXISTING LANDFILL GAS HEADER
	EXISTING LANDFILL GAS HEADER – UNDERGROUND
	EXISTING HORIZONTAL LFG COLLECTOR
—NW—	EXISTING LEACHATE FORCEMAIN
—C—	EXISTING CONDENSATE DRAIN LINE
—A—	EXISTING AIR LINE
—UE—	EXISTING UNDERGROUND ELECTRIC
	EXISTING BUBBLE SUCKER
	EXISTING TEMPORARY CAP
	PROPOSED TEMPORARY CAP
	LIGHT-DUTY ACCESS ROADS (SEE DETAIL 1/10)
GEW-81	EXISTING LFG EXTRACTION WELL
GEW-2	EXISTING LFG EXTRACTION WELL – COMBO
PEW-4	EXISTING LFG PERIMETER EXTRACTION WELL
PEW-4	EXISTING LFG PERIMETER EXTRACTION WELL
CT-1	EXISTING CONDENSATE PUMP STATION
TMP-1	EXISTING TEMPERATURE MONITORING PROBE
GMP-11	EXISTING GAS MONITORING PROBE
IT-3	EXISTING INTERCEPTION TRENCH WELL
	PROPOSED LFG LATERAL (SEE DETAILS 2/10 AND 3/10)
PS-07	PROPOSED CONDENSATE PUMP STATION (SEE DETAIL 1/8)
LCS-1	PROPOSED RCP ABANDONMENT RISERS (SEE DETAIL 4/8)
	PROPOSED DEFLECTOR PIPE BERM (SEE DETAIL 9/10)
	PROPOSED CULVERT PROTECTION FOR GAS LATERAL

NOTES:

1. THE 2013 TOPOGRAPHIC MAP WAS PROVIDED BY COOP AERIAL SURVEYORS, CO., PHOENIX, AZ. DATE OF PHOTO: 02/13/2013.
2. UTILITIES SHOWN TAKEN FROM DRAWING 1 OF 1 "SITE INFRASTRUCTURE" BY AQUATERRA ENVIRONMENTAL SOLUTIONS, INC. DATED 01/09/13.
3. A NEW DOUBLE-WALLED 3" HDPE SDR 11 / 6" HDPE SDR 17 FORCEMAIN WILL BE CONSTRUCTED ABOVE THE CAP AROUND THE PERIMETER OF THE SOUTH QUARRY AS NECESSARY TO CONVEY LIQUID FROM THE PERIMETER COLLECTION SUMP (SHOWN IN DETAIL 1, SHEET 8) TO THE LEACHATE MANAGEMENT SYSTEM.
4. ALL OVER LINER TIE IN POINTS, PERIMETER LINE COLLECTION RISERS, AND INTERCEPTION TRENCH WELLS TO BE MAINTAINED AND BOOTED THROUGH THE NEW FML.

STATE OF MISSOURI
BRIAN O. SMITH
NUMBER E-26255
PROFESSIONAL ENGINEER
4/11/13

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY
1	04/11/13	REVISED PER MDNR COMMENTS	TSS	JGW	ASL	BOS

DATE OF ISSUE 03/25/13 | DRAWN BY TSS | DESIGNED BY TAB | CHECKED BY JGW | APPROVED BY BOS

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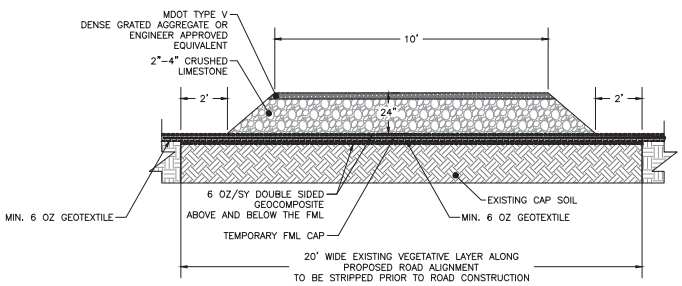
BRIDGETON LANDFILL, LLC.
BRIDGETON LANDFILL
BRIDGETON, MISSOURI

TEMPORARY CAP AND CAP INTEGRITY SYSTEM
CAP INTEGRITY SYSTEM - ABOVE TEMPORARY CAP

SHEET NO. **6**

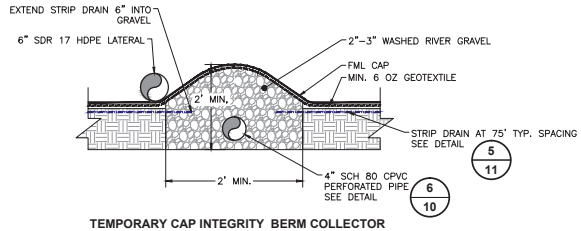
PROJECT NO. 130140

File: X:\PROJECTS\BRIDGETON (NOT)\130140 - CAPPING SYSTEM\PROJ\PROS\CAP INTEGRITY PLANSET\MDNR\SCR01.dwg Layout: 06-ABOVE User: tsolsimone Apr 11, 2013 - 6:15am



LIGHT-DUTY ACCESS ROAD

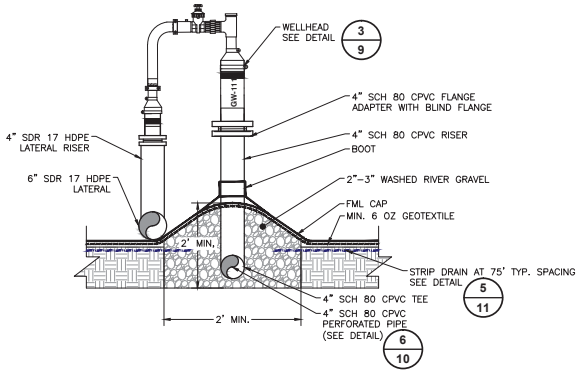
DETAIL 1/10
SCALE: NOT TO SCALE



TEMPORARY CAP INTEGRITY BERM COLLECTOR

DETAIL 2/10
SCALE: NOT TO SCALE

NOTE: WELLHEAD COLLECTION POINTS SHALL BE INSTALLED AT MAXIMUM 500' SPACING

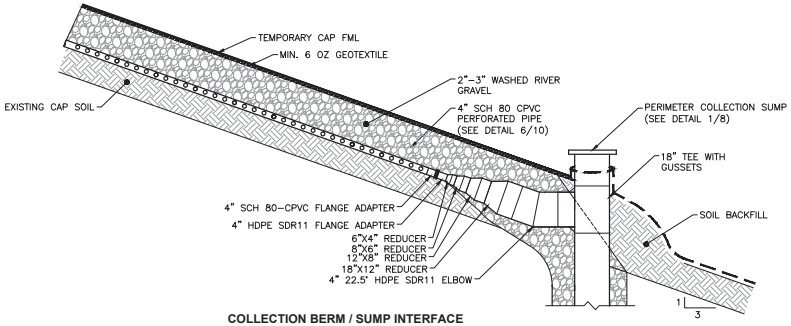


TEMPORARY CAP INTEGRITY BERM COLLECTOR WITH RISER

DETAIL 3/10
SCALE: NOT TO SCALE

NOTES:

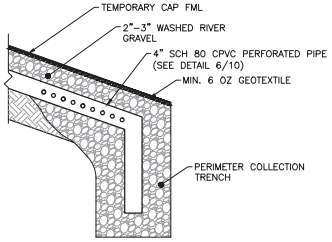
1. WELLHEAD COLLECTION POINTS SHALL BE INSTALLED AT MAXIMUM 500' SPACING.
2. SEE SHEET 5 FOR TEMPORARY CAP LINER TERMINATION LOCATIONS.



COLLECTION BERM / SUMP INTERFACE

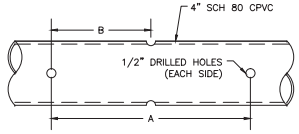
DETAIL 4/10
SCALE: NOT TO SCALE

NOTE: SEE SHEET 5 FOR TEMPORARY CAP LINER TERMINATION LOCATIONS.



COLLECTOR BERM TERMINATION

DETAIL 5/10
SCALE: NOT TO SCALE

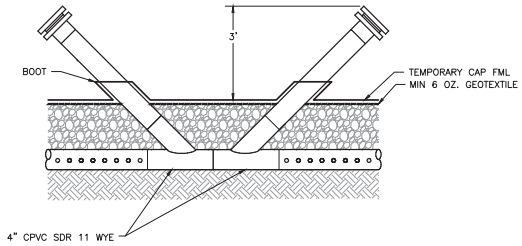


HORIZONTAL COLLECTION PIPE

NOTES:

1. A=20"
   B=10"
   90° ROTATION BETWEEN ROWS
2. ALTERNATIVE PATTERN MAY BE USED WITH APPROVAL OF EM.

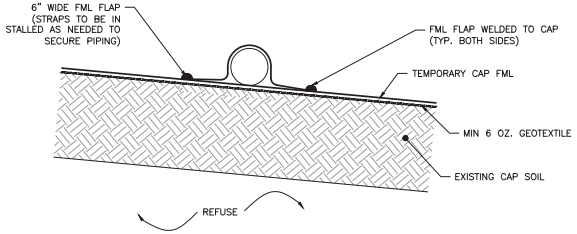
DETAIL 6/10
SCALE: NOT TO SCALE



PERIMETER COLLECTOR TRENCH CLEANOUT RISERS

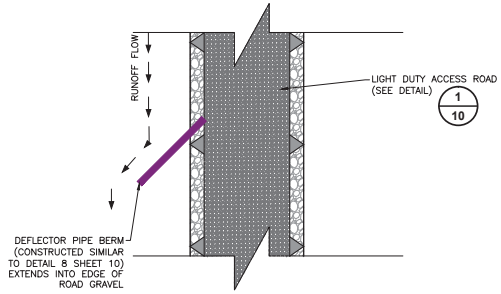
DETAIL 7/10
SCALE: NOT TO SCALE

NOTE: INSTALL AT 500' INTERVAL OR MID-POINT BETWEEN SUMPS.



ABOVE CAP PIPE ANCHOR

DETAIL 8/10
SCALE: NOT TO SCALE



DEFLECTOR PIPE BERM

DETAIL 9/10
SCALE: NOT TO SCALE

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY
1	04/11/13	REVISED PER MDNR COMMENTS	TSS	JGW	ASL	BOS

DATE OF ISSUE 03/25/13 | DRAWN BY TSS | DESIGNED BY TAB | CHECKED BY JGW | APPROVED BY BOS

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BRIDGETON LANDFILL, LLC.
BRIDGETON LANDFILL
BRIDGETON, MISSOURI

TEMPORARY CAP AND CAP INTEGRITY SYSTEM DETAILS

SHEET NO. 10
PROJECT NO. 130140

File: G:\PROJECTS\BRIDGETON (NOT)\130140 - CAPPING SYSTEM\PROJ DWGS\CAP INTEGRITY PLANSET\BRIDEC02A.DWG Layout: DETAILS-10 User: tsteinbronner Apr 11, 2013 - 3:08pm

APPENDIX C

JUNE 25, 2013 WEEKLY DATA REPORT

Bridgeton Landfill, LLC

Weekly Data Submittals

Required by Section 52.F of Agreed Order, Case No. 13SL-CC01088
Effective May 13, 2013

Contents:

Attachment A – Leachate Levels in Leachate Collection Sumps
Attachment B – Temperature Monitoring Probe Analytical Charts
Attachment C – Gas Interceptor Wellhead Temperature Graphs

Provided Separately:

- **Leachate Level in Leachate Collection Sump Raw Data Excel Spreadsheet**
- **Temperature Monitoring Probe Raw Data Excel Spreadsheet**
- **Gas Interceptor Well Reading Raw Data Excel Spreadsheet**

June 25, 2013

Commentary on Data

Attachment A – Leachate Levels in Leachate Collection Sumps

Bridgeton Landfill has installed replacement sump LCS-3C but is unable to install a pump due to excessive pressures and surging conditions. A replacement for LCS-4B has been drilled but attempts to place well casing and pump in it have been temporarily abandoned until some excess pressure in the LCS is relieved.

All functioning leachate collection sumps appear to be operating properly with measures leachate levels below the required pumping levels.

Attachment B – Temperature Monitoring Probe Analytical Charts

TMP-8 has been compromised and no longer monitorable. The following TMPs indicated virtually identical or lower temperature profiles than previous week(s): TMP-2, -3, -5, -6, -9, -10, and -13. These TMPs indicated slight to moderate increases from previous weeks: TMP-1, -4, -7, -11, -12, and -14.

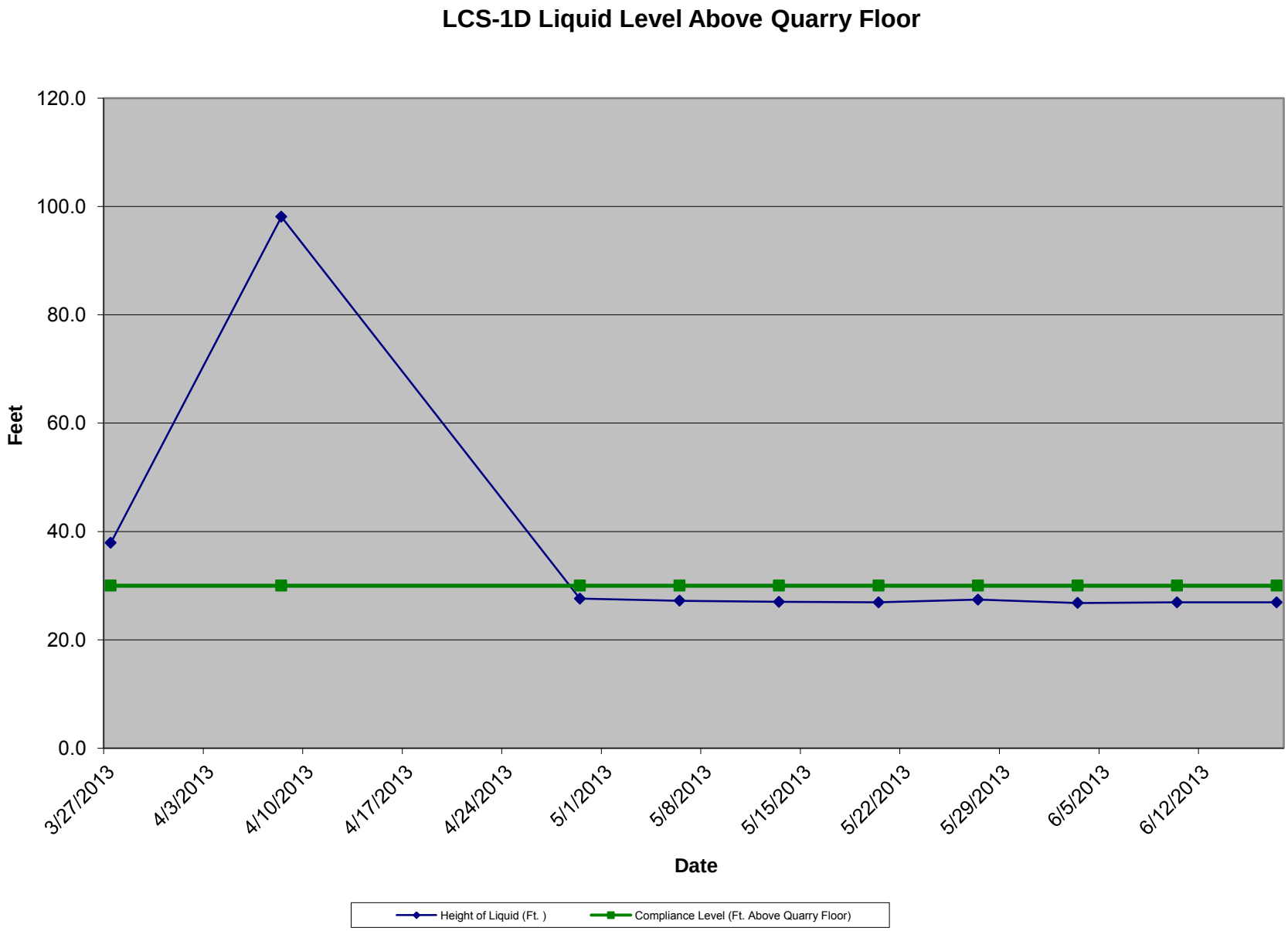
Attachment C – Gas Interceptor Wellhead Temperature Graphs

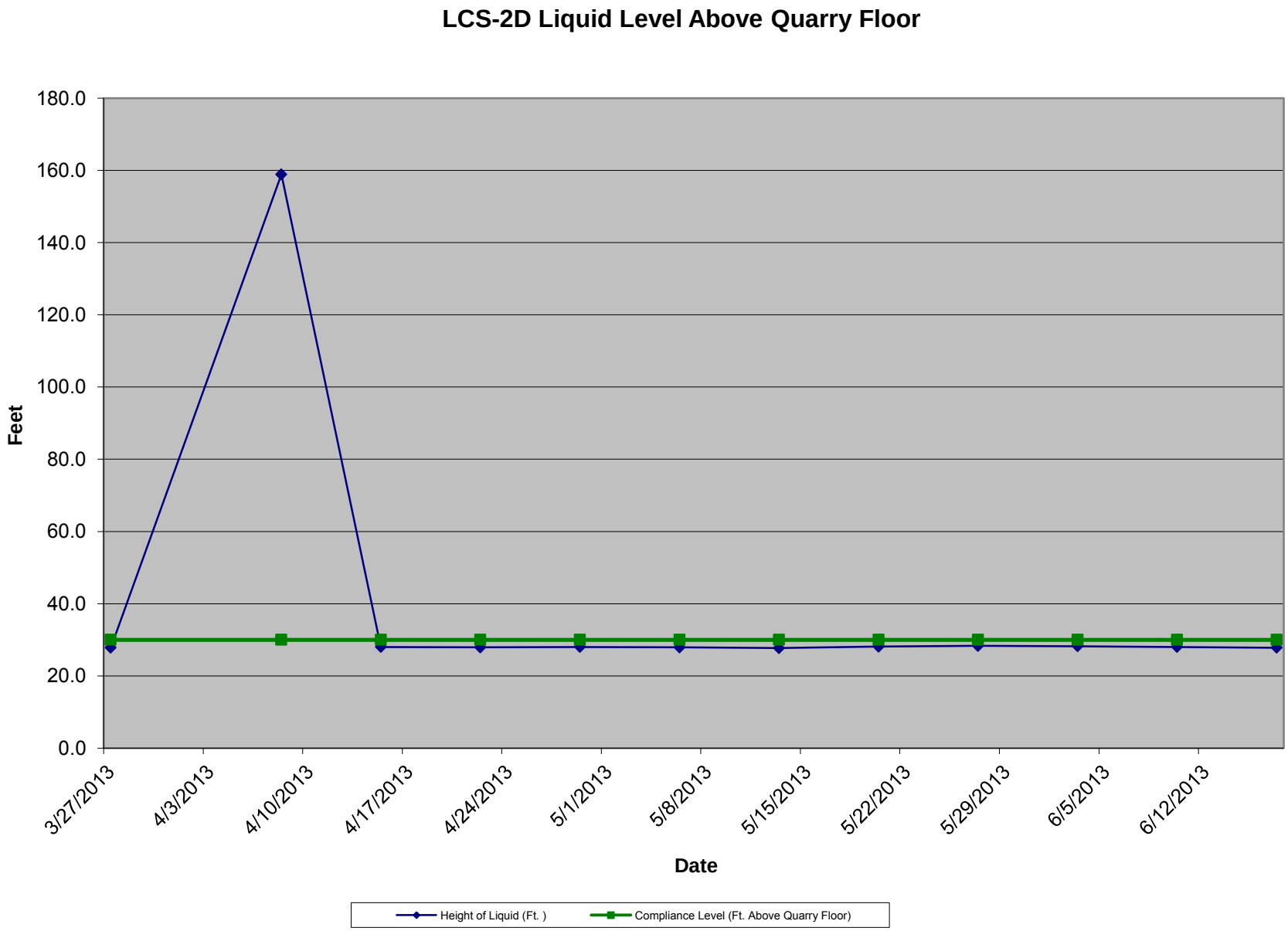
The GIW wells can allow warm reaction gasses to be drawn in and removed from the landfill. As a result, we observe gradually increasing GIW wellhead temperatures in some GIWs. This is an important function of these wells, and they appear to be performing as planned.

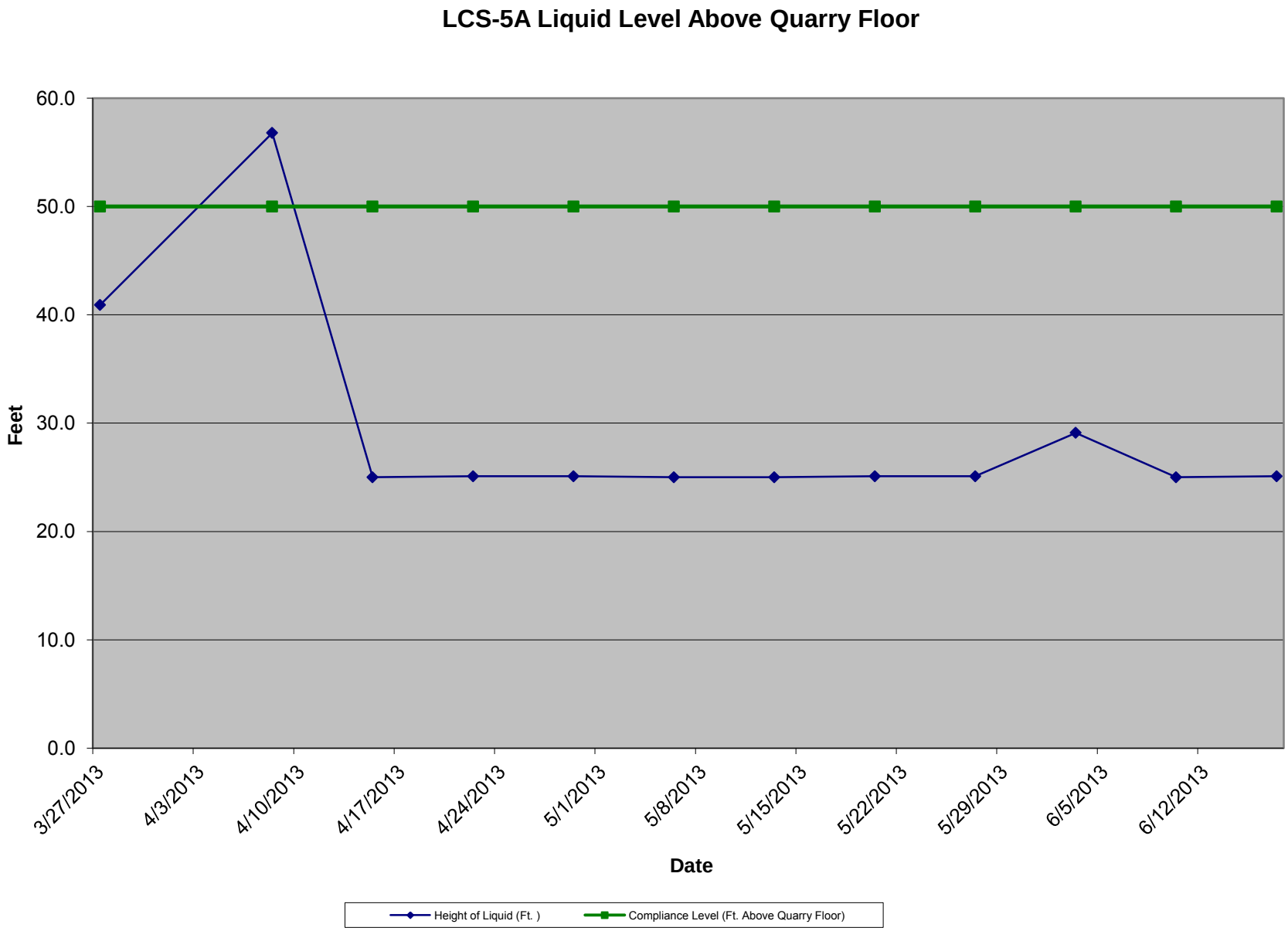
The following GIWs indicated virtually identical or slightly trending lower wellhead temperatures as recent previous week(s): GIW-1, -2, -3, -5, -6, -7, -8, -9, -10, -11, -12, and -13. The following GIWs indicated observable increases in wellhead temperatures as recent previous week(s): GIW-4.

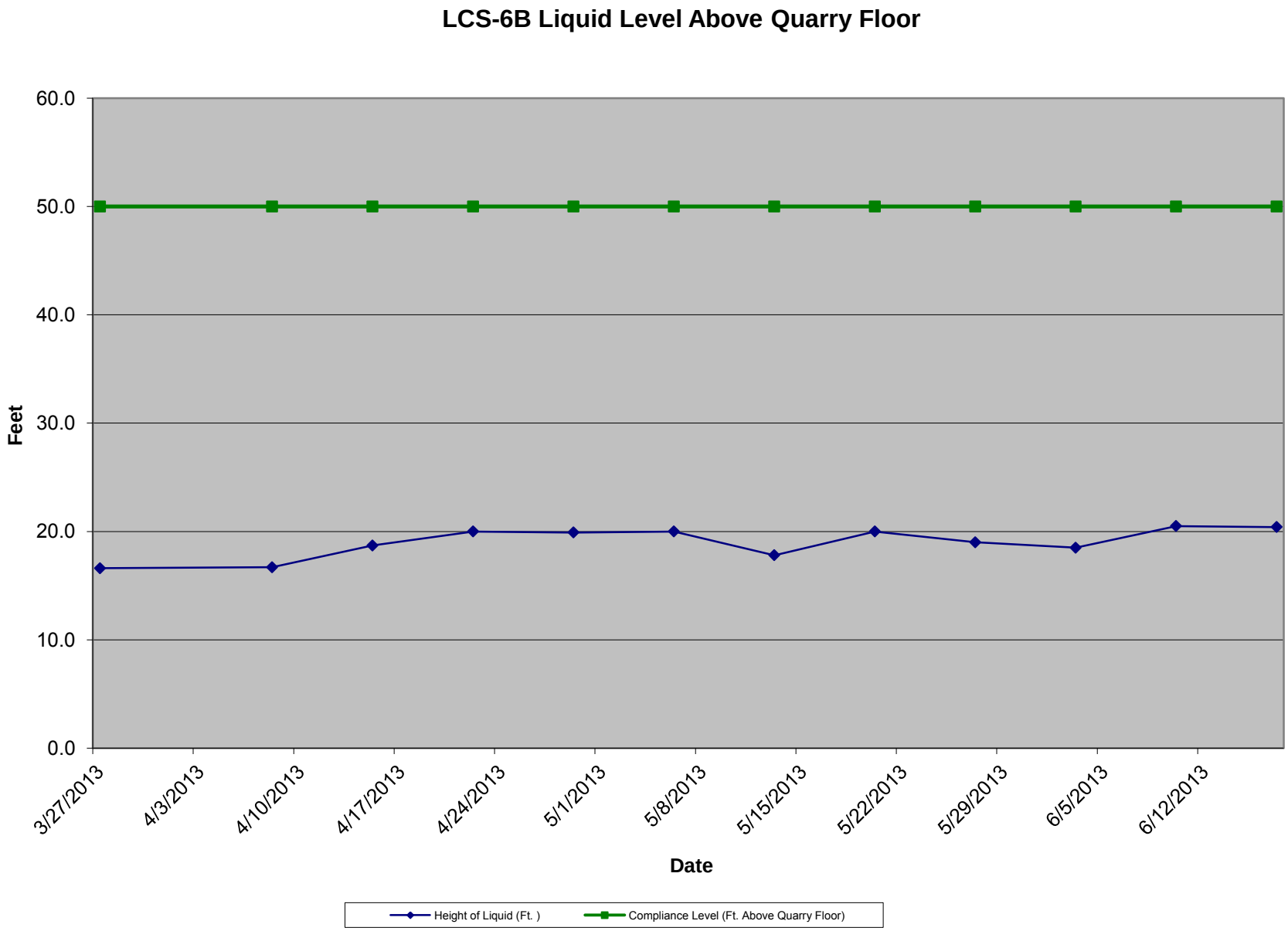
ATTACHMENT A

LEACHATE LEVELS IN LEACHATE COLLECTION SUMPS


LCS-1D Liquid Level Above Quarry Floor
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Feet
3/27/2013
4/3/2013
4/10/2013
4/17/2013
4/24/2013
5/1/2013
5/8/2013
5/15/2013
5/22/2013
5/29/2013
6/5/2013
6/12/2013
Date
Height of Liquid (Ft.)
Compliance Level (Ft. Above Quarry Floor)


LCS-2D Liquid Level Above Quarry Floor
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Feet
3/27/2013
4/3/2013
4/10/2013
4/17/2013
4/24/2013
5/1/2013
5/8/2013
5/15/2013
5/22/2013
5/29/2013
6/5/2013
6/12/2013
Date
Height of Liquid (Ft.)
Compliance Level (Ft. Above Quarry Floor)

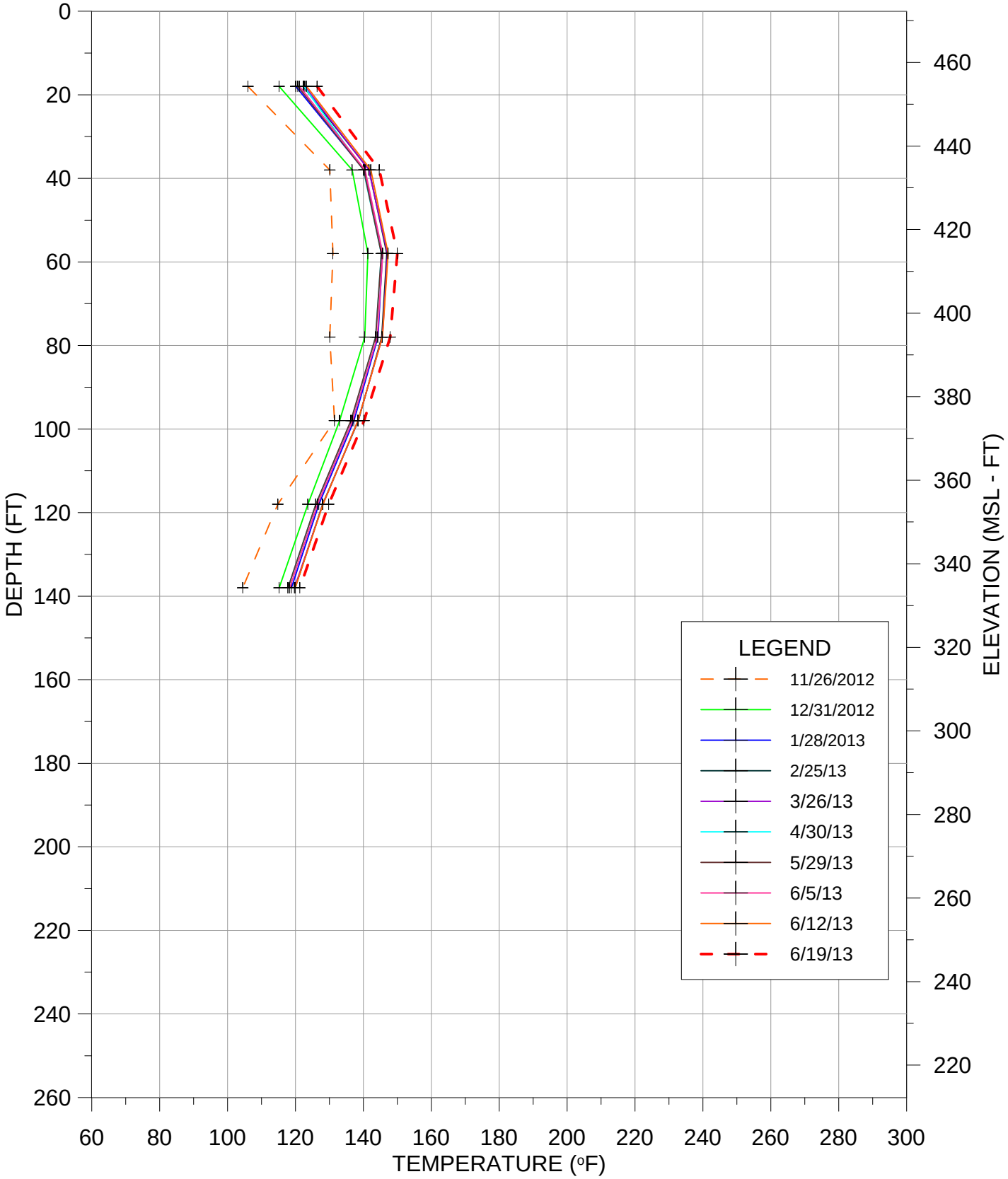

LCS-5A Liquid Level Above Quarry Floor
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Feet
3/27/2013
4/3/2013
4/10/2013
4/17/2013
4/24/2013
5/1/2013
5/8/2013
5/15/2013
5/22/2013
5/29/2013
6/5/2013
6/12/2013
Date
Height of Liquid (Ft.)
Compliance Level (Ft. Above Quarry Floor)


LCS-6B Liquid Level Above Quarry Floor
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Feet
3/27/2013
4/3/2013
4/10/2013
4/17/2013
4/24/2013
5/1/2013
5/8/2013
5/15/2013
5/22/2013
5/29/2013
6/5/2013
6/12/2013
Date
Height of Liquid (Ft.)
Compliance Level (Ft. Above Quarry Floor)

ATTACHMENT B

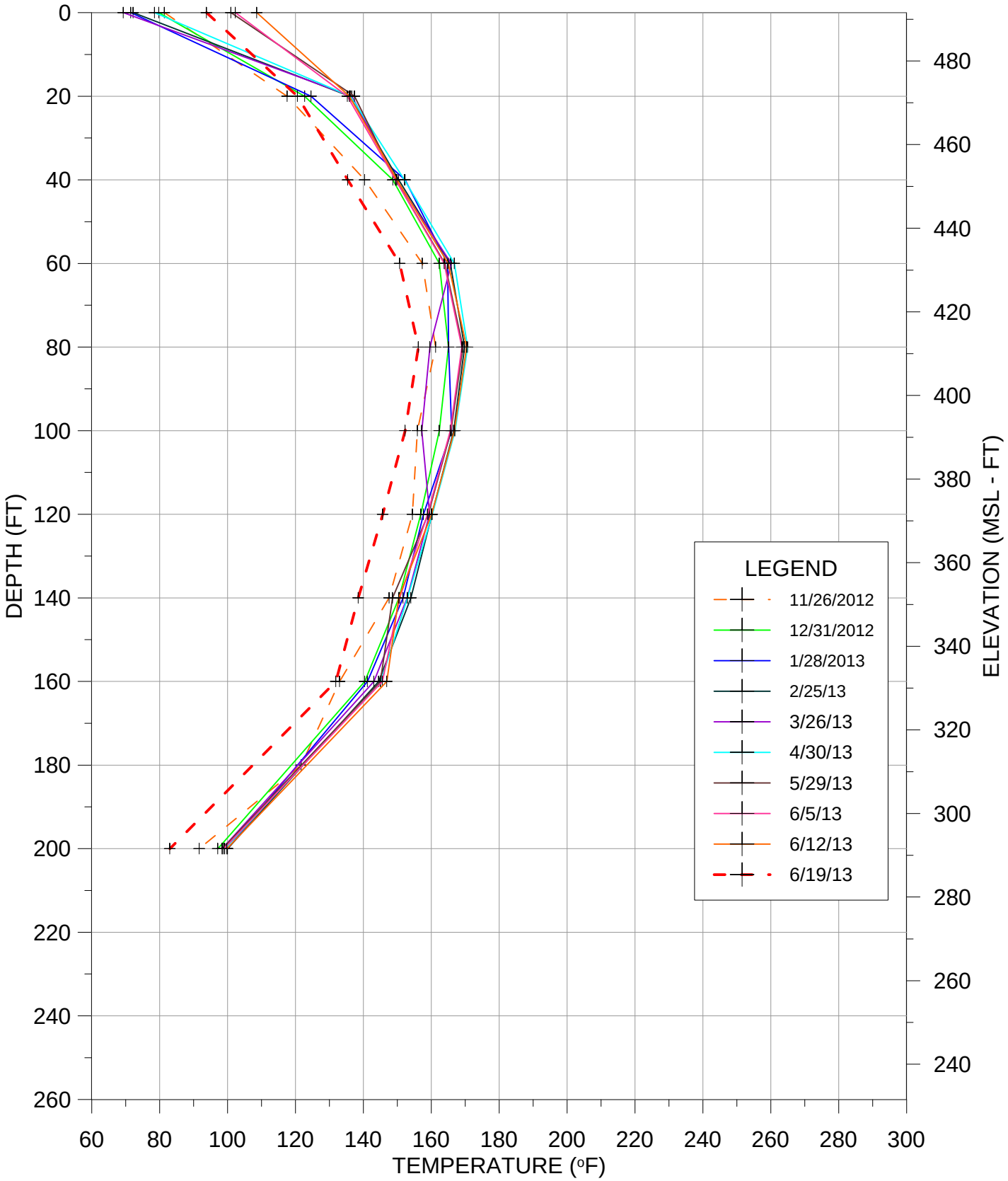
TEMPERATURE MONITORING PROBE ANALYTICAL CHARTS

TMP-1



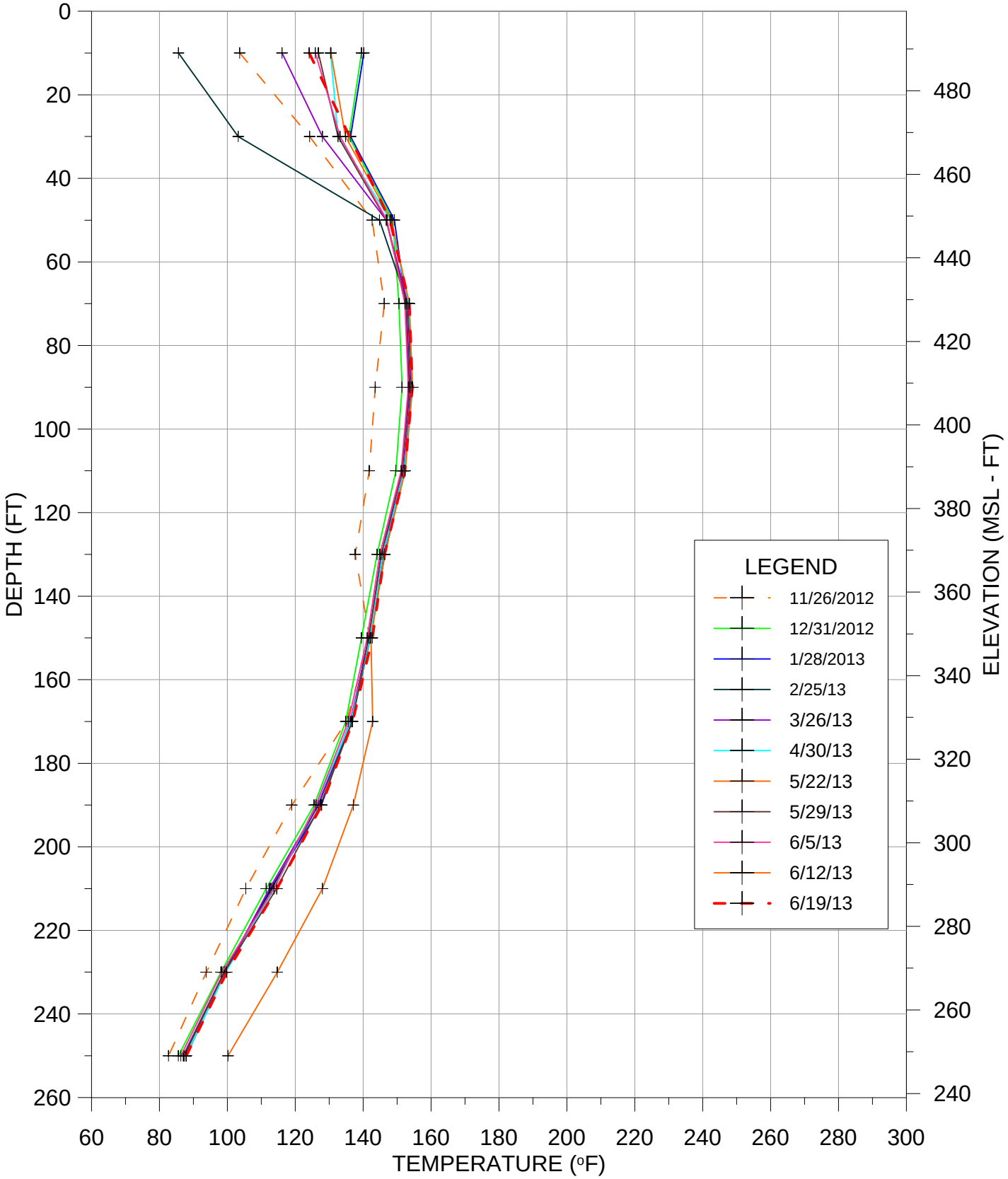
TEMPERATURE VS DEPTH
BRIDGETON LANDFILL

TMP-2



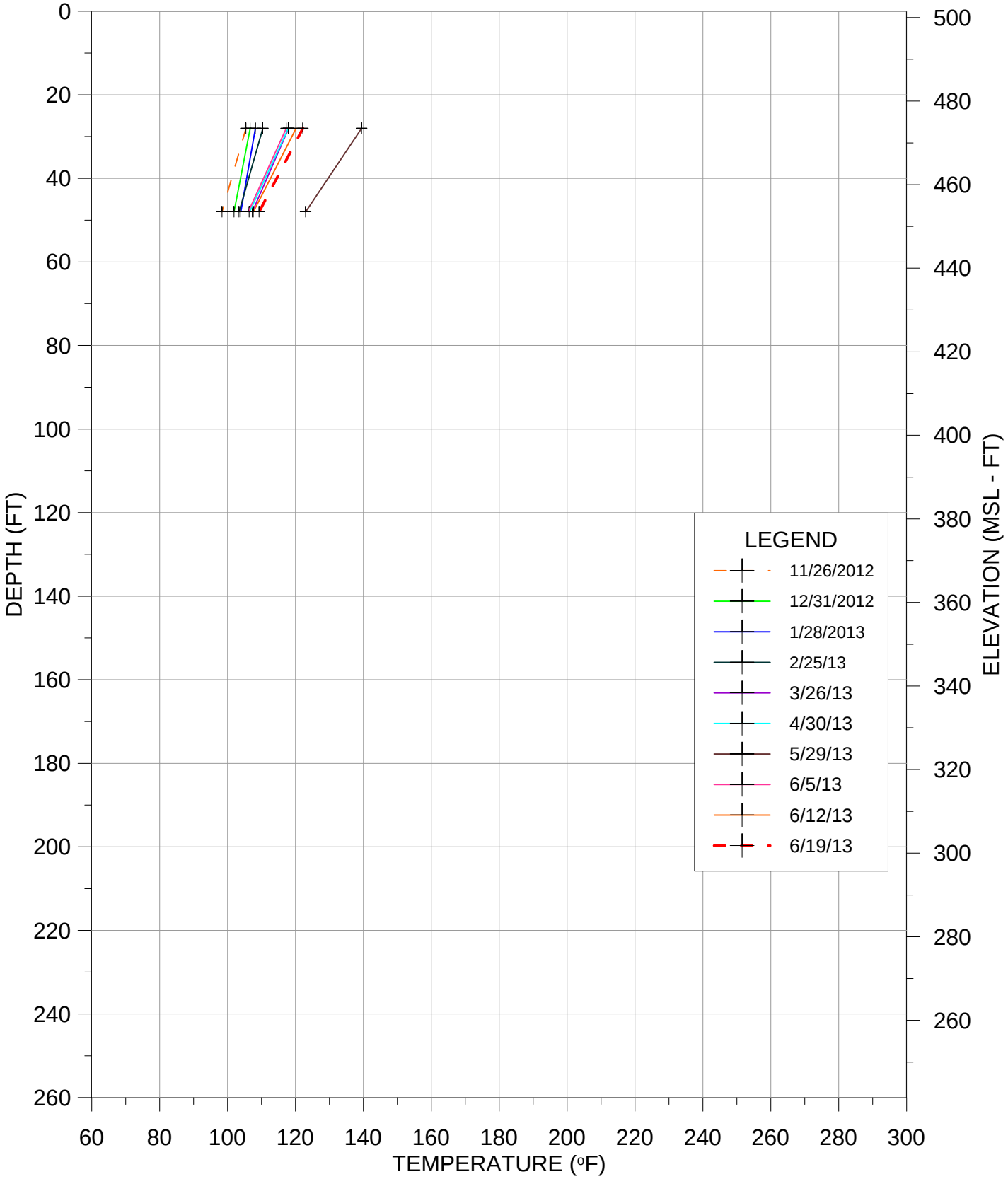
TEMPERATURE VS DEPTH
BRIDGETON LANDFILL

TMP-3



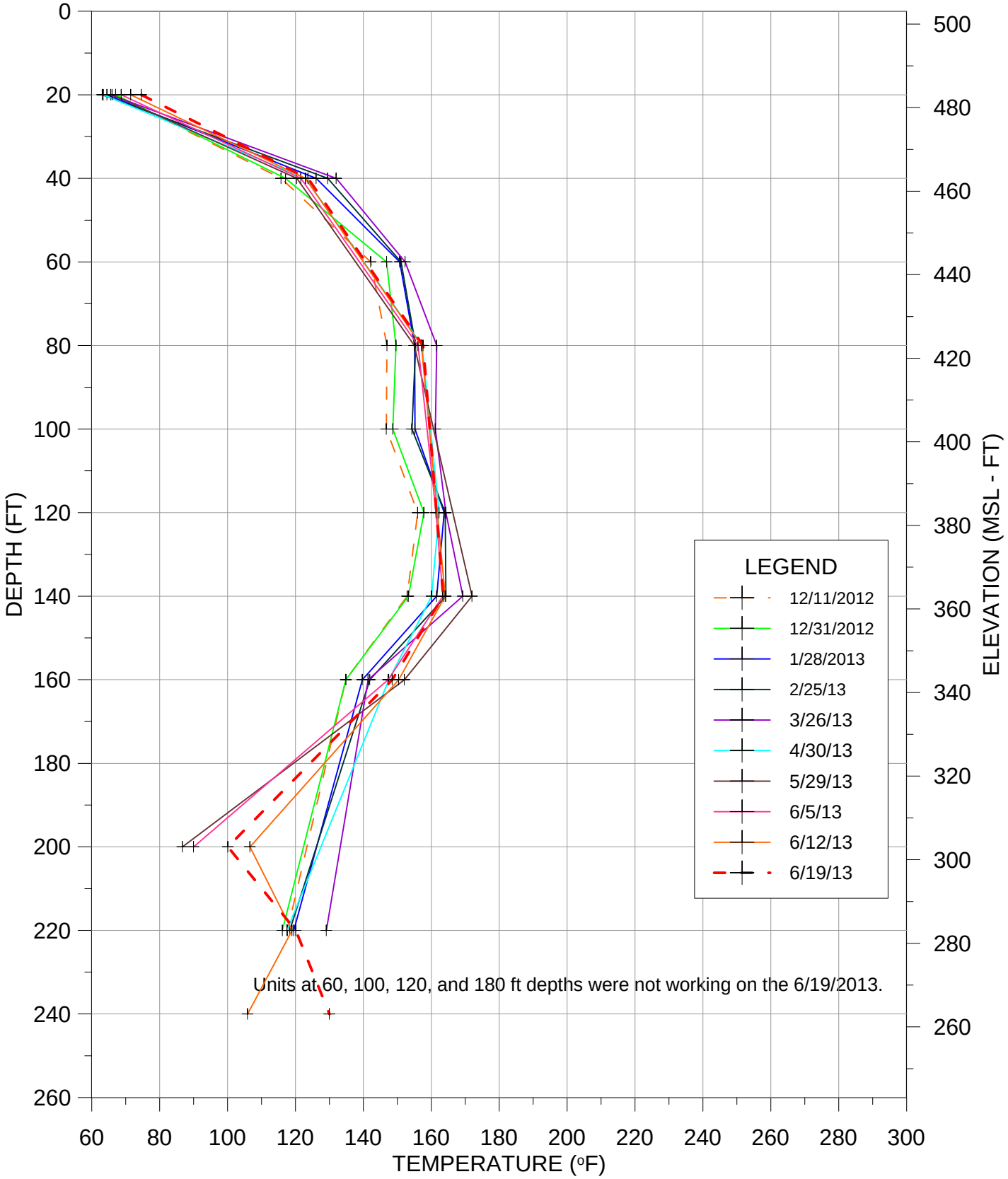
TEMPERATURE VS DEPTH
BRIDGETON LANDFILL

TMP-4



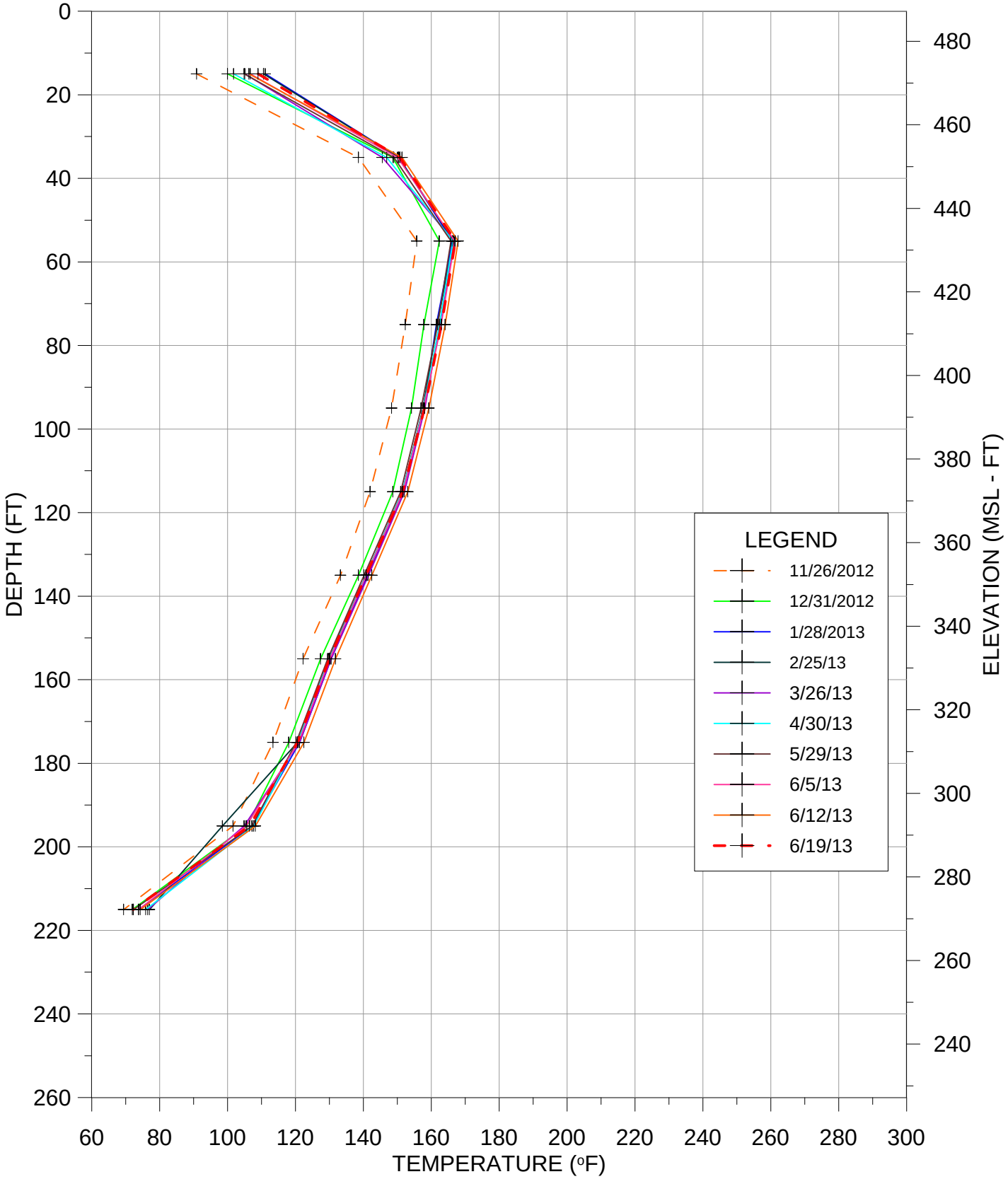
TEMPERATURE VS DEPTH
BRIDGETON LANDFILL

TMP-5



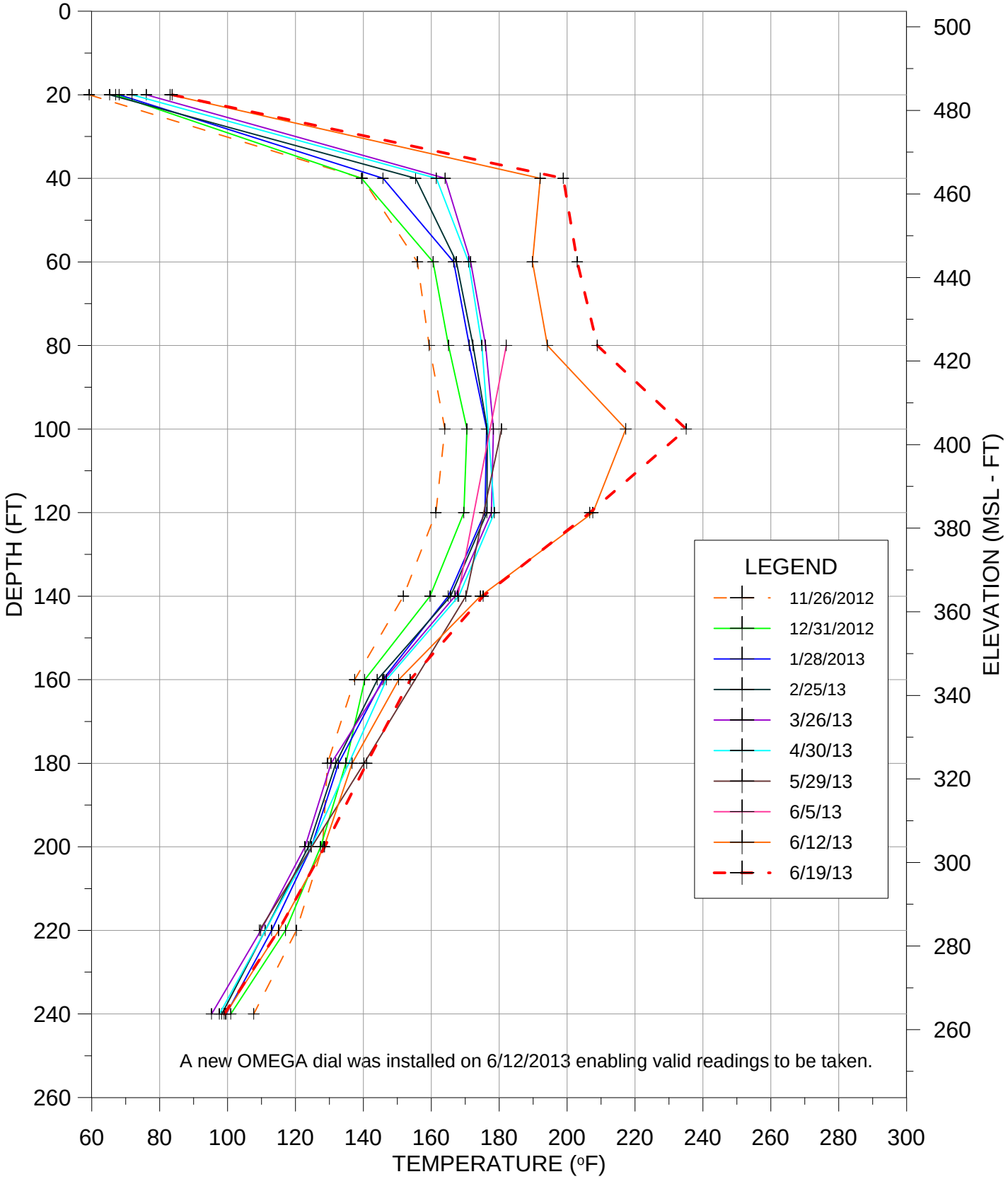
TEMPERATURE VS DEPTH
BRIDGETON LANDFILL

TMP-6



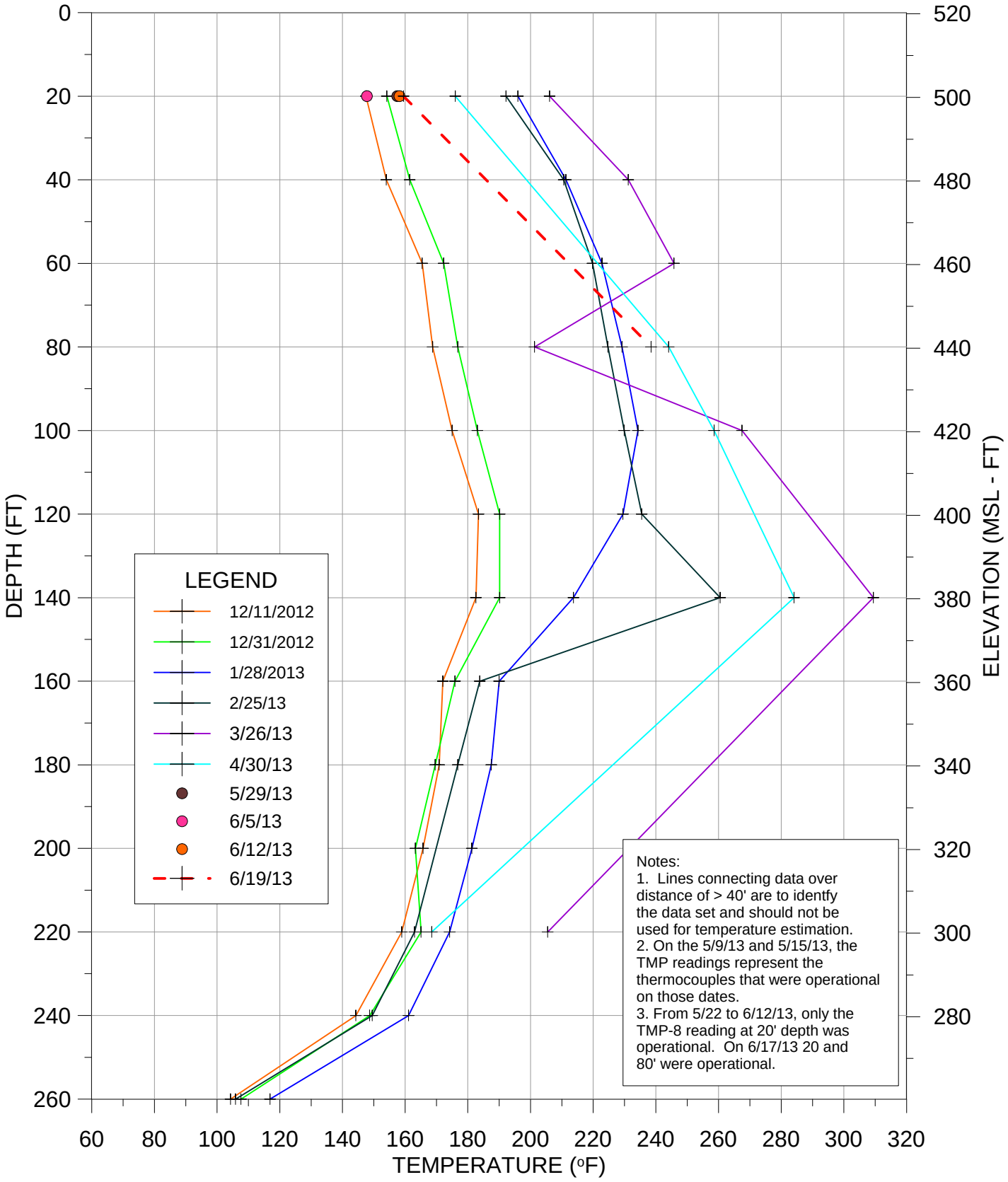
TEMPERATURE VS DEPTH
BRIDGETON LANDFILL

TMP-7R



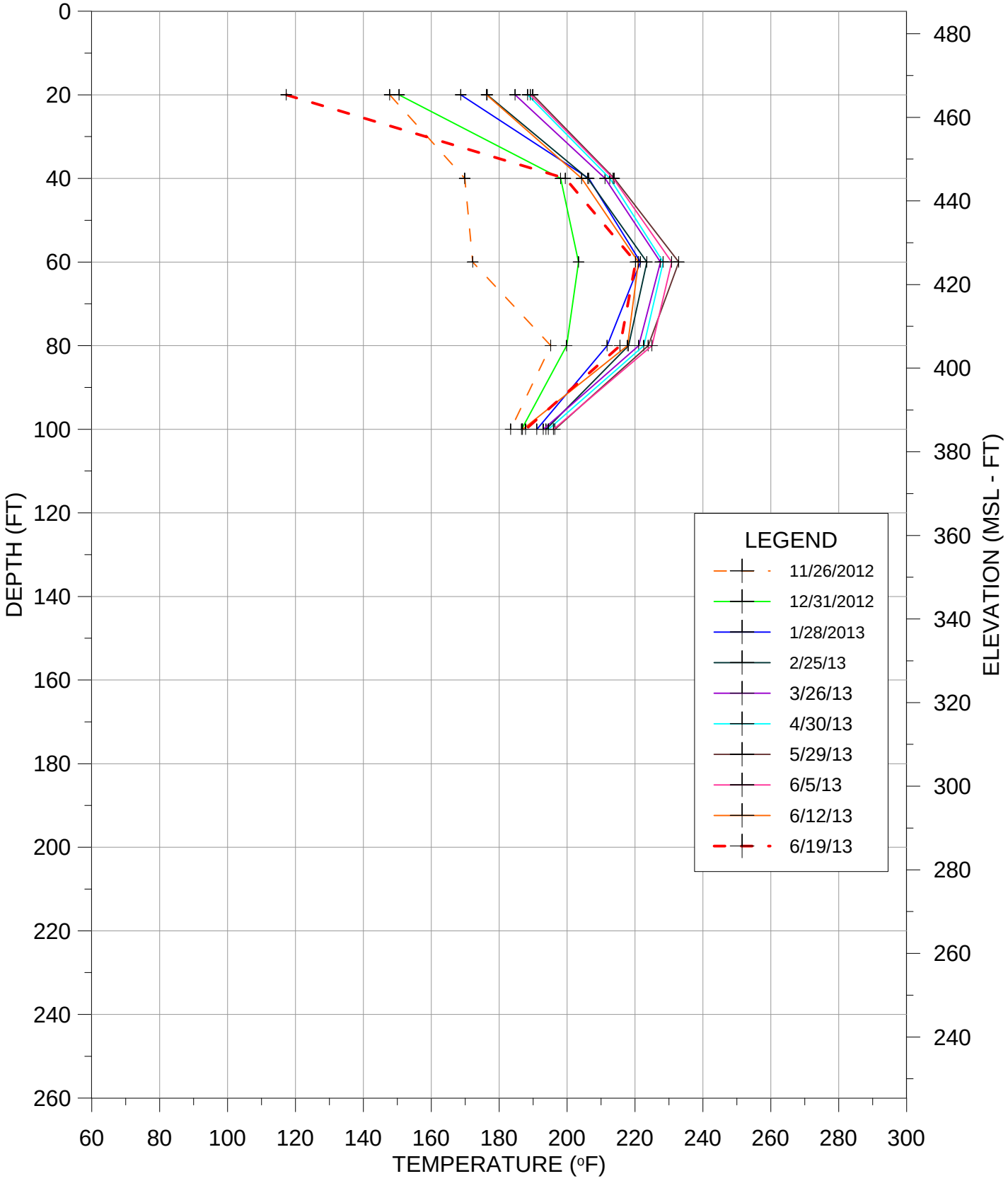
TEMPERATURE VS DEPTH
BRIDGETON LANDFILL

TMP-8



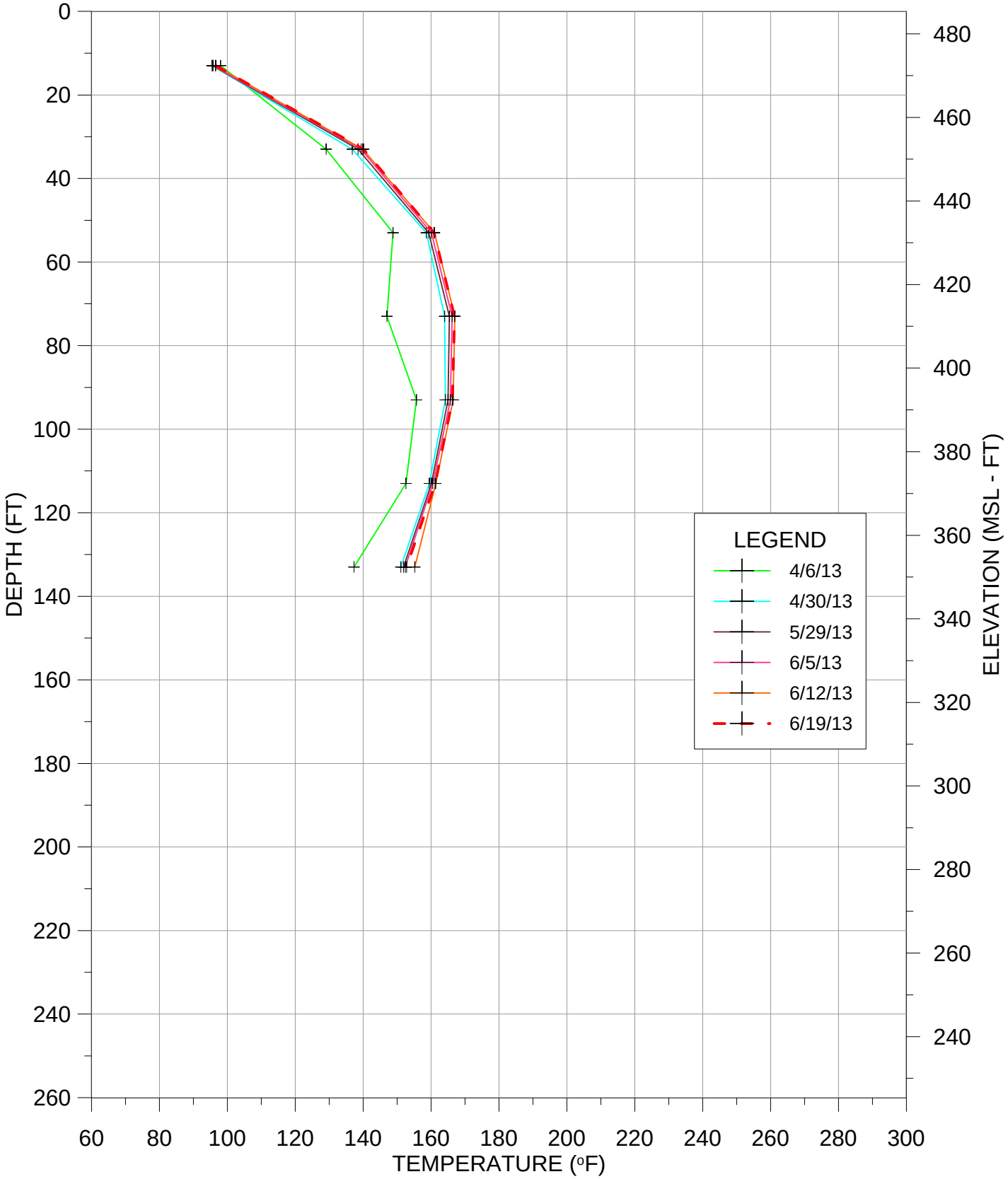
TEMPERATURE VS DEPTH
BRIDGETON LANDFILL

TMP-9



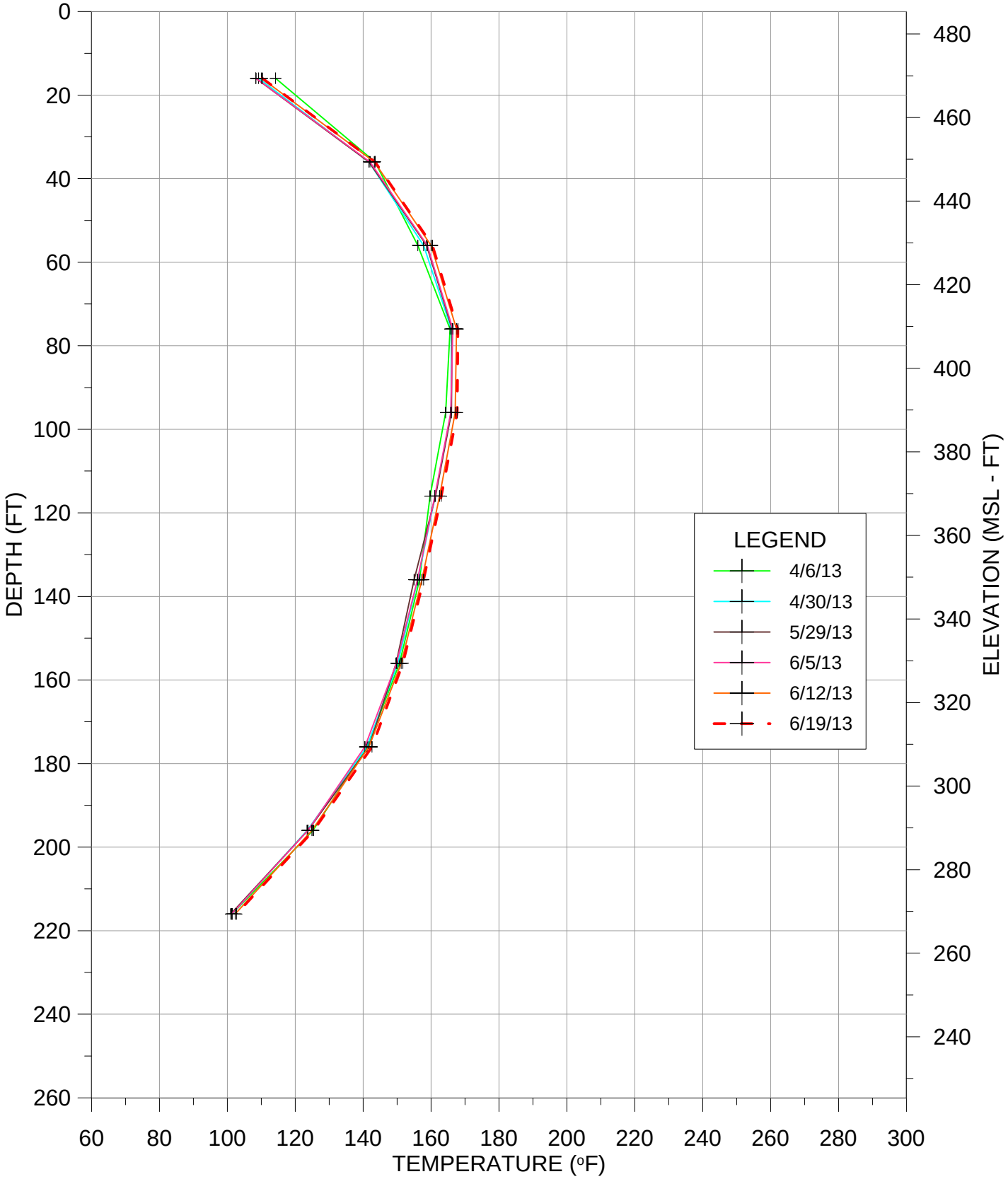
TEMPERATURE VS DEPTH
BRIDGETON LANDFILL

TMP-10



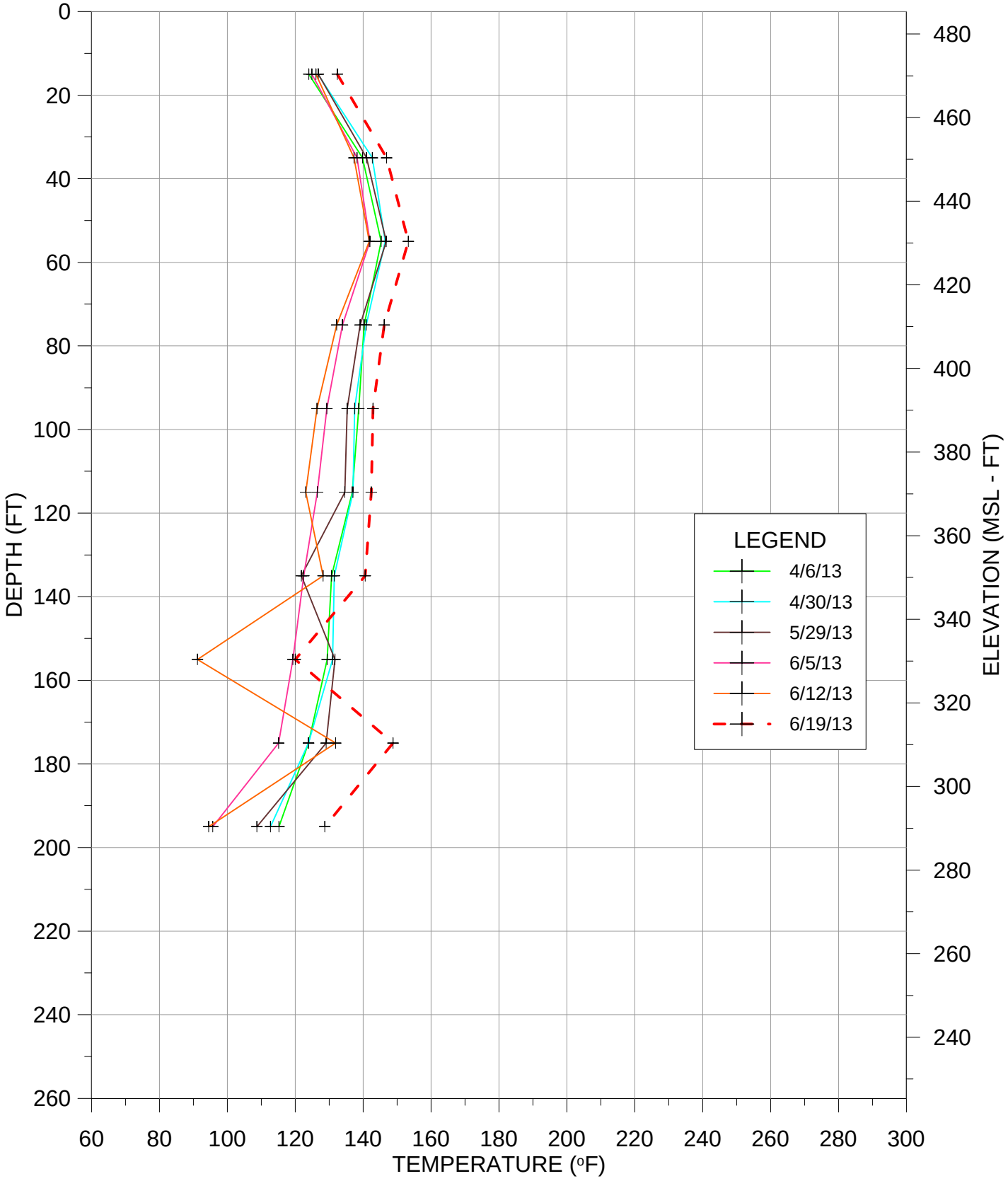
TEMPERATURE VS DEPTH
BRIDGETON LANDFILL

TMP-11



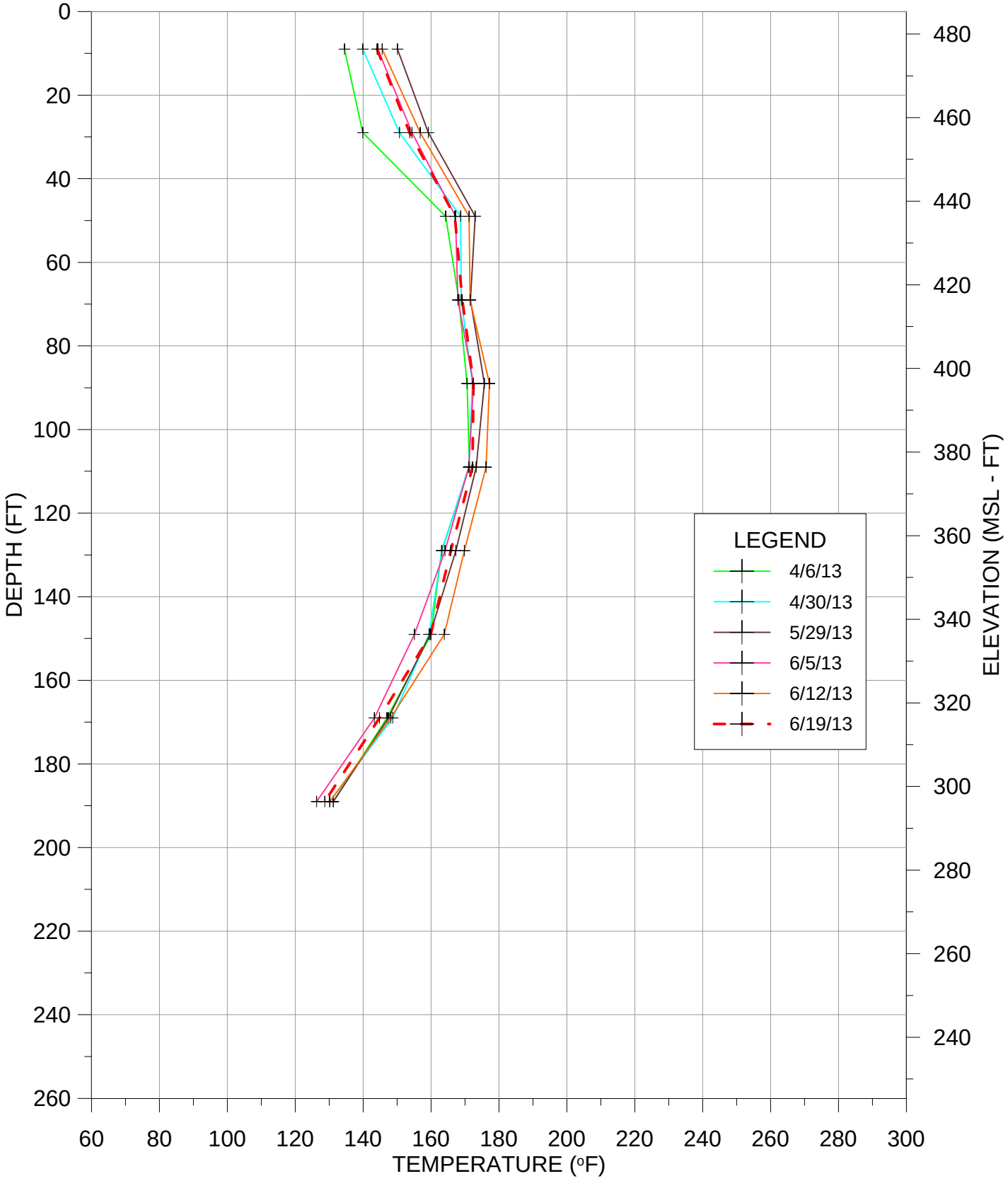
TEMPERATURE VS DEPTH
BRIDGETON LANDFILL

TMP-12



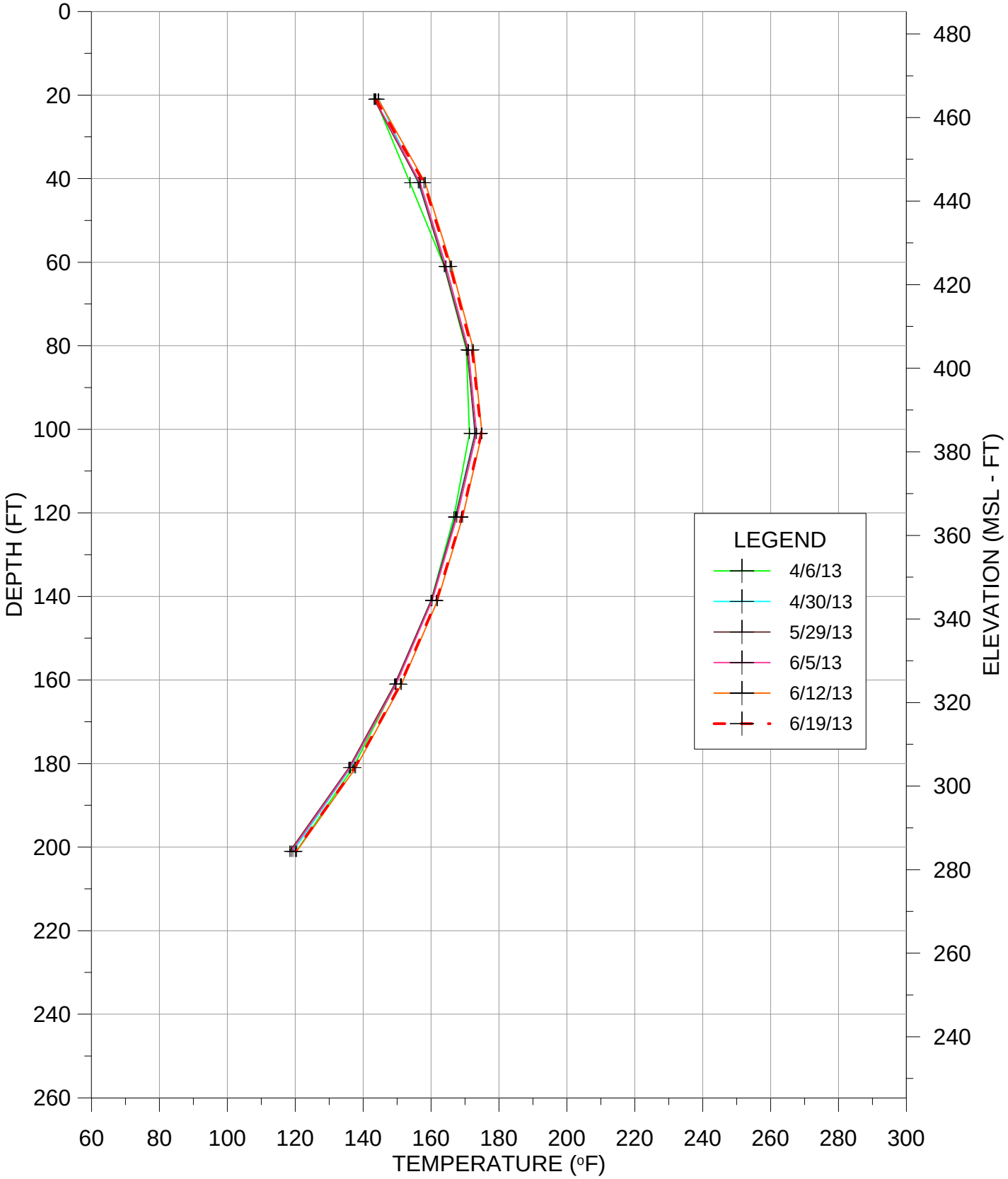
TEMPERATURE VS DEPTH
BRIDGETON LANDFILL

TMP-13



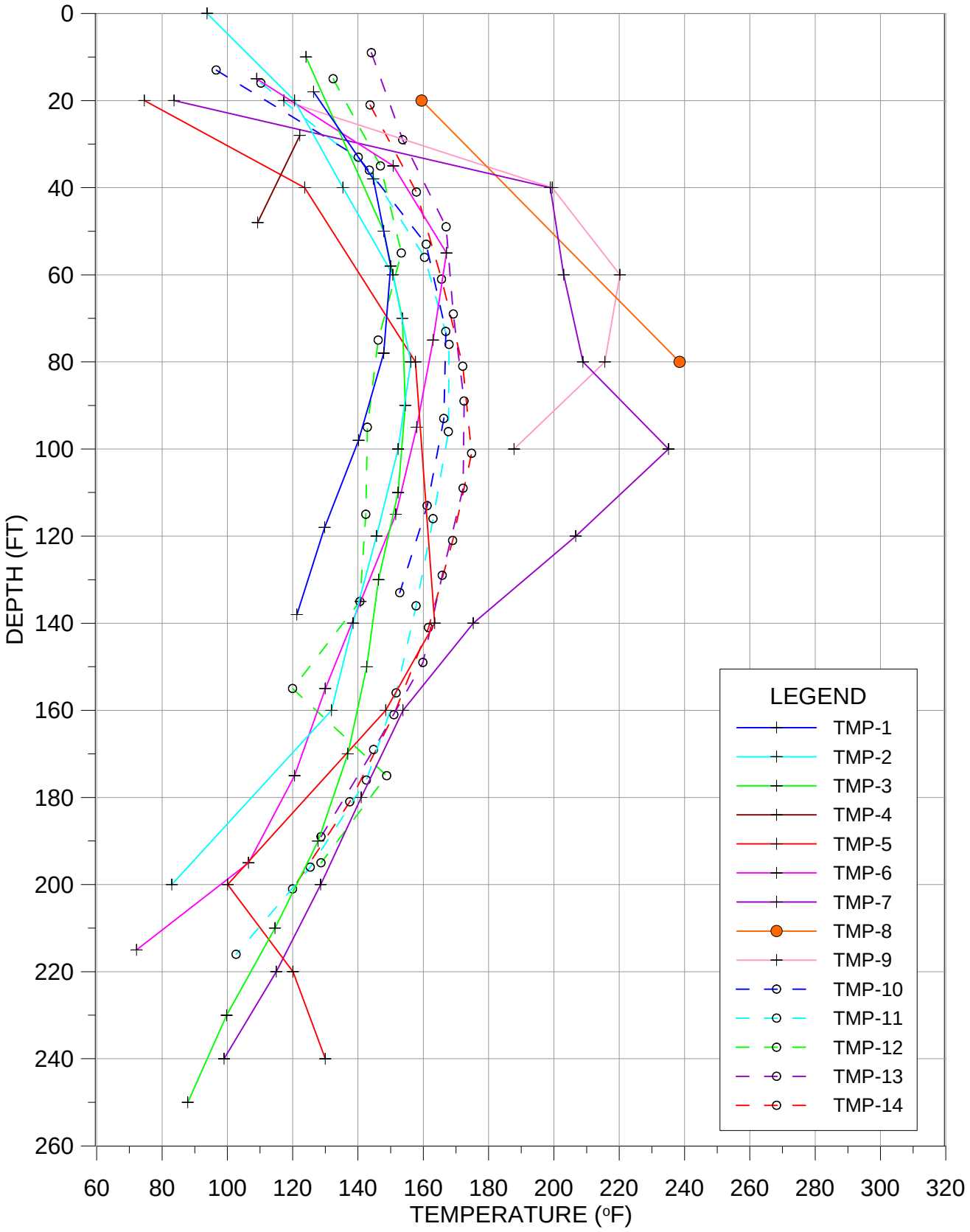
TEMPERATURE VS DEPTH
BRIDGETON LANDFILL

TMP-14



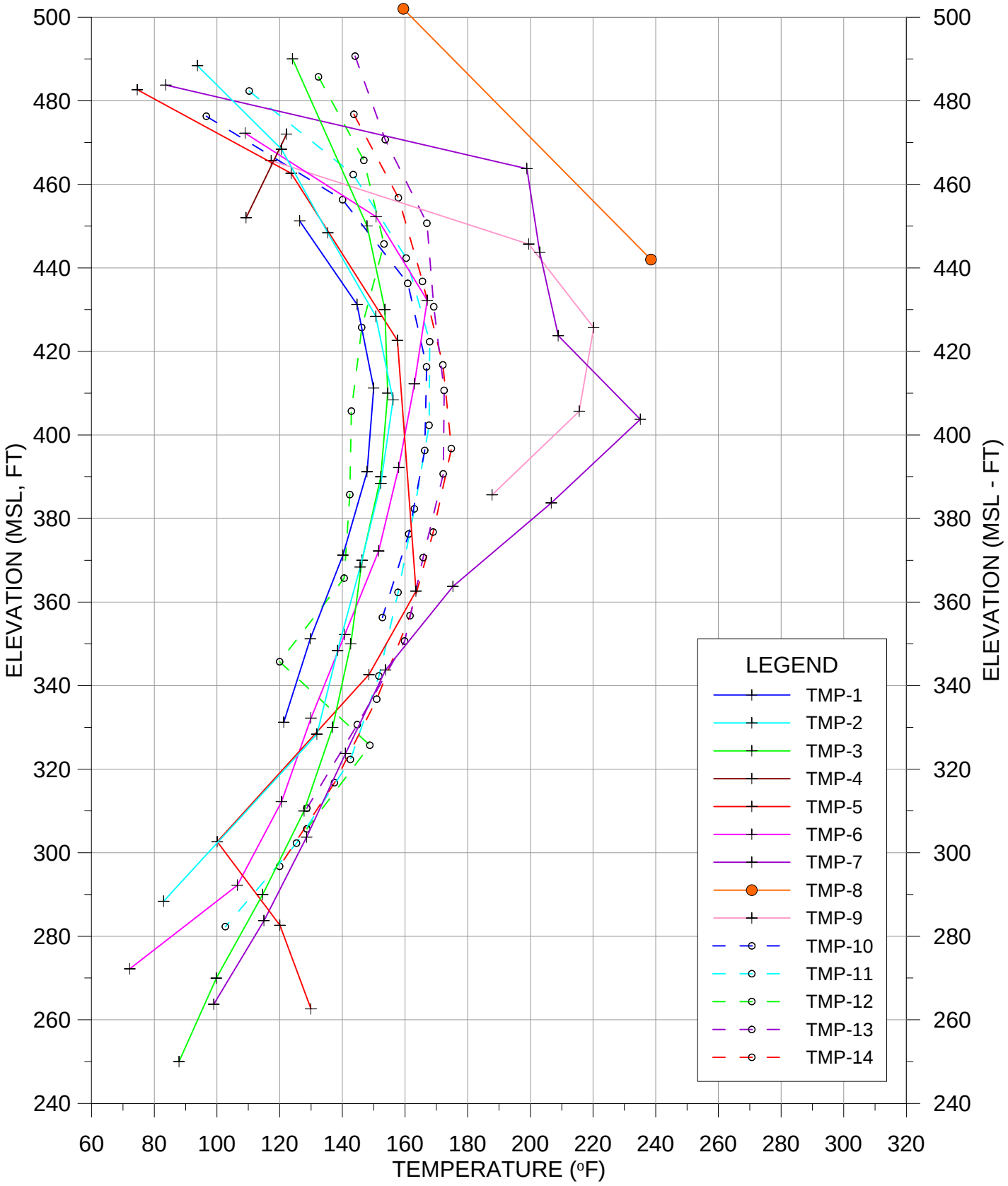
TEMPERATURE VS DEPTH
BRIDGETON LANDFILL

6/19/2013 -DEPTH



TEMPERATURE VS DEPTH
BRIDGETON LANDFILL

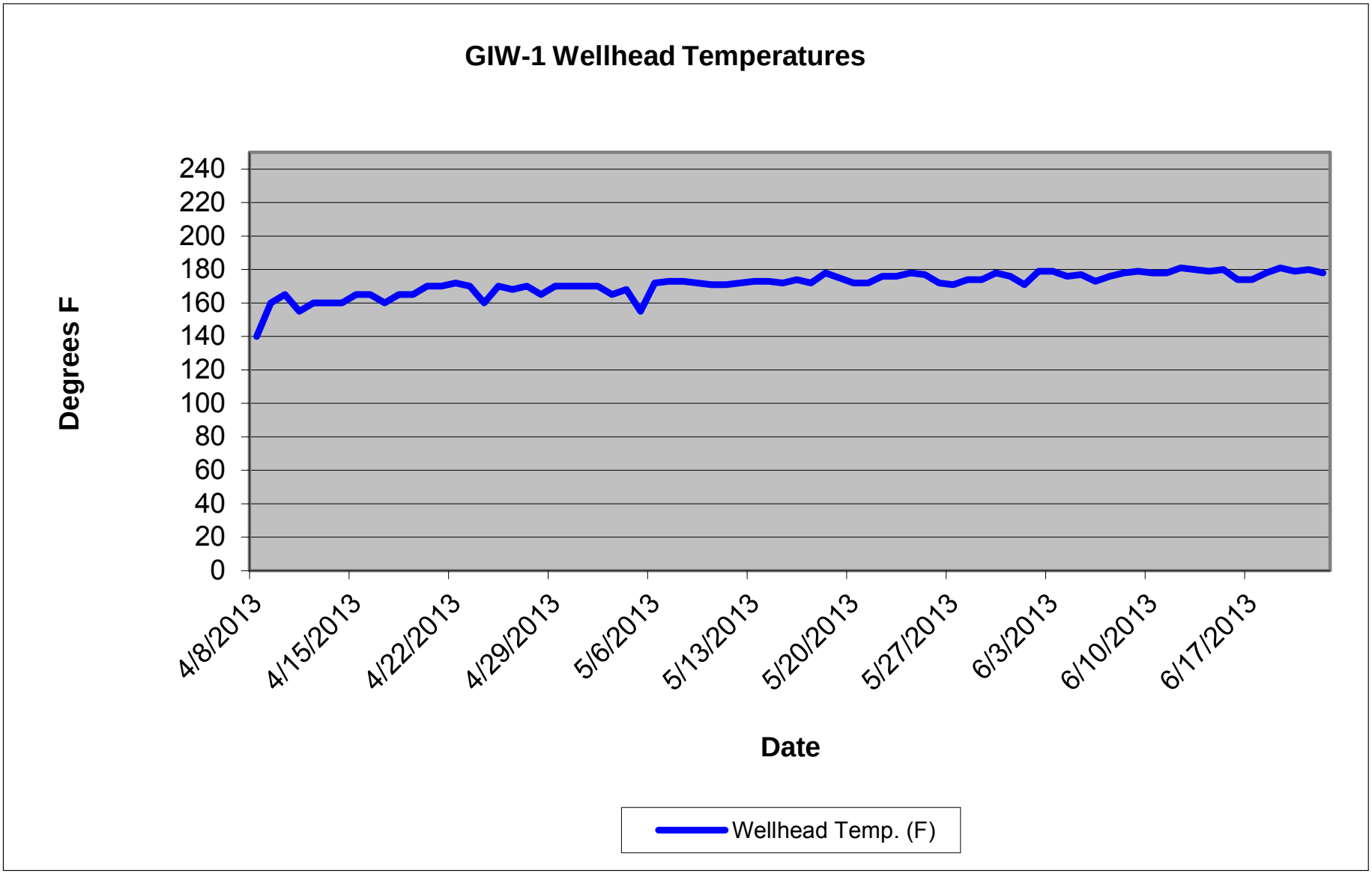
6/19/2013 - ELEVATION



TEMPERATURE VS ELEVATION
BRIDGETON LANDFILL

ATTACHMENT C

GAS INTERCEPTOR WELLHEAD TEMPERATURE GRAPHS


GIW-1 Wellhead Temperatures
Degrees F
240
220
200
180
160
140
120
100
80
60
40
20
0
4/8/2013
4/15/2013
4/22/2013
4/29/2013
5/6/2013
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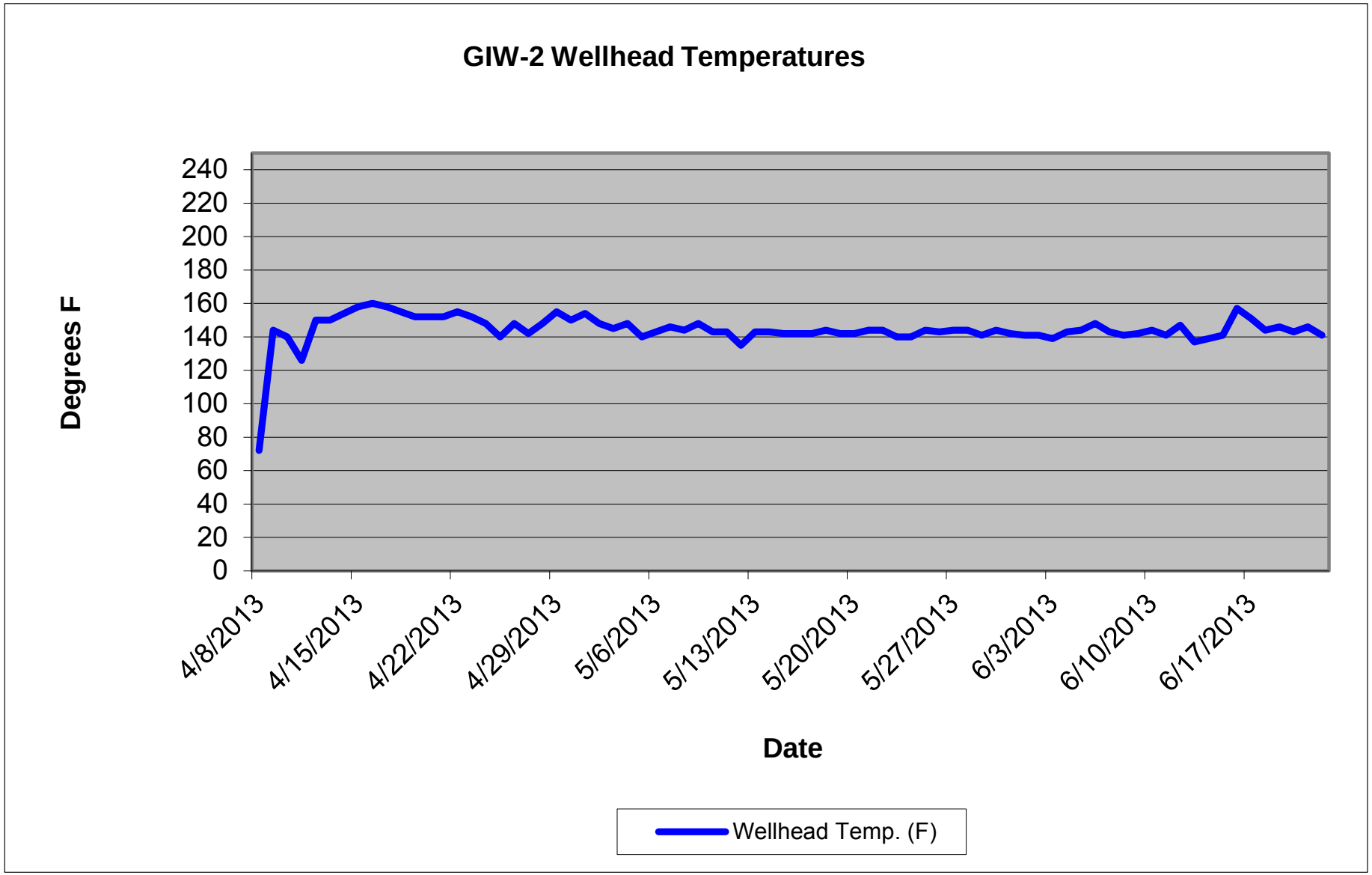
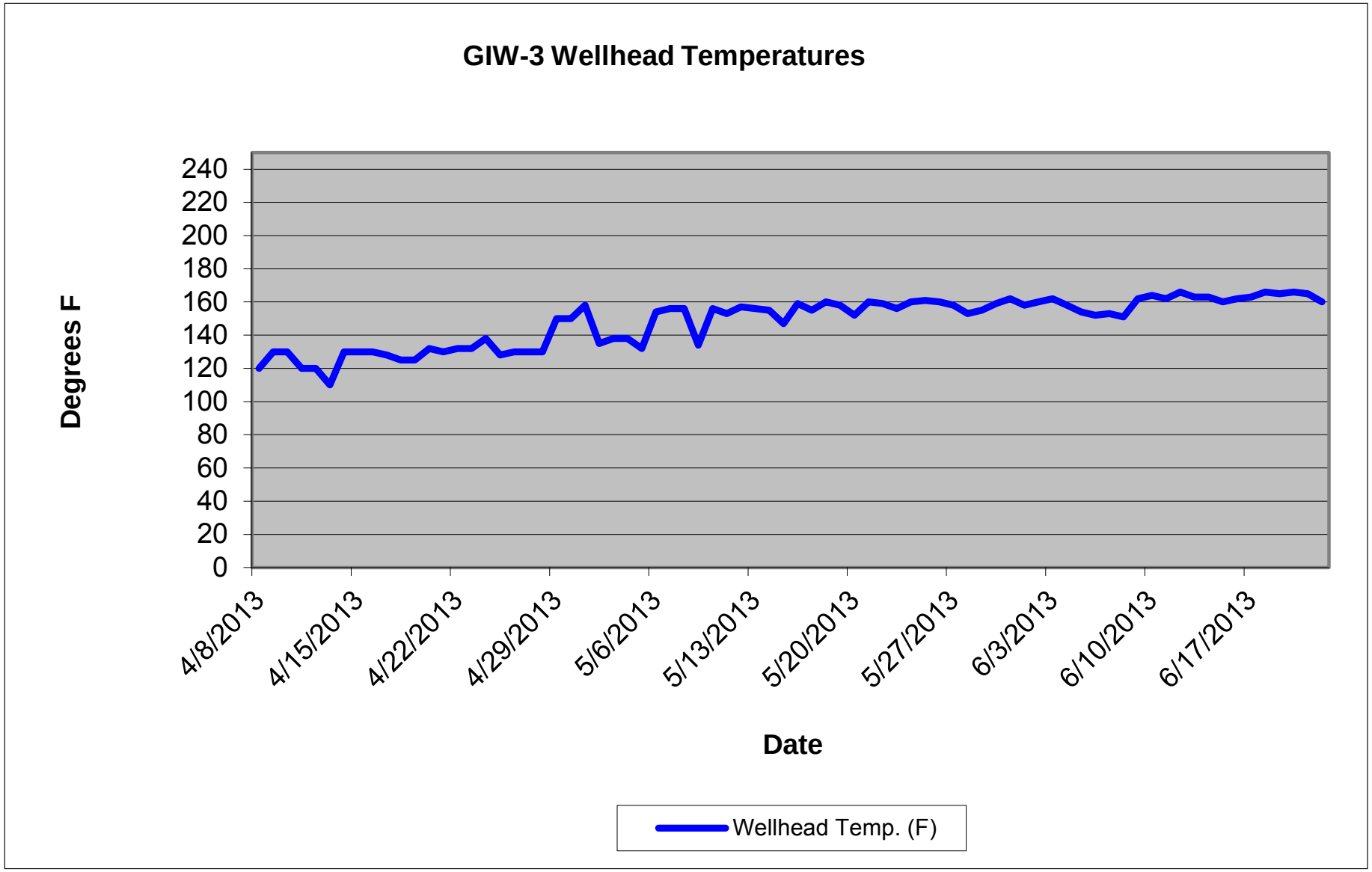
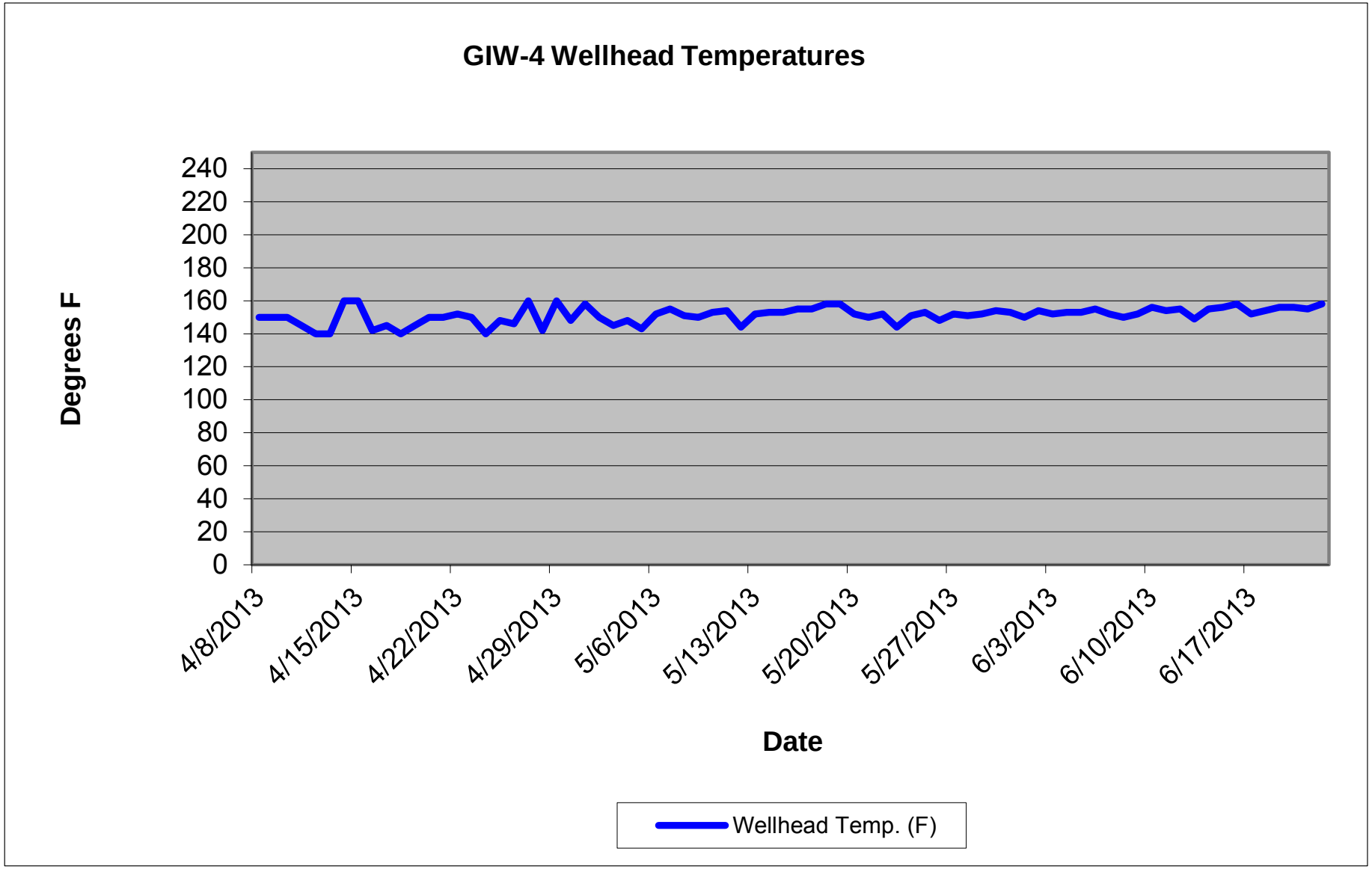
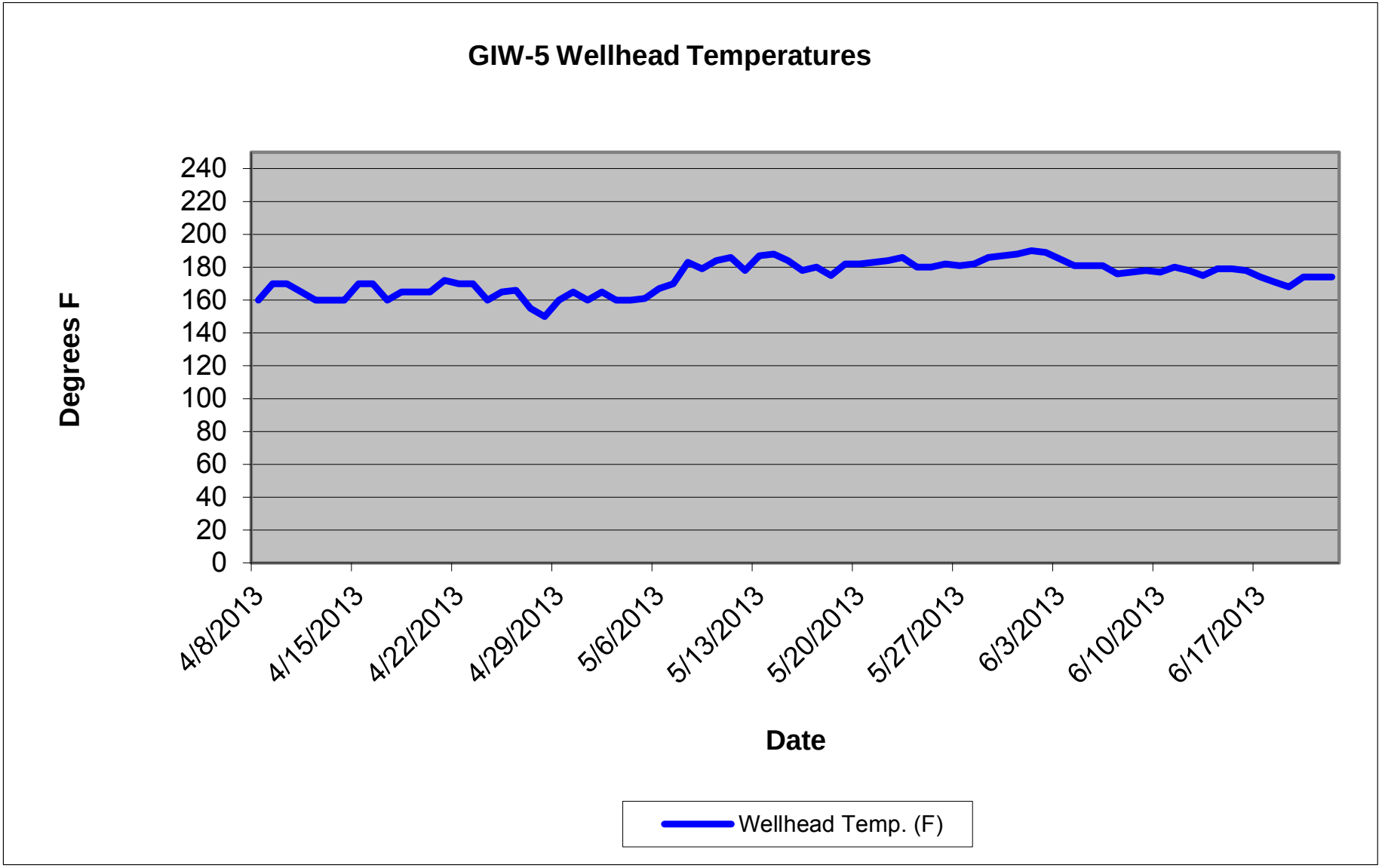
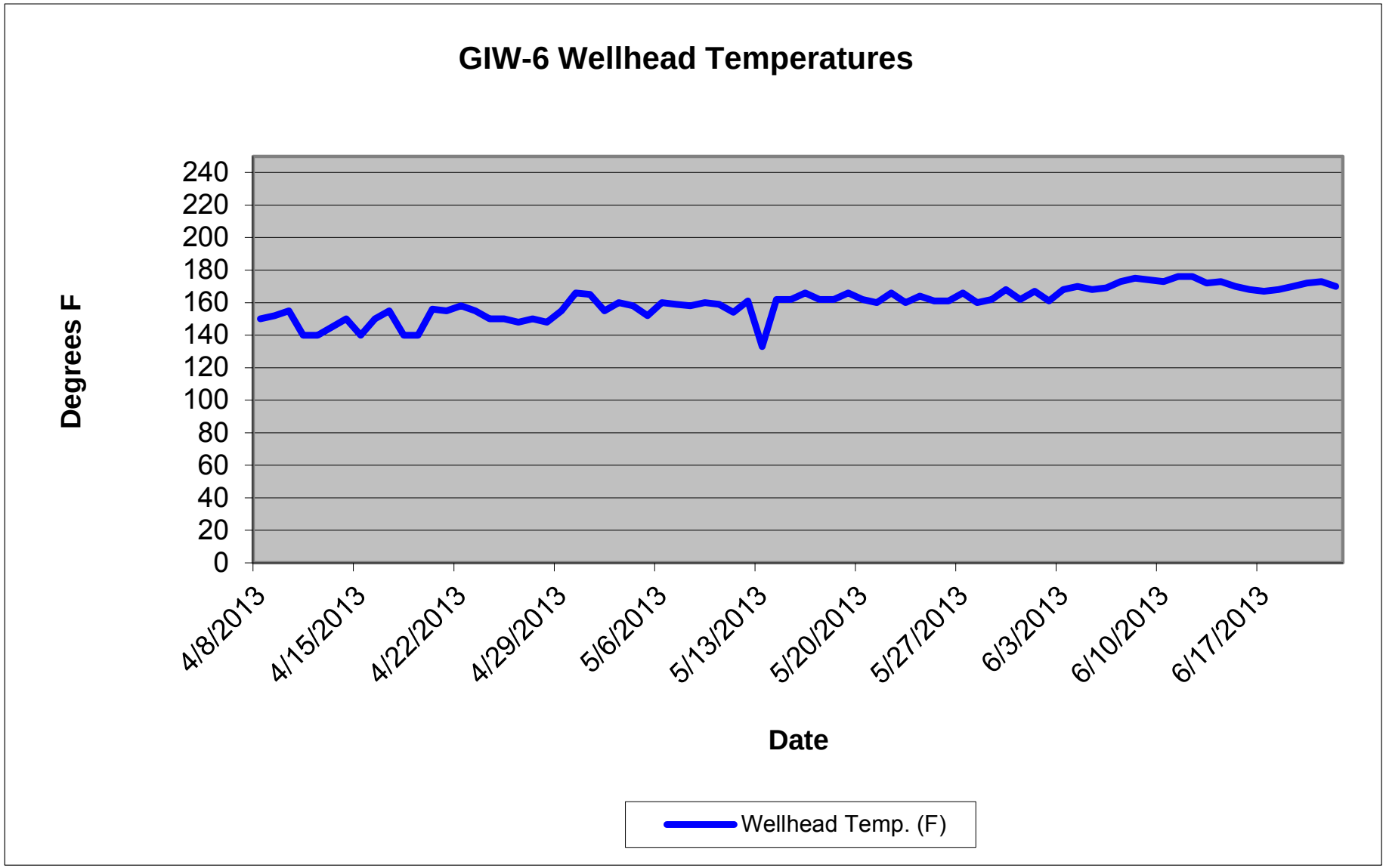
5/20/2013
5/27/2013
6/3/2013
6/10/2013
6/17/2013
Date
Wellhead Temp. (F)

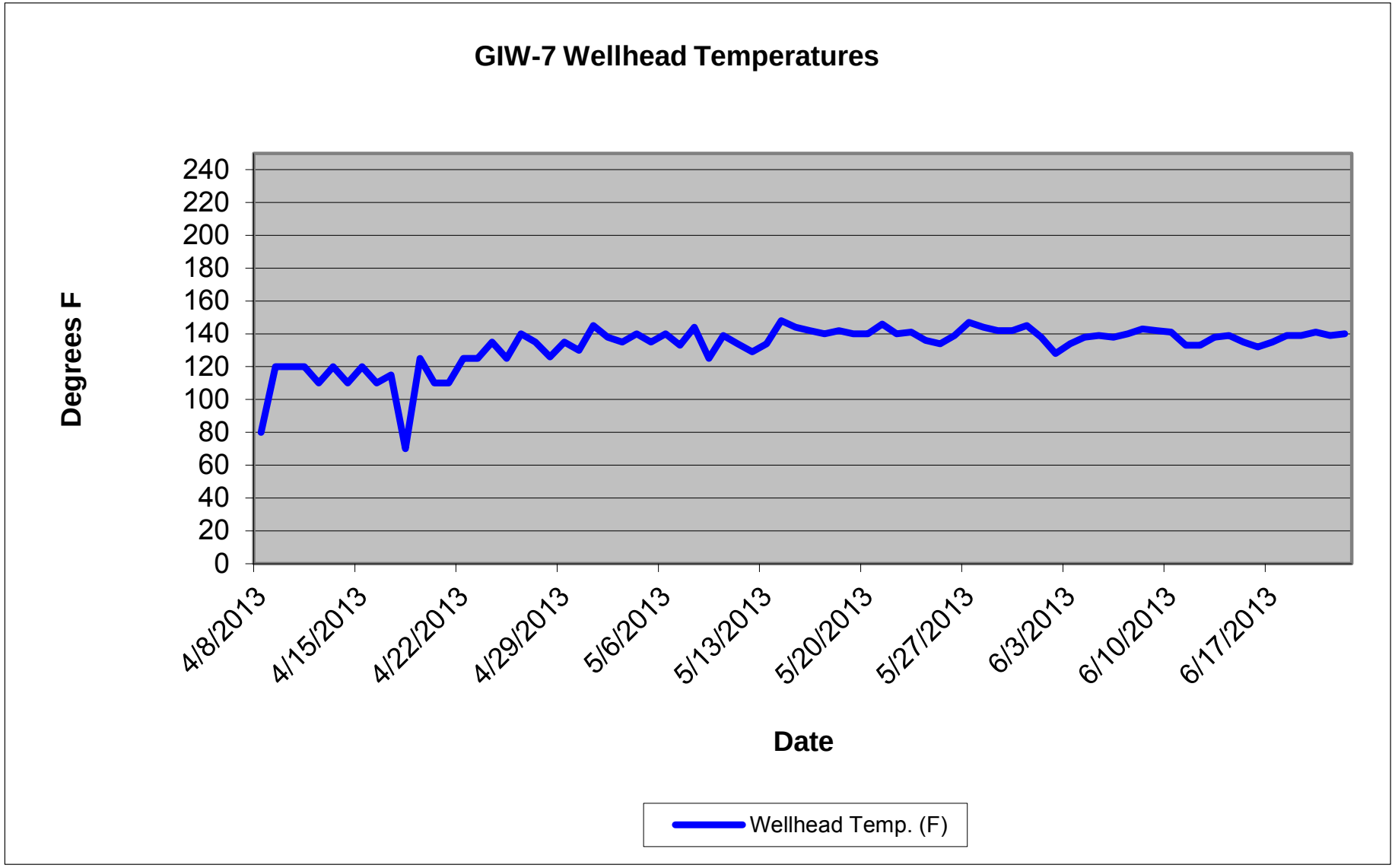

GIW-2 Wellhead Temperatures
Degrees F
240
220
200
180
160
140
120
100
80
60
40
20
0
4/8/2013
4/15/2013
4/22/2013
4/29/2013
5/6/2013
5/13/2013
5/20/2013
5/27/2013
6/3/2013
6/10/2013
6/17/2013
Date
Wellhead Temp. (F)

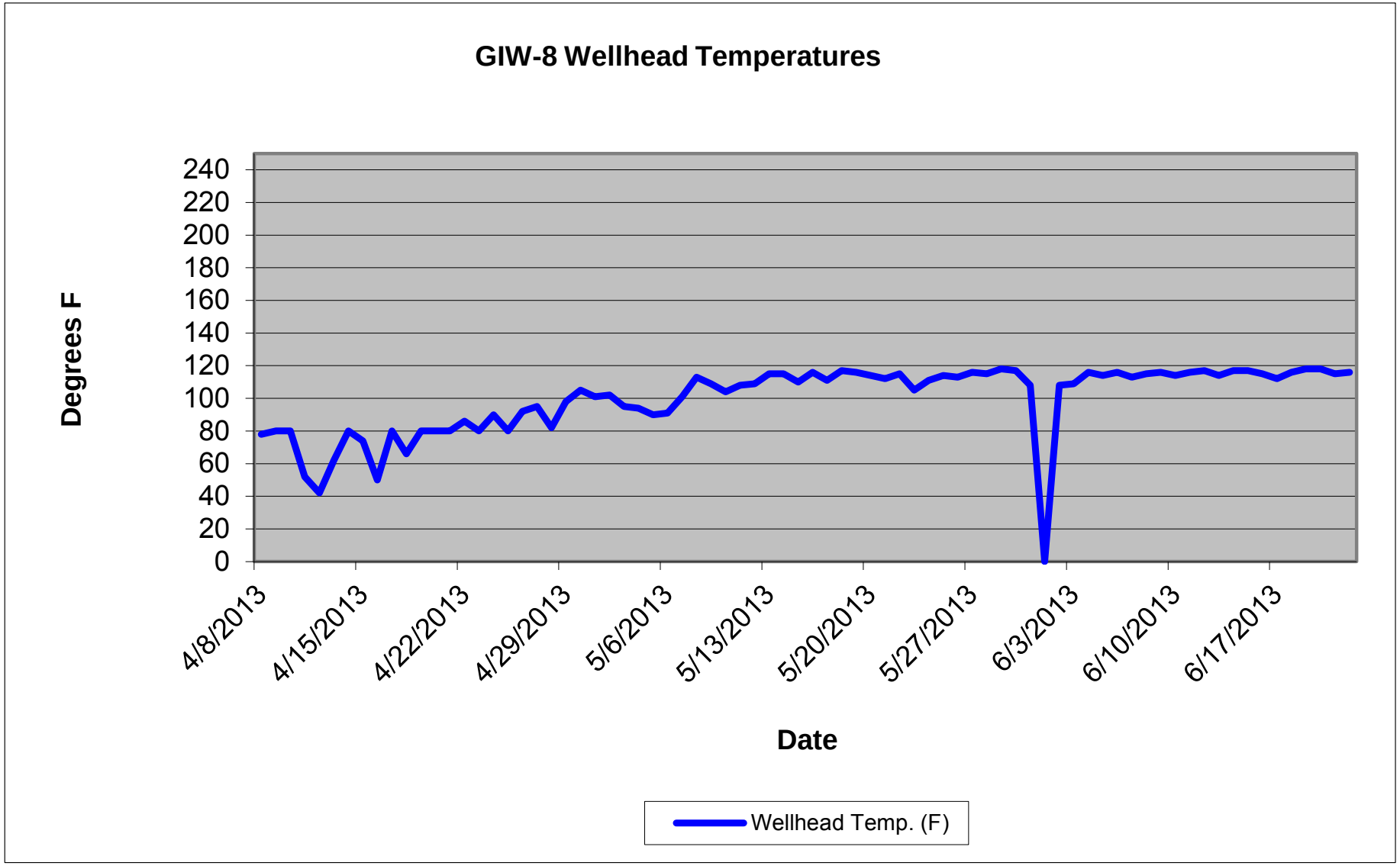

GIW-3 Wellhead Temperatures
Degrees F
240
220
200
180
160
140
120
100
80
60
40
20
0
4/8/2013
4/15/2013
4/22/2013
4/29/2013
5/6/2013
5/13/2013
5/20/2013
5/27/2013
6/3/2013
6/10/2013
6/17/2013
Date
Wellhead Temp. (F)

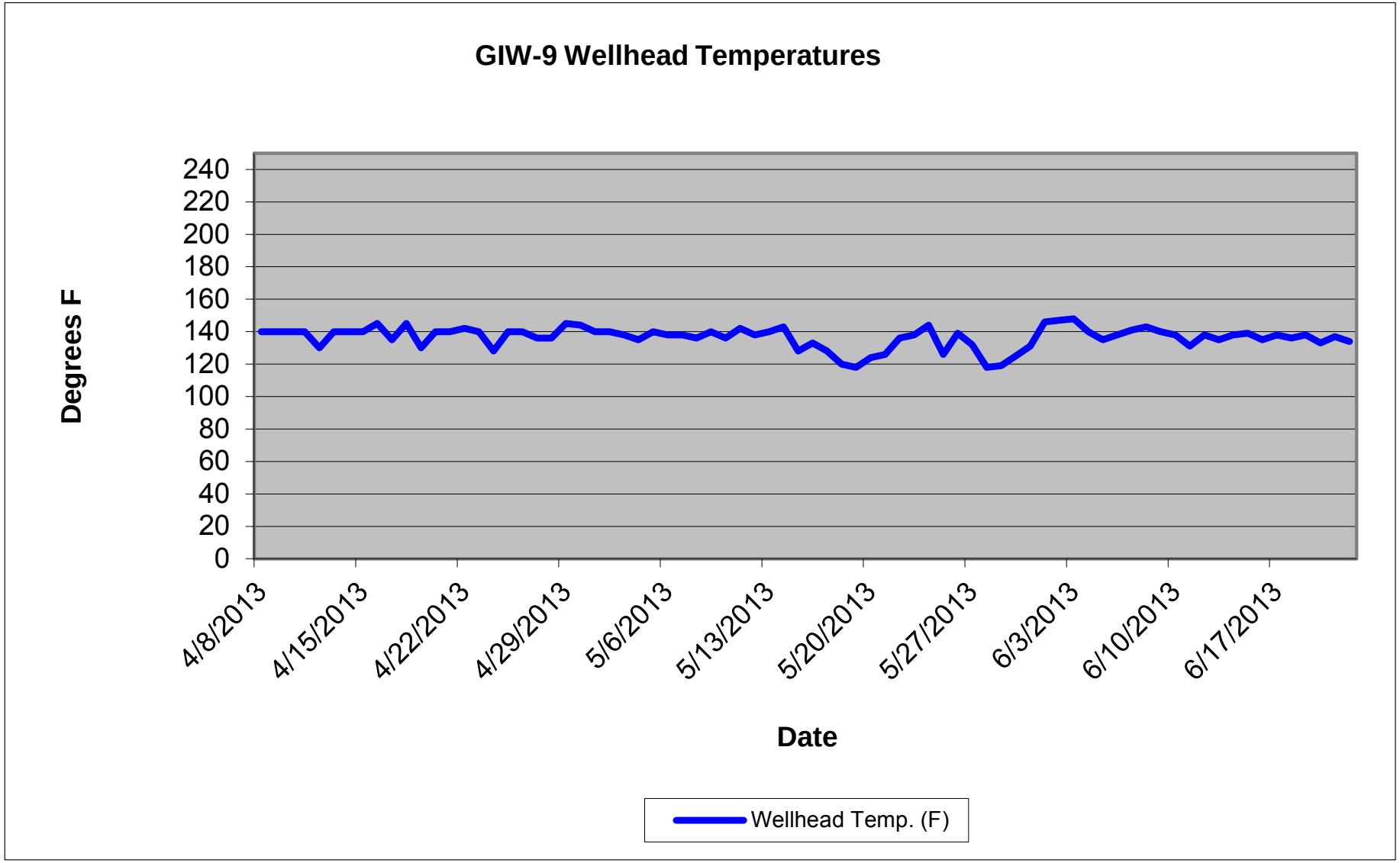

GIW-4 Wellhead Temperatures
Degrees F
240
220
200
180
160
140
120
100
80
60
40
20
0
4/8/2013
4/15/2013
4/22/2013
4/29/2013
5/6/2013
5/13/2013
5/20/2013
5/27/2013
6/3/2013
6/10/2013
6/17/2013
Date
Wellhead Temp. (F)

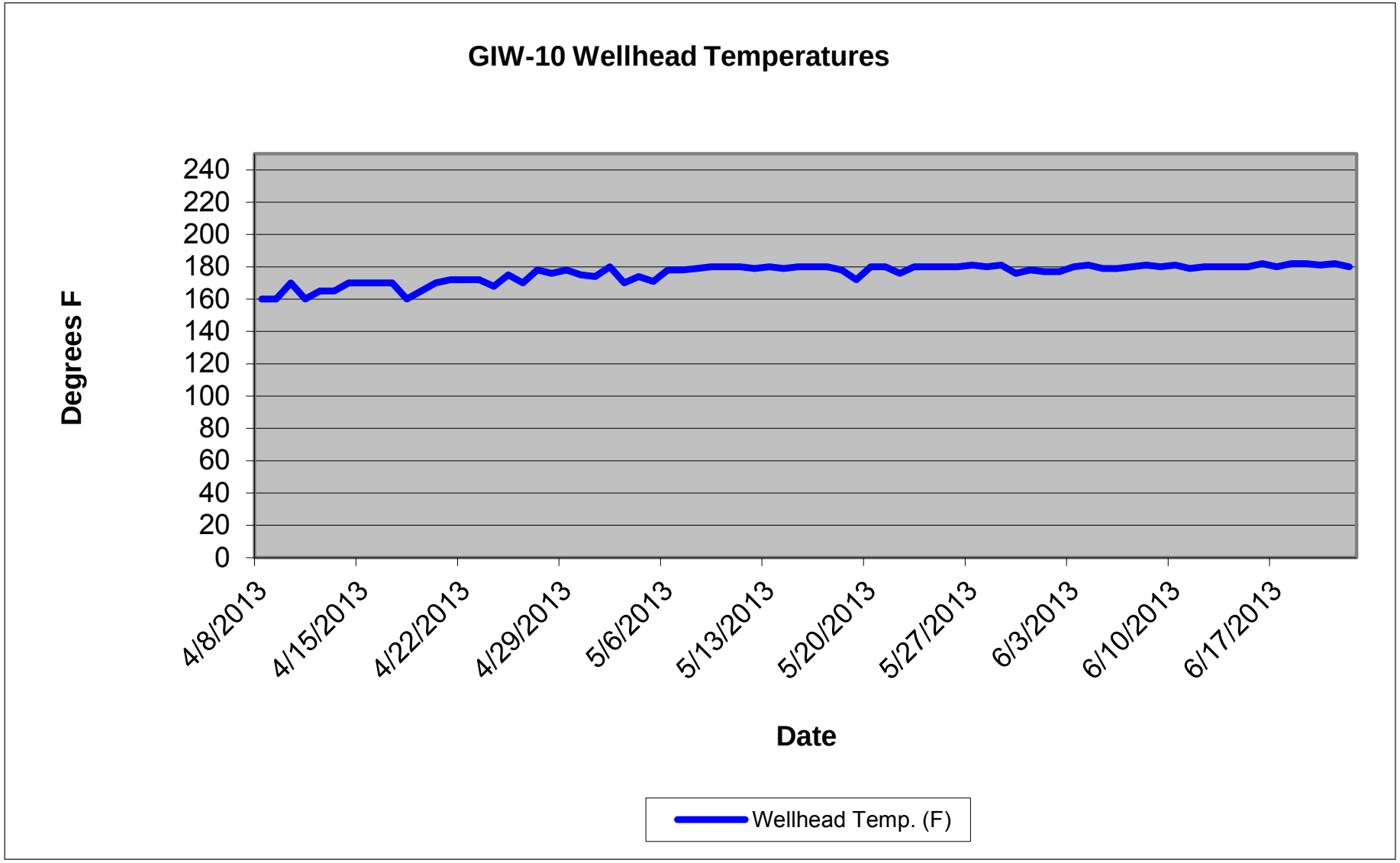

GIW-5 Wellhead Temperatures
Degrees F
240
220
200
180
160
140
120
100
80
60
40
20
0
4/8/2013
4/15/2013
4/22/2013
4/29/2013
5/6/2013
5/13/2013
5/20/2013
5/27/2013
6/3/2013
6/10/2013
6/17/2013
Date
Wellhead Temp. (F)

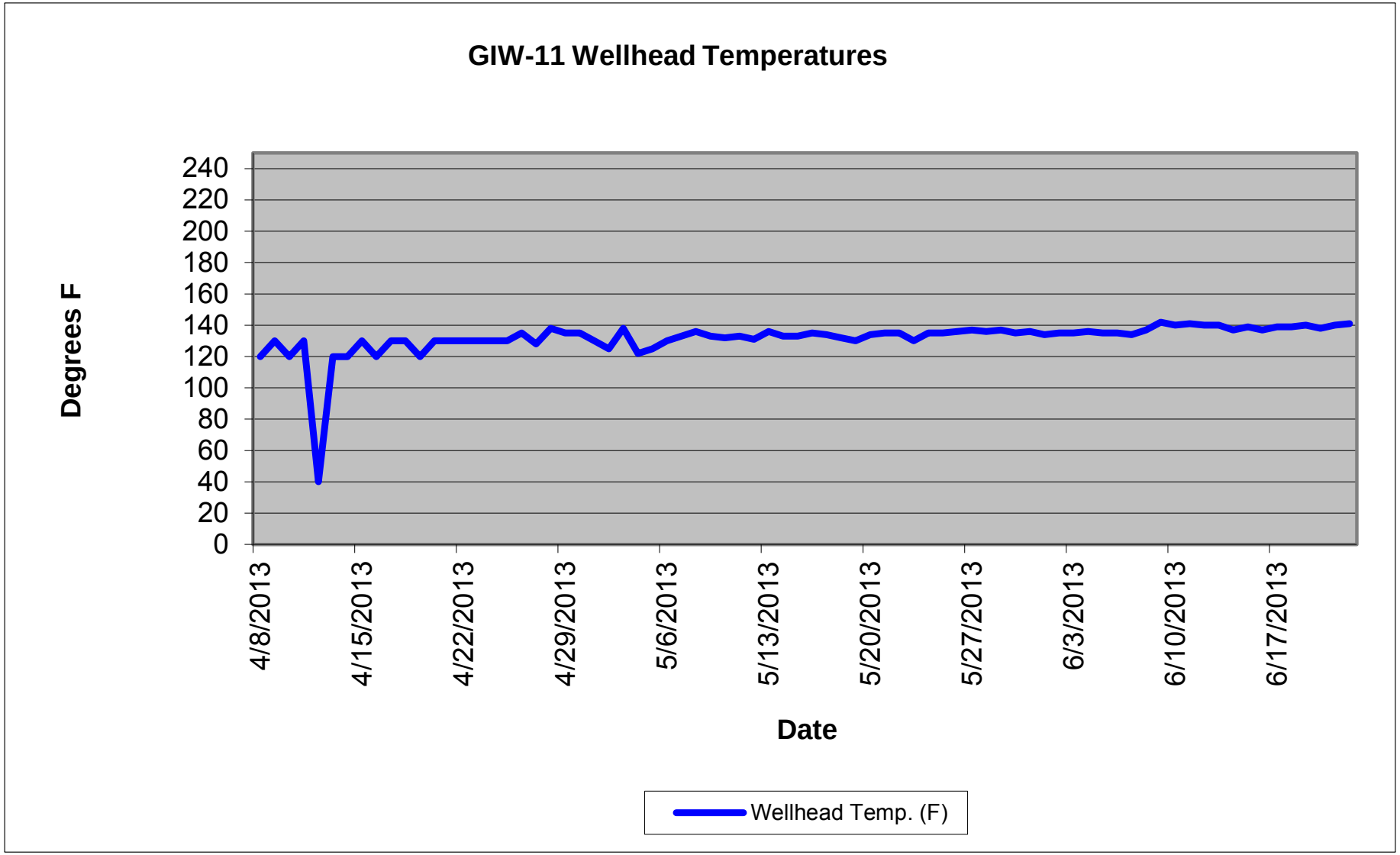

GIW-6 Wellhead Temperatures
Degrees F
240
220
200
180
160
140
120
100
80
60
40
20
0
4/8/2013
4/15/2013
4/22/2013
4/29/2013
5/6/2013
5/13/2013
5/20/2013
5/27/2013
6/3/2013
6/10/2013
6/17/2013
Date
Wellhead Temp. (F)

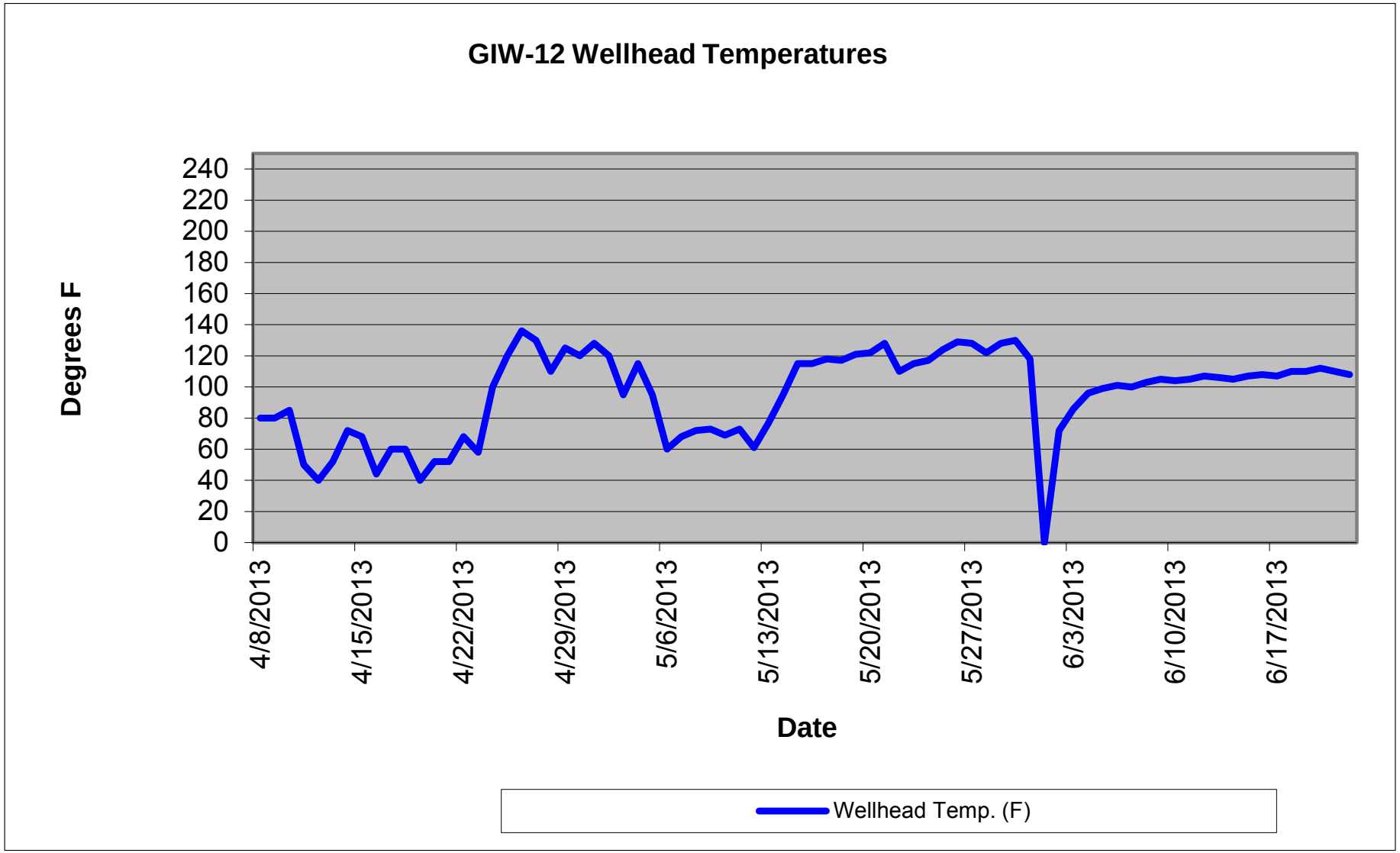

GIW-7 Wellhead Temperatures
Degrees F
240
220
200
180
160
140
120
100
80
60
40
20
0
4/8/2013
4/15/2013
4/22/2013
4/29/2013
5/6/2013
5/13/2013
5/20/2013
5/27/2013
6/3/2013
6/10/2013
6/17/2013
Date
Wellhead Temp. (F)

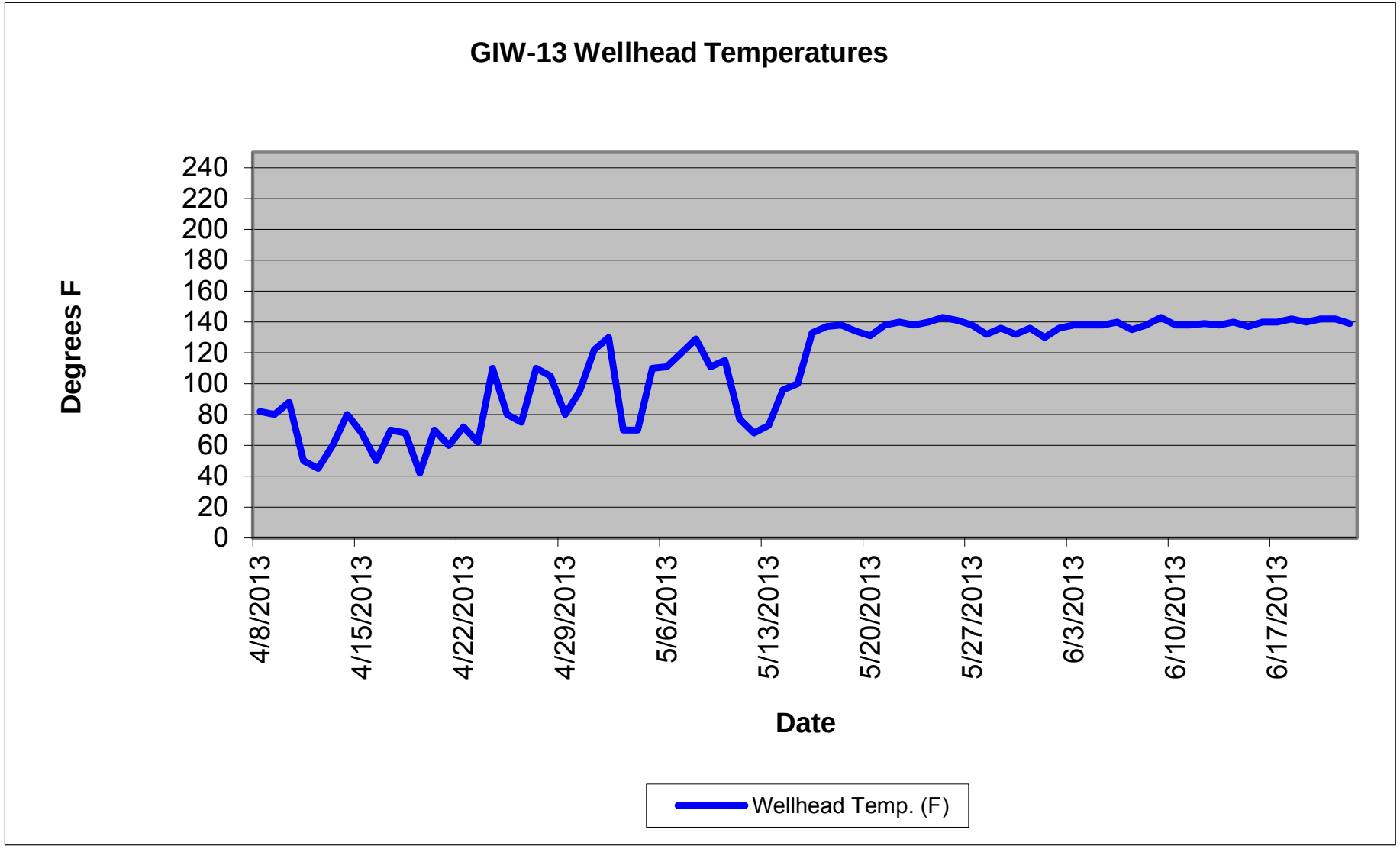

GIW-8 Wellhead Temperatures
Degrees F
240
220
200
180
160
140
120
100
80
60
40
20
0
4/8/2013
4/15/2013
4/22/2013
4/29/2013
5/6/2013
5/13/2013
5/20/2013
5/27/2013
6/3/2013
6/10/2013
6/17/2013
Date
Wellhead Temp. (F)


GIW-9 Wellhead Temperatures
Degrees F
240
220
200
180
160
140
120
100
80
60
40
20
0
4/8/2013
4/15/2013
4/22/2013
4/29/2013
5/6/2013
5/13/2013
5/20/2013
5/27/2013
6/3/2013
6/10/2013
6/17/2013
Date
Wellhead Temp. (F)


GIW-10 Wellhead Temperatures
Degrees F
240
220
200
180
160
140
120
100
80
60
40
20
0
4/8/2013
4/15/2013
4/22/2013
4/29/2013
5/6/2013
5/13/2013
5/20/2013
5/27/2013
6/3/2013
6/10/2013
6/17/2013
Date
Wellhead Temp. (F)


GIW-11 Wellhead Temperatures
Degrees F
240
220
200
180
160
140
120
100
80
60
40
20
0
4/8/2013
4/15/2013
4/22/2013
4/29/2013
5/6/2013
5/13/2013
5/20/2013
5/27/2013
6/3/2013
6/10/2013
6/17/2013
Date
Wellhead Temp. (F)


GIW-12 Wellhead Temperatures
Degrees F
240
220
200
180
160
140
120
100
80
60
40
20
0
4/8/2013
4/15/2013
4/22/2013
4/29/2013
5/6/2013
5/13/2013
5/20/2013
5/27/2013
6/3/2013
6/10/2013
6/17/2013
Date
Wellhead Temp. (F)


GIW-13 Wellhead Temperatures
Degrees F
240
220
200
180
160
140
120
100
80
60
40
20
0
4/8/2013
4/15/2013
4/22/2013
4/29/2013
5/6/2013
5/13/2013
5/20/2013
5/27/2013
6/3/2013
6/10/2013
6/17/2013
Date
Wellhead Temp. (F)

APPENDIX D

JUNE 20, 2013 MONTHLY DATA REPORT

Bridgeton Landfill, LLC

Monthly Data Submittals

Required by Section 52.E of Agreed Order, Case No. 13SL-CC01088
Effective May 13, 2013

Contents:

Commentary on Data
Attachment A Daily Flare Monitoring Data
- **A-1** Data Spreadsheet
- **A-2** Data Graphs

Attachment B Work Completed and Planned
Attachment C Carbon Monoxide Maps
Attachment D Hydrogen Maps
Attachment E Settlement Front Map
Attachment F Gas Wellfield Data
- **F-1** GEM Data Spreadsheet
- **F-2** Maximum Temperature Spreadsheet
- **F-3** Lab Analyses Spreadsheet

Attachment G Wellhead Temperature Maps
Attachment H Summary of Odor Complaints
Attachment I Liquid Characterization Data
Attachment J Liquid Transport Manifest Logs

Provided Separately:

– Flare Raw Data Excel Spreadsheet
– Gas Wellfield Raw Data Excel Spreadsheet

June 20, 2013

Commentary on Data, June 20, 2013

The following observations and comments are offered for the May 2013 data:

- As seen in Attachment A-2, gas collection volume continued to increase (from about 5,500 CFM in February 2013 to about 7,500 CFM in May 2013) as the GIWs were put into service and overall vacuum distribution to the GCCS was improved. There was a corresponding increase in average gas temperature through the past several months reflecting improved gas and heat removal.
- Review of the maps in Attachment B shows that carbon monoxide levels in the "neck" area are stable and even somewhat decreasing in the past few months.
- Review of the maps in Attachment C shows that hydrogen levels in the "neck" area are stable.
- Comparison of the May settlement front on Attachment E to the April settlement front map suggests little to no advancement of settlement front toward the neck area. The past several months appear to show a slowing of advancement toward the neck area.
- Attachment F-2 and G indicate an overall trend to higher gas wellhead temperatures in the South Quarry area. This is attributable to higher ambient temperature, improved gas collection efficiency, and capture of more generated heat. Four wells in the North Quarry area have historically run at or a little over 131° F and they have returned to slightly over that value leading to a color change on the May map in Attachment F-2.
- As seen in Attachment H, there were 76 complaints in May (compared to 15 complaints in April). This was attributable to the RCP abandonment program which *was expected* to increase odors. In addition, many of the complaints were actually inquiries from residents concerning the Lodging Program.

ATTACHMENT A

DAILY FLARE MONITORING DATA

ATTACHMENT A-1

DATA SPREADSHEET

Daily Flare Monitoring Data - Bridgeton Landfill
12/1/2012 - 5/31/2013

Date	Device Flow (scfm)			Total Flow (scfm)
	Enclosed Flare	Callidus Flare	Candlestick Flare	
12/1/2012	2,507	1,863	1,307	**5,677**
12/2/2012	2,616	1,849	1,323	**5,788**
12/3/2012	2,588	1,839	1,409	**5,836**
12/4/2012	2,156	1,980	1,478	**5,614**
12/5/2012	2,015	2,026	1,425	**5,466**
12/6/2012	2,829	1,964	1,118	**5,911**
12/7/2012	2,980	1,900	1,230	**6,110**
12/8/2012	3,000	1,700	1,220	**5,920**
12/9/2012	3,300	1,760	1,075	**6,135**
12/10/2012	2,429	1,670	1,308	**5,407**
12/11/2012	1,786	1,701	1,289	**4,776**
12/12/2012	3,546	1,933	1,440	**6,919**
12/13/2012	1,974	2,089	1,644	**5,707**
12/14/2012	2,217	1,417	1,620	**5,254**
12/15/2012	1,846	2,079	1,607	**5,532**
12/16/2012	1,980	1,882	1,451	**5,313**
12/17/2012	1,743	2,054	1,612	**5,409**
12/18/2012	1,871	1,642	1,597	**5,110**
12/19/2012	1,975	1,860	1,782	**5,617**
12/20/2012	2,177	1,817	1,602	**5,596**
12/21/2012	2,021	1,844	1,551	**5,416**
12/22/2012	2,066	1,850	1,550	**5,466**
12/23/2012	2,037	1,774	1,969	**5,780**
12/24/2012	1,822	1,750	2,059	**5,631**
12/25/2012	1,709	1,805	1,895	**5,409**
12/26/2012	1,481	1,882	1,956	**5,319**
12/27/2012	1,946	1,784	1,662	**5,392**
12/28/2012	1,873	1,891	1,543	**5,307**
12/29/2012	2,031	1,804	1,664	**5,499**
12/30/2012	2,114	1,839	1,523	**5,476**
12/31/2012	2,296	1,909	1,442	**5,647**

Daily Flare Monitoring Data - Bridgeton Landfill
12/1/2012 - 5/31/2013

Date	Device Flow (scfm)			Total Flow (scfm)
	Enclosed Flare	Callidus Flare	Candlestick Flare	
1/1/2013	2,011	1,822	1,418	**5,251**
1/2/2013	1,974	1,977	1,378	**5,329**
1/3/2013	2,130	1,980	1,468	**5,578**
1/4/2013	1,878	1,838	1,393	**5,109**
1/5/2013	1,908	1,860	1,321	**5,089**
1/6/2013	1,712	1,782	1,358	**4,852**
1/7/2013	1,734	1,761	1,265	**4,760**
1/8/2013	1,410	2,009	1,247	**4,666**
1/9/2013	1,902	2,090	1,203	**5,195**
1/10/2013	2,367	2,060	1,243	**5,670**
1/11/2013	1,765	1,646	1,302	**4,713**
1/12/2013	4,388	0	0	**4,388**
1/13/2013	1,569	2,672	1,221	**5,462**
1/14/2013	0	2,904	1,394	**4,298**
1/15/2013	0	3,245	1,401	**4,646**
1/16/2013	0	3,122	1,316	**4,438**
1/17/2013	4,639	3,163	1,514	**9,316**
1/18/2013	0	2,782	1,413	**4,195**
1/19/2013	0	4,064	0	**4,064**
1/20/2013	0	1,888	0	**1,888**
1/21/2013	752	0	1,411	**2,163**
1/22/2013	4,660	2,735	1,894	**9,289**
1/23/2013	730	2,870	730	**4,330**
1/24/2013	671	2,735	1,271	**4,677**
1/25/2013	710	2,759	3,900	**7,369**
1/26/2013	625	2,875	3,901	**7,401**
1/27/2013	591	2,751	3,901	**7,243**
1/28/2013	971	2,843	3,900	**7,714**
1/29/2013	697		1,074	**1,771**
1/30/2013	697	2,862	806	**4,365**
1/31/2013	2,100	2,220	820	**5,140**

Daily Flare Monitoring Data - Bridgeton Landfill
12/1/2012 - 5/31/2013

Date	Device Flow (scfm)			Total Flow (scfm)
	Enclosed Flare	Callidus Flare	Candlestick Flare	
2/1/2013	1,573	2,399	1,452	**5,424**
2/2/2013	2,633	1,618	1,483	**5,734**
2/3/2013	2,880	2,130	868	**5,878**
2/4/2013	3,450	2,358	814	**6,622**
2/5/2013	2,960	2,220	820	**6,000**
2/6/2013	3,204	2,473	981	**6,658**
2/7/2013	2,856	2,258	1,089	**6,203**
2/8/2013	2,641	2,124	832	**5,597**
2/9/2013	2,794	2,366	994	**6,154**
2/10/2013	2,719	2,210	1,080	**6,009**
2/11/2013	3,404	2,216	920	**6,540**
2/12/2013	2,990	2,200	950	**6,140**
2/13/2013	2,915	2,141	965	**6,021**
2/14/2013	2,938	1,995	1,035	**5,968**
2/15/2013	2,824	2,130	941	**5,895**
2/16/2013	2,589	2,064	1,026	**5,679**
2/17/2013	2,760	2,048	1,090	**5,898**
2/18/2013	2,767	2,490	1,060	**6,317**
2/19/2013	2,450	2,233	950	**5,633**
2/20/2013	2,324	2,094	951	**5,369**
2/21/2013	2,435	2,092	1,021	**5,548**
2/22/2013	2,555	2,108	1,150	**5,813**
2/23/2013	2,461	2,024	1,011	**5,496**
2/24/2013	2,694	2,119	1,015	**5,828**
2/25/2013	2,650	1,987	1,080	**5,717**
2/26/2013	2,398	2,293	935	**5,626**
2/27/2013	1,811	1,804	818	**4,433**
2/28/2013	2,112	1,975	908	**4,995**

Daily Flare Monitoring Data - Bridgeton Landfill
12/1/2012 - 5/31/2013

Date	Device Flow (scfm)			Total Flow (scfm)
	Enclosed Flare	Callidus Flare	Candlestick Flare	
3/1/2013	2,192	1,926	848	**4,966**
3/2/2013	2,293	2,202	906	**5,401**
3/3/2013	2,533	2,357	874	**5,764**
3/4/2013	2,659	2,365	913	**5,937**
3/5/2013	2,709	2,313	976	**5,998**
3/6/2013	2,414	2,283	1,012	**5,709**
3/7/2013	2,542	2,340	879	**5,761**
3/8/2013	2,526	2,380	957	**5,863**
3/9/2013	2,711	2,389	915	**6,015**
3/10/2013	2,726	2,266	1,073	**6,065**
3/11/2013	3,134	2,027	1,178	**6,339**
3/12/2013	2,933	2,373	1,202	**6,508**
3/13/2013	2,873	2,207	1,332	**6,412**
3/14/2013	3,615	1,549	768	**5,932**
3/15/2013	3,321	2,237	1,284	**6,842**
3/16/2013	2,762	1,948	1,381	**6,091**
3/17/2013	2,690	1,836	1,842	**6,368**
3/18/2013	2,316	2,171	2,009	**6,496**
3/19/2013	2,252	2,307	1,578	**6,137**
3/20/2013	2,883	2,251	1,167	**6,301**
3/21/2013	2,080	2,106	1,383	**5,569**
3/22/2013	2,216	2,664	1,339	**6,219**
3/23/2013	3,474	2,345	1,247	**7,066**
3/24/2013	2,869	2,248	1,099	**6,216**
3/25/2013	2,946	2,165	1,177	**6,288**
3/26/2013	3,255	2,243	1,112	**6,610**
3/27/2013	3,188	2,249	1,167	**6,604**
3/28/2013	3,237	2,314	1,322	**6,873**
3/29/2013	3,055	2,293	1,898	**7,246**
3/30/2013	2,975	2,349	1,238	**6,562**
3/31/2013	2,826	2,041	1970	**6,837**

Daily Flare Monitoring Data - Bridgeton Landfill
12/1/2012 - 5/31/2013

Date	Device Flow (scfm)			Total Flow (scfm)
	Enclosed Flare	Callidus Flare	Candlestick Flare	
4/1/2013	2,755	2,284	1,994	**7,033**
4/2/2013	2,982	2,109	1,655	**6,746**
4/3/2013	3,138	2,246	1,728	**7,112**
4/4/2013	3,320	2,173	2,008	**7,501**
4/5/2013	3,001	2,034	2,196	**7,231**
4/6/2013	2,976	1,776	1,889	**6,641**
4/7/2013				
4/8/2013	3,122	2,154	1,877	**7,153**
4/9/2013	2,849	2,001	2,156	**7,006**
4/10/2013	3,001	1,614	1,279	**5,894**
4/11/2013	2,719	1,561	1,335	**5,615**
4/12/2013	2,645	1,417	1,441	**5,503**
4/13/2013	3,344	1,504	1,259	**6,107**
4/14/2013	2,369	1,617	2,558	**6,544**
4/15/2013	2,225	1,654	2,135	**6,014**
4/16/2013	1,874	1,472	2,005	**5,351**
4/17/2013	1,889	1,454	2,413	**5,756**
4/18/2013	2,536	1,610	1,808	**5,954**
4/19/2013	2,741	1,558	2,032	**6,331**
4/20/2013	2,963	1,613	1,753	**6,329**
4/21/2013	3,109	1,614	1,773	**6,496**
4/22/2013	3,630	1,564	2,011	**7,205**
4/23/2013	3,202	1,600	1,660	**6,462**
4/24/2013	3,049	1,610	1,675	**6,334**
4/25/2013	3,014	1,585	1,687	**6,286**
4/26/2013	2,832	1,590	1,620	**6,042**
4/27/2013	3,526	1,590	1,029	**6,145**
4/28/2013	3,628	1,615	1,345	**6,588**
4/29/2013	3,506	1,562	1,982	**7,050**
4/30/2013	3,550	1,604	2,124	**7,278**

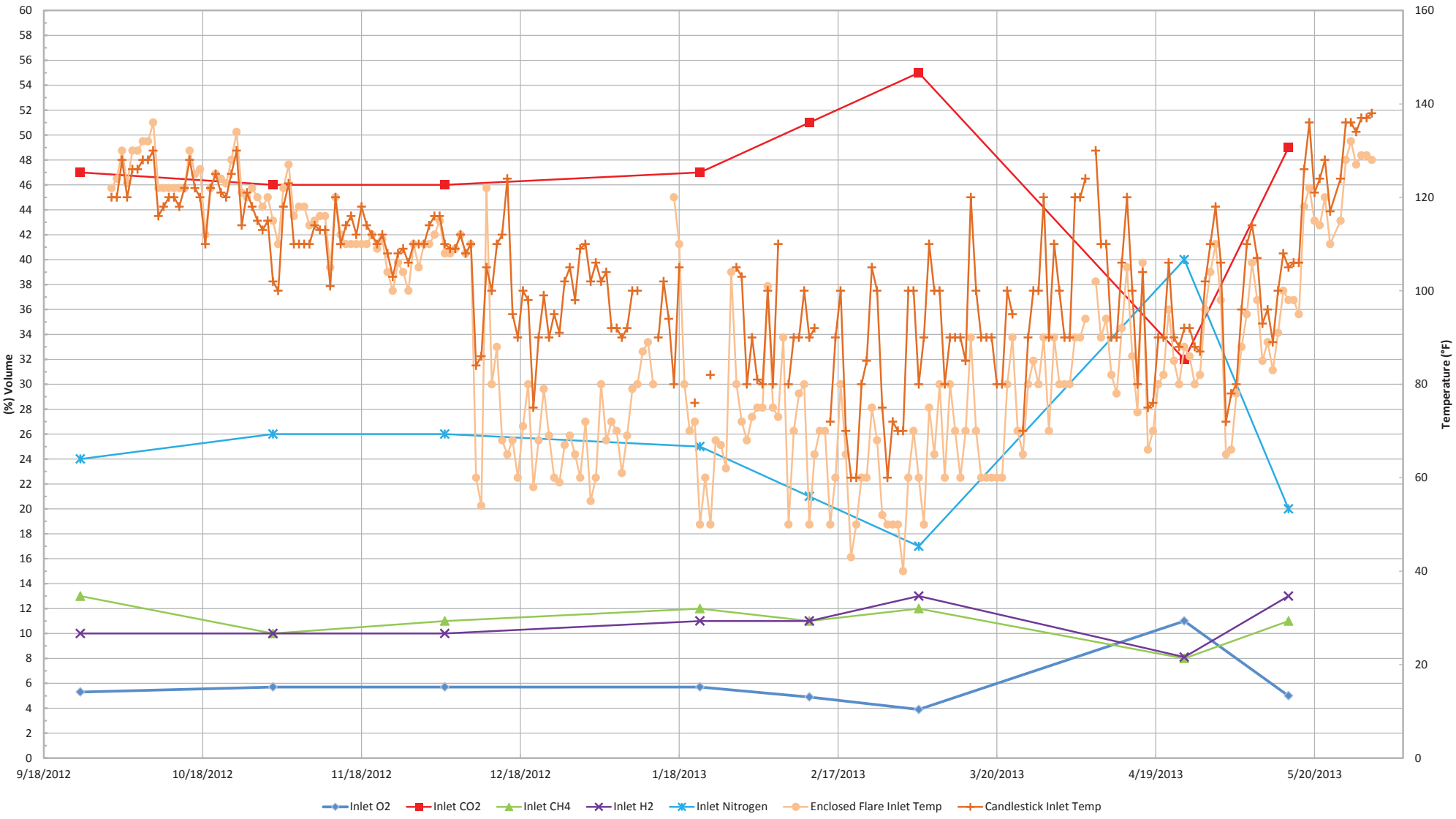
Daily Flare Monitoring Data - Bridgeton Landfill
12/1/2012 - 5/31/2013

Date	Device Flow (scfm)			Total Flow (scfm)
	Enclosed Flare	Callidus Flare	Candlestick Flare	
5/1/2013	1,693	1,516	2,168	**7,298**
5/2/2013	1,562	1,583	1,752	**7,014**
5/3/2013	1,697	1,620	1,779	**6,844**
5/4/2013	1,540	1,606	1,810	**6,996**
5/5/2013	1,740	1,548	1,707	**6,826**
5/6/2013	1,755	1,603	1,730	**7,059**
5/7/2013	1,720	1,687	2,235	**7,487**
5/8/2013	1,656	1,620	2,176	**7,476**
5/9/2013	1,611	1,374	2,110	**7,380**
5/10/2013	1,648	1,582	1,527	**7,004**
5/11/2013	1,663	1,546	1,642	**6,996**
5/12/2013	1,621	1,607	1,900	**7,349**
5/13/2013	1,643	1,564	1,810	**7,227**
5/14/2013	1,626	1,611	2,121	**7,627**
5/15/2013	1,640	1,598	1,920	**7,219**
5/16/2013	1,654	1,404	2,242	**7,520**
5/17/2013	1,648	1,582	2,121	**7,258**
5/18/2013	1,639	1,560	2,141	**7,392**
5/19/2013	1,666	1,595	2,375	**7,614**
5/20/2013	1,667	1,605	1,881	**6,947**
5/21/2013	1,649	1,596	2,112	**7,194**
5/22/2013	1,629	1,574	2,337	**7,414**
5/23/2013	1,662	1,577	2,214	**7,094**
5/24/2013	1,658	1,477	1,873	**6,981**
5/25/2013	1,673	1,539	2,007	**7,170**
5/26/2013	1,669	1,519	2,488	**7,729**
5/27/2013	1,676	1,510	2,601	**7,814**
5/28/2013	1,651	1,612	2,034	**7,277**
5/29/2013	1,614	1,610	2,321	**7,456**
5/30/2013	1,670	1,601	2,828	**7,731**
5/31/2013	1,591	1,596	2,741	**7,338**

ATTACHMENT A-2

DATA GRAPHS

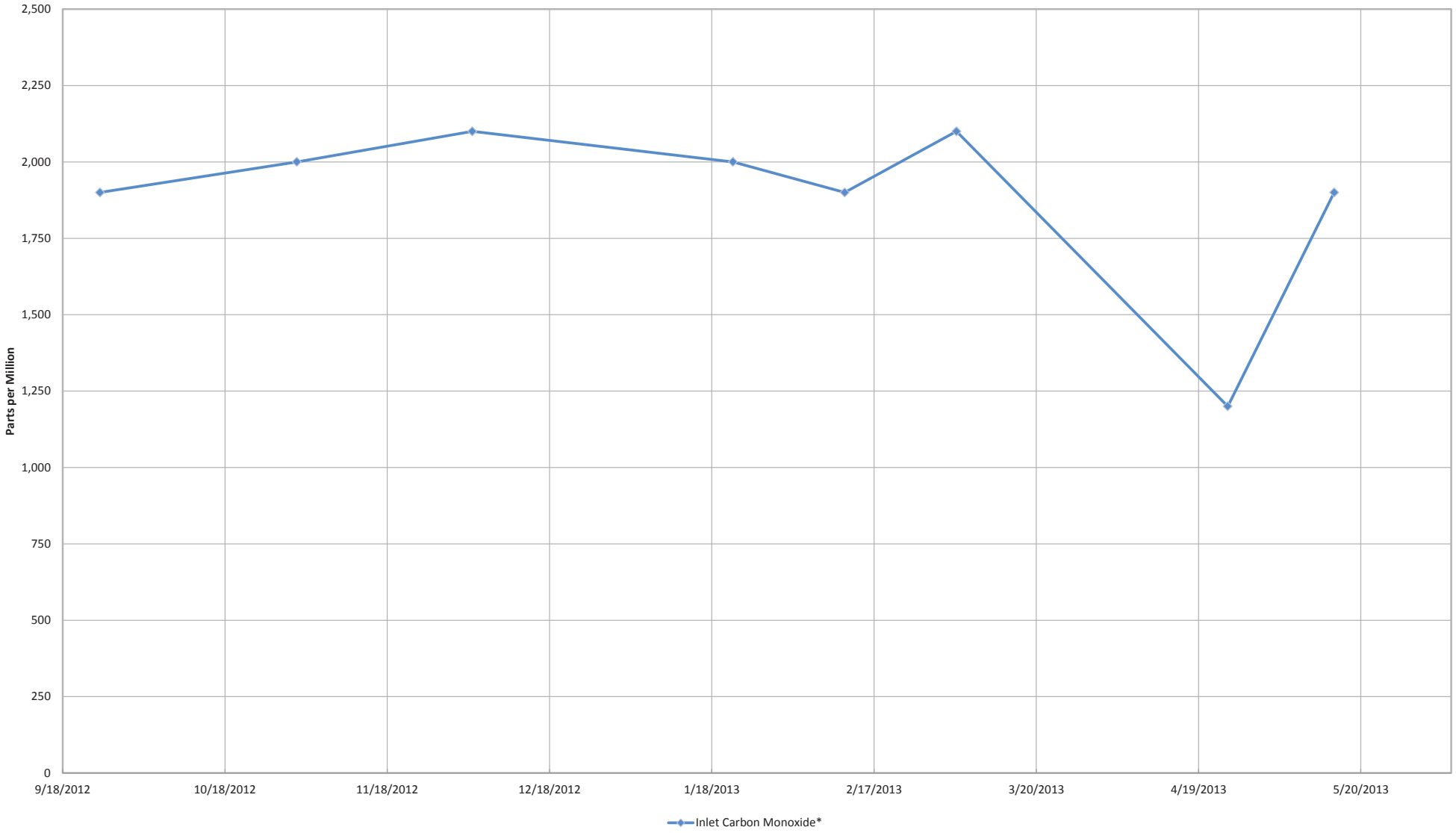
Inlet Gas and Temperature*



*Gas data collected from Laboratory Reports. Temperature data collected from GEM 2000 field readings.

SCS ENGINEERS

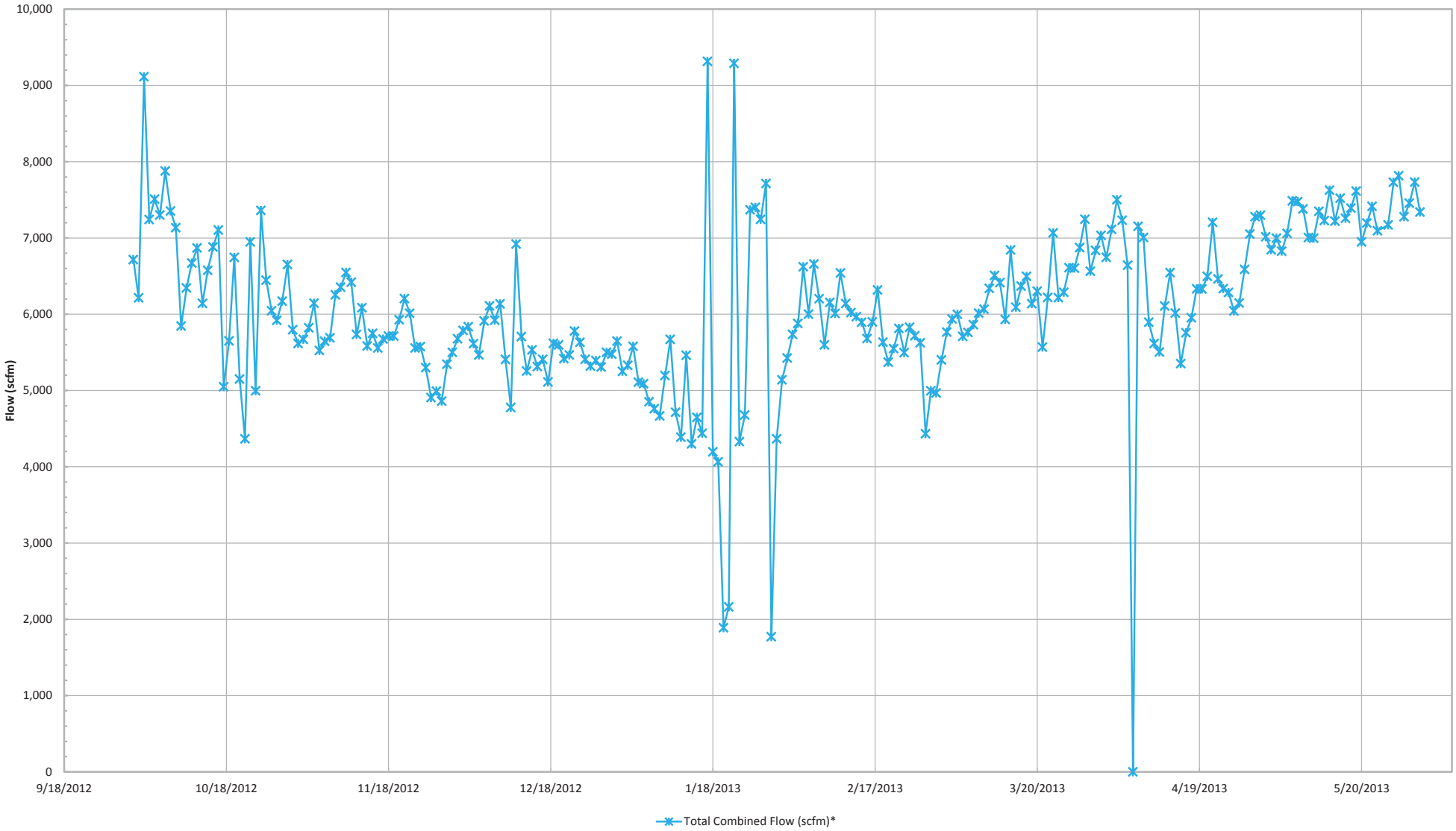
Inlet Carbon Monoxide*



*Data collected from Laboratory Reports.

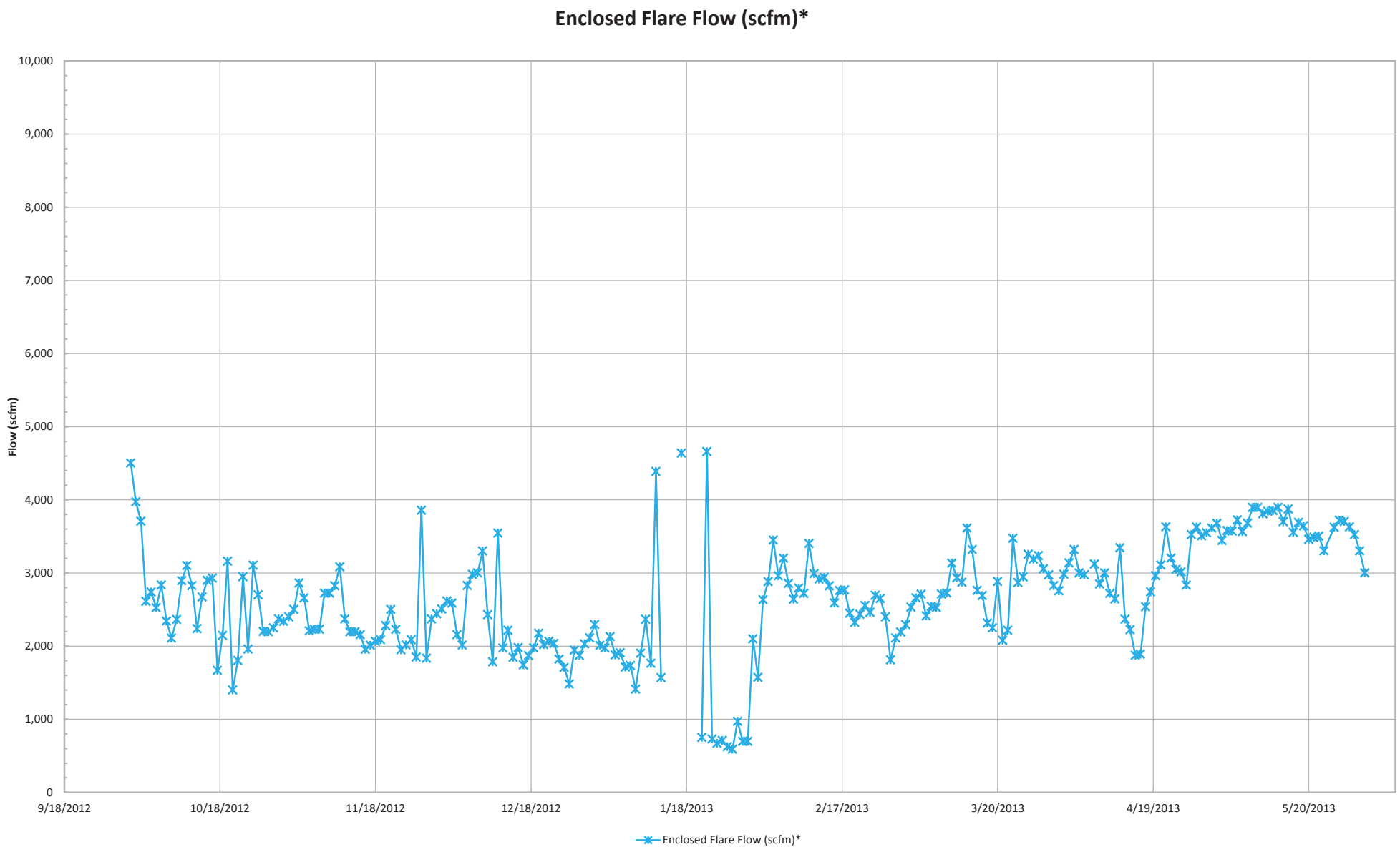
SCS ENGINEERS

Total Combined Flow (scfm)*



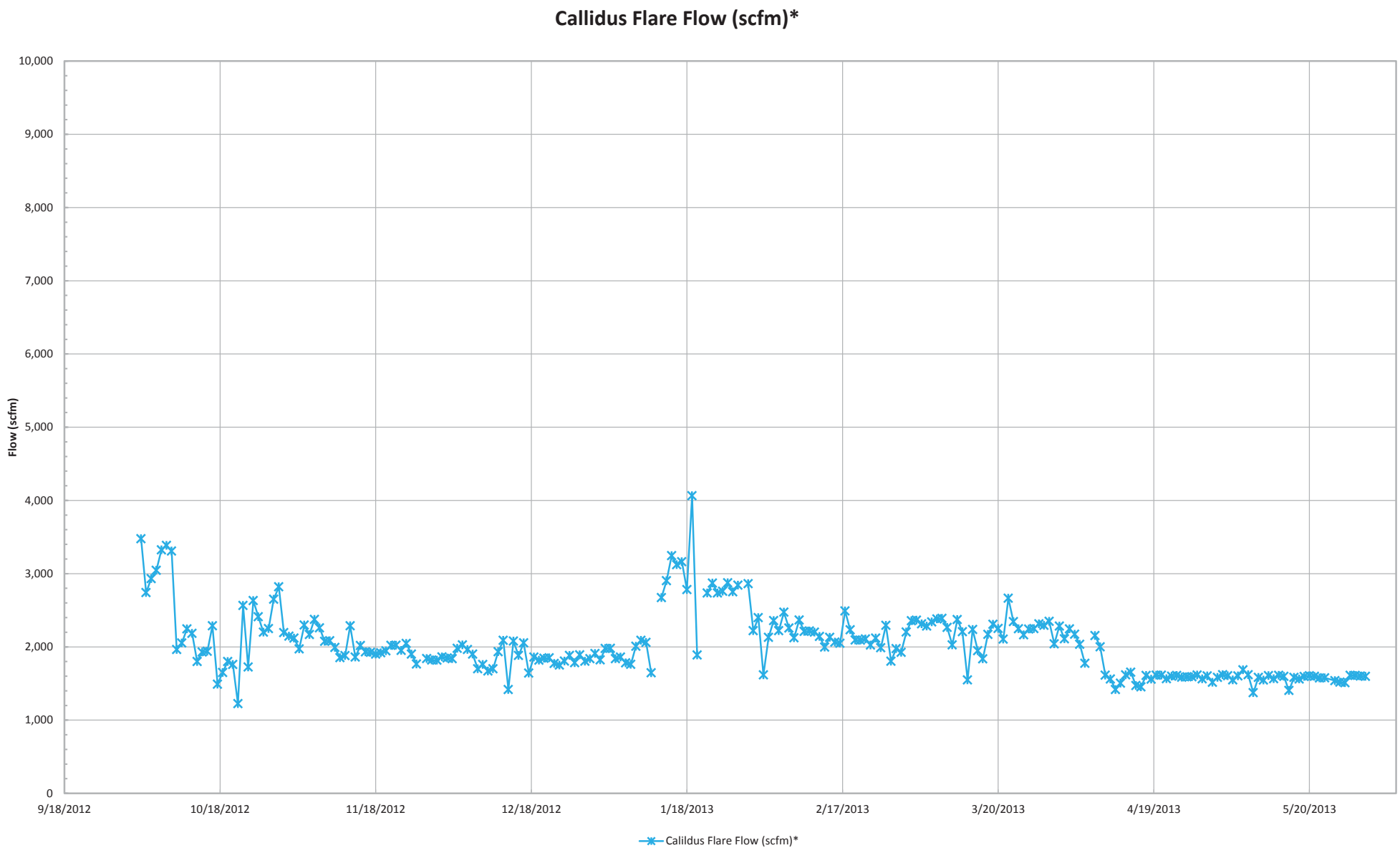
*Combined flow is based on tabulated flow data collected daily from each device.

SCS ENGINEERS



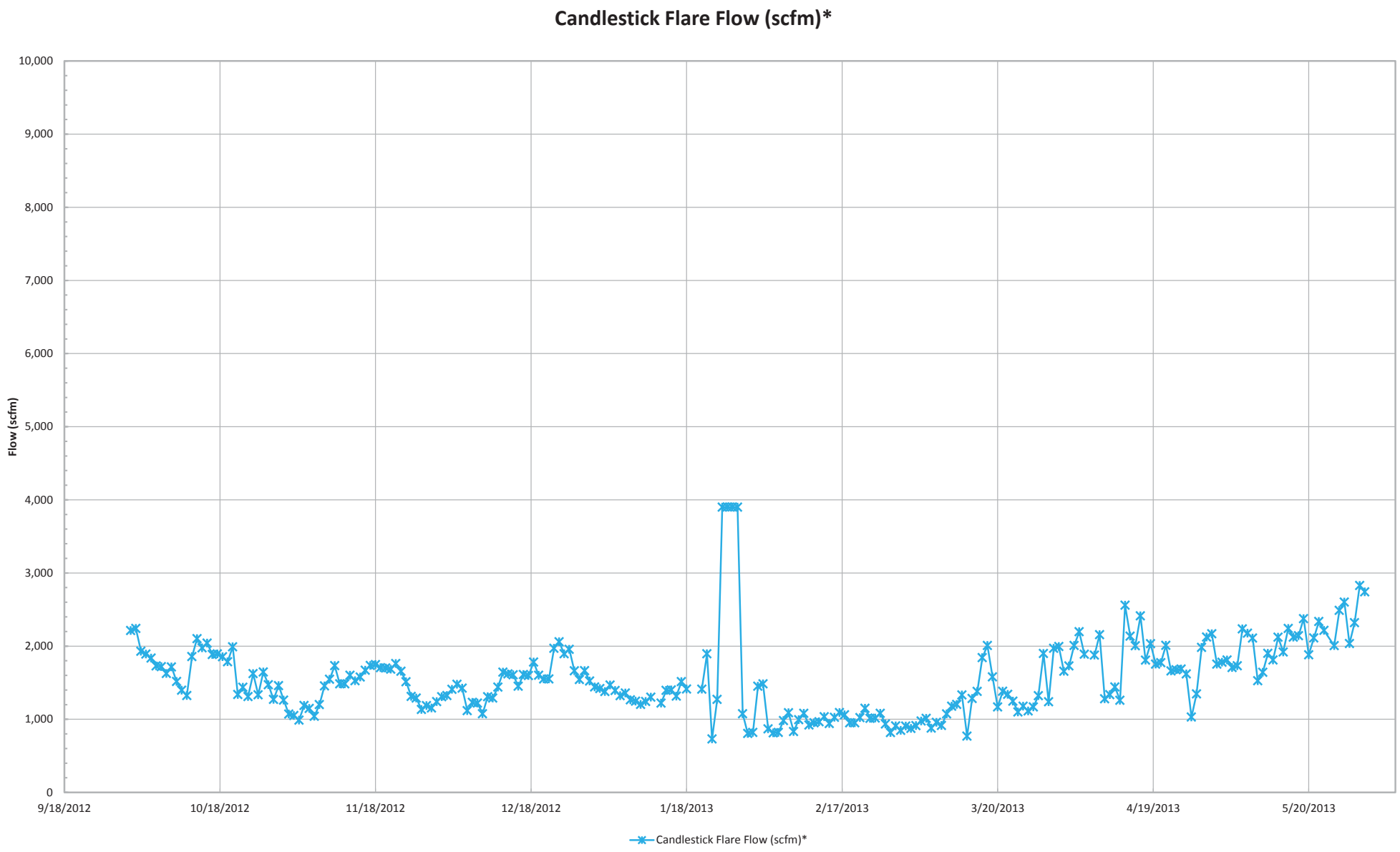
*Flow is based on tabulated flow data collected daily.

SCS ENGINEERS



*Flow is based on tabulated flow data collected daily.

SCS ENGINEERS



*Flow is based on tabulated flow data collected daily.

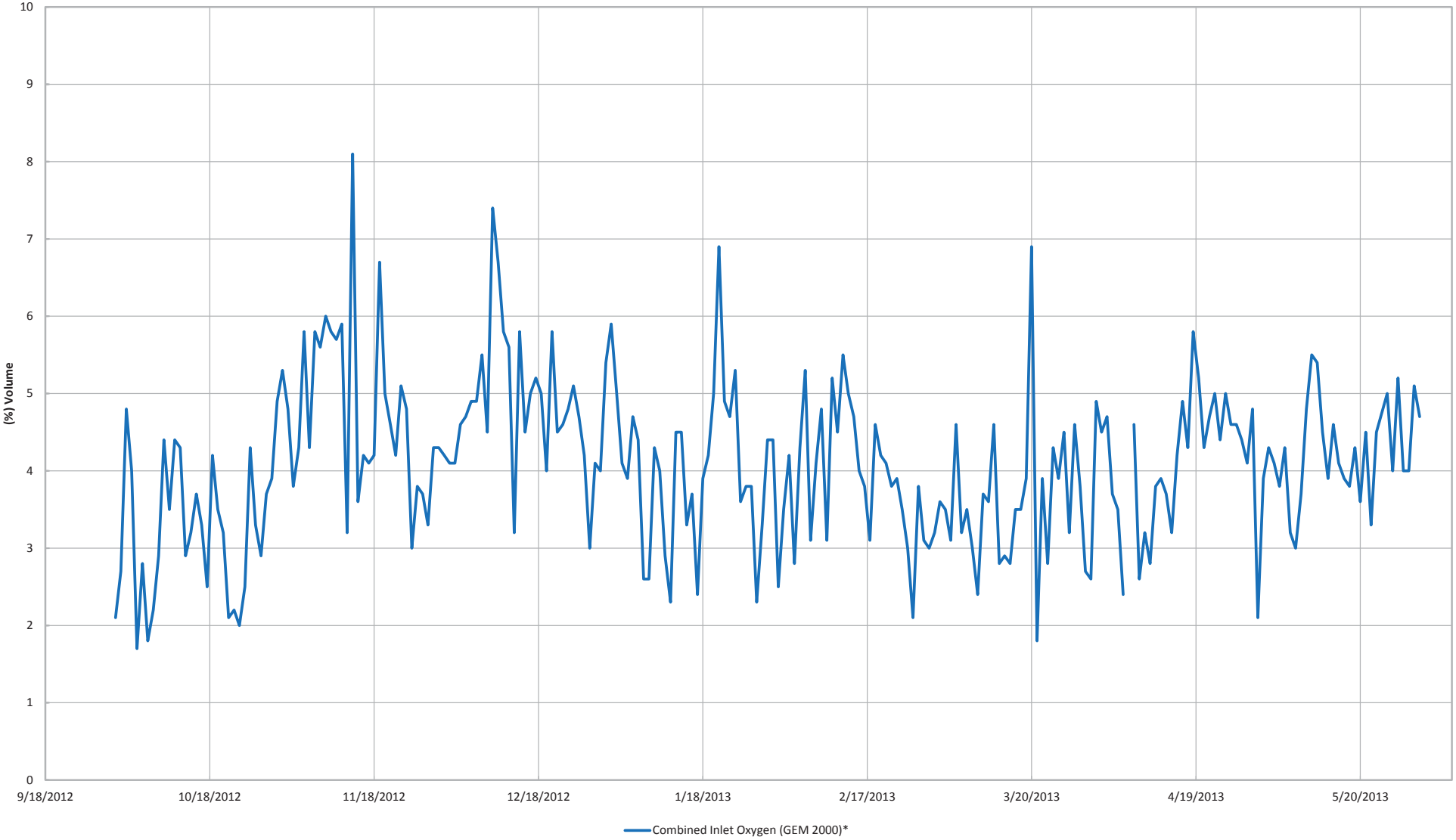
SCS ENGINEERS

Combined Inlet Methane (GEM 2000)*

*Gas data collected from GEM 2000 field monitoring instrument.

SCS ENGINEERS

Combined Inlet Oxygen (GEM 2000)*



*Gas data collected from GEM 2000 field monitoring instrument.

SCS ENGINEERS

ATTACHMENT B

WORK COMPLETED AND PLANNED

Bridgeton Landfill, LLC

Monthly Summary of Work Completed and Planned

Work Completed in May 2013

Gas Collection and Control System

- Removed single-walled phase separation vessels from landfill surface and replace with double-walled vessels located off landfill footprint
- Disconnected, reposition, and reconnect booster blower to make way for storm water detention pond
- RCP abandonments started May 20th ,completed June 3rd

Leachate Management System

- Completed construction and began plumbing of new 316,000 gallon tank
- Continued drilling LCS-4 replacement
- Removed substantial volume of leachate backlog and started removal of frac tanks

Gas Interceptor Wells/Temperature Monitoring Probes

- Continued routine operation of previously installed features

Cap Related

- Installed 25 toe drain sumps (LS features in capping plan)
- Performed grading activities in preparation for capping

Other Work Items

- Continued erosion and sedimentation control grading and sedimentation pond construction

Work Planned for June 2013

Gas Collection and Control System

- Complete RCP Abandonments
- Start operation of 2,500 CFM auxiliary flare to improve vacuum in South Quarry
- Replace 18" header line in "amphitheater" area

Leachate Management System

- Complete LCS-4 replacement
- Begin operation of 316,000 gallon leachate storage tank
- Continue to reduce on-site backlog of leachate and remove frac tanks

Gas Interceptor Wells/Temperature Monitoring Probes

- Replaced 2” Blackhawk pump in GIW-6 with a 3” pump

Cap Related

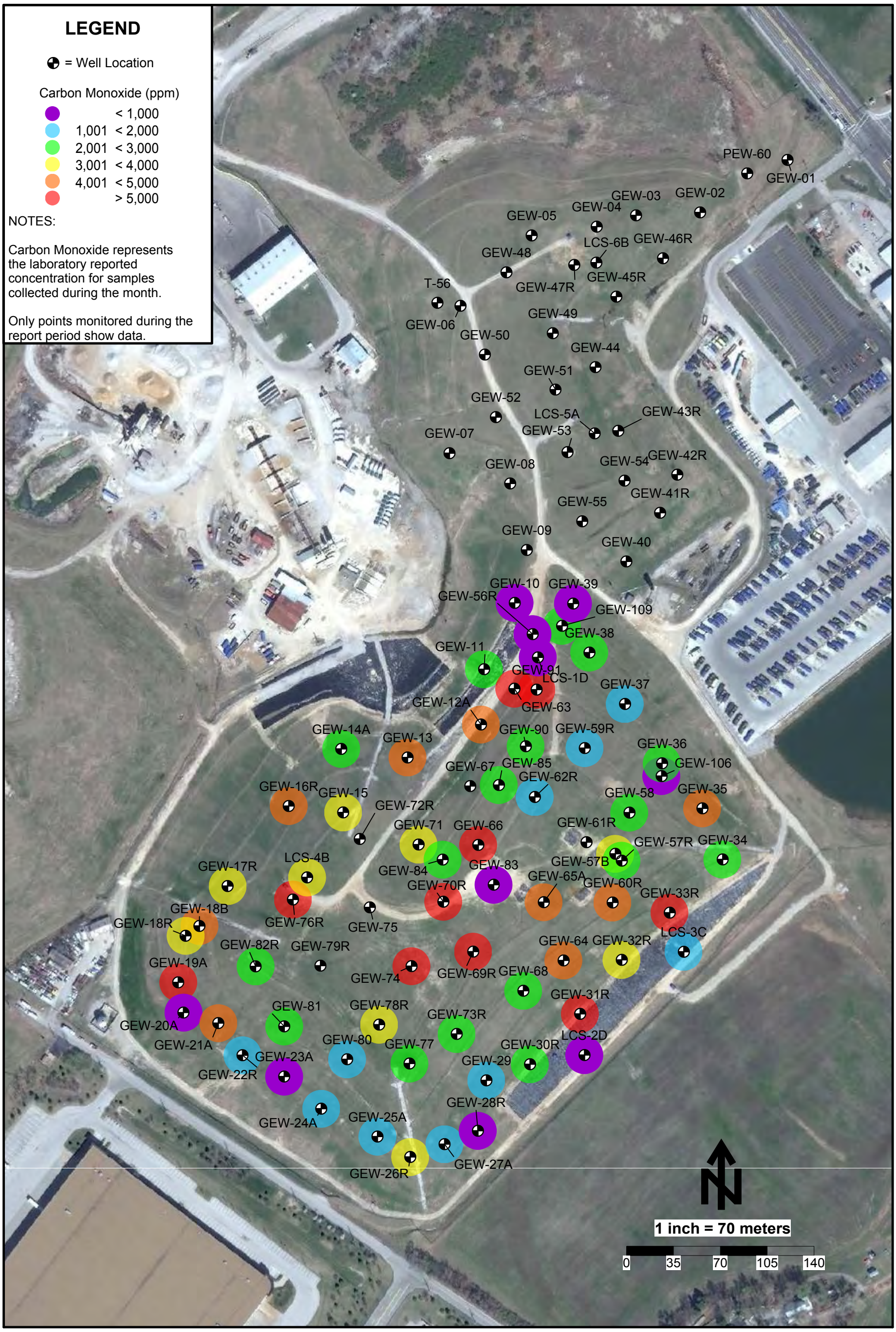
- Connect 25 toe drain sumps with toe drain lines
- Install about 15-20 acres of EVOH cap with subcap features

Other Work Items

- Complete construction and lining of north and east sedimentation ponds
- Complete southwest sedimentation pond
- Complete ditching and drainage work

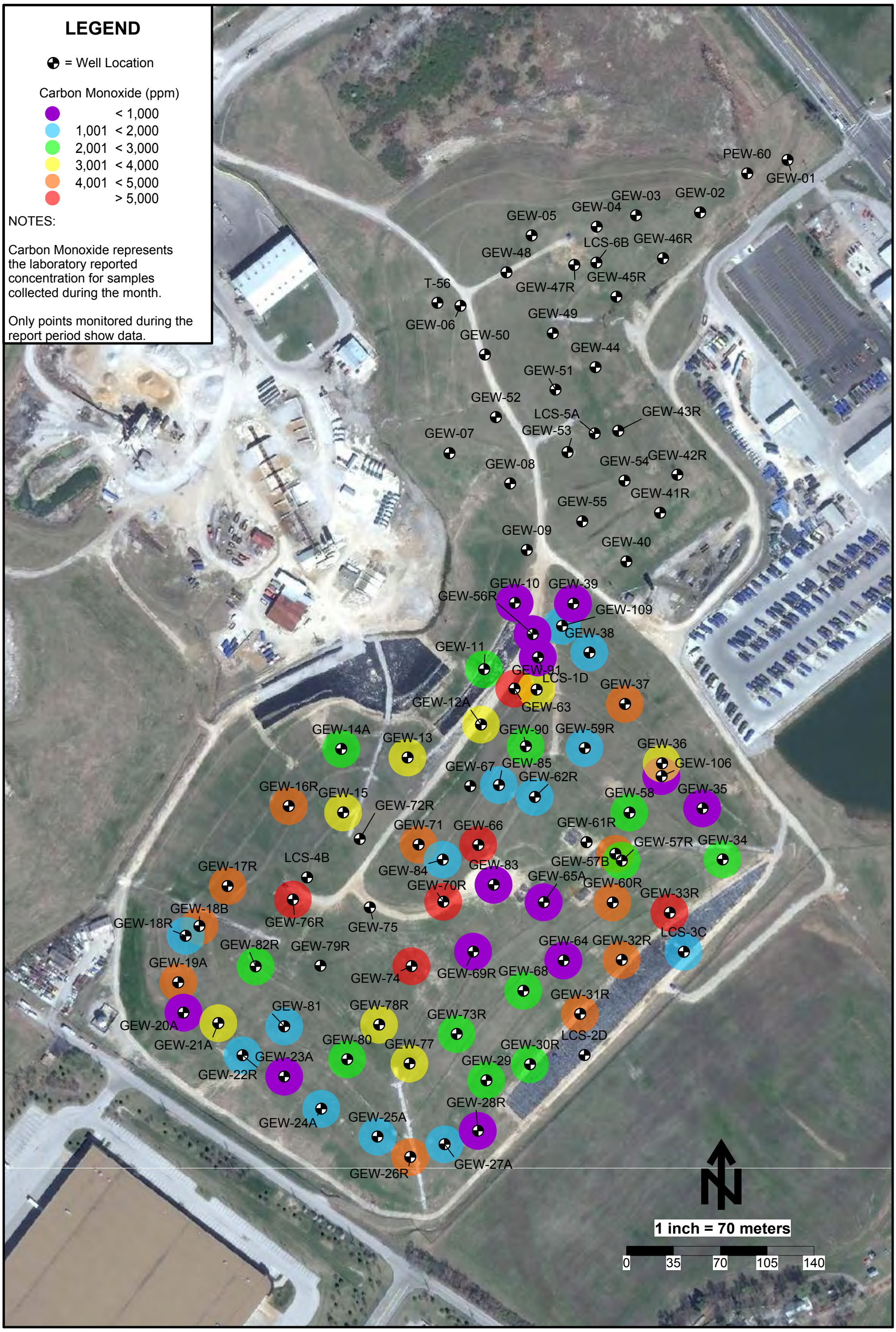
ATTACHMENT C

CARBON MONOXIDE MAPS



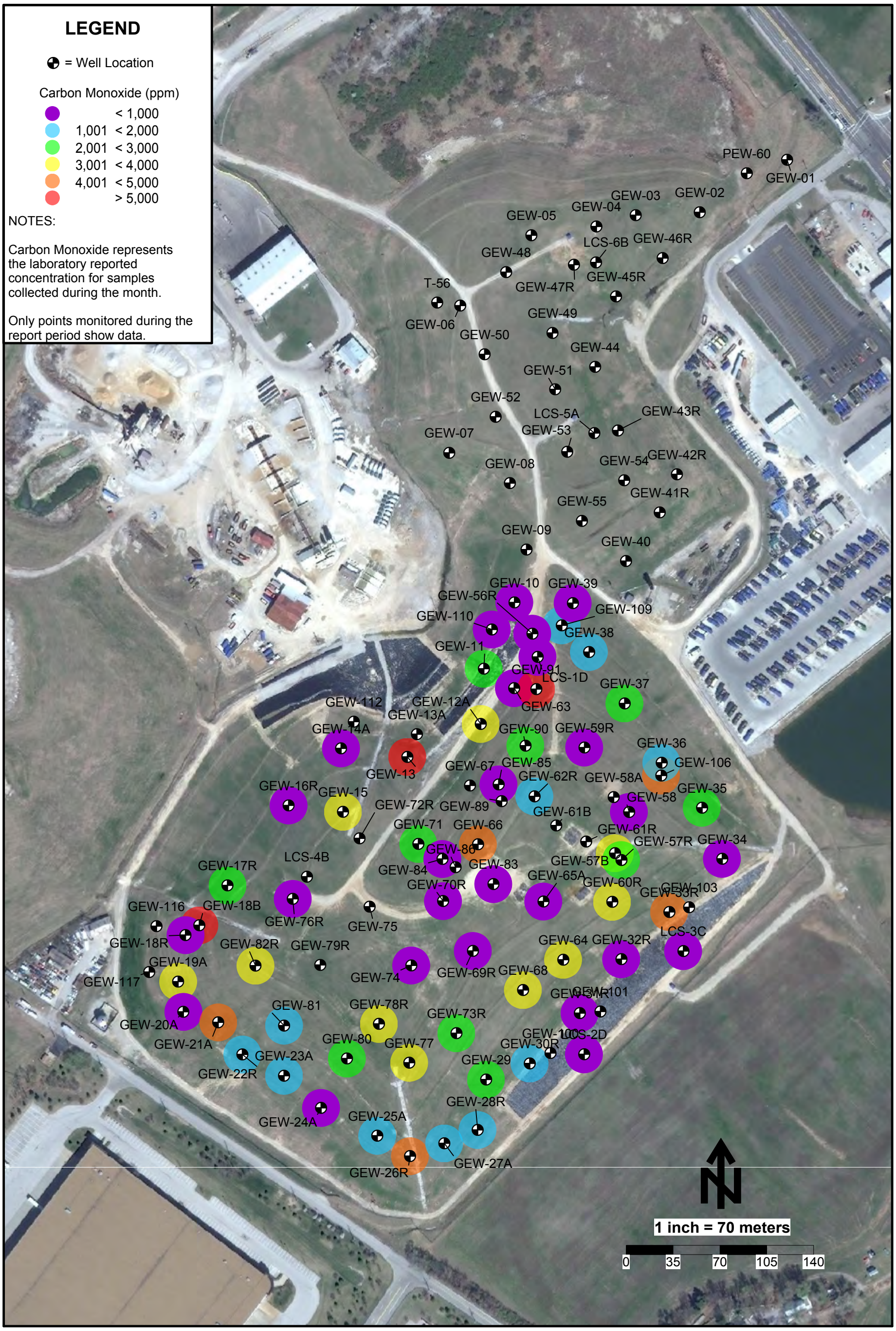
Carbon Monoxide Data Map - February 2013 - Bridgeton Landfill

SCS ENGINEERS



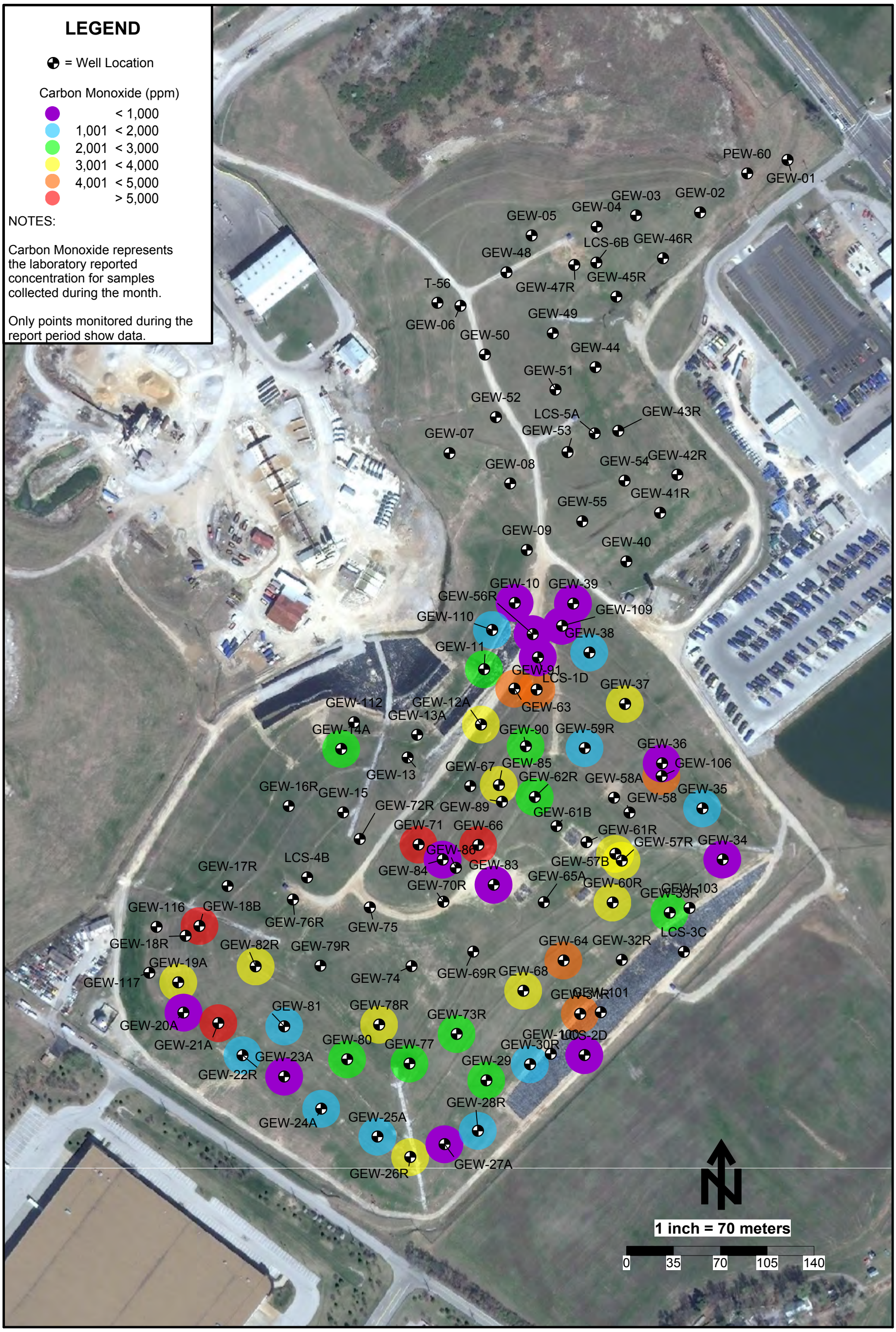
Carbon Monoxide Data Map - March 2013 - Bridgeton Landfill

SCS ENGINEERS



Carbon Monoxide Data Map - April 2013 - Bridgeton Landfill

SCS ENGINEERS

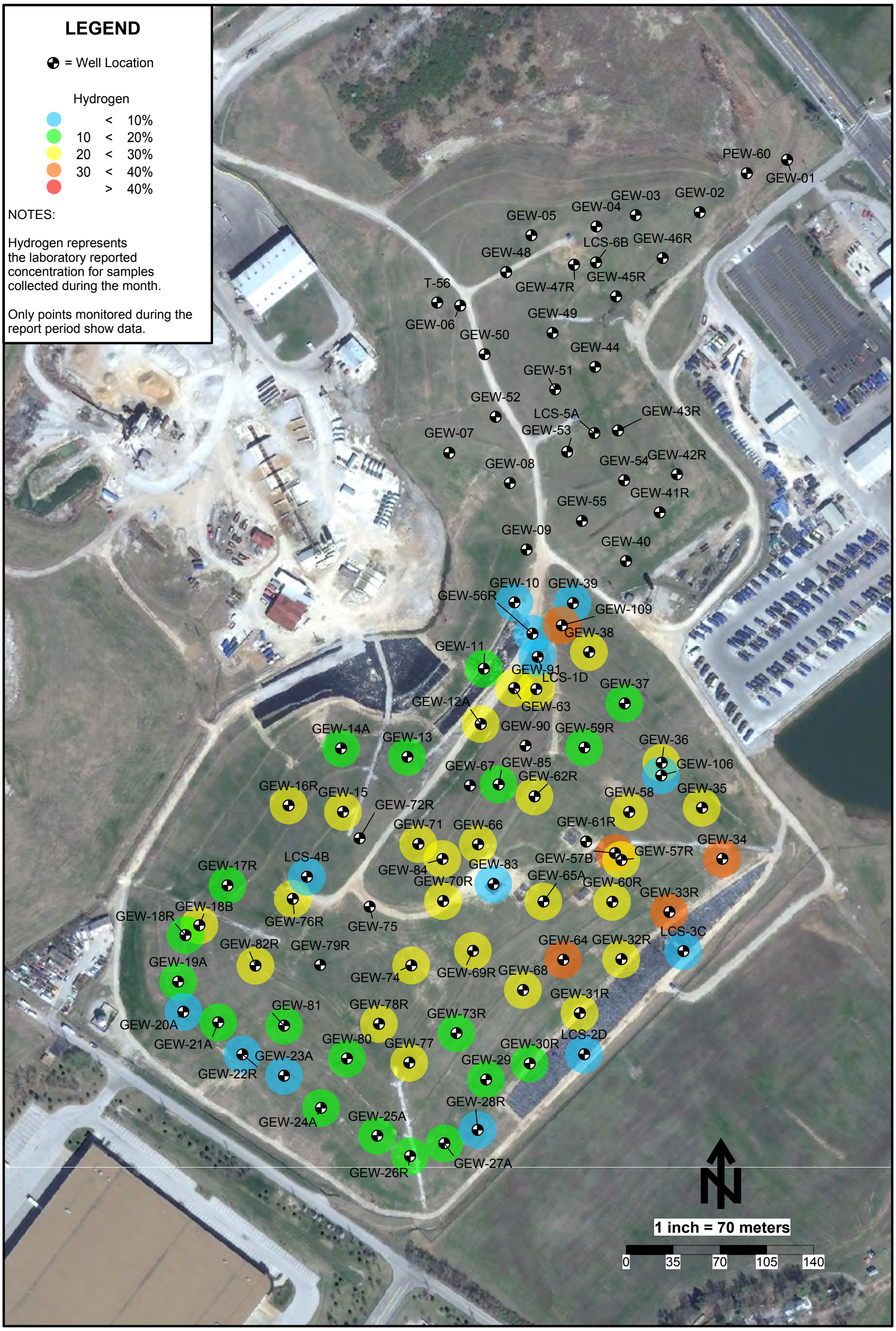


Carbon Monoxide Data Map - May 2013 - Bridgeton Landfill

SCS ENGINEERS

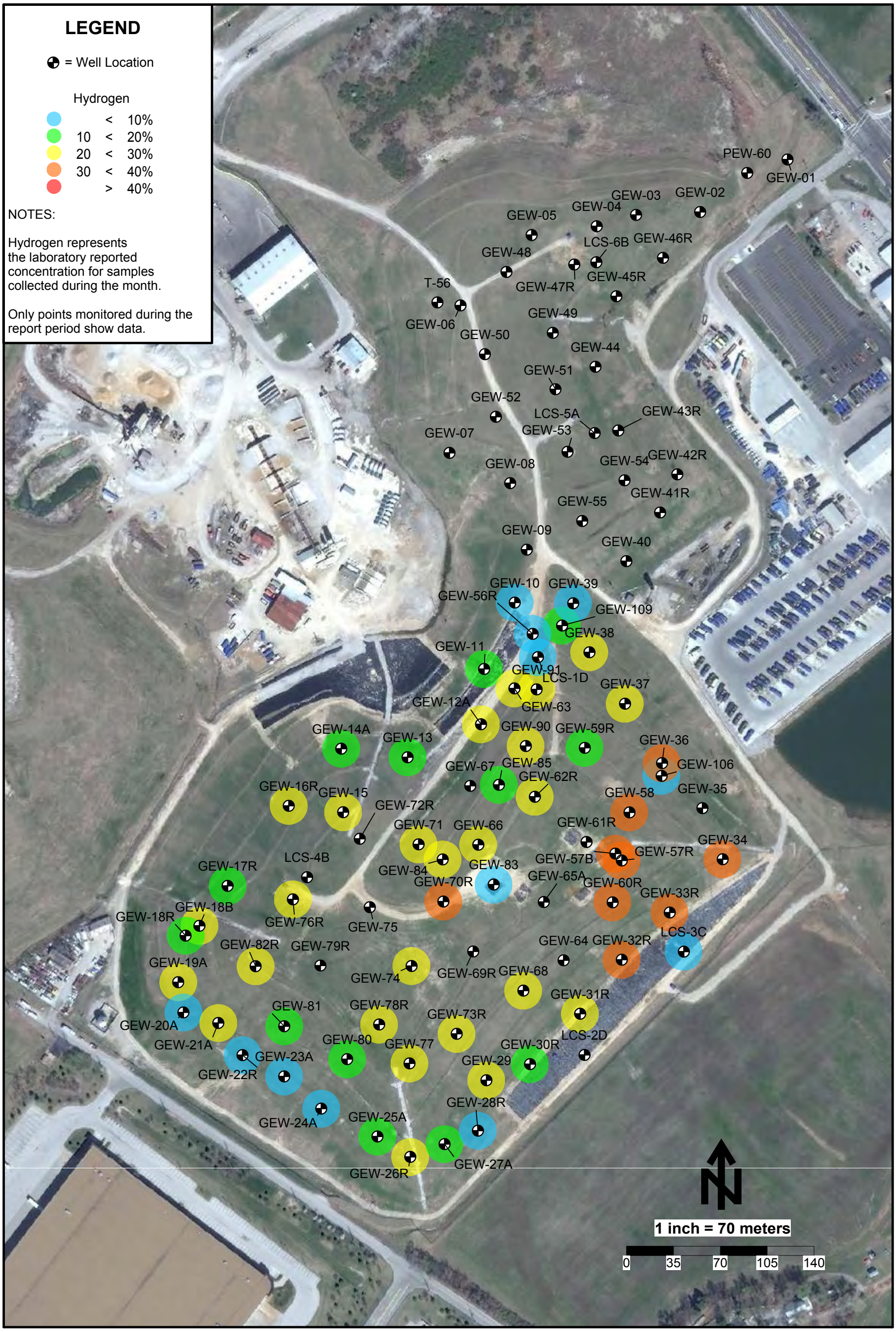
ATTACHMENT D

HYDROGEN MAPS



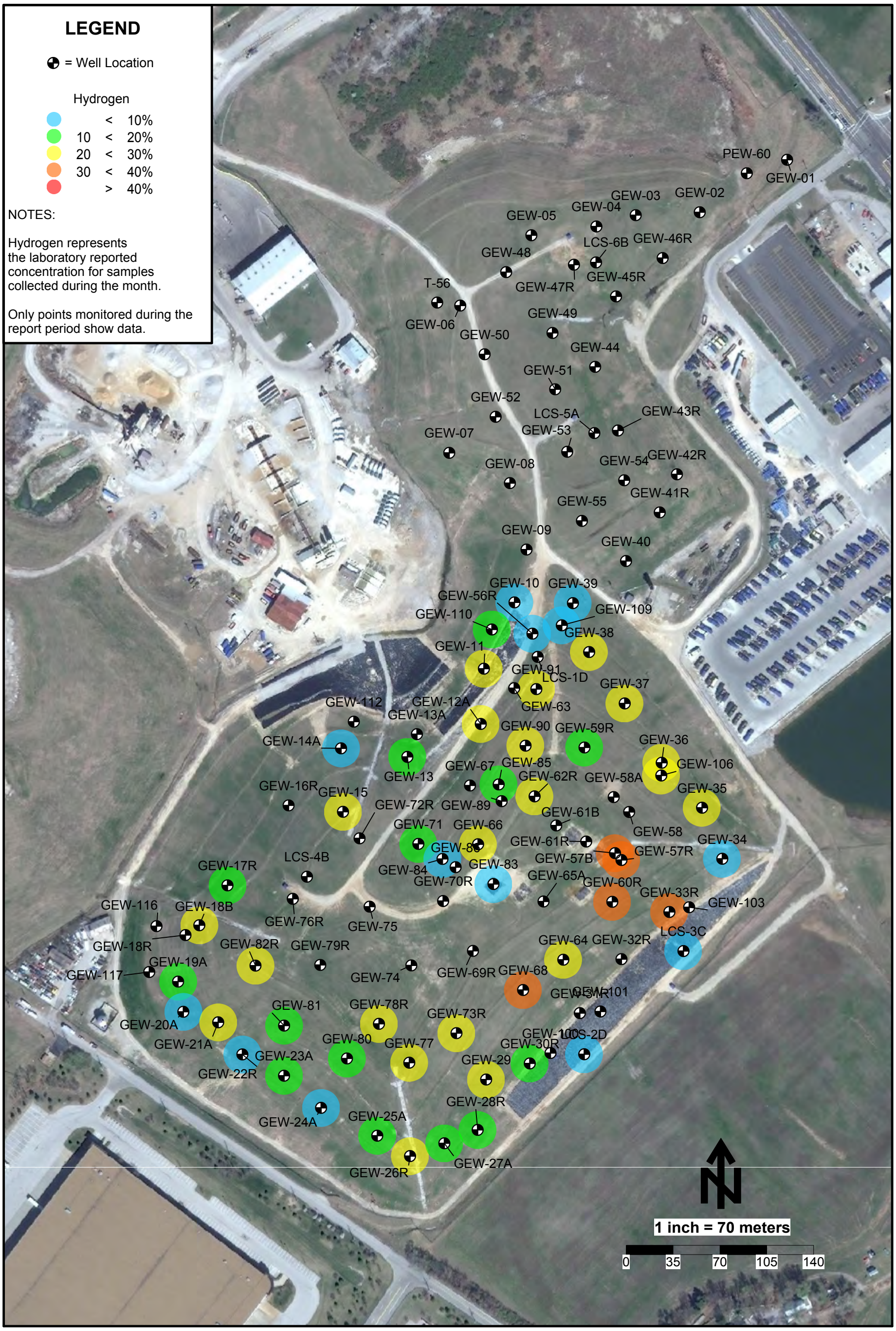
Hydrogen Data Map - February 2013 - Bridgeton Landfill

SCS ENGINEERS



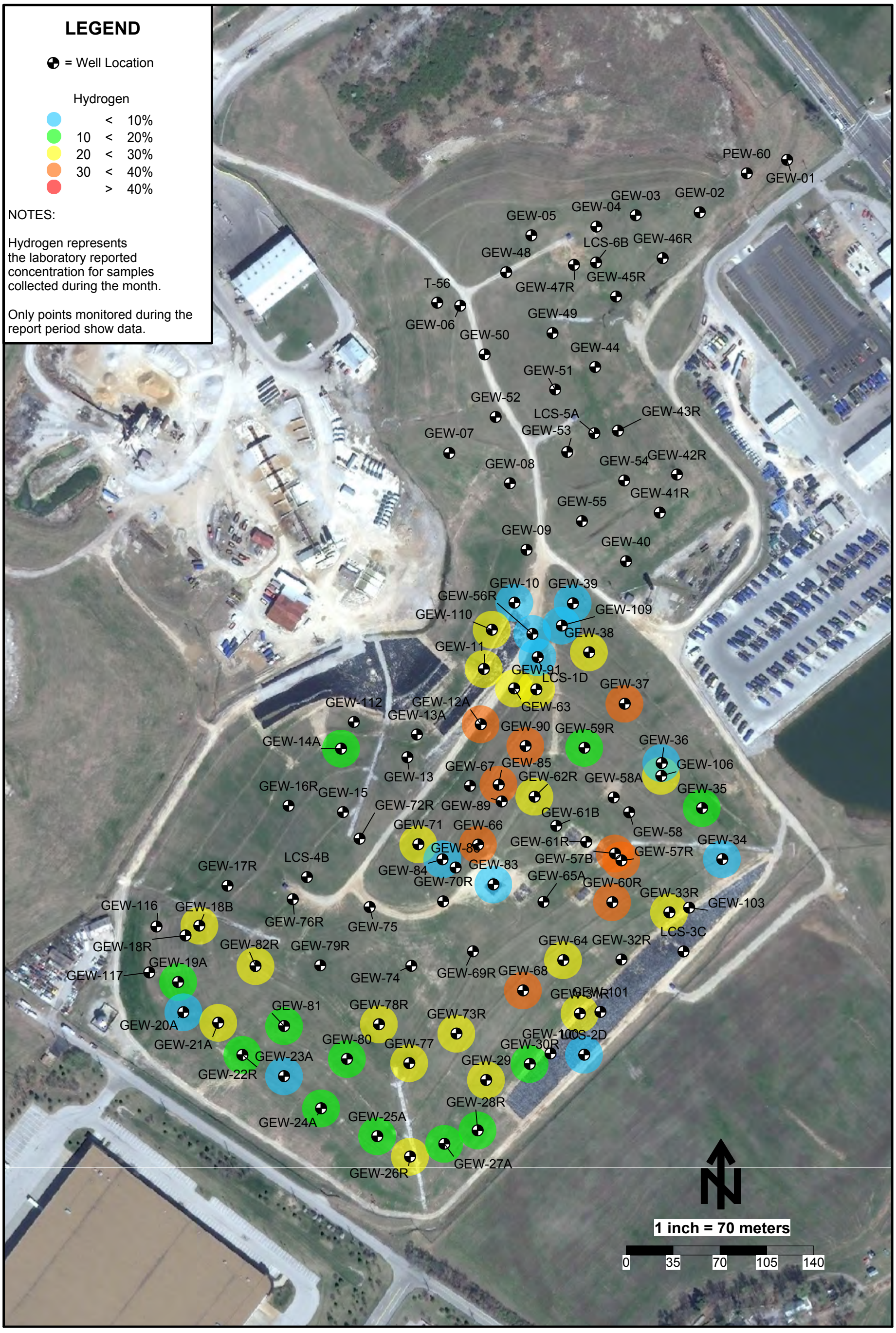
Hydrogen Data Map - March 2013 - Bridgeton Landfill

SCS ENGINEERS



Hydrogen Data Map - April 2013 - Bridgeton Landfill

SCS ENGINEERS

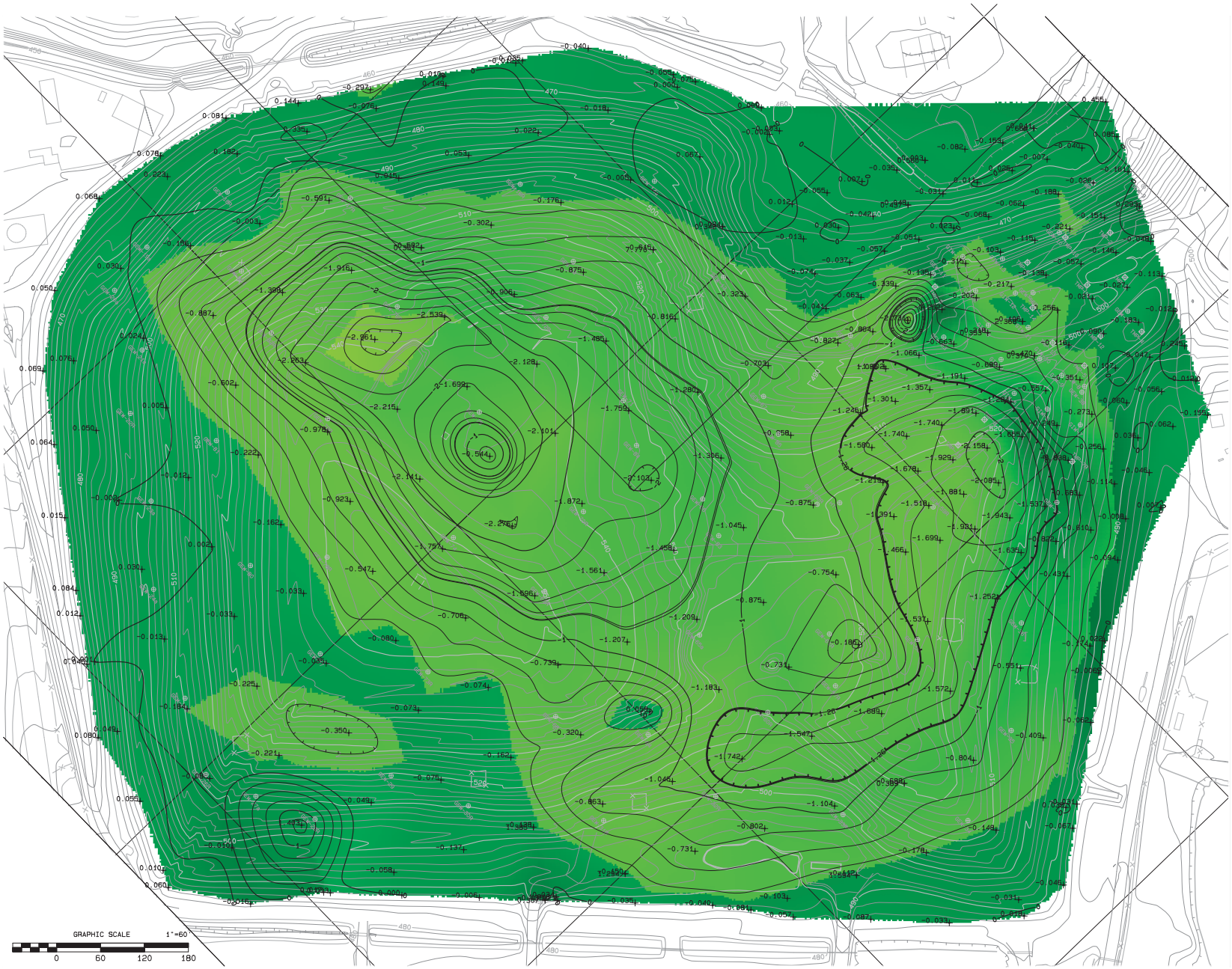


Hydrogen Data Map - May 2013 - Bridgeton Landfill

SCS ENGINEERS

ATTACHMENT E

SETTLEMENT FRONT MAP



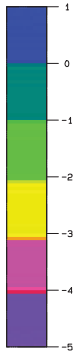
LEGEND
- EXISTING TOPOGRAPHIC CONTOUR
- GAS WELL
- TMP
- SETTLEMENT GRID SURVEY POINT

GENERAL NOTES
TOPOGRAPHY SHOWN BASED ON PHOTOGRAPHY DATED 2-23-2013

SETTLEMENT NOTES
CONTOURS ARE OF CHANGE IN ELEVATION FROM 4-15-2013 TO 5-13-2013 PERFORMED AT GRID POINTS USING GPS METHODS

SETTLEMENT IS REPORTED AS A NEGATIVE CHANGE IN ELEVATION

COUNTOUR AT -1.26 FT
IS SHOWN AS APPROXIMATE BOUNDARY
OF SETTLEMENT FRONT AS OF 5/13/2013



ELEVATION CHANGE COLOR SCALE
(FT)

BRIDGETON LANDFILL, LLC

REVISION	DATE
1	
2	
3	
4	

P. J. CAREY & ASSOCIATES, P.C.
5979 VALLINE WAY, BARR HILL, GA. 30518

PROJ. NO.: 179.009
DATE: 5-13-2013
DESIGNED BY: P.J.C.
DRAWN BY: A.C.KLOH
CHECKED BY: P.J.C.
APPROVED BY: P.J.C.

SETTLEMENT FROM
APRIL 15, 2013 TO
MAY 13, 2013
(28 DAYS)

BRIDGETON LANDFILL
SETTLEMONITORING

DRAWING 5
SHEET 5 OF 8

ATTACHMENT F

GAS WELLFIELD DATA

ATTACHMENT F-1

GEM DATA SPREADSHEET

May 2013 Wellfield Monitoring Data - Bridgeton Landfill

Well Name	Date Sampled	Methane	CO_2	O_2	Balance Gas	Init Temp	Adj Temp	Init Flow	Adj Flow	Init Static Press	Adj Static Press	Init Diff Press	Adj Diff Press	System Pressure	Baro
		(%)				°F		scfm		"H_2O					"Hg
GEW-01	5/7/2013 8:47	21.7	17.1	11.6	49.6	79	80	12	13	-0.8	-0.8	0.041	0.043	-7.5	29.39
	5/7/2013 8:48	19.3	15.2	12.7	52.8	83	85	13	13	-0.7	-0.7	0.048	0.048	-7.9	29.39
	5/16/2013 9:38	27.7	17.8	9.6	44.9	90	91	12	9	-1.8	-3.7	0.039	0.024	-8.79	29.34
	5/16/2013 9:41	28.3	18.8	9.2	43.7	92	92	13	14	-9.6	-9.6	0.049	0.05	-9.64	29.35
	5/23/2013 11:18	1.4	5.5	19.2	73.9	67	67	5		-10.1	-10	0.007	-0.003	-11.09	29.52
	5/23/2013 11:20	0.7	2.3	20.5	76.5	68	68	4	4	-8.9	-8.9	0.006	0.005	-10.95	29.52
	5/29/2013 15:03	1.8	1.4	20.3	76.5	94	94	9		-11.7	-0.7	0.026	-0.027	-13.84	29.31
	5/29/2013 15:06	3.9	3.4	19.1	73.6	94	93			-4	-6.8	-0.045	-0.044	-14.3	29.31
GEW-02	5/7/2013 8:56	44.2	35.7	0	20.1	123	123	32	30	-1.4	-1.4	0.272	0.242	-7.15	29.43
	5/16/2013 9:51	52.3	38.5	0	9.2	132	132	30	26	-0.7	-0.6	0.232	0.173	-9.26	29.32
	5/16/2013 9:52	52.4	40	0	7.6	132	132	18	22	-0.4	-0.5	0.093	0.132	-8.6	29.32
	5/29/2013 15:18	54.6	44.4	0	1	133	133	24		-0.6	-0.3	0.162	-0.078	-14.37	29.27
	5/29/2013 15:20	54.3	45.4	0	0.3	133	133			-0.1	-0.1	-0.092	-0.11	-14.41	29.27
GEW-03	5/7/2013 8:59	35.8	33.8	0.2	30.2	118	118	80	79	-2.5	-2.5	1.626	1.592	-7.55	29.39
	5/16/2013 9:55	38.5	34.7	0	26.8	121	122	27	47	-0.8	-0.9	0.202	0.566	-9.46	29.31
	5/29/2013 15:23	41.7	37.8	0	20.5	123	123			-0.1	-0.1	-0.423	-0.829	-16.54	29.26
GEW-04	5/7/2013 9:02	40.9	36	0.2	22.9	117	117	18	19	-0.8	-0.8	0.093	0.101	-7.73	29.39
	5/16/2013 9:58	45	37.1	0	17.9	121	122	15	14	-0.5	-0.5	0.064	0.059	-8.84	29.31
	5/29/2013 15:26	49.2	41.3	0	9.5	123	123	11	13	-0.6	-0.6	0.033	0.047	-21.42	29.25
GEW-05	5/7/2013 9:09	34	33.1	0	32.9	101	101	22	21	-0.6	-0.6	0.127	0.117	-7.62	29.38
	5/16/2013 10:08	38.9	34.2	0	26.9	103	103	40	39	-0.2	-0.2	0.412	0.386	-9.11	29.31
	5/22/2013 9:01	43.4	36.5	0	20.1	103	103	21	22	-0.7	-0.7	0.114	0.126	-11.25	29.21
	5/29/2013 15:33	44.6	37.7	0	17.7	103	103	17	16	-0.5	-0.5	0.076	0.072	-17.1	29.25
GEW-06	5/7/2013 9:14	38.8	33.5	0.6	27.1	89	89	23	22	-0.5	-0.5	0.137	0.127	-7.27	29.39
	5/16/2013 10:13	47.9	36	0	16.1	94	94	23	19	-0.1	-0.1	0.13	0.094	-9.76	29.31
	5/22/2013 9:06	49	37.4	0	13.6	92	93	12	16	-0.7	-0.7	0.038	0.068	-11.74	29.21
	5/29/2013 15:38	51.2	38.9	0	9.9	95	96	26	25	-0.3	-0.3	0.166	0.157	-11.71	29.25
GEW-07	5/7/2013 9:44	55	40.4	0	4.6	94	94	26	26	-4.6	-4.6	0.169	0.166	-5.84	29.43
	5/16/2013 10:52	52.9	40	0.5	6.6	108	108	11	11	-5.6	-5.6	0.032	0.035	-9.58	29.36
	5/29/2013 16:28	56.4	42.9	0	0.7	107	107	8	11	-2.6	-2.5	0.021	0.033	-3.57	29.28
GEW-08	5/7/2013 9:41	53.7	42.1	0	4.2	122	122	28	27	-0.7	-0.7	0.21	0.197	-8.07	29.41
	5/16/2013 10:49	51.2	42.5	0	6.3	124	125	22	21	-1.5	-1.5	0.137	0.117	-11.22	29.34
	5/22/2013 9:36	53.2	42.1	0	4.7	124	124	2	15	-2	-2	0.002	0.06	-12.38	29.22
	5/29/2013 16:21	51.8	44.4	0	3.8	124	124	18	16	-0.7	-0.7	0.09	0.07	-8.45	29.26
GEW-09	5/7/2013 9:48	57	41.8	0	1.2	82	82	25	27	-0.1	-0.1	0.148	0.171	-11.93	29.45
	5/16/2013 10:56	39.6	34.9	0	25.5	117	117			-0.8	-0.8	-0.242	-0.094	-17.97	29.35
	5/22/2013 9:40	38.3	36	0	25.7	115	115	29	28	-1.3	-1.3	0.219	0.205	-18.65	29.23
	5/29/2013 16:31	41.2	37.8	0	21	111	111	12	6	-0.2	-0.2	0.038	0.01	-10.34	29.27
GEW-10	5/7/2013 10:32	33.2	44.3	0	22.5	100	100	26	24	-7.9	-55.3	0.193	0.181	-10.66	29.44
	5/14/2013 10:24	28.3	48.5	0	23.2	112	112	11	13	-10.9	-10.9	0.041	0.054	-14.85	29.3
	5/14/2013 10:32	28.3	49.2	0	22.5	112	112	30	15	-10.9	-10.9	0.277	0.076	-15.95	29.3
	5/22/2013 10:43	36.8	55	0	8.2	114	114	10	2	-9.8	-9.7	0.033	0.002	-15.72	29.24
	5/29/2013 9:10	31.7	59.4	0.1	8.8	116	116	11	22	-9	-9.1	0.038	0.16	-15.74	29.44
GEW-11	5/7/2013 11:14	7	70.9	0	22.1	170	170	20	16	-4.7	-4.6	0.163	0.109	-4.74	29.47
	5/14/2013 10:49	6.3	70.5	0	23.2	170	170	20	26	-4.2	-4	0.158	0.258	-4.65	29.31
	5/14/2013 10:55	6.3	70.2	0	23.5	170	170	25	22	-3.9	-4.1	0.235	0.194	-4.05	29.31
	5/22/2013 11:29	11.3	73.5	0	15.2	180	180		8	-4.2	-4.3	-0.069	0.028	-4.38	29.24
	5/29/2013 10:12	11.5	75.9	0	12.6	180	180	11	10	-1.8	-1.6	0.052	0.042	-1.67	29.43
GEW-12A	5/7/2013 14:16	0.3	70.8	0	28.9	140	140	95	94	25.7	26.4	26.826	26.497	26.39	29.41
	5/14/2013 11:27	0.6	70	0	29.4	140	140	69	72	14.2	15.8	14.626	15.659	14.27	29.33
	5/14/2013 11:32	0.9	69.4	0	29.7	140	140	74	71	15.6	15.1	16.491	15.322	14.12	29.34
	5/23/2013 8:40	0.3	73.7	0	26	130	130	68	66	11	11.3	14.156	13.357	10.65	29.46
	5/29/2013 10:00	1.1	74.3	0	24.6	150	150	65	68	13.6	14.6	13.404	14.803	13.89	29.44

May 2013 Wellfield Monitoring Data - Bridgeton Landfill

Well Name	Date Sampled	Methane	CO_2	O_2	Balance Gas	Init Temp	Adj Temp	Init Flow	Adj Flow	Init Static Press	Adj Static Press	Init Diff Press	Adj Diff Press	System Pressure	Baro
		(%)				°F		scfm		"H_2O					"Hg
GEW-13	5/7/2013 14:24	0.5	86.9	0	12.6	154	154			-5	-4.9	-0.095	-0.092	-5.24	29.43
GEW-14A	5/7/2013 14:29	6.8	50.7	5.5	37	76	77	17	11	-1.1	-1.2	0.095	0.042	-1.12	29.42
	5/14/2013 15:48	13.3	48.6	4.7	33.4	90	90		6	0.1	0.1	-0.017	0.011	-0.03	29.26
	5/14/2013 15:54	17	58.9	2	22.1	90	90			0	0.1	-0.04	0	0.1	29.26
	5/23/2013 8:50	5.3	31.4	11.5	51.8	62	62	9	5	-3.1	-2.5	0.023	0.008	-2.5	29.49
GEW-15	5/29/2013 11:23	2.9	75	0	22.1	144	144	42	49	3.8	3.9	0.656	0.879	1.85	29.38
GEW-18B	5/9/2013 14:21	0.2	85.3	0	14.5	146	146		13	10.3	10.4	-0.197	0.068	9.65	29.35
	5/14/2013 14:25	0.4	85.6	0	14	148	148			-0.6	-0.6	-0.218	-0.146	-1.19	29.31
	5/14/2013 14:30	0.6	85.2	0	14.2	148	148			-0.9	-0.9	-0.088	-0.141	-1.42	29.31
	5/24/2013 8:41	0.2	83.3	0	16.5	150	150	15		-1.8	-1.5	0.099	-0.132	-2.95	29.87
	5/30/2013 10:26	0.1	77.9	0	22	152	152			-1.4	-1.3	-0.117	-0.027	-1.81	29.27
GEW-18R	5/24/2013 8:44	0.2	16	16.6	67.2	62	62	30	26	-1.9	-2.3	0.228	0.18	-2.32	29.89
	5/30/2013 10:32	0.1	2.2	19.6	78.1	85	85			-1.9	-1.8	-0.016	-0.037	-1.91	29.29
GEW-19A	5/9/2013 14:33	1.1	82.9	0	16	60	60			8.6	8.5	-0.043	-0.177	8.37	29.28
	5/14/2013 14:35	1.6	78.6	1.7	18.1	96	96			-1.7	-1.7	-0.017	-0.059	-1.75	29.33
	5/14/2013 14:40	2.5	83.8	0.8	12.9	96	96			-1.5	-1.3	-0.072	-0.085	-1.57	29.33
	5/24/2013 10:36	1.3	78.6	1.1	19	74	74			-1.1	-1.4	-0.052	-0.056	-1.57	29.91
	5/30/2013 10:49	0.9	68.6	2.6	27.9	85	85		7	-1.7	-1.6	-0.037	0.018	-1.6	29.29
GEW-20A	5/9/2013 14:30	14	78.1	0.1	7.8	60	60			6.8	6.8	-4.927	-4.908	5.56	29.29
	5/14/2013 14:44	10.1	43.5	10	36.4	100	100	58	57	-1.2	-1.1	0.99	0.933	-1.8	29.33
	5/14/2013 14:49	9.7	41	10.6	38.7	100	100	55	51	-1.1	-1	0.883	0.747	-1.69	29.33
	5/24/2013 10:39	9.8	45.6	8.9	35.7	68	68	63	71	-1.1	-1.2	1.088	1.37	-1.6	29.91
	5/30/2013 10:52	11.4	43.2	7.6	37.8	85	85	95	91	-1.5	-1.4	2.454	2.256	-1.47	29.3
GEW-21A	5/9/2013 14:27	1.8	74.2	0	24	60	60		2	7.6	7.5	-0.008	0.002	7.42	29.27
	5/14/2013 14:53	5.5	66.8	1.2	26.5	85	85	19	19	-1.3	-1.2	0.125	0.119	-1.26	29.28
	5/14/2013 14:59	6.1	72.3	0	21.6	85	85	3	11	-1.5	-1.6	0.003	0.04	-1.59	29.28
	5/24/2013 10:43	2	75	0.3	22.7	77	77	29	12	-1.3	-0.8	0.286	0.055	-2.54	29.91
	5/30/2013 11:00	1.8	64.5	2	31.7	82	82			-1.7	-1.5	-0.015	-0.039	-1.7	29.28
GEW-22R	5/9/2013 14:24	10.1	78.9	0	11	110	110	58	51	-1.1	-0.8	1.137	0.901	-1.16	29.27
	5/14/2013 14:45	15.1	79.9	0	5	110	110			1.6	1.7	-1.284	-1.416	1.31	29.27
	5/14/2013 14:50	16.2	79.8	0	4	110	110			1.7	1.7	-1.428	-1.303	1.55	29.27
	5/24/2013 10:47	10	81.4	0	8.6	118	118	8	14	-0.2	-0.1	0.024	0.085	-0.31	29.89
	5/30/2013 11:03	7.1	77.5	0	15.4	122	122			0.6	0.6	-0.506	-0.539	0.5	29.28
GEW-23A	5/9/2013 14:21	19.2	75.6	0	5.2	110	110	54	52	0.3	0.3	0.949	0.895	-0.61	29.27
	5/14/2013 14:36	25.9	73.9	0	0.2	112	112	43	45	2.4	2.4	0.583	0.654	1.37	29.27
	5/14/2013 14:41	26.8	73.1	0	0.1	112	112	51	50	2.4	2.4	0.827	0.801	1.62	29.27
	5/24/2013 10:49	18.6	77.5	0	3.9	120	120	43	34	0.7	0.8	0.622	0.391	0.12	29.89
	5/30/2013 11:05	13.7	75.4	0	10.9	122	122	33	37	1.3	1.3	0.381	0.467	0.52	29.28
GEW-24A	5/9/2013 14:18	19.9	72.4	0	7.7	120	120			-2.4	-2.7	-1.132	-0.377	-3.16	29.27
	5/14/2013 14:27	27.2	71.5	0	1.3	120	120			-0.6	-51.2	-0.506	-0.503	-1.2	29.27
	5/14/2013 14:32	25.8	71.4	0	2.8	120	120			-0.8	-0.8	-0.52	-0.487	-1.29	29.27
	5/24/2013 10:52	18.3	75.6	0	6.1	130	130			-2.6	-2.5	-0.773	-0.815	-3.08	29.87
	5/30/2013 11:12	11.8	76.4	0	11.8	132	132			-1.2	-1.2	-0.427	-0.36	-1.59	29.27

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Well Name	Date Sampled	Methane	CO_2	O_2	Balance Gas	Init Temp	Adj Temp	Init Flow	Adj Flow	Init Static Press	Adj Static Press	Init Diff Press	Adj Diff Press	System Pressure	Baro
		(%)				°F		scfm		"H_2O					"Hg
GEW-25A	5/9/2013 14:13	14.6	74.4	0	11	135	135	25	29	-1	-1.3	0.225	0.301	-3.71	29.27
	5/9/2013 14:15	14.8	73.9	0	11.3	135	135	29	26	-2	-1.9	0.295	0.25	-3.98	29.27
	5/14/2013 14:12	20.6	72.9	0	6.5	135	135	24	25	-0.3	-0.2	0.205	0.213	-1.19	29.26
	5/14/2013 14:17	22.5	72.1	0	5.4	135	135	29	25	-0.3	-0.2	0.284	0.211	-1.14	29.26
	5/24/2013 10:56	16	75.9	0	8.1	146	146	8	15	-2.2	-2.2	0.024	0.085	-3.22	29.87
	5/30/2013 11:15	9.8	76.8	0	13.4	150	150	16	15	-1.2	-1.2	0.105	0.085	-1.93	29.26
GEW-26R	5/9/2013 14:10	0.6	80.8	0	18.6	172	172			3.2	3.2	-11.651	-11.298	-1.94	29.26
	5/14/2013 14:02	1.4	80.3	0	18.3	172	172			4.6	4.6	-10.294	-9.886	0.19	29.25
	5/14/2013 14:08	1.5	80.5	0	18	172	172			4.5	4.5	-10.296	-10.02	-0.06	29.25
	5/24/2013 10:58	0.7	81.4	0	17.9	180	180			4.1	4	-4.092	-4.078	-1.15	29.87
	5/30/2013 11:19	0.6	81.2	0	18.2	185	185			5.3	5.3	-12.314	-13.021	0.03	29.25
GEW-27A	5/9/2013 14:07	21	69.4	0	9.6	135	135	55	50	0	0	0.996	0.843	-1.48	29.27
	5/14/2013 13:50	25.3	67.8	0	6.9	100	100	51	56	0.5	0.5	0.804	0.956	-0.48	29.25
	5/14/2013 13:58	26.7	67.4	0	5.9	100	100	47	48	0.7	0.6	0.682	0.7	-0.44	29.25
	5/24/2013 11:01	15.1	75.5	0	9.4	150	150	31	31	-2	-2	0.352	0.345	-2.46	29.86
	5/30/2013 11:29	8	76.6	0	15.4	150	150	14	23	-1	-1	0.074	0.203	-1.58	29.26
GEW-28R	5/9/2013 14:04	19.3	70.9	0	9.8	120	120	24	22	-1.5	-1.3	0.194	0.161	-2.19	29.27
	5/14/2013 13:41	20.6	70.8	0	8.6	129	129	21	27	-1	-0.9	0.151	0.254	-1.71	29.26
	5/14/2013 13:47	21.6	71.2	0	7.2	129	129	30	30	-0.7	-0.8	0.311	0.312	-1.25	29.26
	5/24/2013 11:04	17.9	74.9	0	7.2	124	124	13	12	-2.7	-2.7	0.065	0.051	-3.24	29.86
	5/30/2013 11:42	14.8	75.1	0	10.1	128	128	18	15	-1.4	-1.5	0.123	0.088	-1.53	29.27
GEW-29	5/9/2013 10:26	7.3	76.5	0	16.2	136	136	72	61	2.7	2.7	1.775	1.298	1.07	29.37
	5/15/2013 10:31	8	71.9	0	20.1	120	120	64	65	2.3	2.2	1.346	1.389	0.55	29.31
	5/15/2013 10:35	7	72.1	0	20.9	120	120	69	67	2.3	2.2	1.587	1.492	0.7	29.31
	5/24/2013 11:10	6.7	76.2	0	17.1	132	132	59	56	0.5	0.6	1.215	1.083	-0.79	29.82
	5/29/2013 10:04	5.2	72.1	0	22.7	125	125	54	60	2.7	2.7	1.01	1.233	1.49	29.29
GEW-30R	5/9/2013 10:29	19.5	71.7	0	8.8	160	160	12	11	-1.8	-1.8	0.381	0.356	-2.22	29.4
	5/15/2013 10:00	24.8	63.4	0	11.8	148	148	12	13	-2.2	-2.1	0.353	0.411	-2.25	29.33
	5/15/2013 10:06	23.3	63.6	0	13.1	148	148	12	9	-2.2	-2.1	0.355	0.215	-2.2	29.32
	5/24/2013 11:13	18.6	72.1	0	9.3	168	168	15	15	-2.5	-2.6	0.644	0.655	-2.98	29.85
	5/29/2013 10:08	15.3	69.3	0	15.4	165	165	14	15	-0.5	-0.4	0.527	0.651	-0.85	29.3
GEW-31R	5/15/2013 11:25	0.7	75.9	0	23.4	162	162			-3.7	-3.6	-3.012	-3.118	-3.83	29.4
	5/15/2013 11:29	2.3	75	0	22.7	162	162			-3.8	-3.8	-3.068	-3.335	-3.84	29.4
	5/31/2013 11:06	0.3	73.8	0	25.9	170	170			-2.8	-2.8	-2.917	-2.912	-2.84	29.26
GEW-33R	5/9/2013 10:41	0.3	47.6	7.4	44.7	192	192			-5.2	-5.3	-5.325	-3.484	-5.51	29.43
	5/15/2013 9:43	17.4	38.8	7.4	36.4	188	188			-3.7	-3.9	-5.947	-2.198	-3.99	29.32
	5/15/2013 9:50	20.1	51.3	3.7	24.9	188	188			-4.9	-4.3	-5.353	-5.853	-4.48	29.35
	5/24/2013 11:27	0.9	34.2	8.9	56	184	184			-4.9	-4.1	-3.893	-3.273	-5.7	29.87
	5/29/2013 10:31	0.2	65.1	0.8	33.9	185	185			-5.1	-5.1	-5.312	-5.099	-4.82	29.32
GEW-34	5/9/2013 10:47	2.4	35.2	10.9	51.5	82	82			-4.5	-4.9	-0.027	-0.034	-5.4	29.4
	5/15/2013 9:28	0.5	4.9	19.4	75.2	80	80	8	6	-7.3	-7.3	0.018	0.011	-8.91	29.42
	5/15/2013 9:34	0.4	5	19.4	75.2	80	80	8	4	-6.9	-6.9	0.02	0.006	-9.16	29.42
	5/24/2013 11:35	0.5	3.8	20.1	75.6	62	62			-6.4	-6.5	-0.072	-0.076	-8.04	29.86
	5/29/2013 10:39	1	17.2	15.1	66.7	82	82		3	-6.3	-6.4	-0.011	0.004	-7.59	29.3
GEW-35	5/9/2013 10:52	0.4	45.5	7.7	46.4	130	130	11		-8.1	-8	0.045	-0.026	-8.07	29.41
	5/15/2013 9:39	0.2	36	10.7	53.1	142	142			-12.6	-12.6	-0.069	-0.092	-13.52	29.42
	5/15/2013 9:44	0.3	36	10.2	53.5	148	148		12	-12.6	-12.7	-0.033	0.052	-13.76	29.42
	5/24/2013 11:43	1.2	38.4	9.7	50.7	146	146			-12.6	-12.3	-0.064	-0.07	-13.46	29.86
	5/29/2013 10:53	0.4	67.2	0	32.4	160	160	11	12	0.6	0.6	0.05	0.064	0.74	29.32

May 2013 Wellfield Monitoring Data - Bridgeton Landfill

Well Name	Date Sampled	Methane	CO_2	O_2	Balance Gas	Init Temp	Adj Temp	Init Flow	Adj Flow	Init Static Press	Adj Static Press	Init Diff Press	Adj Diff Press	System Pressure	Baro
		(%)				°F		scfm		"H_2O					"Hg
GEW-36	5/9/2013 10:55	0.1	18.9	15.4	65.6	82	82		14	-12.3	-12.6	-0.011	0.388	-12.59	29.41
	5/15/2013 9:54	0	10.1	17.5	72.4	90	90	13	9	-12.3	-12.5	0.323	0.158	-13.61	29.42
	5/15/2013 9:59	0	9.6	17.7	72.7	90	90	6	6	-13.3	-13.3	0.069	0.073	-13.09	29.42
	5/29/2013 10:57	0.1	55.6	2.7	41.6	80	80			0	0	-0.154	-0.146	-0.03	29.32
GEW-37	5/9/2013 10:58	0.3	70.9	0.1	28.7	140	140			-10.7	-10.8	-0.045	-0.088	-12.13	29.41
	5/15/2013 10:05	0.2	68.4	0.9	30.5	104	104		19	-12.3	-11.6	-0.208	0.129	-11.25	29.41
	5/15/2013 10:11	0.3	69.7	0.6	29.4	104	104			-12.7	-11.7	-0.062	-0.041	-11.86	29.41
	5/24/2013 11:48	1.7	57.2	4.3	36.8	86	86	1		-12	-11.5	0	-0.135	-12.2	29.87
	5/29/2013 11:04	0.1	67.9	0	32	85	85	3	7	0	0	0.005	0.017	0.07	29.33
GEW-38	5/9/2013 11:03	6	73.1	0	20.9	134	134	18	15	-10.8	-10.9	0.133	0.084	-16.46	29.4
	5/15/2013 10:15	5.9	72.9	0	21.2	135	135	16	21	-13.1	-13	0.097	0.169	-17.23	29.4
	5/15/2013 10:20	7.7	72.5	0	19.8	135	135		17	-13.3	-13.2	-0.034	0.11	-19.24	29.4
	5/24/2013 11:51	9.1	72.7	0	18.2	138	138	25	40	-12.9	-12.9	0.244	0.58	-16.66	29.87
	5/29/2013 11:11	3.8	69.6	0	26.6	125	125	14	24	-12.9	-13	0.075	0.213	-17.38	29.34
GEW-39	5/9/2013 11:06	38	59.9	0	2.1	120	120	73	77	-4.6	-4.7	1.558	1.717	-12.51	29.4
	5/15/2013 10:23	43.4	56.5	0	0.1	118	118	77	77	-5.5	-5.3	1.653	1.649	-14.55	29.4
	5/15/2013 10:28	44.1	55.8	0	0.1	118	118	89	74	-5.5	-5.4	2.185	1.524	-13.64	29.4
	5/24/2013 11:54	44	55.9	0	0.1	116	116	75	79	-5.2	-5.1	1.555	1.721	-13.37	29.86
	5/29/2013 11:15	35.4	53.5	0.4	10.7	105	105	84	71	-4.9	-4.7	1.933	1.398	-13.55	29.33
GEW-40	5/7/2013 8:27	52	47.2	0.2	0.6	94	94	15	15	-1.1	-1.1	0.059	0.063	-16.33	29.38
	5/16/2013 11:03	47.6	49.4	0	3	98	98	13	11	-1	-1	0.048	0.038	-17.77	29.34
	5/22/2013 8:35	46.4	53.4	0	0.2	97	98	31	32	-1.2	-1.2	0.27	0.274	-18.17	29.23
	5/29/2013 16:38	45	54.9	0	0.1	98	99	4	4	-0.4	-0.4	0.006	0.005	-16.25	29.26
GEW-41R	5/7/2013 8:30	49.2	39	0.4	11.4	108	108	16	15	-0.8	-0.8	0.069	0.062	-16.9	29.39
	5/16/2013 11:05	47.3	40.2	0	12.5	112	113	13	15	-0.3	-0.3	0.051	0.061	-18.12	29.33
	5/22/2013 8:39	52.7	41.8	0.2	5.3	113	113	19	18	-0.8	-0.8	0.094	0.087	-18.44	29.24
	5/29/2013 16:40	54.5	43.5	0	2	112	113	23	18	-0.1	-0.1	0.138	0.086	-16.32	29.25
GEW-42R	5/7/2013 8:32	35.9	32.9	0.6	30.6	85	86	11	11	-0.6	-0.6	0.033	0.033	-14.51	29.38
	5/16/2013 14:14	57.2	42.5	0	0.3	109	115	11	15	0.2	-0.3	0.032	0.062	-13.89	29.29
	5/22/2013 8:43	44.8	37.7	0	17.5	113	114	20	14	-1.5	-1.5	0.11	0.057	-15.34	29.23
	5/29/2013 16:42	49.4	41.5	0	9.1	113	114	10	12	-0.7	-0.7	0.03	0.04	-12.7	29.25
GEW-43R	5/7/2013 8:35	56.5	43.2	0	0.3	123	124	34	34	-0.6	-0.6	0.294	0.295	-14.4	29.38
	5/16/2013 14:19	56.5	42.9	0	0.6	137	142	17	32	0.5	-0.1	0.082	0.276	-13.58	29.29
	5/22/2013 8:46	52.5	41.4	0	6.1	139	139	33	32	-2	-2	0.286	0.268	-15.35	29.22
	5/22/2013 8:49	54.3	43.1	0	2.6	132	132			-0.7	-0.7	-0.258	-0.347	-14.98	29.22
	5/29/2013 16:46	55.6	44.2	0	0.2	109	110			-0.8	-0.8	-0.008	-0.016	-11.68	29.24
GEW-44	5/7/2013 8:38	30	32.6	3.5	33.9	100	101	11	12	-2.4	-2.4	0.033	0.041	-14.88	29.38
	5/16/2013 14:22	38.9	31.5	2.7	26.9	106	106	15	13	-1.3	-1.3	0.065	0.049	-14.36	29.29
	5/22/2013 8:55	38.7	31.7	2.9	26.7	108	108	28	8	-2.1	-2.1	0.209	0.02	-16.26	29.22
	5/29/2013 16:49	40.4	34.3	2.4	22.9	108	108	6		-0.9	-0.9	0.01	-0.02	-12.3	29.25
GEW-45R	5/7/2013 8:40	38.2	32.9	0.4	28.5	91	91	37	30	-3.3	-3.3	0.338	0.233	-10.26	29.39
	5/16/2013 14:25	44.1	32.8	0	23.1	94	94	32	39	-2.4	-2.4	0.249	0.376	-8.76	29.3
	5/29/2013 16:52	50.3	37.3	0	12.4	94	95	37	45	-1.3	-1.3	0.325	0.476	-3.73	29.25
GEW-46R	5/7/2013 8:43	19.9	26.9	0.1	53.1	94	95	29	28	-1	-1	0.229	0.208	-9.07	29.4
	5/16/2013 14:27	28.3	29.8	0	41.9	101	101	30	29	-0.2	-0.2	0.23	0.218	-8.16	29.29
	5/29/2013 16:55	37.5	34.6	0	27.9	99	100	7		-0.1	-0.1	0.013	-0.015	-3.39	29.25
GEW-47R	5/7/2013 9:07	34.4	33.5	1.1	31	86	86	19	18	-0.4	-0.4	0.093	0.09	-7.79	29.39
	5/16/2013 10:05	43.1	37.9	0.7	18.3	96	96	14	14	-0.1	-0.1	0.052	0.053	-9.42	29.31
	5/29/2013 15:31	54.3	44.4	0	1.3	96	96	21	23	-0.2	-0.2	0.115	0.132	-19.52	29.25
GEW-48	5/7/2013 9:12	42.1	34.4	0	23.5	107	107	26	29	-1.1	-1.1	0.169	0.211	-7.57	29.38
	5/16/2013 10:10	43.7	35.6	0	20.7	109	109	25	23	-0.8	-0.8	0.169	0.138	-8.94	29.31
	5/22/2013 9:03	46.1	36.7	0	17.2	109	109	24	21	-1.4	-1.4	0.154	0.116	-12.31	29.21
	5/29/2013 15:36	46.6	37.6	0	15.8	108	109	22	18	-1.4	-1.1	0.132	0.084	-14.85	29.24
GEW-49	5/7/2013 9:25	17.8	25.5	0.4	56.3	96	96	21	21	-0.4	-0.4	0.12	0.124	-10.94	29.4
	5/16/2013 10:26	26.7	29.6	0	43.7	102	103	27	27	-0.3	-0.3	0.197	0.194	-14.75	29.31
	5/22/2013 9:17	24.6	29.7	0	45.7	100	101	19	19	-0.6	-0.6	0.102	0.101	-16.23	29.21
	5/29/2013 15:50	42.5	36.8	0	20.7	110	110	20	22	-0.1	-0.1	0.108	0.132	-14.77	29.25
GEW-50	5/7/2013 9:19	50	37.6	0.1	12.3	108	108	25	24	-0.7	-0.7	0.164	0.148	-5.85	29.41
	5/16/2013 10:18	54.4	38	0	7.6	110	111	20	22	-0.4	-0.4	0.099	0.128	-6.18	29.31
	5/22/2013 9:12	56.3	39.8	0	3.9	112	112	22	7	-1.3	-1.4	0.123	0.015	-9.86	29.21
	5/29/2013 15:43	54.4	40.5	0	5.1	111	111	17	9	-0.3	-0.3	0.075	0.022	-4.37	29.25

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Well Name	Date Sampled	Methane	CO_2	O_2	Balance Gas	Init Temp	Adj Temp	Init Flow	Adj Flow	Init Static Press	Adj Static Press	Init Diff Press	Adj Diff Press	System Pressure	Baro
		(%)				°F		scfm		"H_2O					"Hg
GEW-51	5/7/2013 9:28	44.2	37.2	0.1	18.5	120	120	22	24	-1	-1	0.137	0.15	-9.73	29.4
	5/16/2013 10:32	43.9	37	0	19.1	124	124	29	28	-0.9	-0.9	0.221	0.207	-13.86	29.31
	5/22/2013 9:20	46.2	39	0	14.8	125	125	26	27	-1.4	-1.4	0.187	0.202	-14.7	29.21
	5/29/2013 15:52	45.9	40	0	14.1	124	125	9	13	-0.3	-0.3	0.022	0.049	-14.15	29.25
GEW-52	5/7/2013 9:22	28.3	30.6	0	41.1	101	101	35	35	-0.2	-0.2	0.317	0.312	-6.88	29.4
	5/16/2013 10:22	34.5	31.5	0	34	109	109			-0.2	-0.2	-0.822	-0.81	-10.33	29.32
	5/22/2013 9:14	38.1	34.1	0	27.8	113	113	27	28	-0.5	-0.5	0.196	0.209	-12.72	29.21
	5/29/2013 15:46	44.6	37.4	0	18	113	113	4	5	0	-0.1	0.005	0.008	-4.4	29.26
GEW-53	5/7/2013 9:31	43.2	37	0.2	19.6	116	117	22	22	-0.5	-0.5	0.133	0.128	-9.27	29.4
	5/16/2013 10:37	47.1	37.9	0	15	126	126	18	17	-0.4	-0.4	0.087	0.078	-13.11	29.32
	5/22/2013 9:24	45.5	39.2	0	15.3	123	123			-1	-1	-0.022	-0.024	-14.06	29.21
	5/29/2013 15:58	50.8	41.2	0	8	124	131	1	8	0.1	-0.1	0.001	0.018	-12.51	29.25
	5/29/2013 16:00	50.7	42.3	0	7	138	137			-0.1	-0.1	-0.011	-0.011	-12.08	29.25
	5/29/2013 16:02	50.2	41.8	0	8	137	137	27	24	-0.1	-0.1	0.196	0.16	-12.06	29.25
GEW-54	5/7/2013 9:36	45.9	38.6	0	15.5	128	128	28	27	-0.9	-0.9	0.212	0.203	-12.1	29.41
	5/16/2013 10:41	47	39.1	0	13.9	139	139	21	8	-0.9	-0.4	0.124	0.021	-18.47	29.33
	5/16/2013 10:43	46.6	41.1	0	12.3	138	138	5	6	-0.3	-0.3	0.008	0.013	-17.37	29.33
	5/22/2013 9:28	46.3	45	0	8.7	146	146			-0.6	-0.6	-0.025	-0.024	-17.08	29.21
	5/22/2013 9:30	46.1	45.2	0	8.7	141	141			-0.4	-0.4	-0.041	-0.042	-17.9	29.21
	5/29/2013 16:05	44.7	44.4	0	10.9	90	96		8	0.3	-0.1	-0.127	0.02	-12.47	29.26
	5/29/2013 16:07	44.6	44.2	0	11.2	129	126	4		-0.2	-0.1	0.006	-0.003	-13.71	29.26
GEW-55	5/7/2013 9:38	40.7	37.1	0	22.2	124	124	25	24	-0.9	-0.9	0.177	0.163	-12.02	29.41
	5/16/2013 10:46	38.4	36.8	0	24.8	128	129	11	12	-1.1	-1.1	0.039	0.043	-18.18	29.33
	5/22/2013 9:33	39.8	39.2	0	21	128	128			-1.6	-1.5	-0.004	-0.026	-17.7	29.21
	5/29/2013 16:10	41.6	41.8	0	16.6	127	128	7	4	-0.4	-0.4	0.017	0.006	-17.1	29.26
GEW-56R	5/7/2013 10:29	23.9	41.2	0	34.9	110	110	27	26	-2	-2	0.215	0.202	-10.4	29.44
	5/14/2013 10:08	21.8	46.5	0	31.7	120	120	15	17	-3.1	-3.1	0.072	0.095	-16.07	29.38
	5/14/2013 10:13	22	46.5	0	31.5	120	120	17	17	-3.2	-3.1	0.09	0.095	-17.28	29.38
	5/22/2013 10:40	0.1	1.9	20.5	77.5	80	80			-0.4	-0.4	-0.03	-0.029	-13.21	29.25
	5/29/2013 9:07	1.3	5.6	18.6	74.5	86	86	7	8	-0.6	-0.7	0.016	0.017	-13.22	29.45
GEW-57B	5/14/2013 11:40	2.2	72.1	0.9	24.8	178	178	74	82	-3.2	-3.2	2.078	2.541	-2.99	29.34
	5/14/2013 11:46	5	72.6	0.9	21.5	178	178	56	80	-2.6	-3	1.176	2.385	-3.24	29.34
GEW-57R	5/9/2013 9:37	1.3	73.6	0	25.1	192	192	106	132	-5.6	-5.7	4.347	6.618	-5.61	29.42
	5/14/2013 11:30	2.4	74.7	0	22.9	191	191	77	80	-2.9	-2.4	2.289	2.457	-2.97	29.34
	5/14/2013 11:35	5.2	73.6	0	21.2	191	191	83	66	-3	-3	2.627	1.662	-3.32	29.34
	5/23/2013 14:53	1.2	72.8	0	26	192	192	110	115	-4.4	-4.7	4.632	5.013	-5.16	29.57
	5/29/2013 14:52	1.3	72.7	0	26	192	192	47	40	-1	-1.1	0.875	0.645	-1.1	29.36

May 2013 Wellfield Monitoring Data - Bridgeton Landfill

Well Name	Date Sampled	Methane	CO_2	O_2	Balance Gas	Init Temp	Adj Temp	Init Flow	Adj Flow	Init Static Press	Adj Static Press	Init Diff Press	Adj Diff Press	System Pressure	Baro
		(%)				°F		scfm		"H_2O					"Hg
GEW-59R	5/9/2013 9:15	18.8	69.4	0	11.8	172	172	160	155	-8.8	-8.7	8.768	8.222	-8.76	29.4
	5/14/2013 11:21	18.6	72.4	0	9	172	172	136	147	-7.5	-7.7	6.472	7.514	-7.83	29.35
	5/14/2013 11:25	19.3	72.4	0	8.3	172	172	137	141	-7.3	-7.6	6.541	6.931	-7.42	29.35
	5/23/2013 14:40	19.3	71.1	0	9.6	170	170	181	180	-11.6	-11.4	11.35	11.161	-10.95	29.57
	5/29/2013 14:42	8.4	71.7	0	19.9	186	186			5	5	-5.335	-5.316	4.17	29.36
GEW-60R	5/9/2013 9:35	0.5	67.4	1.2	30.9	194	194			-5.1	-4.8	-5.404	-5.32	-5.28	29.41
	5/14/2013 15:26	11.7	70.4	0.8	17.1	196	196			-2.2	-2.2	-1.422	-1.33	-2.23	29.28
	5/14/2013 15:30	19.4	68.9	0.7	11	196	196			-2	-2.7	-1.042	-2.579	-2.6	29.28
	5/23/2013 14:50	0.8	71.1	0.4	27.7	194	194			-2.9	-3.6	-4.277	-4.432	-3.39	29.56
	5/29/2013 14:49	0.8	71.7	0	27.5	196	196			-1	-1.2	-0.641	-1.299	-1.39	29.36
GEW-62R	5/9/2013 9:44	4.9	56.5	3.7	34.9	178	178			-5.2	-4.8	-5.126	-4.779	-5.47	29.4
	5/14/2013 15:35	25.2	62.5	2.1	10.2	180	180			-1.7	-1.8	-1.39	-1.244	-1.65	29.27
	5/14/2013 15:41	30.2	69.4	0	0.4	180	180			-1.1	-1.1	-0.543	-0.997	-1.84	29.27
	5/23/2013 14:59	2	60.7	3.7	33.6	176	176			-3.3	-3.7	-3.066	-3.978	-4.16	29.56
	5/29/2013 14:59	3.9	69.8	0	26.3	180	180	25	24	1.4	1.2	1.796	1.652	1.46	29.35
GEW-63	5/7/2013 11:17	0.4	76.4	0	23.2	196	196	29	20	14	12.6	0.339	0.159	11.88	29.46
	5/14/2013 11:15	0.4	74.6	0	25	195	195	31	23	-0.8	-0.9	0.394	0.219	-1.39	29.31
	5/14/2013 11:22	0.4	75.2	0	24.4	195	195	37	42	-0.4	0.3	0.548	0.696	-0.67	29.31
GEW-64	5/9/2013 10:11	0.4	75.4	0.3	23.9	194	194			-3.5	-3.2	-3.226	-3.672	-3.77	29.4
	5/15/2013 10:41	1.6	69.2	0	29.2	182	182			-3.5	-3.6	-2.895	-4.096	-3.88	29.32
	5/15/2013 10:46	3.3	68	0	28.7	182	182			-3.5	-3.4	-3.221	-2.536	-3.73	29.33
	5/29/2013 15:10	2.5	75.3	0	22.2	196	196			-2	-1.8	-1.924	-0.923	-1.92	29.33
GEW-66	5/9/2013 9:48	0.4	72.4	0.8	26.4	198	198	121	117	-4.8	-5.2	5.598	5.273	-5.41	29.4
	5/14/2013 15:10	1.6	74.9	0.4	23.1	198	198	64		-1.6	-0.8	1.636	-0.373	-1.77	29.29
	5/14/2013 15:15	2.7	74.9	0.3	22.1	198	198	66	34	-1.2	-0.8	1.728	0.461	-1.73	29.29
	5/23/2013 15:03	0.8	69.4	1.9	27.9	190	190	93	112	-2.6	-2.3	3.246	4.694	-4.39	29.56
	5/29/2013 15:02	1.6	73.4	0	25	192	192	52		-1.1	-0.3	1.081	-0.809	-0.38	29.35
GEW-68	5/9/2013 10:17	2.6	75.3	0	22.1	74	74	4	5	7.9	7.9	0.007	0.009	7.9	29.37
	5/15/2013 10:12	4.8	68.8	0	26.4	72	72		3	10.5	10.5	0	0.004	10.52	29.29
	5/15/2013 10:17	9.1	68.1	0	22.8	72	72	7	7	10.5	10.5	0.019	0.019	10.52	29.29
	5/29/2013 15:16	6.5	74.2	0	19.3	92	92			7.4	7.4	-1.235	-1.198	7.43	29.29
GEW-71	5/9/2013 9:51	0.5	76.6	0.2	22.7	180	180	127	125	-6.2	-5.7	6.104	5.92	-5.81	29.39
	5/14/2013 15:37	1.4	73.3	0	25.3	170	170	70	80	-2.2	-2.1	1.81	2.398	-2.36	29.24
	5/14/2013 15:43	2.6	72.7	0	24.7	170	170	73	74	-1.9	-2.1	1.997	2.012	-1.31	29.24
	5/29/2013 11:33	0.3	78.3	0	21.4	182	182			-0.2	-0.1	-0.951	-0.187	-0.3	29.38
GEW-73R	5/9/2013 10:23	6.1	75.4	0	18.5	132	132	42	53	1.1	1	0.624	0.984	0.09	29.36
	5/15/2013 10:22	10	70.1	0	19.9	140	140	50	45	0.8	0.8	0.86	0.709	-0.14	29.28
	5/15/2013 10:27	5.9	70.7	0	23.4	140	140	46	46	0.7	0.8	0.738	0.753	-0.11	29.28
	5/24/2013 11:07	5.7	75.9	0	18.4	132	132	45	40	-0.1	-0.1	0.725	0.576	-1.16	29.82
	5/29/2013 9:59	4.3	71.5	0	24.2	120	120	42	41	1.1	1.2	0.599	0.578	0.36	29.27
GEW-77	5/9/2013 14:07	3.9	78.2	0	17.9	140	140	55	51	0.7	0.5	1.091	0.934	-1.87	29.31
	5/14/2013 13:46	22	77.9	0	0.1	142	142	42	42	0.3	0.2	0.628	0.615	-0.23	29.27
	5/14/2013 13:52	5.2	79	0	15.8	142	142	42	42	0.3	0.1	0.648	0.656	-0.3	29.27
	5/24/2013 8:31	4.6	77	0	18.4	134	134	41	40	-1.7	-1.8	0.609	0.592	-2.39	29.84
	5/29/2013 15:25	4.3	77.5	0	18.2	140	140	35	44	1.1	1.1	0.463	0.696	0.54	29.29
GEW-78R	5/9/2013 14:04	2.9	75.1	0	22	138	138	54	66	0.4	0.8	1.062	1.527	-1.11	29.31
	5/14/2013 13:37	14.3	75.5	0	10.2	138	138	57	56	1.7	1.8	1.124	1.076	0.59	29.28
	5/14/2013 13:43	18.1	76.5	0	5.4	138	138	49	54	1.7	1.8	0.825	0.987	0.67	29.28
	5/24/2013 8:29	2.3	74	0	23.7	138	138	54	44	-0.1	-0.1	1.037	0.693	-1.31	29.84
	5/29/2013 15:22	2.2	75.3	0	22.5	136	136	45	43	2.4	2.4	0.721	0.673	1.42	29.3

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Well Name	Date Sampled	Methane	CO_2	O_2	Balance Gas	Init Temp	Adj Temp	Init Flow	Adj Flow	Init Static Press	Adj Static Press	Init Diff Press	Adj Diff Press	System Pressure	Baro
		(%)				°F		scfm		$"H_2O$					"Hg
GEW-80	5/9/2013 14:10	9.2	80.7	0	10.1	122	122	70	71	0.2	0.1	1.686	1.734	-1.8	29.31
	5/14/2013 13:56	8.5	83	0	8.5	122	122	56	62	1.4	1.5	1.117	1.336	-0.13	29.27
	5/14/2013 14:01	8.6	82.7	0	8.7	122	122	63	57	1.5	1.5	1.374	1.126	-0.27	29.27
	5/24/2013 8:33	8.6	80	0	11.4	126	126	66	55	-0.4	-0.4	1.502	1.073	-2.08	29.84
	5/29/2013 15:27	8.2	80.3	0	11.5	120	120	61	63	2.2	2	1.263	1.353	0.54	29.3
GEW-81	5/9/2013 14:12	8.5	83.6	0	7.9	128	128			0	-0.1	-0.141	-0.239	-0.82	29.31
	5/14/2013 14:05	7.8	85.2	0	7	130	130	33	29	2.1	2.1	0.402	0.323	1.61	29.28
	5/14/2013 14:10	7.8	84.4	0	7.8	130	130	31	33	2.1	2.1	0.357	0.41	1.61	29.28
	5/24/2013 8:36	7.8	82.6	0	9.6	130	130	11		0.4	0.4	0.05	-0.015	0.01	29.84
	5/29/2013 15:29	8.6	81.6	0	9.8	128	128			2.2	2.1	-0.46	-0.336	1.79	29.31
GEW-82R	5/9/2013 14:15	1.7	79.4	0	18.9	180	180	21	40	12	11.8	0.181	0.62	10.43	29.32
	5/14/2013 14:14	2.6	81.8	0	15.6	176	176	48	46	8	7.7	0.91	0.81	3.71	29.29
	5/14/2013 14:20	2.8	80.9	0	16.3	176	176	47	62	7.8	7.7	0.845	1.45	3.5	29.29
	5/29/2013 15:32	1	78.3	0	20.7	168	168		12	16.2	16.2	-0.145	0.058	16.3	29.33
GEW-83	5/9/2013 10:06	27.8	68.1	0	4.1	102	102	126	123	-4.2	-4.2	4.652	4.412	-4.73	29.4
	5/14/2013 15:17	30.3	69.6	0	0.1	104	104	83	72	-2	-1.9	2.06	1.543	-2.1	29.28
	5/14/2013 15:22	31.4	68.5	0	0.1	104	104	58	74	-1.8	-1.9	1.004	1.613	-1.89	29.28
	5/23/2013 15:05	29.7	70.1	0	0.2	100	100	123	128	-4.2	-4.3	4.409	4.784	-3.82	29.56
	5/29/2013 15:07	29.3	70.6	0	0.1	110	110	40	29	-0.7	-0.5	0.505	0.277	-0.74	29.33
GEW-84	5/9/2013 9:54	17.6	82.1	0.2	0.1	110	110	133	129	-5.8	-5.4	5.734	5.427	-5.66	29.39
	5/14/2013 15:29	22.7	77.1	0	0.2	102	102	96	83	-2.2	-2.3	2.886	2.156	-2.16	29.24
	5/14/2013 15:34	21.4	77.8	0	0.8	102	102	95	89	-2.5	-2.5	2.828	2.496	-2.54	29.24
	5/29/2013 11:35	16.2	83.7	0	0.1	110	110	38	20	-0.4	-0.4	0.507	0.139	-0.2	29.37
GEW-85	5/9/2013 10:02	2.3	70.5	0.3	26.9	188	188	106	113	-4.7	-5	4.215	4.807	-4.67	29.42
	5/14/2013 15:13	4.2	65	0.7	30.1	172	172	78	79	-1.7	-1.8	2.187	2.248	-2.22	29.27
	5/14/2013 15:18	4.6	64	0.8	30.6	172	172	79	52	-1.8	-1.8	2.225	0.97	-2.15	29.27
	5/29/2013 11:37	0.4	68.7	0.7	30.2	184	184	65	69	-1.8	-2	1.607	1.803	-1.93	29.39
GEW-90	5/9/2013 9:13	4.8	67.7	0	27.5	190	190	110	109	-3.6	-3.6	4.428	4.412	-3.25	29.4
	5/14/2013 11:13	3.5	69.8	0	26.7	188	188	69	86	-2.8	-2.6	1.794	2.755	-2.65	29.35
	5/14/2013 11:18	3.9	70.6	0	25.5	188	188	72	54	-2.7	-2.3	1.981	1.134	-2.54	29.35
	5/23/2013 14:38	4.2	69.1	0	26.7	196	196	94	101	-3.9	-4.1	3.32	3.816	-3.91	29.57
	5/29/2013 14:39	2.4	69.1	0	28.5	186	186	28		0	0.5	0.307	-0.15	-0.32	29.37
GEW-91	5/7/2013 10:21	0.2	78.5	0	21.3	180	180	155	118	-8.3	-8.4	9.151	5.422	-7.95	29.43
	5/14/2013 9:49	0.1	82.6	0	17.3	190	190	178	160	-13.2	-12.5	12.564	10.176	-13.78	29.39
	5/14/2013 9:55	0.2	86.2	0	13.6	190	190	190	178	-13.7	-14.6	14.535	12.839	-14.54	29.39
	5/22/2013 10:34	0.3	80	0	19.7	194	194	123	143	-7.5	-9.2	5.96	8.088	-7.12	29.24
	5/29/2013 9:01	0.2	81	0	18.8	192	192	142	134	-7.8	-6.3	7.94	7.04	-7.34	29.45
	5/29/2013 11:31	0.2	77.9	0	21.9	178	178	189	192	-13.9	-14.2	13.607	14.045	-13.55	29.33
GEW-106	5/9/2013 14:51	0.3	79.3	0.1	20.3	150	150	187	199	-13.6	-14.9	12.806	14.533	-12.28	29.36
	5/15/2013 11:11	0.4	78.5	0	21.1	154	154	93	77	-6.4	-2.6	3.196	2.223	-8.07	29.41
	5/15/2013 11:16	0.4	77.2	0	22.4	154	154	147	158	-8.9	-9.1	7.845	9.057	-5.79	29.41
	5/31/2013 10:50	0.2	71	1.4	27.4	98	98	151	152	-7.3	-7.4	7.321	7.412	-7.45	29.27
GEW-109	5/9/2013 11:08	22.1	54.9	0.1	22.9	88	88			-1.8	-1.8	-0.018	-0.019	-16.39	29.4
	5/15/2013 10:31	28.4	61.7	0.1	9.8	92	92		16	-2	-2	-0.059	0.076	-17.03	29.4
	5/15/2013 10:36	32.1	61.7	0.1	6.1	92	92			-1.9	-1.9	-0.059	-0.05	-16.2	29.4
	5/24/2013 11:56	25.5	69.3	0	5.2	90	90			-1.1	-1.2	-0.062	-0.038	-15.93	29.85
	5/29/2013 11:18	14.8	64	0	21.2	102	102	5	6	-2.9	-3	0.01	0.016	-16.52	29.33
GEW-110	5/7/2013 10:37	6.3	75.1	0	18.6	70	70	23	22	-2.3	-2.3	0.18	0.167	-11.86	29.46
	5/14/2013 10:37	5.8	75.2	0	19	79	79			-2.4	-2.4	-0.107	-0.085	-18.78	29.29
	5/14/2013 10:44	5.8	74.7	0	19.5	79	79			-2.4	-2.3	-0.081	-0.114	-16.47	29.3
	5/22/2013 10:48	4.7	79.4	0	15.9	80	80	15	16	-2.1	-2.1	0.085	0.088	-16.19	29.26
	5/29/2013 9:16	11.6	67.3	1.3	19.8	86	86	16	15	-0.9	-0.9	0.09	0.075	-15.28	29.46

May 2013 Wellfield Monitoring Data - Bridgeton Landfill

Well Name	Date Sampled	Methane	CO_2	O_2	Balance Gas	Init Temp	Adj Temp	Init Flow	Adj Flow	Init Static Press	Adj Static Press	Init Diff Press	Adj Diff Press	System Pressure	Baro
		(%)				°F		scfm		"H_2O					"Hg
LCS-1D	5/7/2013 10:27	59.4	40.5	0	0.1	82	82			12.5	11.2	-13.494	-9.487	12.99	29.43
	5/14/2013 9:59	57.5	42.4	0	0.1	94	94	120	128	-2.7	-3.2	3.274	3.736	-3.06	29.38
	5/14/2013 10:05	58.9	41	0	0.1	94	94	139	130	-2.5	-2.6	4.296	3.798	-3.33	29.38
	5/22/2013 10:37	59.6	40.3	0	0.1	90	90	113	114	-1.9	-3.2	2.821	2.877	-2.37	29.24
	5/29/2013 9:04	58	41.9	0	0.1	94	94		108	-0.3	-1	-1.66	2.638	-1.72	29.45
LCS-2D	5/2/2013 10:53	50.4	49.5	0	0.1	99	99	113	113	-3.1	-3.3	3.165	3.148	-3.15	29.66
	5/8/2013 10:00	50.9	49	0	0.1	102	103	96	99	-2.9	-3	2.285	2.455	-2.92	29.54
	5/15/2013 11:29	53.6	46.3	0	0.1	95	95	100	107	-2.3	-2.6	2.364	2.724	-2.52	29.36
	5/15/2013 11:33	44.2	46.6	0	9.2	95	95	96	100	-2.3	-2.5	2.298	2.496	-2.64	29.36
LCS-3C	5/31/2013 10:54	6.6	34	11.7	47.7	128	128	126	126	-4.4	-4.4	4.597	4.594	-4.54	29.27
LCS-5A	5/7/2013 9:33	57.9	42	0	0.1	99	99	189	195	-8.1	-7.9	8.158	8.638	-7.9	29.4
	5/16/2013 10:34	57.3	41.5	0	1.2	100	100	233	225	-12.2	-12.2	12.443	11.567	-12.37	29.32
	5/22/2013 9:22	57.2	41.8	0	1	99	99	236	230	-12.9	-12.9	12.731	12.144	-13.04	29.21
	5/29/2013 15:55	57.2	41.6	0	1.2	96	96	239	272	-13.4	-14.4	12.974	16.85	-13.67	29.25
LCS-6B	5/7/2013 9:04	34.9	32.2	2.2	30.7	113	114	17	18	-6.8	-6.8	0.083	0.094	-8.07	29.39
	5/16/2013 10:01	38.9	34.1	1.9	25.1	118	120	15	14	-7	-6.6	0.063	0.054	-9.35	29.31
	5/29/2013 15:29	42.8	39.7	0.8	16.7	124	125		2	-15.3	-14.9	-0.003	0.001	-19.1	29.25
PEW60	5/7/2013 8:51	18.9	14.4	14.4	52.3	78	78	14	14	-5.9	-5.9	0.054	0.055	-7.47	29.42
	5/7/2013 8:53	9.3	6.9	16.6	67.2	79	79	15	14	-1.4	-1.2	0.056	0.055	-9.3	29.42
	5/16/2013 9:45	70.8	29.1	0	0.1	93	95	6	5	1.9	-2.1	0.009	0.005	-9.68	29.35
	5/16/2013 9:46	46.9	22.9	4.9	25.3	92	92		6	-5.5	-5.6	-0.007	0.009	-9.45	29.35
	5/23/2013 11:22	40.9	19.5	7.8	31.8	68	68	1	10	-10.4	-10.4	0	0.026	-10.74	29.53
	5/29/2013 15:09	14.9	8.3	15.5	61.3	94	95	7		-12.3	-5.4	0.014	-0.016	-13.25	29.31
	5/29/2013 15:13	29	14.6	10.8	45.6	95	94			-10.9	-10.8	-0.028	-0.014	-13.79	29.31
T-56	5/7/2013 9:17	44.1	33.5	0.6	21.8	65	65	34	40	-0.1	-0.1	0.265	0.361	-7.67	29.4
	5/16/2013 10:15	37.5	31.2	1.4	29.9	71	71	38	39	-0.2	-0.3	0.336	0.361	-9.72	29.32
	5/22/2013 9:09	40.4	32.6	1.7	25.3	72	72	38	29	-0.7	-0.7	0.346	0.208	-12.57	29.21
	5/29/2013 15:40	41	33.3	1.2	24.5	76	76	31	41	-0.1	-0.2	0.232	0.401	-8.39	29.26

ATTACHMENT F-2

MAXIMUM TEMPERATURE SPREADSHEET

Wellfield Temperature - Bridgeton Landfill

Well Name	Maximum Initial Temperature °F			
	Feb	Mar	Apr	May
GEW-01	89	70	75	94
GEW-02	127	125	129	133
GEW-03	113	112	123	123
GEW-04	120	102	119	123
GEW-05	102	102	102	103
GEW-06	92	92	91	95
GEW-07	108	108	109	108
GEW-08	123	123	122	124
GEW-09	102	99	100	117
GEW-10	115	115	108	116
GEW-11	170	170	170	180
GEW-12A	88	102	170	150
GEW-13	110	120	154	154
GEW-14A	182	128	122	90
GEW-15	138	144	140	144
GEW-16R	146	150	148	--
GEW-17R	140	154	170	--
GEW-18B	140	142	142	152
GEW-18R	136	125	122	85
GEW-19A	138	44	88	96
GEW-20A	68	40	90	100
GEW-21A	150	148	140	85
GEW-22R	118	118	122	122
GEW-23A	124	122	120	122
GEW-24A	132	134	126	132
GEW-25A	138	134	140	150
GEW-26R	194	180	180	185
GEW-27A	150	140	142	150
GEW-28R	136	126	124	129
GEW-29	140	130	128	136
GEW-30R	172	168	164	168
GEW-31R	45	45	64	170
GEW-32R	195	190	190	192
GEW-33R	200	198	194	82
GEW-34	80	65	80	74
GEW-35	192	190	188	160
GEW-36	180	178	168	90
GEW-37	162	170	180	140
GEW-38	130	120	126	138
GEW-39	120	112	118	120

Wellfield Temperature - Bridgeton Landfill

Well Name	Maximum Initial Temperature °F			
	Feb	Mar	Apr	May
GEW-40	92	94	95	98
GEW-41R	107	108	109	113
GEW-42R	105	95	89	113
GEW-43R	136	125	107	139
GEW-44	104	97	107	108
GEW-45R	98	95	97	94
GEW-46R	95	101	97	101
GEW-47R	114	116	108	96
GEW-48	108	107	107	109
GEW-49	105	104	98	110
GEW-50	115	108	109	112
GEW-51	123	120	121	125
GEW-52	116	107	103	113
GEW-53	130	127	124	138
GEW-54	140	127	126	146
GEW-55	121	120	124	128
GEW-56R	127	122	108	120
GEW-57B	188	174	172	178
GEW-57R	185	182	182	192
GEW-58	180	178	164	184
GEW-59R	172	180	164	186
GEW-60R	196	196	190	196
GEW-62R	178	146	165	180
GEW-63	190	190	196	196
GEW-64	192	190	188	196
GEW-65A	184	--	--	170
GEW-66	196	198	190	198
GEW-68	130	130	124	100
GEW-69R	190	--	--	92
GEW-70R	198	194	194	150
GEW-71	168	170	164	182
GEW-72R	--	--	--	--
GEW-73R	138	132	130	140
GEW-74	198	196	--	--
GEW-75	--	--	--	--
GEW-76R	196	200	--	--
GEW-77	140	137	132	142
GEW-78R	140	132	132	138
GEW-79R	--	--	--	
GEW-80	124	120	125	126

Wellfield Temperature - Bridgeton Landfill

Well Name	Maximum Initial Temperature °F			
	Feb	Mar	Apr	May
GEW-81	132	126	126	130
GEW-82R	160	180	178	180
GEW-83	102	100	98	110
GEW-84	120	120	110	110
GEW-85	156	154	160	188
GEW-90	192	192	186	196
GEW-91	156	170	182	194
GEW-106	50	120	136	154
GEW-109	128	115	90	102
GEW-110	--	60	78	86
GEW-111	142	--	--	--
GIW-01	161	159	172	178
GIW-02	154	137	160	154
GIW-03	140	134	150	162
GIW-04	158	157	160	158
GIW-05	187	185	172	188
GIW-06	121	134	166	168
GIW-07	--	--	140	148
GIW-08	--	60	105	118
GIW-09	124	190	145	144
GIW-10	--	167	178	181
GIW-11	--	70	138	138
GIW-12	107	120	136	130
GIW-13	120	70	110	141
LCS-1D	92	70	46	94
LCS-2D	93	95	98	102
LCS-3C	105	115	118	128
LCS-4B	188	--	--	--
LCS-5A	98	60	99	100
LCS-6B	78	80	109	124
PEW60	58	56	72	95
T-56	54	53	62	76

-- = Indicates no data available.

ATTACHMENT F-3

LAB ANALYSES SPREADSHEET

Laboratory Analysis - Bridgeton Landfill

Well Name	Date Sampled	Methane	CO_2	O_2/Argon	Nitrogen	Hydrogen	Carbon Monoxide
		(%)					(ppm)
GEW-10	2/13/2013	38	38	4	20	ND	42
	3/5/2013	30	55	2	10	0	390
	4/22/2013	30	41	ND	28	ND	60
	5/14/2013	19	30	8	42	ND	ND
GEW-11	2/13/2013	9.2	62	1	8.7	18	2,600
	3/5/2013	7.1	57	3	13	19	2,500
	4/22/2013	7.7	61	ND	5.3	24	2,500
	5/14/2013	5.6	63	ND	ND	25	3,000
GEW-12A	2/13/2013	0.3	59	2	9	28	4,100
	3/5/2013	0.2	47	6	22	24	3,400
	4/22/2013	0.38	60	2	6	29	3,400
	5/14/2013	0.32	61	ND	ND	32	3,700
GEW-13	1/23/2013	0.19	75	1	3	20	6,000
	2/13/2013	0.2	77	1	2	18	4,800
	3/6/2013	0.2	46	9	33	11	3,200
	4/22/2013	0.23	76	ND	5	14	5,300
GEW-14A	2/13/2013	9.1	71	1	2	16	2,600
	3/6/2013	9.5	70	0	0	17	2,600
	4/22/2013	18	69	ND	ND	8.1	960
	5/14/2013	7.2	51	5	17	19	2,500
GEW-15	1/25/2013	6	64	3	11	16	2,800
	2/13/2013	3.7	69	1	2.1	24	3,400
	3/6/2013	2.5	67	0	0	27	3,800
	4/22/2013	2.7	67	ND	ND	25	3,700
GEW-16R	1/25/2013	3.1	68	1	3.1	24	5,000
	2/13/2013	1.8	70	1	2	24	4,300
	3/6/2013	1.8	69	0	0	26	4,600
GEW-17R	1/25/2013	8.1	69	1	4.3	16	4,300
	2/12/2013	9.5	71	1	2.5	16	3,500
	3/6/2013	6.1	70	0	0	19	4,100
	4/25/2013	0.19	37	10	38	13	3,000
GEW-18B	2/12/2013	2.7	73	1	2.3	21	4,400
	3/6/2013	3.7	69	0	0	23	4,300
	4/25/2013	0.13	68	2	7.6	20	6,400
	5/14/2013	0.17	72	ND	ND	22	6,400
GEW-18R	2/12/2013	6.5	71	1	4.9	16	3,500
	3/6/2013	7.3	46	8	28	11	1,800
GEW-19A	2/12/2013	1.1	74	1	4.5	19	5,100
	3/6/2013	1.4	71	0	3.7	21	4,500
	4/25/2013	1.1	76	ND	ND	19	3,900
	5/14/2013	0.8	71	ND	6.4	18	3,500
GEW-20A	2/12/2013	17	41	9	33	ND	200
	3/6/2013	6.7	21	16	57	ND	170
	4/25/2013	4.3	36	12	43	3.7	920
	5/14/2013	6.3	37	11	42	ND	840

Laboratory Analysis - Bridgeton Landfill

Well Name	Date Sampled	Methane	CO_2	O_2/Argon	Nitrogen	Hydrogen	Carbon Monoxide
		(%)					(ppm)
GEW-21A	2/12/2013	1.9	68	2	8.8	18	4,300
	3/6/2013	1.9	67	2	6.6	21	3,900
	4/25/2013	1.5	68	ND	5.2	23	4,800
	5/14/2013	1.7	65	ND	4.4	26	5,600
GEW-22R	2/12/2013	14	76	1	2	7.6	1,500
	3/6/2013	13	73	0	4	8.3	1,700
	4/25/2013	5.9	53	7	25	8.8	1,600
	5/14/2013	8.1	74	ND	ND	14	1,900
GEW-23A	2/12/2013	25	65	1	3.2	6.6	840
	3/6/2013	23	65	0	3.9	6.9	890
	4/25/2013	16	70	ND	ND	10	1,500
	5/14/2013	14	57	4	16	8.5	910
GEW-24A	2/12/2013	20	66	1	2.8	10	1,300
	3/6/2013	17	56	4	13	9.5	1,300
	4/25/2013	11	40	9	33	7.5	900
	5/14/2013	17	66	ND	ND	13	1,100
GEW-25A	2/12/2013	10	71	1	3.1	15	1,800
	3/6/2013	8.1	50	7	24	11	1,400
	4/25/2013	12	66	ND	4.4	15	1,800
	5/14/2013	14	66	ND	ND	15	1,300
GEW-26R	2/12/2013	0.5	65	3	12	19	3,400
	3/6/2013	0.5	70	1	5	22	4,100
	4/25/2013	0.49	74	ND	ND	22	4,300
	5/14/2013	0.6	73	ND	ND	22	3,200
GEW-27A	2/12/2013	23	62	1	2.9	10	1,200
	3/6/2013	21	63	0	0	12	1,500
	4/25/2013	19	64	ND	ND	13	1,500
	5/14/2013	21	62	ND	3.6	12	910
GEW-28R	2/12/2013	16	55	4	16	8.6	980
	3/6/2013	13	46	7	25	8.3	960
	4/25/2013	20	65	ND	ND	13	1,200
	5/14/2013	17	64	ND	3.7	13	1,300
GEW-29	2/12/2013	11	68	1	2.9	16	2,000
	3/5/2013	9.5	68	0	0	20	2,200
	4/22/2013	7.4	68	ND	ND	22	2,300
	5/15/2013	6.3	68	ND	ND	23	2,400
GEW-30R	2/12/2013	16	64	1	2.9	16	2,300
	3/5/2013	12	66	0	0	19	2,700
	4/22/2013	25	60	ND	ND	12	1,700
	5/15/2013	21	60	ND	ND	15	1,900
GEW-31R	1/22/2013	0.55	67	1	3.2	28	5,600
	2/12/2013	0.6	67	2	6.1	24	5,100
	3/5/2013	0.4	68	0	0	27	5,000
	5/15/2013	0.29	64	ND	ND	28	4,300
GEW-32R	1/23/2013	1.1	60	1.2	4	32	4,700
	2/12/2013	0.9	55	3.4	13	27	3,700
	3/5/2013	1	62	0	0	33	4,100

Laboratory Analysis - Bridgeton Landfill

Well Name	Date Sampled	Methane	CO_2	O_2/Argon	Nitrogen	Hydrogen	Carbon Monoxide
		(%)					(ppm)
GEW-33R	2/12/2013	0.2	62	1	2.6	33	5,200
	3/5/2013	0.3	60	0	0	36	5,400
	4/22/2013	0.67	57	ND	ND	35	4,400
	5/15/2013	0.17	37	8	29	23	2,700
GEW-34	2/12/2013	1.4	63	1	3.2	31	2,100
	3/5/2013	2.7	61	0	4	30	2,500
	4/22/2013	1.2	8.7	19	68	ND	210
	5/15/2013	0.44	4.6	20	73	ND	ND
GEW-35	1/23/2013	0.3	66	2	5.4	26	5,500
	2/12/2013	0.28	69	1	3	25	4,600
	4/22/2013	0.31	38	8	29	23	2,200
	5/15/2013	0.23	30	11	40	18	1,600
GEW-36	2/12/2013	0.32	52	4	15	28	2,900
	3/5/2013	0.7	61	0	0	34	3,300
	4/22/2013	0.14	38	8	30	22	1,900
	5/15/2013	0.021	9.4	18	66	6	710
GEW-37	2/12/2013	15	64	1	6	13	1,900
	3/5/2013	0.2	66	0	4	28	4,700
	4/22/2013	0.15	45	6	21	26	2,600
	5/15/2013	0.17	57	ND	5	33	3,200
GEW-38	2/12/2013	5	66	1	2.6	25	2,100
	3/5/2013	6.7	63	2	6.5	22	1,600
	4/22/2013	5.6	63	ND	ND	27	1,800
	5/15/2013	4.1	57	2	8	26	2,000
GEW-39	2/12/2013	35	60	1	2.6	1	170
	3/5/2013	43	53	0	0	ND	100
	4/22/2013	40	52	ND	5.5	ND	140
	5/15/2013	33	46	3	15	ND	230
GEW-56R	2/12/2013	25	48	1	23	3	200
	3/5/2013	21	57	0	18	ND	270
	4/22/2013	21	45	ND	31	ND	140
	5/14/2013	22	40	ND	33	4.1	240
GEW-57B	2/12/2013	0.19	57	3	9	30	3,900
	3/5/2013	0.2	60	0	5	32	4,300
	4/22/2013	0.2	57	2	8	30	3,600
	5/14/2013	0.21	59	ND	6	31	3,500
GEW-57R	2/12/2013	3.8	63	1	2.8	28	3,000
	3/5/2013	3.7	62	0	0	30	2,900
	4/22/2013	1.7	59	ND	4.6	31	2,900
	5/14/2013	1.1	59	ND	3.8	32	3,100
GEW-58	1/23/2013	1.7	55	2	7.7	32	3,300
	2/12/2013	1.2	53	3	12	29	2,500
	3/5/2013	1.3	60	0	0	34	2,900
GEW-59R	2/12/2013	14	50	1	23	11	1,400
	3/5/2013	17	64	0	4	13	1,400
	4/22/2013	18	60	ND	7.3	14	1,000
	5/14/2013	16	59	ND	6.6	16	1,200

Laboratory Analysis - Bridgeton Landfill

Well Name	Date Sampled	Methane	CO_2	O_2/Argon	Nitrogen	Hydrogen	Carbon Monoxide
		(%)					(ppm)
GEW-60R	2/12/2013	0.31	59	2	8.4	28	4,100
	3/5/2013	0.4	59	2	6.9	30	4,200
	4/22/2013	0.39	55	3	10	30	3,300
	5/14/2013	0.52	56	ND	7.1	31	3,100
GEW-62R	2/12/2013	6.8	54	2.7	12	23	1,500
	3/6/2013	6.1	45	5.8	22	20	1,300
	4/22/2013	4.6	43	5.9	21	23	1,700
	5/14/2013	1.8	50	4	15	28	2,300
GEW-63	1/23/2013	0.27	69	1	4.3	24	6,500
	2/13/2013	0.19	71	1	3.3	23	5,400
	3/5/2013	0.3	70	0	0	26	6,100
	5/14/2013	0.32	67	ND	ND	26	4,800
GEW-64	1/24/2013	0.31	63	1	4	31	5,600
	2/12/2013	0.22	65	1	2	30	4,800
	4/22/2013	0.25	48	6	22	22	3,600
	5/15/2013	0.42	64	ND	3	29	4,500
GEW-65A	11/7/2012	0.19	57	3	9.3	30	5,600
	12/5/2012	0.4	60	1	4.8	32	6,400
	1/24/2013	0.32	62	1	5	30	6,700
	2/12/2013	0.27	62	2	7	27	5,000
GEW-66	2/12/2013	0.24	67	1	2.2	28	5,900
	3/6/2013	0.3	61	2	8.4	27	5,800
	4/22/2013	0.26	57	2	8.5	28	4,900
	5/14/2013	0.29	62	ND	ND	30	5,400
GEW-68	2/12/2013	4.6	67	1	2.9	24	2,500
	3/5/2013	4.5	67	0	0	25	2,700
	4/22/2013	2.1	64	ND	ND	30	3,400
	5/15/2013	2.3	64	ND	ND	30	3,200
GEW-69R	11/6/2012	1.4	67	1	4	24	6,300
	12/6/2012	8.3	65	1	5	20	4,900
	1/24/2013	7.6	68	1	3	19	5,400
	2/13/2013	2.2	68	2	6	20	5,100
GEW-70R	1/24/2013	0.19	64	1	5	29	6,500
	2/12/2013	0.15	67	1	2.1	28	5,500
	3/5/2013	0.2	66	0	0	30	6,100
GEW-71	2/12/2013	3.7	66	2	6	21	3,900
	3/6/2013	3.9	66	0	5.2	23	4,200
	4/22/2013	1.7	43	9	33	12	2,800
	5/14/2013	0.35	66	ND	3.9	27	5,200
GEW-72R	11/1/2012	1.7	68	1	4.5	24	6,900
	12/5/2012	0.51	70	1	3.2	23	8,900
	1/22/2013	20	60	1	5.8	13	1,800
GEW-73R	2/12/2013	13	67	1	2.8	16	2,300
	3/5/2013	8.3	68	0	0	21	2,700
	4/22/2013	6.6	64	ND	5.4	22	2,700
	5/15/2013	4.9	66	ND	ND	25	2,900

Laboratory Analysis - Bridgeton Landfill

Well Name	Date Sampled	Methane	CO_2	O_2/Argon	Nitrogen	Hydrogen	Carbon Monoxide
		(%)					(ppm)
GEW-74	1/24/2013	0.35	67	1	3	28	8,000
	2/12/2013	0.24	66	1	4	26	6,100
	3/5/2013	0.3	66	0	0	28	6,400
GEW-75	11/1/2012	0.26	66	1	4	27	7,300
	1/24/2013	0.23	47	7	26	18	4,200
GEW-76R	1/24/2013	0.28	59	4	16	19	6,900
	2/13/2013	0.2	71	1	2.3	23	6,700
	3/5/2013	0.2	69	0	0	25	6,500
GEW 77	3/6/2013	6.4	68	0	0	23	3,100
	4/25/2013	4.9	67	ND	ND	25	3,100
	5/14/2013	4.7	66	ND	ND	25	2,900
GEW-78R	3/6/2013	3.9	63	0	4.5	26	3,800
	4/25/2013	2.3	65	ND	ND	29	4,000
	5/14/2013	2.3	64	ND	ND	29	3,800
GEW-79R	11/1/2012	0.56	73	1	3	22	8,000
	12/5/2012	2.1	70	1	2.7	23	6,700
GEW 80	3/6/2013	10	74	0	0	13	2,100
	4/25/2013	8.1	71	ND	ND	17	2,300
	5/14/2013	7.9	71	ND	ND	17	2,100
GEW 81	3/6/2013	9.7	73	0	3.7	12	2,000
	4/25/2013	7.7	74	ND	ND	16	1,900
	5/14/2013	6.9	72	ND	ND	15	1,700
GEW-82R	2/12/2013	4.3	73	1	2.4	20	2,900
	3/6/2013	2.1	57	5	16	20	2,900
	4/25/2013	1.9	68	ND	ND	26	3,500
	5/14/2013	2.3	67	ND	3.7	24	3,200
GEW-83	2/12/2013	23	54	2	20	ND	170
	3/6/2013	26	60	0	11	ND	230
	4/22/2013	24	58	ND	13	ND	300
	5/14/2013	26	62	ND	7	4	350
GEW-84	2/12/2013	5.2	68	0.87	3.2	22	2,200
	3/6/2013	5.5	66	0	3.7	23	2,000
	4/22/2013	14	72	ND	3.4	8	400
	5/14/2013	16	75	ND	3.4	3.9	160
GEW-85	2/12/2013	10	63	1.4	6.2	18	2,300
	3/6/2013	14	65	0	ND	17	1,500
	4/22/2013	16	57	2.6	12	11	850
	5/14/2013	0.16	57	1.8	6.4	33	3,300
GEW-90	2/12/2013	4.8	53	1.8	15	25	2,800
	3/5/2013	7.1	57	0	6.1	27	3,000
	4/22/2013	2.7	51	2.7	14	28	2,700
	5/14/2013	3.2	56	ND	4.4	32	2,800
GEW-91	2/12/2013	0.15	72	0.61	2.2	24	5,800
	3/5/2013	0.1	70	0	ND	25	3,100
	4/22/2013	0.21	71	ND	ND	24	5,500
	5/14/2013	0.16	59	4	15	21	4,500

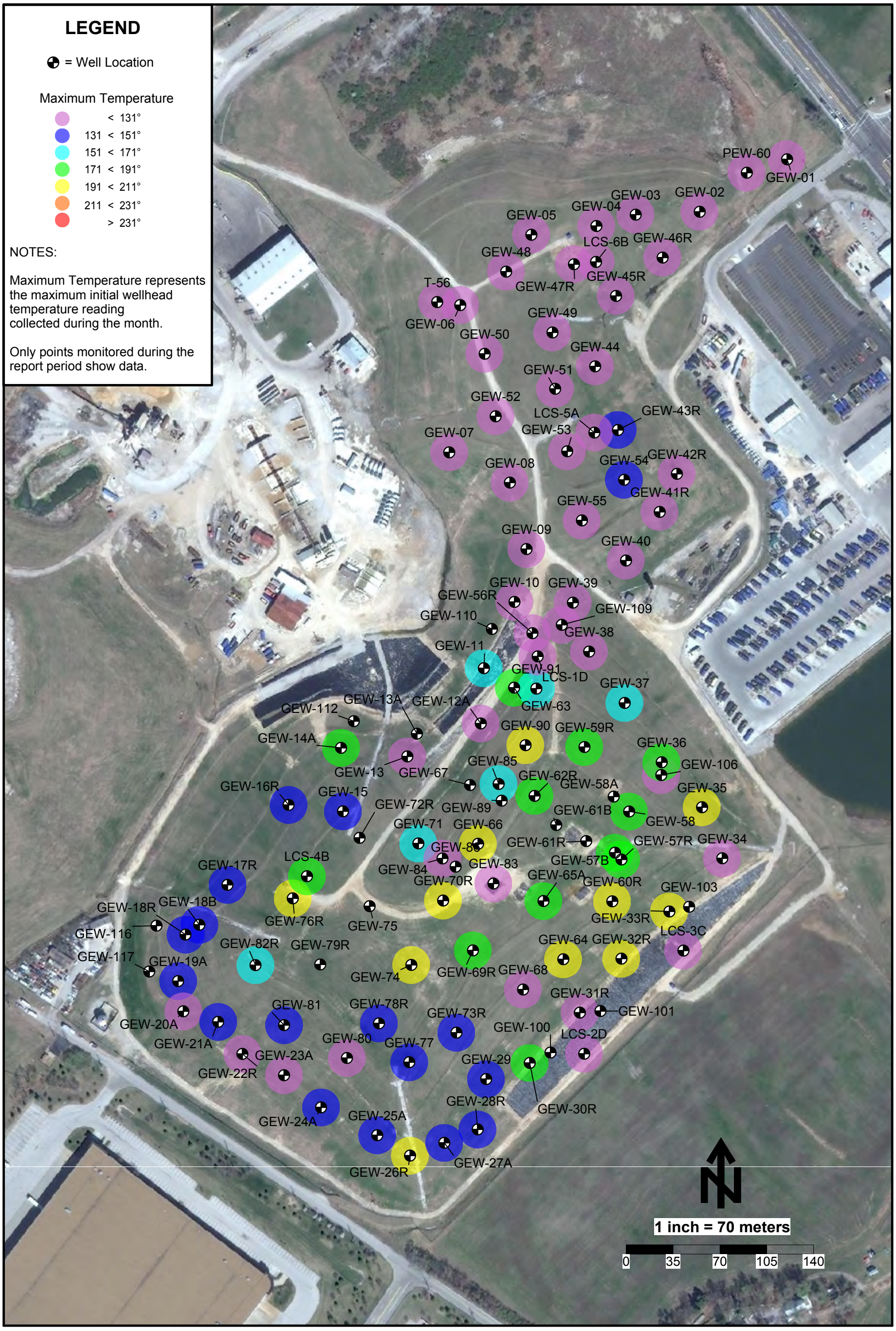
Laboratory Analysis - Bridgeton Landfill

Well Name	Date Sampled	Methane	CO_2	O_2/Argon	Nitrogen	Hydrogen	Carbon Monoxide
		(%)					(ppm)
GEW-106	2/12/2013	7	26	13	50	2.4	480
	3/5/2013	10	37	10	38	4.2	710
	4/22/2013	0.19	69	ND	ND	25	4,900
	5/15/2013	0.27	67	ND	ND	27	4,200
GEW-109	2/12/2013	4.4	62	0.67	2.4	30	2,800
	3/5/2013	12	62	0	14	12	1,300
	4/22/2013	11	47	2.3	30	9.5	1,200
	5/15/2013	20	55	ND	13	9.8	770
GEW-110	4/22/2013	8.8	62	ND	8.8	19	940
	5/14/2013	5.3	67	ND	4.4	21	1,700
GEW-111	2/13/2013	7.9	37	5.5	43	5.7	980
LCS-1D	2/12/2013	57	30	2.7	10	ND	52
	3/6/2013	66	31	0	0	ND	0
	5/14/2013	61	36	ND	ND	ND	ND
LCS-2D	2/12/2013	47	39	3	11	ND	21
	4/22/2013	52	45	ND	ND	ND	ND
	5/15/2013	49	43	1.7	6.4	ND	ND
LCS-3C	1/23/2013	18	66	1.4	4.8	8.7	1,900
	2/12/2013	17	70	0.97	3.5	8.1	1,600
	3/5/2013	16	69	0	4.6	8.7	1,800
	4/25/2013	2.6	13	17	65	ND	380
LCS-4B	12/5/2012	0.2	64	4.3	15	15	7,600
	2/13/2013	0.11	31	13	47	8.2	3,500
INLET	2/12/2013	11	51	4.9	21	11	1,900
	3/5/2013	12	55	3.9	17	13	2,100
	4/25/2013	8	32	11	40	8.1	1,200
	5/15/2013	11	49	5	20	13	1,900

ND = Analyte not detected in sample.

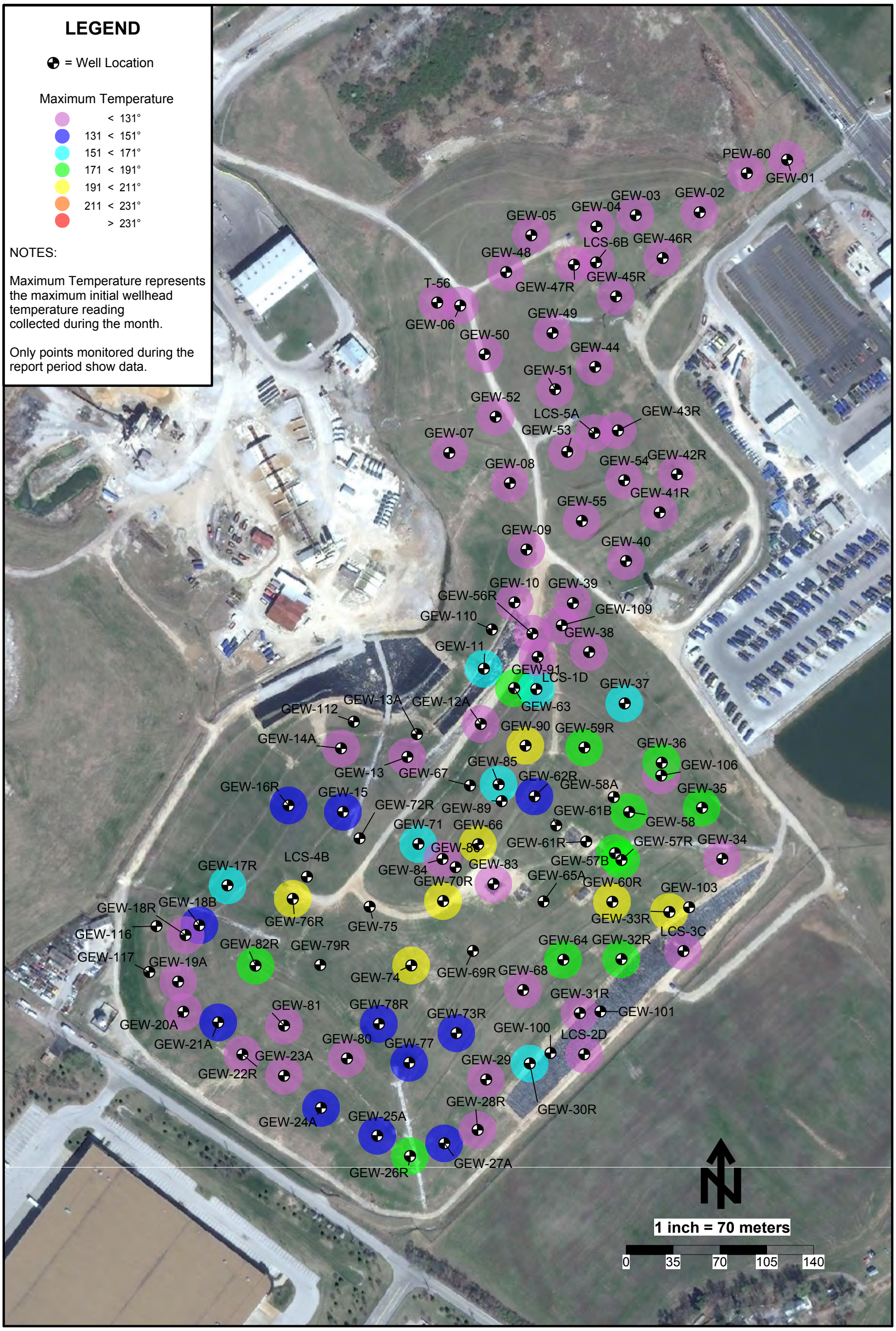
ATTACHMENT G

WELLHEAD TEMPERATURE MAPS



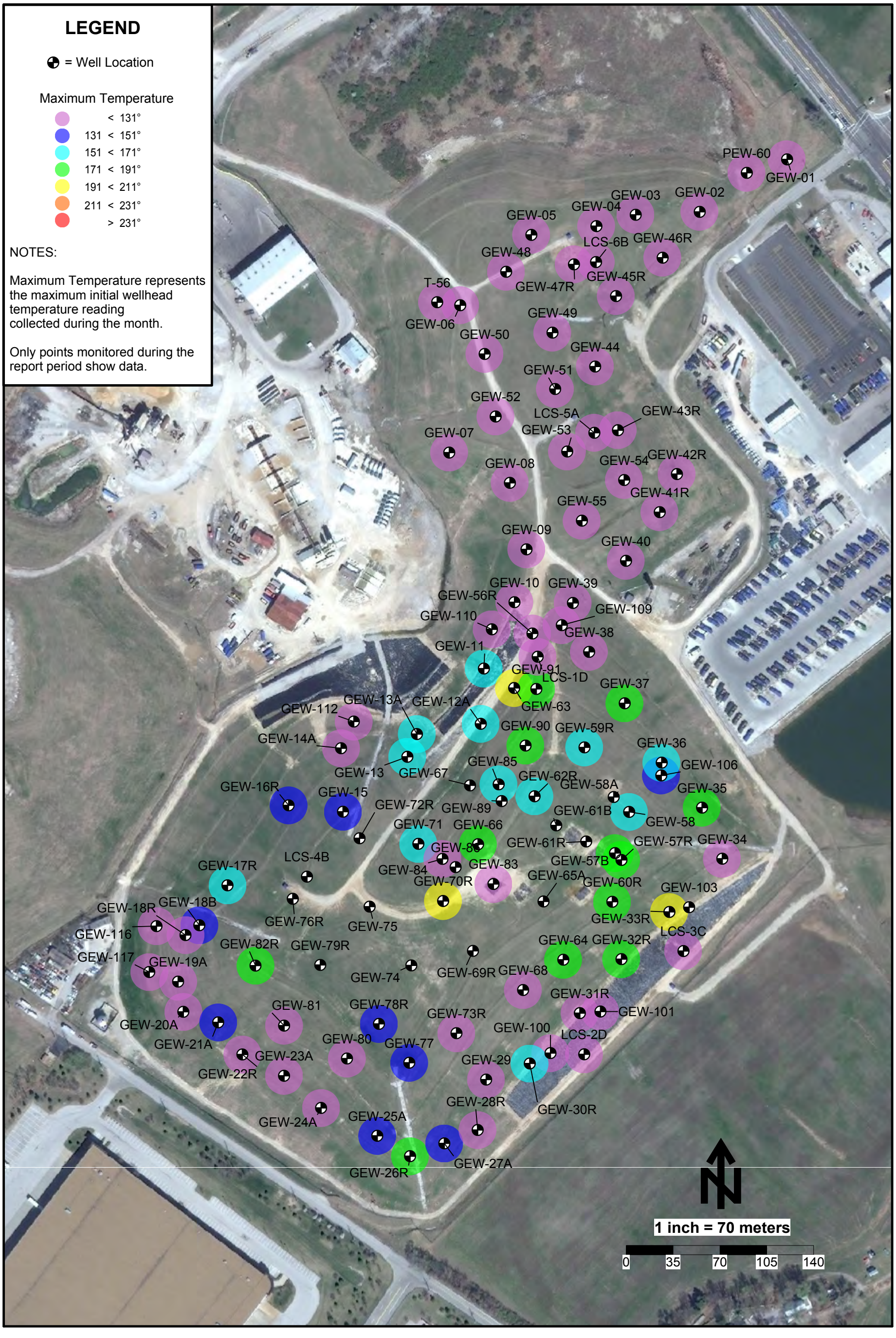
Initial Temperature Maximums - February 2013 - Bridgeton Landfill

SCS ENGINEERS



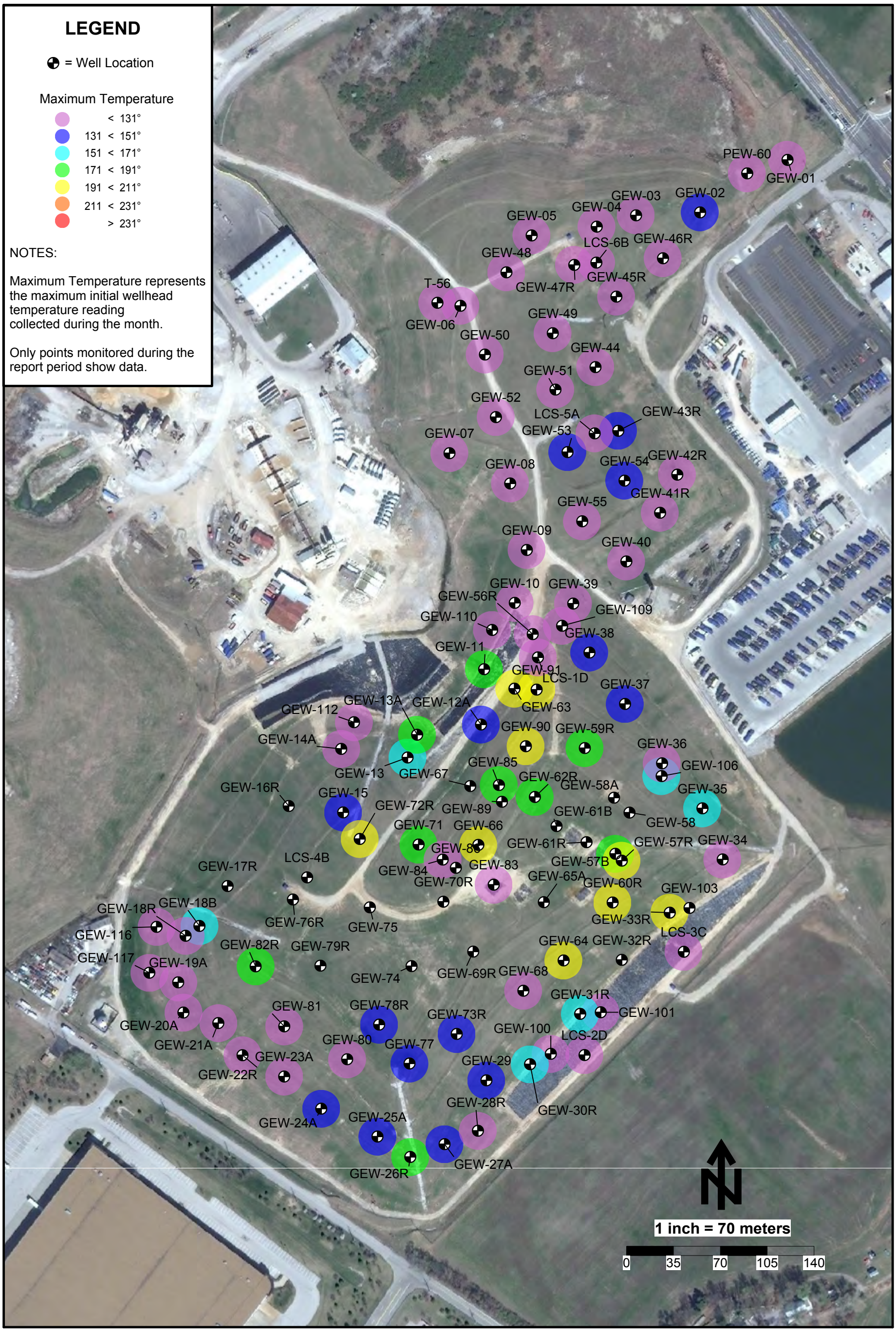
Initial Temperature Maximums - March 2013 - Bridgeton Landfill

SCS ENGINEERS



Initial Temperature Maximums - April 2013 - Bridgeton Landfill

SCS ENGINEERS



Initial Temperature Maximums - May 2013 - Bridgeton Landfill

SCS ENGINEERS

ATTACHMENT H

SUMMARY OF ODOR COMPLAINTS

May 1, 2013 – May 11, 2013

Voicemails

Resident: Marge Menke

Voicemail: Ms. Menke asked for a return call.

Follow-up: Ms. Menke asked if we are aware of the mailer delivered to her door today and stated that she knows the smell is bad and asked if it is necessary to relocate. She was assured that this was a voluntary decision; however, Bridgeton is making available the opportunity for her to relocate to an extended stay motel which we will pay for or she can obtain $125 per week reimbursement if she chooses to stay with a friend or relative. She asked if there would be reimbursement if she chose to stay home; and she was informed there will be no reimbursement if she does not relocate. Ms. Menke asked if there will be 24/7 security at Spanish Village, at which point she was directed to Jennifer or Kurt at the Development Resource Partners, whose number she has.

Resident: George Porter

Voicemail: Mr. Porter called, asking for a return call after receiving the door flyer.

Follow-up: Mr. Porter asked what motel we will pay for and if payment will be made up front in lump sum or how paid. He was directed to Jennifer or Kurt at DRP, LLC and given their number. He explained that he was outdoors enjoying the day so he would look again at the flyer and call them. He indicated that he does not have a way to fax or email nor can he get to their office. He was hoping he could drop off the form at the landfill. We explained that DRP is administering the lodging arrangements and to relay this information to Kurt or Jennifer when he calls them.

Resident: Alice Mack

Voicemail: Ms. Mack left a message regarding the lodging program, asking if we were demanding that she move out of her residence.

Follow-up: Ms. Mack had several questions. First she asked if we were demanding she leave her home. She was informed that the offer extended is voluntary. She asked how intense the smells will be and what we expect individuals' reactions to the odor to be. We explained that we expect that the odors will be noticeable but how any one individual will react cannot be known.

Resident: Roger Chik

Voicemail: Mr. Chik left a message asking for additional information about what is being done at the landfill to help him determine if he should relocate.

Follow-up: Mr. Chik said he had spoken with Kurt at DRP, LLC who was able to answer a couple of his principal questions: did he have to accept the relocation offer prior to May 19th or could he wait to see if the odors were too strong for him to remain at home? Roger said Kurt told him that he could accept the offer after May 19th. Mr. Chik said that he and a neighbor spoke and wonder if there will be increased police patrols in Spanish Village to protect the vacant property from crime. He was directed to Jennifer or Kurt for an answer and given their contact number. We informed Roger of the work that is taking place that may increase the intensity of the odors in the coming weeks.

Resident: Deborah Strickland

Voicemail: Ms. Strickland left a message requesting to be relocated from her home in Terrisan Rest.

Follow-up: Ms. Strickland said she has a lot of sensitivities and was diagnosed with a condition called misophytosis. With her severe allergies, Ms. Strickland explained there are only two motels where she can stay where she knows rooms have been properly prepped for her. She was directed to Jennifer and Kurt with DRP. She received the forms and has their contact number.

Voicemail: Ms. Strickland left another message asking for a manager or higher to phone her back.

Follow-up: Ms. Strickland she said that she had spoken Jeannie at DRP earlier and that she is unable to stay in a suite where there is kitchenette because of allergies to prior cooking oils, shower scents, etc. She wants to stay at Super 8 in Bridgeton. She was reminded that the relocation is voluntary and if she is comfortable at home she does not need to relocate

Voicemail: Ms. Strickland left a third message with her name and number.

Follow-up: Ms. Strickland stated that her father relayed information that he heard on Channel 4 talking about Bridgeton possibly changing dates for the work being done as it relates to the temporary relocation. It was explained to her that we expect the RCP Abandonment Project to begin on May 20th and end on June 14th; however, it might finish sooner or take slightly longer. Ms. Strickland talked about parents concerned with shuttling school children greater distances if they choose to relocate and thought that Bridgeton might push back dates of the work. We indicated that she could communicate with Jennifer and Kurt; however we plan to move ahead as scheduled on May 20th.

Resident: Jerry Black

Voicemail: Mr. Black called the Bridgeton Landfill voicemail complaining of his throat burning and having discomfort from the strong odors.

Follow-up: We apologized to Mr. Black for the odors and inconvenience. He stated he knows we are relocating Bridgeton residents. We described our offer for voluntary relocation made in conjunction with the MDNR and the MOAG office. After obtaining his address at 4135 Fuller Lane in Bridgeton, he was informed that if he did not receive a hand delivered notice yesterday, it is likely because he lives outside of the covered area. He said that he has asthma and it is a serious health problem and that for us to not consider individuals' health conditions when offering voluntary relocation is absurd. He then talked about a class action law suit and that he will take this as far as he has to. Since he threatened legal action, we wished him a nice day and ended the call.

Resident: Ned Rishi

Voicemail: Mr. Rishi left just his number and asked for a call back.

Follow-up: Mr. Rishi said he is a resident of the Carrolton Village Condominiums and that he received our notices yesterday about the voluntary housing. He asked if he had to go to a hotel because they cannot cook their authentic food there. We explained that the relocation is voluntary and he stated that they would likely stay with a relative. Since he received the forms, he was encouraged to complete the application and return it to DRP. He asked if he would be able to come back during the course of the week to check on his house. He was given the contact number for Jennifer and Kurt and suggested as program administrators, they would be the right people to answer specific questions like that.

Resident: Rita Triplett

Voicemail: Rita Triplett called saying that the local news has been on site at the Carrolton Condo's where she lives talking about the expected increasing odors and the Bridgeton offer to voluntarily relocate residents.

Follow-up: Ms. Triplett provided us with her email address so that she could receive an application for the voluntary alternative housing program, though it was explained to her that her address had not yet been confirmed to be within the covered areas, so there is no determination as of yet whether or not approval will be granted to extend. She asked about why this work couldn't have been done in the winter while weather was colder rather than waiting for warmer temperatures when people are outdoors more. We advised that various stages of the odor mitigation have been in process for many months. We offered to email the application forms to her today, and she understands that we will review and consider her request.

Resident: Barbara Hundsel, St. Charles Embassy Suites

Voicemail: Barbara Hundsel of the St. Charles Embassy Suites noticed we sent out letters to area homeowners about the temporary lodging program. She said she is interested in speaking to us about the program and to see if we could meet to discuss sending residents to their hotel.

Follow-up: Ms. Hundsel stepped out for lunch; so she was left a detailed voicemail referring her to Jennifer or Kurt at Development Resource Partners. We let her know that this company is administering our voluntary lodging program, and she should feel free to contact them with her questions and interest. The number for DRP was provided along with extension numbers.

Resident: Chris Musterman, Rock Road Trailer

Voicemail: Mr. Musterman said he had a few questions and asked for a call back.

Follow-up: Mr. Musterman explained that he is the sole employee at Rock Road Trailer. He suffers with emphysema and has been having asthma attacks in recent months requiring more inhalers. He explained that he has a nearly constant headache when he is at work, and he notices that his symptoms go away on the weekends. He wanted to know if we have started "tearing into" the landfill already or if the odors will get a whole lot worse. The upcoming work scheduled to begin approximately May 20th was explained to him, and he will appreciate being contacted by Bryan Sehie anytime Monday - Friday.

Complaints forwarded by MDNR

Resident: Jennifer Woodman

Message: Ms. Woodman emailed MDNR concerning odors from the Bridgeton Landfill. She was given a general overview of the site and what the current status is. She said she was familiar with the odors generated from time to tome by the Champ Landfill and that Bridgeton is definitely the source of the recent increase in bad odors. She was informed that she would be contacted by Republic.

Follow-up: Ms. Woodman explained that she doesn't usually smell the landfill odors at her house. We apologized for the increase in odors and explained that part of the overall odor resolution is the RCP Abandonment Project. Ms. Woodman asked if this was part of the well installation process and said she thought we would be finished by now. We told her that 40 new wells were finished in mid-April and that this leg is part of the long term solution.

Resident: Rachael Moeller

Message: Ms. Moeller contacted MDNR concerning odors from the Bridgeton Landfill; she said the smell is so bad that she can smell the scent in Florissant, MO. Ms. Moeller was given a

general overview of the site and what the current status was. She was informed that Republic would be contacting her.

Follow-up: Ms. Moeller was left a message explaining that MDNR shared her complaint information with us and that while we are aware she has spoken with Joe Trunko, we are happy to answer any additional questions. She was given the 314 number to call should she have any further questions.

Resident: Melissa Davis

Message: Ms. Davis submitted a complaint to the MDNR to report an odor concern. She asked when the odor issue would be resolved.

Follow-up: The Missouri Department of Natural Resources forwarded your email from Tuesday, May 7, 2013. Thank you for your feedback. First, we want to apologize for the odor. We understand there is a problem and we are working diligently to address the issue. In mid-April, we completed our work on adding 40 new wells to work along with the 160 wells already on site. Much like a vacuum, these wells remove the gas from within the landfill. These gases are then transported to a newly-upgraded processing facility located on site that destroys the odor-causing gas. We are currently working with the MDNR and the Missouri Attorney General's Office to implement the next phase of our plan, eliminating odor conduits created by reinforced concrete pipes. Removing these pipes will make the site safer for all onsite workers, and must be completed to prepare the landfill surface for an additional plastic cap. Work on removing the pipes is scheduled to begin Monday, May 20 and conclude Friday, June 14. This intensive work requires excavating small sections of the landfill to remove reinforced concrete pipe sections. As a result, this work may increase the odor for local businesses and residents. We are taking action to reduce and mitigate the odor that may come from this phase, including the installation of misting systems to deodorize the landfill odor. In addition, ongoing air monitoring will be continued both on and off site during this work to ensure that the air is safe to breathe for employees and local residents. Again, we do apologize for the odor, but we do expect in the coming months we will be able to drastically reduce the intensity of the odor.

Resident: Andre Keller

Message: Mr. Keller submitted a complaint to the MDNR to say that he is very concerned the odor is getting worse. He worries especially about when his grandchildren are over. He asked what his options might be when those times arise and what he can do when the odor is unbearable and his grandchildren are over.

Follow-up: We left Mr. Keller a message explaining that we would be happy to bring him up to date on the work being done at the Bridgeton Landfill. He was given the 855 number to give us a call back.

Resident: Kathleen Logan Smith

Message: Ms. Smith submitted a complaint to the MDNR writing that she was at Charles Rock Road and I-270 and the smell was extremely foul. She said that it set off a bout of coughing, which is abnormal for her and that other residents who had been in the area that morning also reported similar conditions.

Resident: Gale Thackrey

Message: Ms. Thackrey submitted a complaint to the MDNR explaining that while on her motorcycle by the 270/70 junction, the small was so bad that she had a gag reaction. She said she also smells it in her office building.

Follow-up: Ms. Thackrey said that she spoke with Joe Trunko with the MDNR who already explained the reason for the more intense odors. We followed up by apologizing for the odors and the inconvenience caused - essentially they're related to Mother Nature's low winds and high barometric pressure. She said riding on two wheels and smelling the odors is not a good combination. We explained that we have been taking action to fix the broad odor issue and the good news is that it will be much less noticeable in the coming weeks. We thanked her for being in touch and she said that she would continue to email so that we know how far out the odors are reaching.

Emails

Resident: William Bischof

Resident email: We reached Mr. Bischof by phone on May 7th to follow up on the flyers regarding the lodging program that the canvassers dropped off. Mr. Bischof said he did not receive the forms and requested that we email them to him.

Response: Thank you for taking the time to speak with us yesterday evening about the voluntary, temporary alternative housing program being offered by Bridgeton Landfill. We have attached the informational forms to this email. Please let us know if you have any questions.

Resident: Councilman Norm Rhea

Resident email: Councilman Rhea replied to our email about the lodging program with this: Could this cover any parts of Maryland Heights?

Response: The scope of the program is based upon the scope requested by the Attorney General's Office and includes the households closest to the landfill. The area does not include Maryland Heights. We remain available to you and your team to answer any questions and respond to any concerns as we continue work towards achieving a long term solution - drastic reduction of the odor.

Resident: Tom Schlag

Resident email: Please get started with this next phase, we had hoped that it would be done by now. Now we have to wait at least a week for it to get started, its worse waiting. Please get started.

Response: Thank you for your feedback. First, we want to apologize for the odor. We understand there is a problem and we are working diligently to address the issue. Second, we are coordinating with the Missouri Department of Natural Resources and the Missouri Attorney General's office to implement our plan to reduce the odor. The RCP Abandonment Project is expected to start on Monday, May 20 and conclude on Friday, June 14. This phase of work focuses on eliminating odor conduits created by reinforced concrete pipes. It will also make the site safer for all onsite workers, and must be completed to prepare the landfill surface for an additional plastic cap on the south quarry. This intensive work requires excavating small sections of the landfill to remove reinforced concrete pipe sections. As a result, this work may increase the odor for local businesses and residents. The Bridgeton Landfill team is taking action to reduce and mitigate the odor that may come from this phase. The team is executing a 104-page plan that minimizes excavation and involves installing misting systems to deodorize the landfill odor. In addition, ongoing air monitoring will be continued both on and off site during this work to ensure that the air is safe to breathe for employees and local residents. Again, we do apologize for the odor, but we do expect in the coming months we will be able to drastically reduce the intensity of the odor.

Resident: Barbara Appel

Resident email: Is this air dangerous to our help? With cooler weather we like to open windows. Sometimes there is no bad smell. Is it dangerous to our health even if we don't smell it? Is it ever safe to open the window? Be outdoors?

Response: Thank you for your feedback. First, we want to apologize for the odor. We understand there is a problem and we are working diligently to address the issue. Second, we want to you to know we are committed to ensuring that our employees and neighbors have clean air to breathe. We are working closely with the MDNR to ensure the air at and around the landfill is safe. To date, all air quality tests have shown that the air remains safe. And third, we'd like to provide you with as much information as we can about the ways we are working to reduce the odor. We are currently upgrading the system used to collect and manage the gas which causes the unpleasant odor. We recently completed the process of adding 40 new wells to work along with the 160 wells already on site. Much like a vacuum, these wells remove the gas from within the landfill. These gases are then transported to a newly-upgraded processing facility located on site that destroys the odor-causing gas. After the wells are installed, we will put a large, durable cap over the landfill that will trap additional gas so that is can be managed by the upgraded systems. We are currently working with the Missouri Department of Natural Resources and the Missouri Attorney General's office to implement our plan. Again, we do

apologize for the odor, but we do expect in the coming months we will be able to drastically reduce the intensity of the odor.

Resident: Steve Junger

Resident email: What motels are available for the temporary housing?

Response: Thank you for your inquiry. The voluntary, temporary alternative lodging program is being administered by Development Resource Partners, LLC (DRP), a St. Louis business with expertise in short-term relocation. They should be able to answer your question. You may call DRP at 314-395-9905 (Jennifer Kaniecki at Ext 3 or Kurt Schulte at Ext 6).

Resident: Paul Moate

Resident email: I have been trying to contact Mrs. Owens from Cahokia IL for the past week about a truck driving job and all it does is goes to her voice mail there is never any call back or emails from this company I believe this matter should be checked into thank you Paul a moate

Response: We appreciate your patience in this matter. I would encourage you to continue to try to reach out to Mrs. Owens or someone else at the Cahokia, IL office. They will be much better suited to address your application than our team. Our records show the office number is (618) 337-6455.

Resident: Mark

Resident email: I understand that some older landfills have crossed the threshold of safely injecting air directly into the waste through the cover to not only control odors (similar to earthy, composting aromas) but also to speed up waste decay (30x faster) and actually reduce methane, a Greenhouse gas that is 21 more harmful than CO2 in the atmosphere. Apparently, the addition of liquids along with the air controls the temperatures and thus no fires have been reported. Lastly, faster waste decay could mean less toxicity sooner, thus a possible lowering of costly post-closure care (30+yrs?) and a more sustainable site redevelopment. There is reportedly a large closed landfill site in Alberta that is doing this. BTW- if this works, can the "avoided" GHGs be sold as credits? I looked up a UN Methodology named AM0083. If so, these credits could pay in part for such an approach. Thanks.

Response: Thank you for your feedback. We have a team of experts on site who are very familiar with landfill heat generating reactions. Additionally, we are working in close coordination with the Missouri Department of Natural Resources and the Missouri Attorney General's Office to implement our plan to control the reaction and reduce the odors long term.

Resident: Lonnie Dake, OATS Inc.

Resident email: I happened to see on the news that you or an affiliation is offering a relocation program for certain residents in the area for the upcoming month or so. I was wondering what you are going to do for those of us that work in the area and endure the stinch on a daily basis. I understand that the smell is going to be worse (not sure how that can be) during this timeframe. Our office is open from 4:00 am to 7:00 pm so that is a 15 hour timeframe. Some are here for 10-12 hours, how is that going to affect our health? The majority of the office staff already have headaches on a regular basis and feel nauseas at times. OATS, Inc.

Response: The Bridgeton Landfill team responds to business inquiries and includes interested businesses on regular updates.

May 12, 2013 – May 18, 2013

Voicemails

Resident: Yvonne Leonard

Voicemail: Yvonne Leonard left a voice mail message asking for relocation assistance during the course of the next work phase at the landfill though she did not receive notification at her door.

Follow-up: Ms. Leonard detailed that she has asthma, COPD and uses a CPAP machine for sleep apnea. The arrangement for voluntary reimbursed relocation was explained to her. She was very upset that the program didn't take into account individuals living outside the one mile radius that have health conditions. We offered to email her an application for relocation assistance which we will consider though no commitment is being made to provide the assistance to residents living more than one mile away. She said she already knows what she will do if she gets sick because she stays home, she will sue us. We explained that, since she is talking legal action, we had to end the call but will mail her an application.

Resident: Laura Tucker, Emdeon

Voicemail: Ms. Tucker left a message explaining that she is an Emdeon representative—a business located next to the landfill. She said she needs to speak to someone regarding the upcoming work on the landfill.

Follow-up: Ms. Tucker explained that Emdeon employees started noticing extremely strong odors on January 23, 2013 and had to be sent home. She asked for us to relay the following questions to Bryan Sehie. Ms. Tucker asked us to predict how intense the upcoming odors are expected to be in comparison (significantly worse, not as bad as, etc.) to those on January 23rd and the schedule for the work we will be doing from May 20th to about June 16th—specifically she wants to know they expected daily hours of operation. They operate 24/7 around the clock and know that they will be impacted. They want this information so they can do as much as possible to reduce/minimize odors and the expenses involved with employees impacted by the odors. Moving to another building is not feasible. She also asked for any remedies available to them since they will need to incur additional expenses to make their employees comfortable to continue work. Lara is very pleasant and appreciative of the call and outreach. Time is growing short for them to take preventive action for their business operations so she asked that Bryan contact her at the first opportunity. She already included him on an email earlier today. The Bridgeton Landfill team followed up with Ms. Tucker and offered to include her on future updates.

Resident: Jerry Black

Voicemail: Jerry Black called requesting updates on the work being done at the Bridgeton Landfill and on whether or not the one mile radius for the lodging program will be extended to those living outside that perimeter.

Follow-up: Mr. Black was left a message providing him with our 855 to call so we can answer his questions.

Resident: Amber Branstetter

Voicemail: Ms. Branstetter called regarding the lodging program fliers that were delivered to her doorstep. She said she has a few questions about the program and requested a return call.

Follow-up: Ms. Branstetter received the relocation papers on her door but misplaced them. She asked that we send her a new set. She has a 15-month old baby and said it isn't easy for them to relocate. Ms. Branstetter asked about how to participate, and we discussed the option to stay with friend or relative and receive an inconvenience payment.

Resident: David Schutte

Voicemail: Mr. Schutte called in regard to the lodging program fliers he found on his doorstep after returning to town.

Follow-up: Mr. Schutte asked about which hotels we had available and/or if he could take advantage of the inconvenience payments if he chose to stay at his cabin about 50 miles outside of the city. He was referred to DRP directly to ask those questions, and to confirm that he is an eligible resident of the Carrolton Condos.

Resident: Ned Rishi

Voicemail: Mr. Rishi left a message asking for a return call.

Follow-up: Mr. Rishi called to let us know that he spoke with Jennifer and mailed back the enrollment form.

Resident: Sue

Voicemail: Sue left a message explaining that she is the daughter of Rosemarie Jones who received our voluntary relocation notice. She asked for a call back so we can answer some questions she has.

Follow-up: Sue was left a message directing her to DRP with her question of how soon her mom needed to sign up for the relocation assistance. Jennifer and Kurt's number and extensions were provided as well as our 855 number should she have any more questions for us.

Resident: Deborah Strickland

Voicemail: Ms. Strickland left a message asking for a return call.

Follow-up: Ms. Strickland said that it is getting down to the wire and Jennifer hasn't provided a confirmation number for her lodging. She also asked if our work start date is shifting. We told her our work is on target to start as scheduled 5/20 and asked if Jennifer has received her enrollment form. Ms. Strickland indicated that Jennifer has it. While it may seem to Ms. Strickland that the timing is short, there are still 6 days and that Jennifer and Kurt will take care of everything with respect to the relocation in time.

Resident: Brianne

Voicemail: Brianne left a voicemail asking about security for residents like herself living in Spanish Village who choose to relocate.

Follow-up: We left Brianne a message advising that we are working with the local police department to increase patrols of Spanish Village, Carrollton Condominiums, and Terrisan Mobile home community for the duration of the lodging program. She was given the 855 number to call if she has additional questions.

Resident: Jan Healy

Voicemail: Ms. Healy asked for a call back regarding questions she has about the lodging program.

Follow-up: We spoke to Jennifer who is going to reach out to Ms. Healy.

Resident: Patrick Gallager

Voicemail: Mr. Gallagher asked for a return call regarding questions he has about the lodging program.

Follow-up: Patrick Gallagher tried reaching Jennifer at DRP earlier and has questions about where he will be relocated. Patrick is a fireman and his brother lives with him in the Carrolton Condominiums. He also is wondering if they will get two rooms or one. After ensuring that he has the correct contact number for Jennifer and Kurt, we urged him to call again and advised that if he leaves reaches their voicemail to leave a message and he will get a prompt call back.

Resident: Darlene Wanstall

Voicemail: Ms. Wanstall called to ask why she didn't receive notice of the voluntary relocation but many of her neighbors did. She lives at 4214 Carrollton Drive in the Carrollton Village Apartments—outside the covered areas for relocation.

Follow-up: We explained to Ms. Wanstall about the scope of coverage which was authorized by the MOAG and offered to provide her with the DRP contact number should she want to submit an application for consideration. She indicated that she and her roommate Myrick Pieron had already decided they wouldn't go to a motel and they have nowhere else to stay.

Resident: Will Bischof

Voicemail: Mr. Bischof called the voicemail asking for a return call about how to sign up for the voluntary relocation.

Follow-up: We ensured that Mr. Bischof now has the necessary forms and the full contact info for DRP, Jennifer and Kurt with extension numbers and their address, though it was recommended that since it is already Wednesday, he should phone them first rather than mailing in the forms in case they are delivered late by USPS.

Resident: James Myers

Voicemail: Mr. James Myers left a voice mail saying that he didn't get a return call last week and would like someone to call him.

Follow-up: Mr. Myers said he has been unable to reach Jennifer or Kurt by phone and is unable to leave a message. He is asking how he'll get reimbursed for leaving his home. We reached out to the DRP concerning Mr. Myers request to be contacted and were assured that he would receive a call shortly.

Resident: Linda Mae Slenker

Voicemail: Ms. Slenker left a voicemail asking questions about the housing program.

Follow-up: Ms. Slenker is one of the plaintiffs in the lawsuit, so per the direction of her counsel, we did not return her call. We informed her attorneys of her inquiry.

Resident: Denyse DuBrucq, Cryorain, Inc.

Voicemail: Ms. DuBrucq left a voicemail saying that her business, Cryorain, Inc. in Ohio can “put out the embedded fire in the Bridgeton Landfill rapidly.” She asked for a return call regarding her offer.

Follow-up: Ms. DuBrucq was unhappy that we only provided her with a physical address for the Bridgeton Landfill and our 855 number to contact with her information. She said that won't work for her despite suggesting that she mail some information to our environmental department and they could contact her with an email address if they would like to know more. We relayed the message that we appreciate her getting in contact with us but we are not interested at this time.

Resident: Robert Nowlin

Voicemail: Mr. Nowlin left a message asking for a return call concerning what level of security will be done for Spanish Village residents who choose relocation.

Follow-up: We informed Mr. Nowlin that, in coordination with MOAG, we are working with the local police department to increase patrols in the communities where residents may choose to relocate. Mr. Nowlin is unhappy with that and says that most of his neighbors believe increased patrols are insufficient and leave residents exposed to vandals. With only one entrance in/out of Spanish Village, and guest of the local residence inn walking in the neighborhood, he believes the empty homes are vulnerable. We told him we understand his concern and that relocation is voluntary, and it is unlikely that everyone will take advantage of the option to leave their home.

Resident: Shelly Gowan

Voicemail: Ms. Gowan called to let us know that the stench from the landfill was strong and heavy inside her house. She called the gas company thinking the odor was a gas leak.

Follow-up: We apologized to Ms. Gowan for the odors and explained that the wind and barometric pressure conditions likely made it so noticeable. Detailed info was provided about the upcoming work that will begin on Monday and while the odors will likely be more easily detected, we are working diligently and quickly to remedy the situation for the long term. He was given the 855 number should he have any future questions.

Resident: Mark Meyer

Voicemail: Mr. Meyer left a message saying Jennifer at DRP referred him back to us though he didn't indicate what question(s) she couldn't provide answers to.

Follow-up: Mr. Meyer never received the relocation paperwork and cannot access the application on the website. We apologized and assured him that we would email to forms to him immediately. He was also provided with Jennifer's fax number and email address. We sent him the forms and then called to confirm he received them.

Resident: Angel Morris King

Message: Ms. Morris King left a message with Sean at Bridgeton Landfill asking for relocation forms.

Follow-up: We left Ms. Morris King a message requesting she call back with her email address so we can send her the application forms.

Complaints forwarded by MDNR

Resident: Andre Keller

Message: Mr. Keller emailed MDNR about the odors and what to do when his children and grandchildren are visiting.

Follow-up: Mr. Keller explained that he lives on the border of Bridgeton and Maryland Heights and that there are times that he is able to smell the landfill odors and is concerned about any safety risks from the air. We explained that the MDNR has been conducting periodic air quality samples and with each test has reported back no safety or health risk to employees or neighbors. While the odors may get worse during the next phase of our work, they will be greatly improved after we are able to place the cap over the landfill. Mr. Keller seemed satisfied with this information and asked if he could call me in the future if he has additional questions. He was provided with the 855 number to call should he have any further questions.

Resident: Ron Robinson

Message: Mr. Robinson contacted the MDNR concerning odors from the Bridgeton Landfill. He was given a general overview of the site and what the current status is. He was also emailed links to the MDNR and Republic websites and was provide contact information for the Missouri Department of Health. He was informed that he may be contacted by Republic.

Follow-up: Two attempts were made to reach Mr. Robinson. The first time someone picked up then hung up the phone immediately. The second time it rang to an answering machine. We left a message explaining that we are following up to his email to the DNR and gave the 855 number if he has any questions.

Resident: Stacy Friedrich

Message: Ms. Friedrich submitted a complaint to the MDNR regarding the odor coming from the Bridgeton Landfill. She wrote that she is concerned about the long term effects of the odor.

Follow-up: We left a message for Ms. Friedrich following up to her complaint to the DNR and gave the 855 number to call if she has any questions.

Resident: Megan Geary, Virbac Animal Health

Message: Ms. Geary contacted the MDNR concerning odors from the Bridgeton Landfill. She was given a general overview of the site and what the current status is. She was emailed links to the MDNR and Republic websites and provided contact information for the Missouri Department of Health. She was informed that she may be contacted by Republic.

Follow-up: We called Ms. Geary and also provided her information to the Bridgeton Landfill team so that she could be included in updates provided to area businesses by the on-site team.

Resident: Laura Willingham

Message: Ms. Willingham contacted the MDNR concerning odors from the Bridgeton Landfill. She was given a general overview of the site and what the current status is. She was emailed links to the MDNR and Republic websites and provided contact information for the Missouri Department of Health. She was informed that she may be contacted by Republic.

Follow-up: We left a message for Ms. Willingham following up after her conversation with Joe Trunko and gave the 855 number for her to call back should she have any questions.

May 19, 2013 – May 25, 2013

Voicemails

Resident: Angel Morris King

Voicemail: Ms. Morris King left a message with Sean at Bridgeton Landfill asking for relocation forms.

Follow-up: Ms. Morris King never got the forms and needs to know if she is eligible or not. She is aware that if it is determined she is outside of the covered area that we are not guaranteeing she will be eligible for relocation. After follow-up, we emailed Ms. Morris King the forms.

Resident: Karen Nickell

Voicemail: Ms. Nickell left a message saying that she has left several messages at DRP and has not received a return call from Jennifer.

Follow-up: Ms. Nickell explained to us that she has documented illnesses and is smelling the odors, some days only faintly but has an 8 year old stepson who visits on weekends, and she states that she has noticed that for the last 4-6 months, the boy has breathing trouble by the time he leaves on Sunday evening. She also has a 19 year old son who uses an inhaler, and he has to drive past the landfill 6 times per day for work. She stated that her 11 year old daughter has severe anxiety because of what is going on at the landfill. She lives in Maryland Heights, about two miles away. We told her we would email the relocation form to her and suggested that she complete and return to DRP, though at this time there is no plan to expand the relocation beyond the agreed upon neighborhoods determined by the MOAG.

Follow-up email: Thank you for your call regarding the voluntary temporary lodging program. Per your request we have attached the application to this email. Please note that no decision has been made to expand the program but you will be considered if that changes.

Resident: Carol Lehn

Voicemail: Ms. Lehn left a message explaining that she had spoken with Jennifer and asking for a call back so we can email her the lodging agreement forms.

Follow-up: Ms. Lehn said she found the lodging agreement forms on the ground in front of her house and wanted to know if they fell off her door or were someone else's. She said that she completed the forms several days ago and sent them to Jennifer at DRP, though she said we could send her additional information if we wanted. She was informed that the only forms she would have to provide are the enrollment forms and was directed to please call Jennifer or Kurt at DRP to confirm that they received her forms and for further instruction.

Resident: Dough Hughes

Voicemail: Mr. Hughes left a voicemail asking for a call back.

Follow-up: Mr. Hughes wanted to know if Republic Services is hiring. We suggested that he send a
resume or letter directly to Bridgeton Landfill at 1350 St., Charles Rock Road in Bridgeton.

Resident: Linda, Conway Freight

Voicemail: Linda left a voicemail asking for a return call.

Follow-up: Linda called because she needed a new point of contact and phone number. Her driver needs to make a delivery and the number they had is for an employee no longer with Bridgeton Landfill. Linda was provided with the number 636-947-5959.

Resident: Linda Peterson, Gabriel Group

Voicemail: Ms. Peterson, calling with the Gabriel Group, a Direct Marketing Firm, left a message inquiring about provisions we would be making for local businesses regarding the RCP project and increased odors from the Bridgeton Landfill.

Follow-up: Ms. Peterson had a question about resident relocation. It was explained to her that the lodging program is for any resident that lives within certain areas as agreed to in the Attorney Generals' Agreed Order. We provided her with the MDNR website where she can access air sample results.

Resident: Reed Greer

Voicemail: Mr. Greer, with Dust Control Technology in Peoria, IL, asked for a return call.

Follow-up: Mr. Greer explained that his company does some work with odor suppression and has done business with Republic Services in California in the past. He was encouraged to send his information to the Landfill and was provided with the address and the customer service number.

Resident: Dawn Chapman

Voicemail: Ms. Chapman left a voicemail requesting to participate in the relocation program. She said she has a five year old with severe asthma and can provide a doctor's note if needed. She said she lives 1.5 miles from the landfill.

Resident: Jerry Black

Voicemail: Mr. Black left a message saying that he has been in contact with DRP and that they referred him back to Republic.

Follow-up: When we reached Mr. Black, he said he was told by Kurt at DRP to call us on the 855 number with regard to his request for alternate housing because he has asthma and is beyond the one mile radius. He was informed that inasmuch as he lives outside the agreed upon lodging program neighborhoods, which were determined by MOAG, there is no plan to extend at this time.

Resident: Angela Moon

Voicemail: Ms. Moon left a message stating that her husband works at AAA Trailer Service that backs up to the landfill. There is a sign on the back fence regarding radioactive waste, and she is concerned that it may still be radioactive.

Follow-up: We reached Ms. Moon's answering machine and left a detailed message that the radiologic waste is located at the West Lake landfill. She was provided with the West Lake Landfill website and given the 855 number to call should she have any questions regarding the Bridgeton Landfill.

Resident: Deondrae Boykin

Voicemail: Mr. Deondrae Boykin called the voice mail indicating he had been referred to call us by the relocation company.

Follow-up: Mr. Boykin said he spoke with DRP and they told him to call us at the 855 number. After getting his address, we explained about the MOAG agreed upon neighborhoods and that at this time there is no plan to extend to additional residents. We explained that we have begun our next phase of work and are working on the long term solution including placing a cap over the landfill. He was very nice and content with the information.

Complaints forwarded by MDNR

Resident: Kathy Baumann

Message: Ms. Baumann submitted a complaint to the MDNR regarding the odors from the Bridgeton Landfill. She was contacted and given an overview of the site and what the current status is. She was emailed links to the MDNR and Republic websites and provided with contact information for the Missouri Department of Health and Senior Services. She was informed that she may be contacted by Republic.

Follow-up: After receiving Ms. Baumann's complaint from the MDNR, we reached her answering machine and left a message that we would be glad to answer any questions she has about the work going on at the Bridgeton Landfill, then left the 855 number for her to call back.

Resident: Leanne Brown

Message: Ms. Brown submitted a complaint to the MDNR concerning the odors from the Bridgeton Landfill and its proximity to the West Lake Landfill.

Follow-up: We reached Ms. Brown's answering machine and left a detailed message, letting her know that we are happy to answer her questions about the work being done and explaining that the Bridgeton and West Lake Landfills are separate. It was suggested that she reach out to West Lake by visiting their website at www.westlake.com. Our 855 number was provided if she would like to call back.

Resident: Crystal Glaenzer

Message: Ms. Glaenzer submitted a complaint to the MDNR saying that odor from Bridgeton landfill can be smelled from Rose Acres Elementary school and surrounding neighborhood. Investigation must be done to make sure our health is not in jeopardy.

Follow-up: We reached Ms. Glaenzer's answering machine and apologized for the odors and let her know what we are doing may create a short term increase in odors but is part of the long term solution. We provided the website for the landfill and explained about the MDNR's regular and ongoing air quality test indicating no health or safety risk for employees or community. We also left the 855 number if she has any further questions.

Emails

Resident: Linda Peterson

Resident email: See voicemail section of report.

Response: Thank you for taking the time to speak with us this morning. We appreciate your feedback and patience as we work to reduce the odor at the landfill. We will add you to our email update list, but you may also check www.bridgetonlandfill.com for updates or email or call us at any time with questions. You can find the most recent Missouri Department of Natural Resources air sampling tests here:
http://dnr.mo.gov/env/swmp/facilities/BridgetonSanitaryLandfill-AirSampling.htm.

Resident: Mike Klinghammer, County Council Member

Resident email: Thanks for the update. This will allow everyone to move forward and solve the problem. I appreciate you letting me know the progress that you're making on this issue.

Response: Thank you for your note and your support.

Resident: Michelle

Resident email: I have a few questions regarding the work currently being done at the landfill. 1. What hours are planned to be worked during the day (i.e. 8am -5pm)? 2. After the scheduled working hours, will the places that have been opened and causing odors be covered so as to not emit odors throughout the night and into the early morning hours? 3. Is work only expected to happen on weekdays, or will weekend work been done also? Thanks!

Response: To answer your questions: 1. We work during daylight hours. 2. We close all excavations before the end of the work day. 3. Our goal is to finish this work as quick as possible to reduce the inconvenience of our neighbors and we will plan on working seven days a week, weather permitting.

Resident: Dawn Chapman

Resident email: My little girl has severe asthma! She is only 5 years old and I'm asking if there is ANYWAY we can participate in the temporary housing program that you have set up. I can provide a Dr.'s note if needed. If someone could please call or e-mail me this afternoon/evening as I left a message on the mail line earlier around 1:30 pm. My phone number is ----------. Thank you, Dawn Chapman

Resident: Douglas Huse

Resident Email: DOUGLAS HUSE 10287 Plantation Manor, Foristell, MO 63348 | | C: --------- Background Hard working and dedicated Heavy Equipment Operator with 30 years in heavy equipment operation. Expert in running hilift, rubber tire loader, dozer, trackhoe, scraper, backhoe, skid steer, trencher, and agricultural tractors. Highly motivated to produce quality work with safety in mind. Summary of Qualifications OSHA 10-hr certification US Citizen CDL License Drug and alcohol free Can weld and use cutting torches Very reliable Experience Heavy Equipment Operator Castle Construction - St. Louis, MO May 2012 - Present *Worked on a variety of jobs - grading and excavating of commercial sites. Heavy Equipment Operator KC Excavating - High Hill, MO 2001 - March 2003 *Worked part-time. Dug basements and various other grading. Owner/President Huse Grading, Inc - Wright City, MO February 2002 - 2010 *Owner of excavating, grading and hauling company. Grading, excavating, hauling; residential and commercial; including lakes, ponds, roads, land clearing, basements, and cut and fill sites. Leadman Calvary Cemetery - St. Louis, MO 1984 - May 2001 *In charge of digging and grading of all new developments and sections. References *Rodney Thomas Tristar Business Communities, Earth City, MO --------- Tom Kuehner Catholic Cemeteries, St. Louis, MO ---------

Response: Thank you for your interest in employment. We will forward your information to the appropriate parties.

Resident: Councilwoman Linda Eaker

Resident Email: In response to the May 23rd evening update, Councilwoman Eaker emailed: Thank you so much for the updates. I had surgery two weeks ago and have been unable to drive around the area.

May 26, 2013 – May 31, 2013

Complaints forwarded by MDNR

Sister Jeanne Derer, Franciscan Sisters of Mary

Message: Sister Derer submitted a complaint to the MDNR concerning the Bridgeton Landfill. She was at the Pattonville High School meeting the night prior and had concerns about the information that was presented. She was given a general overview of the site and what the current status is. She was also provided with links to the Dept. and Republic websites and with contact information for the MO Dept. of Health and Senior Services. She was fairly familiar with the websites already. She was informed that she may be contacted by Republic.

Follow-up: After leaving Sister Derer a message with our 855 number, we were able to contact her. She said she could not remember what her questions were and that she would call back when she could remember. She was given the 855 number again should she need it.

Emails

Resident: Linda J. Eaker

Resident email: What is the correct info? Regarding the distance of the smoldering event from the nuclear waste? I heard from residents and from TV reporters that the distance is 1000 feet, rather than 1200 feet. Is this correct and has the smoldering event moved past the monitors? Some of the Spanish Village citizens are becoming more upset. What can be done to ease their Fear?

Response: Thank you very much for contacting us and raising this concern. We just issued a press statement on our website addressing this very issue. It is attached here for you.

Resident response: Thank you. The Mo. Coalition for the Environment is causing mass hysteria among the residents. The residents are trusting them more than Republic. I don't know what can be done about it. Have you looked at the Mo. Coalition for the Environment Map, which intends to show that the fire has breached the monitors? I had major surgery 2 1/2 weeks ago, so I'm unable to do much, except share information and concerns.

Resident: Mindy

Resident email: The Department of Health and Senior Services has referred me to you. I live in Bridgeton and want to be relocated during the cleanup. Please, respond ASAP.

Response: In coordination with the Missouri Attorney General's office and the Missouri Department of Natural Resources, we are offering the voluntary temporary lodging program to

residents of Spanish Village, the Terrisan Mobile Home Community, and certain residents of the Carrollton Village Condominiums. The lodging program is being administered by Development Resource Partners, LLC, who can be reached at 314-395-9905. Jennifer Kaniecki at extension 3 or Kurt Schulte at extension 6 should be able to help you with your request if you live in one of those neighborhoods.

Resident: Tom Schlag

Resident email: Help me out here. You say that it will take 10 years for the "fire" to get to the radioactive area if nothing is done. At a meeting last night a group, supported by a state Rep, said that the "fire" has moved from 1200 feet to 1000 feet away in less than 5 months. If true that would indicate that it is moving much faster than we were told. Who is telling the truth and what evidence can I see that supports this? Thank you

Response: Thank you for contacting us. Please find attached a statement we issued yesterday in response to your question.

Resident: Anne Schweitzer

Resident email: AHHHH I JUST WANT IT TO BE OVER. Ok. Sounds good. Will be on update soon.

Response: Thank you for your note. We too look forward to completing work soon. Even with the weather delays we are ahead of schedule and only have one remaining RCP to excavate. We appreciate your note and again thank you for your patience in this matter.

Resident: Janet Rentrop

Resident email: We have some old Railroad ties that we are removing from old landscaping in our yard. Do you take old railroad ties? If so what is the charge to do this? Thanks, Janet Rentrop

Response: Our customer service team will best be able to answer your questions. They can be reached at 636-947-5959.

Resident: Steven Thomas

Resident email: I am one of the terrisan reste residents currently staying in a hotel until the completion of the project. The last I heard, the completion date was projected as June 14th. Because of the rain delays, is there a NEW estimated completion date? I am just wondering. Thank you! Steven Thomas

Response: This individual is a plaintiff in the current litigation. Per the direction of his counsel, we are not able to respond. We informed his attorney of his inquiry.

ATTACHMENT I

LIQUID CHARACTERIZATION DATA

The Liquid Characterization Data for May 2013 consists of 1805 pages of laboratory results.

In order to make this Monthly Report a manageable electronic document, the Liquid Characterization Data will be provided in separate file(s).

ATTACHMENT J

LIQUID TRANSPORT MANIFEST LOGS

Manifest Summary

Bridgeton Landfill Liquids

Loading Date 5/1/2013

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
1	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Tank Battery 4	Triad Transport	5,000	1691717-16209	Emily Heikes
2	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Altom	5,300	AWS 76929	Emily Heikes
3	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 70016	Emily Heikes
4	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086371	Emily Heikes
5	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,500	1691287-15240	Emily Heikes
6	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Heritage Transport	5,000	1691318-15240	Emily Heikes
7	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	SET Environmental	5,500	086372	Emily Heikes
8	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 4	Turn Key	5,500	011448442	Emily Heikes
9	Hazardous Leachate	Clean Harbors - Sarnia		Frank's Vacuum Truck Service	5,000	006583150	Emily Heikes
10	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	Wayne Transports	6,000	AWS 76947	Emily Heikes
11	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,500	1691288-15240	Emily Heikes
12	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086373	Emily Heikes
13	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,200	1691289-15240	Emily Heikes
14	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	SET Environmental	5,400	086374	Emily Heikes
15	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Ziron Environmental	5,000	010902476	Emily Heikes
16	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	SET Environmental	5,500	AWS 76948	Emily Heikes
17	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Ziron Environmental	5,000	010902487	Emily Heikes
18	Hazardous Leachate	Clean Harbors - Kimball		Clean Harbors	4,200	006056030	Emily Heikes
19	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086375	Emily Heikes
20	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,400	1691290-15240	Emily Heikes
21	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 3	Wayne Transports	6,000	AWS 76949	Emily Heikes
22	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Mid America Waste Solutions	5,200	1691313-15240	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
23	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 3	Turn Key	6,000	011448439	Emily Heikes
24	Hazardous Leachate	Clean Harbors - Sarnia		HazMat Environmental	5,000	006583149	Emily Heikes
25	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	K&R	6,100	AWS 76951	Emily Heikes
26	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	6,000	AWS 70014	Emily Heikes
27	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,400	1691291-15240	Emily Heikes
28	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086376	Emily Heikes
29	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Tank Battery 3	Coal City Cob	5,400	AWS 77510	Emily Heikes
30	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	K&R	6,100	AWS 76952	Emily Heikes
31	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	5,400	010902488	Emily Heikes
32	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,200	1691292-15240	Emily Heikes
33	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	5,900	AWS 76953	Emily Heikes
34	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	5,600	010902489	Emily Heikes
35	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086377	Emily Heikes
36	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	5,500	010902490	Emily Heikes
37	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Neier	5,000	1691293-15240	Emily Heikes
38	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	Altom	5,200	AWS 76954	Emily Heikes
39	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Sparge 1	Coal City Cob	5,400	AWS 77511	Emily Heikes
40	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Neier	5,000	1691294-15240	Emily Heikes
41	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Sparge 1	Coal City Cob	5,500	AWS 77512	Emily Heikes
41					**232,400**		

Loading Date 5/2/2013

0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	17,524	2013-05-02	
1	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Sparge 1	Triad Transport	5,000	1691715-16209	Emily Heikes
2	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086378	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
3	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 70015	Emily Heikes
4	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	SET Environmental	5,300	086379	Emily Heikes
5	Hazardous Leachate	Clean Harbors - Sarnia		Frank's Vacuum Truck Service	5,000	006583220	Emily Heikes
6	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 70028	Emily Heikes
7	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Heritage Transport	5,000	1691319-15240	Emily Heikes
8	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,000	010902492	Emily Heikes
9	Hazardous Leachate	Clean Harbors - Deer Park		Pulido Trucking LP	5,100	006583279	Emily Heikes
10	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,500	1691295-15240	Emily Heikes
11	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Sparge 2	Triad Transport	5,000	1691718-16209	Emily Heikes
12	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Sparge 2	Turn Key	5,500	011448438	Emily Heikes
13	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086380	Emily Heikes
14	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Mid America Waste Solutions	5,200	1691314-15240	Emily Heikes
15	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,500	1691296-15240	Emily Heikes
16	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	SET Environmental	5,400	086381	Emily Heikes
17	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,200	1691297-15240	Emily Heikes
18	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 2	Wayne Transports	6,000	AWS 76955	Emily Heikes
19	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 2	Ziron Environmental	5,000	AWS 77408	Emily Heikes
20	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 2	Ziron Environmental	5,100	AWS 77409	Emily Heikes
21	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086382	Emily Heikes
22	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 2	Ziron Environmental	5,000	010902493	Emily Heikes
23	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 2	Altom	5,200	AWS 76956	Emily Heikes
24	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,200	1691298-15240	Emily Heikes
25	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Sparge 2	Turn Key	6,000	011448437	Emily Heikes
26	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086383	Emily Heikes
27	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 2	Coal City Cob	5,400	010902494	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
28	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,400	1691299-15240	Emily Heikes
29	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	Wayne Transports	6,000	AWS 76957	Emily Heikes
30	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 70029	Emily Heikes
31	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	5,400	010902495	Emily Heikes
32	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,400	1691300-15240	Emily Heikes
33	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Tank Battery 4	Coal City Cob	5,400	AWS 77513	Emily Heikes
34	Hazardous Leachate	Clean Harbors - Sarnia		Frank's Vacuum Truck Service	5,000	006583139	Emily Heikes
35	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	5,600	010902496	Emily Heikes
36	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,200	086384	Emily Heikes
37	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,000	1691301-15240	Emily Heikes
38	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Tank Battery 4	Coal City Cob	5,600	AWS 77514	Emily Heikes
39	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,000	1691302-15240	Emily Heikes
40	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	5,500	010902497	Emily Heikes
41	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	K&R	6,100	AWS 76928	Emily Heikes
42					**248,724**		

Loading Date 5/3/2013

0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	17,503	2013-05-03	
1	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	SET Environmental	5,400	AWS 76958	Brad Vits
2	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086385	Brad Vits
3	Hazardous Leachate	Clean Harbors - Kimball	Tank Farm - South	Clean Harbors	5,000	006056031 FLE	Brad Vits
4	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 70030	Brad Vits
5	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	SET Environmental	5,400	086386	Brad Vits
6	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 3	Coal City Cob	5,600	AWS 70151	Brad Vits
7	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Tank Battery 3	Triad Transport	5,000	1691719-16209	Brad Vits

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
8	Hazardous Leachate	Clean Harbors - Deer Park	Tank Farm - South	Clean Harbors	5,000	006583281 FLE	Brad Vits
9	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	6,000	AWS 70031	Brad Vits
10	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Heritage Transport	5,000	1691320-15240	Brad Vits
11	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Ziron Environmental	5,000	010902498 JJK	Brad Vits
12	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Mid America Waste Solutions	5,200	1691315-15240	Brad Vits
13	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Ziron Environmental	5,000	010902499 JJK	Brad Vits
14	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086387	Brad Vits
15	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Wayne Transports	6,000	AWS 70152	Brad Vits
16	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 3	Turn Key	5,500	011448436 JJK	Brad Vits
17	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	SET Environmental	5,200	086388	Brad Vits
18	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,500	1691303-15240	Brad Vits
19	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,200	1691304-15240	Brad Vits
20	Hazardous Leachate	Clean Harbors - Baltimore	Tank Farm - South	Clean Harbors	4,800	001997484 GBF	Brad Vits
21	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	Ziron Environmental	5,100	AWS 77410	Brad Vits
22	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086389	Brad Vits
23	Hazardous Leachate	Clean Harbors - Deer Park	Tank Farm - South	Pulido Trucking LP	4,400	006583280 FLE	Brad Vits
24	Hazardous Leachate	Clean Harbors - Sarnia	Tank Farm - South	Frank's Vacuum Truck Service	5,000	006583170 FLE	Brad Vits
25	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,400	1691305-15240	Brad Vits
26	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 6	Neier	5,400	1691306-15240	Brad Vits
27	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 6	Neier	5,200	1691307-15240	Brad Vits
28	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 6	Coal City Cob	5,400	AWS 70153	Brad Vits
29	Hazardous Leachate	Clean Harbors - Sarnia	Tank Farm - South	Freehold Cartage	4,350	006583171 FLE	Brad Vits
30	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086390	Brad Vits

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
31	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 6	Turn Key	6,000	011448443 JJK	Brad Vits
32	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 6	Coal City Cob	5,600	010902500 JJK	Brad Vits
33	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 70032	Brad Vits
34	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	6,150	AWS 70154	Brad Vits
35	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	Coal City Cob	5,400	AWS 70155	Brad Vits
36	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Neier	5,000	1691308-15240	Brad Vits
37	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Neier	5,000	1691309-15240	Brad Vits
38	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086391	Brad Vits
39	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	5,600	011449511 JJK	Brad Vits
40	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	5,400	011449510 JJK	Brad Vits
41	Non-Hazardous Leachate	Advanced Waste - New Castle	Sparge 1	Kuhnle Bros	5,000	AWS 77327	Brad Vits
42	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	6,100	AWS 70156	Brad Vits
43	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 70033	Brad Vits
44					**258,303**		

Loading Date 5/4/2013

0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	17,502	2013-05-04	
1	Non-Hazardous Leachate	Advanced Waste - New Castle	Sparge 1	Kuhnle Bros	5,000	AWS 77328	Brad Vits
2	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086392	Brad Vits
3	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Sparge 1	Triad Transport	5,000	1694036-16209	Brad Vits
4	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086393	Brad Vits
5	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	5,600	011449509 JJK	Brad Vits
6	Hazardous Leachate	Clean Harbors - Sarnia	Tank Farm - South	Jade Transport, Ltd.	5,000	006583169 FLE	Brad Vits
7	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 2	Sully	5,900	AWS 70034	Brad Vits
8	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	SET Environmental	5,400	086394	Brad Vits

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
9	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Sparge 2	Turn Key	5,400	011448444 JJK	Brad Vits
10	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Sparge 2	K&R	6,100	AWS 77515	Brad Vits
11	Non-Hazardous Leachate	Advanced Waste - New Castle	Sparge 2	Kuhnle Bros	5,000	AWS 77329	Brad Vits
12	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Sparge 2	K&R	6,000	AWS 77516	Brad Vits
13	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	SET Environmental	5,500	086395	Brad Vits
14	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086396	Brad Vits
15	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086397	Brad Vits
16	Hazardous Leachate	Clean Harbors - Kimball	Tank Farm - South	Triad Transport	5,000	006056032 FLE	Brad Vits
17	Hazardous Leachate	Clean Harbors - Deer Park	Tank Farm - South	Triad Transport	5,000	006056025 FLE	Brad Vits
18	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	SET Environmental	5,600	086398	Brad Vits
19	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Sparge 2	Turn Key	5,500	011448445 JJK	Brad Vits
20	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 2	SET Environmental	5,400	AWS 70157	Brad Vits
21	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 2	Coal City Cob	5,600	AWS 70158	Brad Vits
22	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 2	Sully	6,000	AWS 70035	Brad Vits
23	Hazardous Leachate	Clean Harbors - Deer Park	Tank Farm - South	Clean Harbors	4,200	006056024 FLE	Brad Vits
24	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 2	Coal City Cob	5,400	AWS 70159	Brad Vits
25	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 2	Sully	5,900	AWS 70036	Brad Vits
26					**161,002**		

Loading Date 5/5/2013

0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	17,502	2013-05-05	
1	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Sparge 2	Triad Transport	5,000	1694037-16209	Brad Vits
2	Hazardous Leachate	Clean Harbors - Deer Park	Tank Farm - South	Triad Transport	4,700	006056023 FLE	Brad Vits

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
3	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 2	Sully	5,800	AWS 70037	Brad Vits
4	Hazardous Leachate	Clean Harbors - Deer Park	Tank Farm - South	Triad Transport	4,700	006056026 FLE	Brad Vits
5	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	K&R	6,100	AWS 70160	Brad Vits
6	Hazardous Leachate	Clean Harbors - Sarnia	Tank Farm - South	Frank's Vacuum Truck Service	5,000	006583173 FLE	Brad Vits
7	Hazardous Leachate	Clean Harbors - Sarnia	Tank Farm - South	Frank's Vacuum Truck Service	5,000	006583172 FLE	Brad Vits
8	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	K&R	6,000	AWS 70161	Brad Vits
9	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	K&R	6,000	AWS 70165	Brad Vits
10	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 70038	Brad Vits
11	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 70040	Brad Vits
12					**77,802**		

Loading Date 5/6/2013

0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	17,502	2013-05-06	
1	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086399	Brad Vits
2	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Wetterau Homestead	5,300	AWS 76950	Brad Vits
3	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	SET Environmental	5,400	086400	Brad Vits
4	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 70041	Brad Vits
5	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Heritage Transport	5,000	1693600-15240	Brad Vits
6	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Wayne Transports	6,000	AWS 70164	Brad Vits
7	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Ziron Environmental	5,000	011449508 JJK	Brad Vits
8	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	5,400	011449507 JJK	Brad Vits
9	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Ziron Environmental	5,000	011449506 JJK	Brad Vits
10	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086401	Brad Vits
11	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,800	1693471-15240	Brad Vits

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
12	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Tank Battery 3	Schiber	5,500	AWS 77517	Brad Vits
13	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	SET Environmental	5,600	086402	Brad Vits
14	Hazardous Leachate	Clean Harbors - Deer Park	Tank Farm - South	Triad Transport	4,700	006056027 FLE	Brad Vits
15	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 3	Turn Key	5,400	011448446 JJK	Brad Vits
16	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Tank Battery 3	Schiber	5,500	AWS 77518	Brad Vits
17	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	Ziron Environmental	5,100	AWS 77411	Brad Vits
18	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	5,500	011449505 JJK	Brad Vits
19	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Wayne Transports	6,000	AWS 70163	Brad Vits
20	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086403	Brad Vits
21	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	5,400	011449504 JJK	Brad Vits
22	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,500	1693472-15240	Brad Vits
23	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 3	Wayne Transports	6,000	AWS 70162	Brad Vits
24	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	Altom	5,000	AWS 77412	Brad Vits
25	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,400	1693473-15240	Brad Vits
26	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 3	Turn Key	5,500	011448447 JJK	Brad Vits
27	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086404	Brad Vits
28	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,400	1693474-15240	Brad Vits
29	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Altom	5,000	AWS 70175	Brad Vits
30	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Neier	5,200	1693475-15240	Brad Vits
31	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Mid America Waste Solutions	4,800	1693627-15240	Brad Vits
32	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	Wayne Transports	6,100	AWS 70174	Brad Vits
33	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	6,000	AWS 70173	Brad Vits
34	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Neier	5,500	1693476-15240	Brad Vits
35	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086405	Brad Vits
36	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 70042	Brad Vits

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
37	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Neier	5,200	1693477-15240	Brad Vits
38	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 70043	Brad Vits
39	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	5,400	011449503 JJK	Brad Vits
40	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	5,600	011449502 JJK	Brad Vits
41	Hazardous Leachate	Clean Harbors - Deer Park	Tank Farm - South	Triad Transport	4,800	006056028 FLE	Brad Vits
42	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	5,600	011449512 JJK	Brad Vits
43	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Sparge 1	Triad Transport	5,000	1693632-16209	Brad Vits
44					**261,602**		

Loading Date 5/7/2013

0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	10,426	2013-05-07	
1	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 2	Coal City Cob	5,400	AWS 77413	Emily Heikes
2	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086406	Emily Heikes
3	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 2	SET Environmental	5,500	AWS 70172	Emily Heikes
4	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	SET Environmental	5,400	086407	Emily Heikes
5	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 2	Veolia	5,000	AWS 77414	Emily Heikes
6	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 2	Sully	6,000	AWS 70044	Emily Heikes
7	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Heritage Transport	5,000	1693601-15240	Emily Heikes
8	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Sparge 2	Schiber	5,500	AWS 77519	Emily Heikes
9	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,300	1691310-15240	Emily Heikes
10	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 2	Ziron Environmental	5,000	011449513	Emily Heikes
11	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086408	Emily Heikes
12	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 2	Ziron Environmental	5,000	011449514	Emily Heikes
13	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Sparge 2	Turn Key	5,400	011448448	Emily Heikes
14	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 2	Coal City Cob	5,400	011449515	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
15	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	SET Environmental	5,500	086409	Emily Heikes
16	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Sparge 2	Schiber	5,600	AWS 77520	Emily Heikes
17	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 2	Ziron Environmental	5,100	AWS 77415	Emily Heikes
18	Hazardous Leachate	Clean Harbors - Sarnia		Jade Transport, Ltd.	5,000	006583174	Emily Heikes
19	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 2	Coal City Cob	5,500	AWS 77416	Emily Heikes
20	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086410	Emily Heikes
21	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Mid America Waste Solutions	4,800	1693628-15240	Emily Heikes
22	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 4	Turn Key	5,500	011448449	Emily Heikes
23	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Altom	5,200	AWS 70171	Emily Heikes
24	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,500	1693481-15240	Emily Heikes
25	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,200	1693482-15240	Emily Heikes
26	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086411	Emily Heikes
27	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 70045	Emily Heikes
28	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	K&R	6,100	AWS 70170	Emily Heikes
29	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086412	Emily Heikes
30	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Coal City Cob	5,400	AWS 70169	Emily Heikes
31	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	5,900	AWS 70046	Emily Heikes
32	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,500	1693483-15240	Emily Heikes
33	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Coal City Cob	5,600	AWS 70168	Emily Heikes
34	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,200	1693484-15240	Emily Heikes
35	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,500	1693485-15240	Emily Heikes
36	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,400	1693486-15240	Emily Heikes
37	Hazardous Leachate	Clean Harbors - Kimball		Frank's Vacuum Truck Service	5,000	006056033	Emily Heikes
38	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Tank Battery 3	Triad Transport	5,000	1693633-16209	Emily Heikes
39	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Altom	5,200	AWS 70167	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
40	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	K&R	6,000	AWS 70166	Emily Heikes
41	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Heritage Transport	5,000	1693602-15240	Emily Heikes
42					**241,526**		

Loading Date 5/8/2013

0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	8,653	2013-05-08	
1	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086413	Emily Heikes
2	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	5,400	011449516	Emily Heikes
3	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	SET Environmental	5,300	086414	Emily Heikes
4	Hazardous Leachate	Clean Harbors - Kimball		Triad Transport	4,800	006056034	Emily Heikes
5	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 3	Coal City Cob	5,400	AWS 70176	Emily Heikes
6	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	5,400	011449517	Emily Heikes
7	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,000	011448411	Emily Heikes
8	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	Veolia	5,000	AWS 77417	Emily Heikes
9	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	6,000	AWS 70047	Emily Heikes
10	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 3	Coal City Cob	5,400	AWS 77207	Emily Heikes
11	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	5,600	011449518	Emily Heikes
12	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 3	Turn Key	5,400	011448450	Emily Heikes
13	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086415	Emily Heikes
14	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Ziron Environmental	5,000	011449519	Emily Heikes
15	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	SET Environmental	5,400	086416	Emily Heikes
16	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Tank Battery 3	Schiber	5,700	AWS 77521	Emily Heikes
17	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Sparge 1	Schiber	5,500	AWS 77522	Emily Heikes
18	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,000	011449520	Emily Heikes
19	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	5,500	011449521	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
20	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,000	011448410	Emily Heikes
21	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 1	Ziron Environmental	5,000	AWS 77418	Emily Heikes
22	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Sparge 1	Turn Key	5,500	011448451	Emily Heikes
23	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,000	011448409	Emily Heikes
24	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Mid America Waste Solutions	4,800	1693629-15240	Emily Heikes
25	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,100	011448408	Emily Heikes
26	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086417	Emily Heikes
27	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 1	Altom	5,500	AWS 77419	Emily Heikes
28	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	6,000	AWS 77208	Emily Heikes
29	Hazardous Leachate	Clean Harbors - Sarnia		Frank's Vacuum Truck Service	5,000	006583176	Emily Heikes
30	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086418	Emily Heikes
31	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	SET Environmental	5,400	AWS 77209	Emily Heikes
32	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 70048	Emily Heikes
33	Hazardous Leachate	Clean Harbors - Deer Park		Clean Harbors	5,000	006055861	Emily Heikes
34	Non-Hazardous Leachate	Advanced Waste - New Castle	Sparge 1	Kuhnle Bros	4,500	AWS 77330	Emily Heikes
35	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Heritage Transport	5,000	1693603-15240	Emily Heikes
36	Hazardous Leachate	Clean Harbors - Deer Park		Clean Harbors	4,200	006055862	Emily Heikes
37	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	Coal City Cob	5,400	AWS 77210	Emily Heikes
38	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,200	1693490-15240	Emily Heikes
39	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,200	1693491-15240	Emily Heikes
40	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086419	Emily Heikes
41	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	K&R	6,100	AWS 77211	Emily Heikes
42	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	5,900	AWS 70049	Emily Heikes
43	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,400	1693492-15240	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
44	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Tank Battery 4	Triad Transport	5,000	1693634-16209	Emily Heikes
45	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	5,600	011449522	Emily Heikes
46					**261,753**		

Loading Date 5/9/2013

0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	16,110	2013-05-09	
1	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086420	Emily Heikes
2	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	Coal City Cob	5,400	AWS 77212	Emily Heikes
3	Hazardous Leachate	Clean Harbors - Kimball		Triad Transport	4,700	006056035	Emily Heikes
4	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,000	011448407	Emily Heikes
5	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Wetterau Homestead	5,300	AWS 77213	Emily Heikes
6	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	SET Environmental	5,600	086421	Emily Heikes
7	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 70050	Emily Heikes
8	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	5,800	011449523	Emily Heikes
9	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Tank Battery 4	Schiber	5,000	AWS 77523	Emily Heikes
10	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Tank Battery 4	Schiber	5,500	AWS 77524	Emily Heikes
11	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 5	Coal City Cob	5,600	011449524	Emily Heikes
12	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086422	Emily Heikes
13	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Tank Battery 5	Schiber	5,500	AWS 77525	Emily Heikes
14	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	SET Environmental	5,500	086423	Emily Heikes
15	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 5	Veolia	5,000	AWS 77420	Emily Heikes
16	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 5	Ziron Environmental	5,000	AWS 77421	Emily Heikes
17	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 5	Ziron Environmental	5,000	011449525	Emily Heikes
18	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Mid America Waste Solutions	4,800	1693630-15240	Emily Heikes
19	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 5	Ziron Environmental	5,000	011449526	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
20	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086424	Emily Heikes
21	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,000	011448406	Emily Heikes
22	Hazardous Leachate	Clean Harbors - Sarnia		Jade Transport, Ltd.	5,000	006583165	Emily Heikes
23	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 5	Coal City Cob	5,600	AWS 77214	Emily Heikes
24	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Heritage Transport	5,000	1693604-15240	Emily Heikes
25	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,100	011448405	Emily Heikes
26	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 3	Turn Key	5,500	011448452	Emily Heikes
27	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 3	Turn Key	6,000	011448453	Emily Heikes
28	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,400	1693255-15240	Emily Heikes
29	Hazardous Leachate	Clean Harbors - Deer Park		Frank's Vacuum Truck Service	5,000	006055865	Emily Heikes
30	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,500	1693256-15240	Emily Heikes
31	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086425	Emily Heikes
32	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	K&R	6,000	AWS 77215	Emily Heikes
33	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	6,000	AWS 70051	Emily Heikes
34	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Coal City Cob	5,500	AWS 77216	Emily Heikes
35	Hazardous Leachate	Clean Harbors - Deer Park		Pulido Trucking LP	6,000	006055863	Emily Heikes
36	Hazardous Leachate	Clean Harbors - Deer Park		Pulido Trucking LP	6,200	006055795	Emily Heikes
37	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Sparge 2	Triad Transport	5,000	1693635-16209	Emily Heikes
38	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	5,900	AWS 70052	Emily Heikes
39	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	K&R	5,900	AWS 77217	Emily Heikes
40	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,200	1693257-15240	Emily Heikes
41	Hazardous Leachate	Clean Harbors - Sarnia		Clean Harbors	5,000	006583148	Emily Heikes
42	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086428	Emily Heikes
43	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	Veolia	5,000	AWS 77423	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
44	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	5,600	011449527	Emily Heikes
45	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Coal City Cob	5,400	AWS 77218	Emily Heikes
46	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Sparge 2	Triad Transport	5,000	1693636-16209	Emily Heikes
47	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	6,000	AWS 70053	Emily Heikes
48	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 3	SET Environmental	5,400	AWS 77219	Emily Heikes
49	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	4,600	011449528	Emily Heikes
50					**293,110**		

Loading Date 5/10/2013

0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	18,896	2013-05-10	
1	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086460	Emily Heikes
2	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,000	1693460-15240	Emily Heikes
3	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	SET Environmental	5,600	086461	Emily Heikes
4	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Sparge 1	Wayne Transports	6,000	011448404	Emily Heikes
5	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 1	Veolia	5,000	AWS 77424	Emily Heikes
6	Hazardous Leachate	Clean Harbors - Deer Park		Clean Harbors	5,000	006540658	Emily Heikes
7	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	6,000	011449529	Emily Heikes
8	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	Coal City Cob	5,400	AWS 77220	Emily Heikes
9	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Sparge 1	Turn Key	5,400	011448454	Emily Heikes
10	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	6,000	011449530	Emily Heikes
11	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,000	011449531	Emily Heikes
12	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Sparge 2	Schiber	5,500	AWS 77526	Emily Heikes
13	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086462	Emily Heikes
14	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Sparge 2	Schiber	6,000	AWS 77527	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
15	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Sparge 1	Wayne Transports	5,000	011448401	Emily Heikes
16	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	SET Environmental	5,500	086463	Emily Heikes
17	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	Coal City Cob	5,400	AWS 77221	Emily Heikes
18	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 1	Ziron Environmental	5,000	AWS 77425	Emily Heikes
19	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,000	011449532	Emily Heikes
20	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Sparge 1	Wayne Transports	6,000	011448402	Emily Heikes
21	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086464	Emily Heikes
22	Non-Hazardous Leachate	Valicor - Cincinnati	Sparge 1	Advanced Vac	6,000	001997485	Emily Heikes
23	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,000	1693461-15240	Emily Heikes
24	Non-Hazardous Leachate	Valicor - Cincinnati	Tank Battery 4	Advanced Vac	5,350	001997486	Emily Heikes
25	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,200	1693462-15240	Emily Heikes
26	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Mid America Waste Solutions	4,800	1693631-15240	Emily Heikes
27	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,500	1693463-15240	Emily Heikes
28	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086465	Emily Heikes
29	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 4	Turn Key	5,500	011448455	Emily Heikes
30	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Coal City Cob	5,600	AWS 77222	Emily Heikes
31	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,400	1693464-15240	Emily Heikes
32	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 4	Altom	5,400	AWS 77426	Emily Heikes
33	Hazardous Leachate	Clean Harbors - Deer Park		Clean Harbors	5,000	006055866	Emily Heikes
34	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,700	1693465-15240	Emily Heikes
35	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 70054	Emily Heikes
36	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	K&R	6,000	AWS 77223	Emily Heikes
37	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086466	Emily Heikes
38	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Altom	5,000	AWS 77224	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
39	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Wayne Transports	6,100	011449533	Emily Heikes
40	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	5,000	011449534	Emily Heikes
41	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	5,500	011449535	Emily Heikes
42	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,400	1693466-15240	Emily Heikes
43	Hazardous Leachate	Clean Harbors - Deer Park		Frank's Vacuum Truck Service	5,000	006540657	Emily Heikes
44	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 3	Coal City Cob	5,400	AWS 77225	Emily Heikes
45	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	5,000	011449536	Emily Heikes
46	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,000	1693467-15240	Emily Heikes
47	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Altom	5,200	AWS 77226	Emily Heikes
48	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Tank Battery 3	Triad Transport	5,000	1693637-16209	Emily Heikes
49	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Coal City Cob	5,600	AWS 77227	Emily Heikes
50	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	TDR Transport	5,300	011449537	Emily Heikes
51					**299,146**		

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0A	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	17,502	2013-05-11A	
0B	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	6,610	2013-05-11B	
1	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	5,800	AWS 70055	Emily Heikes
2	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086467	Emily Heikes
3	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 3	Turn Key	5,400	011448456	Emily Heikes
4	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,700	086468	Emily Heikes
5	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	6,000	AWS 70056	Emily Heikes
6	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	5,400	011449538	Emily Heikes
7	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086469	Emily Heikes
8	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,700	086470	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
9	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086471	Emily Heikes
10	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,700	086472	Emily Heikes
11	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 3	Turn Key	5,500	011448457	Emily Heikes
12	Non-Hazardous Leachate	Advanced Waste - ECO Water Solutions	Tank Battery 3	Capital City Oil	5,400	0044	Dan Feezor
13	Non-Hazardous Leachate	Advanced Waste - ECO Water Solutions	Sparge 1	Capital City Oil	5,400	0050	Dan Feezor
14	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	5,800	AWS 70057	Emily Heikes
15	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	6,075	AWS 77229	Emily Heikes
16	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	6,200	AWS 77230	Emily Heikes
18					**126,687**		

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1	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	5,900	AWS 70058	Emily Heikes
2	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 77003	Emily Heikes
3	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Sparge 1	Triad Transport	5,000	1693638-16209	Emily Heikes
4	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	6,000	AWS 77231	Emily Heikes
5	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 1	Wetterau Homestead	5,300	AWS 77232	Emily Heikes
5					**28,200**		

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1	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086473	Emily Heikes
2	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	SET Environmental	5,500	AWS 77243	Emily Heikes
3	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,000	011448400	Emily Heikes
4	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 77004	Emily Heikes
5	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	SET Environmental	5,400	086474	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
6	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,500	011448399	Emily Heikes
7	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,500	1693493-15240	Emily Heikes
8	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	5,600	011449539	Emily Heikes
9	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 4	Turn Key	5,500	011448458	Emily Heikes
10	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 77005	Emily Heikes
11	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Heritage Transport	5,000	1695516-15240	Emily Heikes
12	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 4	Turn Key	5,400	011448460	Emily Heikes
13	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086475	Emily Heikes
14	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 4	Ziron Environmental	5,000	AWS 77427	Emily Heikes
15	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Ziron Environmental	5,000	011449540	Emily Heikes
16	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	TDR Transport	5,000	011448398	Emily Heikes
17	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 1	TDR Transport	5,800	011448397	Emily Heikes
18	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 4	Coal City Cob	6,000	AWS 77428	Emily Heikes
19	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	5,500	011448396	Emily Heikes
20	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Ziron Environmental	5,000	011449541	Emily Heikes
21	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	SET Environmental	5,400	086476	Emily Heikes
22	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,000	1693494-15240	Emily Heikes
23	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	5,300	011448395	Emily Heikes
24	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	K&R	6,000	AWS 77233	Emily Heikes
25	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Coal City Cob	5,400	011448394	Emily Heikes
26	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	5,900	AWS 77006	Emily Heikes
27	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086477	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
28	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,000	011448393	Emily Heikes
29	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,100	011448392	Emily Heikes
30	Non-Hazardous Leachate	Valicor - Cincinnati	Tank Battery 4	Advanced Vac	6,000	VAL 001	Emily Heikes
31	Non-Hazardous Leachate	Valicor - Cincinnati	Tank Battery 3	Advanced Vac	5,825	VAL 002	Emily Heikes
32	Non-Hazardous Leachate	Valicor - Cincinnati	Tank Battery 3	Advanced Vac	6,000	VAL 003	Emily Heikes
33	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	5,400	011449542	Emily Heikes
34	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	5,500	011449543	Emily Heikes
35	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Altom	5,000	AWS 77234	Emily Heikes
36	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086478	Emily Heikes
37	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,200	1693495-15240	Emily Heikes
38	Non-Hazardous Leachate	Valicor - Cincinnati	Tank Battery 3	Advanced Vac	6,000	VAL 004	Emily Heikes
39	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	Altom	5,000	AWS 77429	Emily Heikes
40	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Coal City Cob	5,600	AWS 77235	Emily Heikes
41	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086479	Emily Heikes
42	Non-Hazardous Leachate	Advanced Waste - New Castle	Tank Battery 3	Kuhnle Bros	5,300	AWS 77331	Emily Heikes
43	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,200	1693496-15240	Emily Heikes
44	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 1	Coal City Cob	6,000	011449544	Emily Heikes
45	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,200	1693497-15240	Emily Heikes
46	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Altom	5,500	AWS 77236	Emily Heikes
47	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Schiber	5,800	AWS 77237	Emily Heikes
48	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	6,000	AWS 77007	Emily Heikes
49	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Mid America Waste Solutions	5,200	1695535-15240	Emily Heikes
50	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Veolia	5,200	011448391	Emily Heikes
51	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,000	1695509-15240	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
51					**292,225**		

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0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	328	2013-05-14	
1	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086480	Emily Heikes
2	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,500	1695510-15240	Emily Heikes
3	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 77008	Emily Heikes
4	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Sparge 2	Triad Transport	5,000	1695556-16209	Emily Heikes
5	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	SET Environmental	5,300	086481	Emily Heikes
6	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,000	011448390	Emily Heikes
7	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,000	1693250-15240	Emily Heikes
8	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,000	011448389	Emily Heikes
9	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 77009	Emily Heikes
10	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Heritage Transport	5,000	1695517-15240	Emily Heikes
11	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	6,000	011449545	Emily Heikes
12	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,000	1693252-15240	Emily Heikes
13	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	TDR Transport	5,000	011448388	Emily Heikes
14	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	Coal City Cob	5,400	AWS 77238	Emily Heikes
15	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,400	086482	Emily Heikes
16	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	6,000	011449546	Emily Heikes
17	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	Coal City Cob	5,600	AWS 77239	Emily Heikes
18	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,000	011449547	Emily Heikes
19	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,000	011449548	Emily Heikes
20	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	SET Environmental	5,600	086483	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
21	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Liquid Environmental Solutions	5,100	011449549	Emily Heikes
22	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,100	011448387	Emily Heikes
23	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,100	011448386	Emily Heikes
24	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	SET Environmental	5,400	AWS 77240	Emily Heikes
25	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086484	Emily Heikes
26	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Sparge 1	Turn Key	5,500	011448459	Emily Heikes
27	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,000	011448385	Emily Heikes
28	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,000	011449550	Emily Heikes
29	Non-Hazardous Leachate	Valicor - Cincinnati	Sparge 1	Advanced Vac	5,825	VAL 005	Emily Heikes
30	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Heritage Transport	6,000	1697123-15240	Emily Heikes
31	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Wetterau Homestead	5,300	AWS 77241	Emily Heikes
32	Non-Hazardous Leachate	Valicor - Cincinnati	Tank Battery 4	Advanced Vac	5,700	VAL 006	Emily Heikes
33	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	Coal City Cob	5,500	AWS 77242	Emily Heikes
34	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086485	Emily Heikes
35	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,600	1693253-15240	Emily Heikes
36	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	6,000	011449551	Emily Heikes
37	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 2	Neier	5,200	1693254-15240	Emily Heikes
38	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 4	Turn Key	5,500	011448461	Emily Heikes
39	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	K&R	6,000	AWS 77244	Emily Heikes
40	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Schiber	5,800	AWS 77251	Emily Heikes
41	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086486	Emily Heikes
42	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 2	K&R	6,000	AWS 77245	Emily Heikes
43	Non-Hazardous Leachate	Valicor - Cincinnati	Tank Battery 4	Advanced Vac	5,800	VAL 007	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
44	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 2	Mid America Waste Solutions	5,200	1695536-15240	Emily Heikes
45	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	5,500	011448384	Emily Heikes
46	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	6,000	011449552	Emily Heikes
47	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,200	1695511-15240	Emily Heikes
48	Non-Hazardous Leachate	Valicor - Cincinnati	Tank Battery 4	Advanced Vac	5,700	VAL 008	Emily Heikes
49	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 77010	Emily Heikes
50	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	5,600	011449553	Emily Heikes
51	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	Veolia	5,000	AWS 77430	Emily Heikes
52	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Altom	4,600	011448403	Emily Heikes
53	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,000	1695512-15240	Emily Heikes
54	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,500	1696129-15240	Emily Heikes
55	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 3	Coal City Cob	5,600	AWS 77246	Emily Heikes
56	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,500	1695094-15240	Emily Heikes
57					**319,953**		

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1	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086487	Emily Heikes
2	Non-Hazardous Leachate	Valicor - Cincinnati	Tank Battery 3	Neier	5,000	VAL 009	Emily Heikes
3	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	SET Environmental	5,600	086488	Emily Heikes
4	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Tank Battery 3	Triad Transport	5,000	1695557-16209	Emily Heikes
5	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	6,000	AWS 77011	Emily Heikes
6	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Schiber	5,000	AWS 77247	Emily Heikes
7	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	TDR Transport	5,000	AWS 77431	Emily Heikes
8	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,000	1695095-15240	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
9	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086489	Emily Heikes
10	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	5,500	AWS 77012	Emily Heikes
11	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Heritage Transport	5,000	1695518-15240	Emily Heikes
12	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	SET Environmental	5,600	086490	Emily Heikes
13	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 1	TDR Transport	5,200	AWS 77432	Emily Heikes
14	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Neier	5,200	1695096-15240	Emily Heikes
15	Non-Hazardous Leachate	Valicor - Cincinnati	Sparge 1	Advanced Vac	5,800	VAL 010	Emily Heikes
16	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	6,000	011449554	Emily Heikes
17	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086491	Emily Heikes
18	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,000	011449555	Emily Heikes
19	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,000	011449556	Emily Heikes
20	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Sparge 1	Turn Key	5,500	011448462	Emily Heikes
21	Non-Hazardous Leachate	Valicor - Cincinnati	Sparge 1	Advanced Vac	5,700	VAL 011	Emily Heikes
22	Non-Hazardous Leachate	Valicor - Cincinnati	Sparge 1	Advanced Vac	5,825	VAL 012	Emily Heikes
23	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	5,400	011449557	Emily Heikes
24	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	Wetterau Homestead	5,500	AWS 77248	Emily Heikes
25	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	Schiber	4,300	AWS 77249	Emily Heikes
26	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-1	Mid America Waste Solutions	5,200	1695537-15240	Emily Heikes
27	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086492	Emily Heikes
28	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-1	Neier	5,500	1695097-15240	Emily Heikes
29	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-1	Neier	5,200	1695098-15240	Emily Heikes
30	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 1	Coal City Cob	6,000	011449558	Emily Heikes
31	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086493	Emily Heikes
32	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Tank Sparge 2-1	Schiber	5,400	AWS 77528	Emily Heikes
33	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 1	Wayne Transports	6,100	AWS 77250	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
34	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 1	Wayne Transports	6,100	AWS 77252	Emily Heikes
35	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-2	Neier	5,500	1695099-15240	Emily Heikes
36	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-2	Neier	5,000	1695100-15240	Emily Heikes
37	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 1	SET Environmental	5,500	AWS 77253	Emily Heikes
38	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 2	Sully	6,000	AWS 77013	Emily Heikes
39	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 2	Turn Key	6,000	011448463	Emily Heikes
40	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Tank Sparge 2-2	Triad Transport	5,000	1695558-16209	Emily Heikes
41	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 2	Altom	5,300	AWS 77254	Emily Heikes
42	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Liquid Environmental Solutions	5,400	011449559	Emily Heikes
43	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 77014	Emily Heikes
44	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,600	1695101-15240	Emily Heikes
45	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Schiber	5,374	AWS 77255	Emily Heikes
46	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	6,000	011449560	Emily Heikes
47	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	K&R	6,000	AWS 77256	Emily Heikes
48	Non-Hazardous Leachate	Valicor - Cincinnati	Tank Battery 4	Advanced Vac	5,800	VAL 013	Emily Heikes
49	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	5,500	011449561	Emily Heikes
50	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	K&R	6,200	AWS 77257	Emily Heikes
51	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 4	Veolia	5,000	AWS 77433	Emily Heikes
52	Non-Hazardous Leachate	Valicor - Cincinnati	Tank Battery 4	Advanced Vac	5,800	VAL 014	Emily Heikes
53	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	Coal City Cob	5,400	AWS 77258	Emily Heikes
53					**300,499**		

Loading Date 5/16/2013

0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	17,502	2013-05-16	
1	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 3	Wayne Transports	6,000	AWS 77259	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
2	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086494	Emily Heikes
3	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	SET Environmental	5,600	086495	Emily Heikes
4	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	6,000	AWS 77015	Emily Heikes
5	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	TDR Transport	5,180	AWS 77434	Emily Heikes
6	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Heritage Transport	5,000	1695520-15240	Emily Heikes
7	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Tank Battery 3	Schiber	5,425	AWS 77529	Emily Heikes
8	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	TDR Transport	5,200	AWS 77435	Emily Heikes
9	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086496	Emily Heikes
10	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 3	Turn Key	5,500	011448464	Emily Heikes
11	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 3	SET Environmental	5,400	AWS 77260	Emily Heikes
12	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,500	1695124-15240	Emily Heikes
13	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086497	Emily Heikes
14	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,500	1695123-15240	Emily Heikes
15	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 3	Turn Key	5,500	011448465	Emily Heikes
16	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 3	Wayne Transports	6,000	AWS 77261	Emily Heikes
17	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	6,100	AWS 77262	Emily Heikes
18	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-4	Neier	5,000	1695125-15240	Emily Heikes
19	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086498	Emily Heikes
20	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-4	Mid America Waste Solutions	5,200	1695539-15240	Emily Heikes
21	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-4	Neier	5,200	1695126-15240	Emily Heikes
22	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 77016	Emily Heikes
23	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-4	Neier	5,000	1695127-15240	Emily Heikes
24	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	6,100	AWS 77263	Emily Heikes
25	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086499	Emily Heikes
26	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Neier	5,500	1695128-15240	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
27	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 2	Sully	6,000	AWS 77017	Emily Heikes
28	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Neier	5,400	1695129-15240	Emily Heikes
29	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	6,100	AWS 77264	Emily Heikes
30	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 2	Altom	5,000	AWS 77265	Emily Heikes
31	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Liquid Environmental Solutions	5,575	011449562	Emily Heikes
32					**198,982**		

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0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	17,502	2013-05-17	
1	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 1	TDR Transport	5,180	AWS 77436	Brad Vits
2	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086500	Brad Vits
3	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	5,900	AWS 77018	Brad Vits
4	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Heritage Transport	5,000	1695519-15240	Brad Vits
5	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 1	TDR Transport	5,200	AWS 77437	Brad Vits
6	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Sparge 1	Schiber	5,400	AWS 77530	Brad Vits
7	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 4	Turn Key	5,500	011448466 JJK	Brad Vits
8	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Tank Battery 4	Schiber	6,000	AWS 77531	Brad Vits
9	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	SET Environmental	5,500	1698067-15240	Brad Vits
10	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086501	Brad Vits
11	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 4	Turn Key	6,000	011448467 JJK	Brad Vits
12	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Mid America Waste Solutions	5,200	1695538-15240	Brad Vits
13	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,500	1695114-15240	Brad Vits
14	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	Wayne Transports	6,100	AWS 77266	Brad Vits
15	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086502	Brad Vits
16	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,500	1695115-15240	Brad Vits

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
17	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,200	1695116-15240	Brad Vits
18	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,000	1695117-15240	Brad Vits
19	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	Wayne Transports	6,100	AWS 77267	Brad Vits
20	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086503	Brad Vits
21	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 1	Sully	6,000	AWS 77019	Brad Vits
22	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 1	Altom	4,600	AWS 77268	Brad Vits
23	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	K&R	6,100	AWS 77269	Brad Vits
24	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086504	Brad Vits
25	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,000	1695118-15240	Brad Vits
26	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	6,000	1695119-15240	Brad Vits
27	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,800	1695120-15240	Brad Vits
28	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	6,000	AWS 77020	Brad Vits
29	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086505	Brad Vits
30	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 1	Heritage Transport	6,000	1695521-15240	Brad Vits
31	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 1	Liquid Environmental Solutions	5,640	011449563 JJK	Brad Vits
32	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 1	TDR Transport	5,300	AWS 77438	Brad Vits
33					**207,222**		

Loading Date 5/18/2013

0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	17,502	2013-05-18	
1	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Heritage Transport	5,000	1698063-15240	Brad Vits
2	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086506	Brad Vits
3	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,700	086507	Brad Vits
4	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,000	1698065-15240	Brad Vits
5	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 3	Turn Key	5,500	011448468 JJK	Brad Vits

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
6	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086508	Brad Vits
7	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 3	Turn Key	5,500	011448469 JJK	Brad Vits
8	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,700	086509	Brad Vits
9	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	6,000	011449564 JJK	Brad Vits
10	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	SET Environmental	5,300	1698068-15240	Brad Vits
11	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	6,000	1698066-15240	Brad Vits
12	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086510	Brad Vits
13	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	5,800	AWS 77021	Brad Vits
14	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,700	086511	Brad Vits
15	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Triad Transport	5,000	1698765-15240	Brad Vits
16	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	6,000	AWS 77022	Brad Vits
17	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	6,000	AWS 77023	Brad Vits
18					**124,202**		

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0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	17,541	2013-05-19	
1	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Heritage Transport	6,000	1698086-15240	Brad Vits
2	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	5,800	AWS 77024	Brad Vits
3	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	6,000	AWS 77270	Brad Vits
4	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 77025	Brad Vits
5	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	Wetterau Homestead	5,500	AWS 77271	Brad Vits
6	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,000	1698069-15240	Brad Vits
7	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	Coal City Cob	5,600	AWS 77272	Brad Vits
8	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	6,075	AWS 77273	Brad Vits
9	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 1	TDR Transport	5,180	AWS 77439	Brad Vits

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
10	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	Coal City Cob	5,600	AWS 77274	Brad Vits
11					**74,296**		

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0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	17,502	2013-05-20	
1	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086512	Brad Vits
2	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	Schiber	5,000	AWS 77275	Brad Vits
3	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Coal City Cob	5,400	011448383 JJK	Brad Vits
4	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	Coal City Cob	5,400	AWS 77276	Brad Vits
5	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,000	011448382 JJK	Brad Vits
6	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Heritage Transport	5,000	1697749-15240	Brad Vits
7	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Coal City Cob	5,400	011448381 JJK	Brad Vits
8	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 77026	Brad Vits
9	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,200	1697615-15240	Brad Vits
10	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	SET Environmental	5,300	AWS 77277	Brad Vits
11	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086514	Brad Vits
12	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 1	Transwood Inc	5,500	AWS 77440	Brad Vits
13	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 4	Transwood Inc	5,500	AWS 77441	Brad Vits
14	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Ziron Environmental	5,000	011449565 JJK	Brad Vits
15	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,000	011448380 JJK	Brad Vits
16	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	6,000	011449566 JJK	Brad Vits
17	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Ziron Environmental	5,000	011449567 JJK	John Powell
18	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,100	011448379 JJK	John Powell

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
19	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 4	Transwood Inc	5,500	AWS 77442	John Powell
20	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	5,500	011449568 JJK	John Powell
21	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086515	Brad Vits
22	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Ziron Environmental	5,000	011449569 JJK	John Powell
23	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	SET Environmental	5,500	AWS 77278	John Powell
24	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	5,100	011449570 JJK	John Powell
25	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 4	Turn Key	5,500	011448470 JJK	John Powell
26	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	K&R	6,100	011448378 JJK	John Powell
27	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	K&R	6,100	AWS 77286	John Powell
28	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,500	1697616-15240	John Powell
29	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086516	John Powell
30	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 4	Turn Key	6,000	011448471 JJK	John Powell
31	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,500	1697617-15240	Brad Vits
32	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	K&R	6,150	AWS 77285	Brad Vits
33	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	6,000	011449571 JJK	John Powell
34	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Schiber	5,800	AWS 77284	John Powell
35	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086517	John Powell
36	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,400	1697618-15240	John Powell
37	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,500	1697619-15240	John Powell
38	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Mid America Waste Solutions	5,200	1697755-15240	John Powell
39	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	K&R	6,000	AWS 77283	John Powell
40	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,000	1697620-15240	John Powell
41	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086518	John Powell
42	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,700	1697621-15240	John Powell
43	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,000	1697622-15240	Brad Vits

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
44	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Liquid Environmental Solutions	5,650	011449572 JJK	John Powell
45	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	5,600	011449573 JJK	John Powell
46	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Altom	5,000	AWS 77282	Brad Vits
47	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	5,700	AWS 77027	Brad Vits
48	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 3	Coal City Cob	5,400	AWS 77281	Brad Vits
49	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	TDR Transport	5,180	AWS 77443	Brad Vits
50					**299,882**		

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0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	17,502	2013-05-21	
1	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	6,000	AWS 77028	John Powell
2	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086519	John Powell
3	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,000	011448377 JJK	John Powell
4	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 77029	Emily Heikes
5	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Heritage Transport	5,000	1697750-15240	John Powell
6	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,000	011449574 JJK	John Powell
7	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,000	011449575 JJK	John Powell
8	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	6,000	011449576 JJK	John Powell
9	Non-Hazardous Leachate	Advanced Waste - New Castle	Sparge 1	Kuhnle Bros	5,200	AWS 77332	John Powell
10	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086520	John Powell
11	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 1	Transwood Inc	4,829	AWS 77444	John Powell
12	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 1	Transwood Inc	5,500	AWS 77445	John Powell
13	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,000	011448376 JJK	John Powell
14	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Neier	5,200	1697634-15240	John Powell

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
15	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	K&R	6,100	011448375 JJK	John Powell
16	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,000	011449577 JJK	John Powell
17	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 1	TDR Transport	5,350	AWS 77446	John Powell
18	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086521	John Powell
19	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Neier	5,200	1697635-15240	John Powell
20	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	Coal City Cob	5,400	AWS 77280	John Powell
21	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,100	011448374 JJK	John Powell
22	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 1	TDR Transport	5,300	AWS 77447	John Powell
23	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086522	John Powell
24	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Coal City Cob	5,500	011448373 JJK	John Powell
25	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,100	011448372 JJK	John Powell
26	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,000	1697636-15240	John Powell
27	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Mid America Waste Solutions	5,200	1697756-15240	John Powell
28	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 4	Turn Key	6,000	011448472 JJK	John Powell
29	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Wetterau Homestead	5,500	AWS 77279	John Powell
30	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,500	1697637-15240	John Powell
31	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086523	John Powell
32	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Schiber	5,500	AWS 77287	John Powell
33	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,500	1697638-15240	Emily Heikes
34	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Schiber	5,800	AWS 77288	John Powell
35	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	K&R	6,075	AWS 77289	Emily Heikes
36	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,000	1697639-15240	Emily Heikes
37	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086524	John Powell

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
38	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	TDR Transport	5,300	011448371 JJK	John Powell
39	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 1	TDR Transport	5,180	AWS 77448	John Powell
40	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 1	Heritage Transport	5,000	1697751-15240	John Powell
41	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 77030	John Powell
42	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Neier	5,600	1697640-15240	John Powell
43	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Altom	4,500	AWS 77290	John Powell
44					**264,936**		

Loading Date 5/22/2013

0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	17,462	2013-05-22	
1	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,000	011448370 JJK	John Powell
2	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	6,000	011449578 JJK	John Powell
3	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086525	John Powell
4	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	6,000	AWS 77031	John Powell
5	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	6,000	AWS 77032	John Powell
6	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Ziron Environmental	5,000	011449579 JJK	John Powell
7	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Schiber	5,500	AWS 77291	John Powell
8	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Coal City Cob	5,600	011448369 JJK	John Powell
9	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Schiber	5,500	1699696-15240	John Powell
10	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086526	John Powell
11	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Ziron Environmental	5,000	011449580 JJK	John Powell
12	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	TDR Transport	5,200	AWS 77449	John Powell
13	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	6,000	011449581 JJK	John Powell

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
14	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,000	011448368 JJK	John Powell
15	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	Transwood Inc	5,500	AWS 77450	John Powell
16	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	Transwood Inc	5,500	AWS 77451	John Powell
17	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	K&R	6,100	011448367 JJK	John Powell
18	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Schiber	6,000	AWS 77292	John Powell
19	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	K&R	6,000	AWS 77293	John Powell
20	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,100	011449980 JJK	John Powell
21	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086527	John Powell
22	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,100	011449981 JJK	John Powell
23	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,000	011449582 JJK	John Powell
24	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 1	Transwood Inc	5,500	AWS 77452	John Powell
25	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,200	1697643-15240	John Powell
26	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	SET Environmental	5,200	1699707-15240	John Powell
27	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Mid America Waste Solutions	5,200	1697757-15240	John Powell
28	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086528	John Powell
29	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Sparge 1	Turn Key	5,500	011449707 JJK	John Powell
30	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,500	1697644-15240	John Powell
31	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,500	1697645-15240	John Powell
32	Non-Hazardous Leachate	Metalworking Lubricants	Sparge 2	Metalworking Lubricants	5,500	ML 001	John Powell
33	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Sparge 1	Turn Key	6,000	011449708 JJK	John Powell
34	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	Wetterau Homestead	5,500	AWS 77294	John Powell
35	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Liquid Environmental Solutions	5,660	011449583 JJK	John Powell
36	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086529	John Powell

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
37	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,500	1697646-15240	John Powell
38	Non-Hazardous Leachate	Advanced Waste - New Castle	Sparge 1	Kuhnle Bros	5,300	AWS 77333	John Powell
39	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Heritage Transport	5,000	1697752-15240	John Powell
40	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	5,500	011449584 JJK	John Powell
41	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	Altom	5,400	AWS 77295	John Powell
42	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 77034	John Powell
43	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	Coal City Cob	5,400	AWS 77296	John Powell
44	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086530	John Powell
45	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	6,000	AWS 77297	John Powell
46	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,200	1697647-15240	John Powell
47	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	4,800	1697648-15240	John Powell
48	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,800	1697649-15240	John Powell
49	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 2	TDR Transport	5,180	AWS 77453	John Powell
50	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,000	1697650-15240	John Powell
51	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	6,000	011449585 JJK	John Powell
52	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Coal City Cob	5,500	011449982 JJK	John Powell
53	Non-Hazardous Leachate	Advanced Waste - New Castle	Tank Battery 4	Kuhnle Bros	5,000	AWS 77334	John Powell
54					**323,402**		

Loading Date 5/23/2013

0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	17,502	2013-05-23	
1	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-4	SET Environmental	5,000	1699708-15240	Emily Heikes
2	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 77035	Emily Heikes
3	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086531	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
4	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,000	011449983	Emily Heikes
5	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	Coal City Cob	5,600	AWS 77298	Emily Heikes
6	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	6,000	011449586	Emily Heikes
7	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Ziron Environmental	5,000	011449587	Emily Heikes
8	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 77036	Emily Heikes
9	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 4	TDR Transport	5,200	AWS 77454	Emily Heikes
10	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 4	Turn Key	5,500	011449709	Emily Heikes
11	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Ziron Environmental	5,000	011449588	Emily Heikes
12	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086532	Emily Heikes
13	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 4	Schiber	5,500	1699697-15240	Emily Heikes
14	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,000	011449984	Emily Heikes
15	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	Coal City Cob	5,600	AWS 77299	Emily Heikes
16	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	6,000	011449589	Emily Heikes
17	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 4	Transwood Inc	5,500	AWS 77455	Emily Heikes
18	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Ziron Environmental	5,000	011449590	Emily Heikes
19	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,100	011449985	Emily Heikes
20	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086533	Emily Heikes
21	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Mid America Waste Solutions	5,200	1697758-15240	Emily Heikes
22	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,100	011449986	Emily Heikes
23	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	Transwood Inc	5,500	AWS 77456	Emily Heikes
24	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,400	1697652-15240	Emily Heikes
25	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	TDR Transport	5,300	AWS 77457	Emily Heikes
26	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,500	1697653-15240	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
27	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086534	Emily Heikes
28	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Heritage Transport	5,000	1697753-15240	Emily Heikes
29	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 3	Turn Key	6,000	011449710	Emily Heikes
30	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	Transwood Inc	5,500	AWS 77458	Emily Heikes
31	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Altom	5,000	AWS 77300	Emily Heikes
32	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Schiber	5,000	AWS 77301	Emily Heikes
33	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,200	1697654-15240	Emily Heikes
34	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	5,500	011449591	Emily Heikes
35	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086535	Emily Heikes
36	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Schiber	5,800	AWS 77302	Emily Heikes
37	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	6,000	AWS 77037	Emily Heikes
38	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	5,900	AWS 77303	Emily Heikes
39	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Sparge 1-1	Schiber	5,800	AWS 77304	Emily Heikes
40	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	6,000	AWS 77305	Emily Heikes
41	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086536	Emily Heikes
42	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-1	Neier	5,500	1697655-15240	Emily Heikes
43	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-1	Neier	5,500	1697656-15240	Emily Heikes
44	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,500	1697657-15240	Emily Heikes
45	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-1	Neier	5,000	1697658-15240	Emily Heikes
46	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Sparge 1-2	Coal City Cob	5,500	011449592	Emily Heikes
47	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	4,800	1697659-15240	Emily Heikes
48	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Sparge 1-2	Liquid Environmental Solutions	5,660	011449593	Emily Heikes
49	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	Coal City Cob	5,400	AWS 77306	Emily Heikes
50					**300,062**		

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
Loading Date 5/24/2013							
0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	15,571	2013-05-24	
1	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 77038	Emily Heikes
2	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086537	Emily Heikes
3	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	Wetterau Homestead	5,200	AWS 77307	Emily Heikes
4	Non-Hazardous Leachate	Advanced Waste - Portage	Sparge 1	TDR Transport	5,180	AWS 77459	Emily Heikes
5	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	6,000	011449594	Emily Heikes
6	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 77039	Emily Heikes
7	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,000	011449595	Emily Heikes
8	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Sparge 1	Turn Key	5,500	011449711	Emily Heikes
9	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086538	Emily Heikes
10	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 5	Wayne Transports	6,000	011449987	Emily Heikes
11	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	Coal City Cob	5,600	AWS 77308	Emily Heikes
12	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Ziron Environmental	5,500	011449596	Emily Heikes
13	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Ziron Environmental	5,500	011449597	Emily Heikes
14	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 4	TDR Transport	5,200	AWS 77460	Emily Heikes
15	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086539	Emily Heikes
16	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	6,000	011449598	Emily Heikes
17	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-2	Heritage Transport	5,000	1699947-15240	Emily Heikes
18	Non-Hazardous Leachate	Metalworking Lubricants	Tank Sparge 2-2	Metalworking Lubricants	5,500	ML 002	Emily Heikes
19	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-3	Mid America Waste Solutions	5,200	1697759-15240	Emily Heikes
20	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 4	Wayne Transports	6,100	011449988	Emily Heikes
21	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-3	Neier	5,000	1697740-15240	Emily Heikes
22	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086540	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
23	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 4	TDR Transport	5,300	AWS 77461	Emily Heikes
24	Non-Hazardous Leachate	Advanced Waste - New Castle	Tank Battery 4	Kuhnle Bros	5,200	AWS 77335	Emily Heikes
25	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 4	Turn Key	5,500	011449712	Emily Heikes
26	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Altom	5,000	AWS 77608	Emily Heikes
27	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,400	1697741-15240	Emily Heikes
28	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	6,000	011449599	Emily Heikes
29	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086541	Emily Heikes
30	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Neier	5,500	1697742-15240	Emily Heikes
31	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	K&R	6,000	AWS 77609	Emily Heikes
32	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-4	Neier	5,200	1697743-15240	Emily Heikes
33	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-4	Neier	5,500	1697744-15240	Emily Heikes
34	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 77040	Emily Heikes
35	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	5,500	011449600	Emily Heikes
36	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-4	Neier	5,500	1697745-15240	Emily Heikes
37	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086542	Emily Heikes
38	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	5,500	1697746-15240	Emily Heikes
39	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Neier	4,800	1697747-15240	Emily Heikes
40	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 2	Altom	5,000	AWS 77610	Emily Heikes
41	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	K&R	6,100	AWS 77611	Emily Heikes
42	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Coal City Cob	5,600	AWS 77612	Emily Heikes
43	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Coal City Cob	5,400	AWS 77636	Emily Heikes
44	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	Heritage Transport	5,000	1699940-15240	Emily Heikes
45	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Tank Battery 3	Schiber	5,425	AWS 77532	Emily Heikes
46	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	6,000	AWS 77041	Emily Heikes
47					**280,476**		

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk

Loading Date 5/25/2013

0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	19,244	2013-05-25	
1	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	SET Environmental	5,500	1700077-15240	Emily Heikes
2	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 3	SET Environmental	5,300	1700078-15240	Emily Heikes
3	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086543	Emily Heikes
4	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Sully	6,000	AWS 77042	Emily Heikes
5	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,700	086544	Emily Heikes
6	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 3	Turn Key	5,500	011449713	Emily Heikes
7	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Sparge 1	Turn Key	5,500	011449714	Emily Heikes
8	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086545	Emily Heikes
9	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,700	086546	Emily Heikes
10	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-1	Triad Transport	5,000	1700044-15240	Emily Heikes
11	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-1	Triad Transport	5,000	1700046-15240	Emily Heikes
12	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086547	Emily Heikes
13	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-1	Triad Transport	5,000	1700047-15240	Emily Heikes
14	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,700	086548	Emily Heikes
15	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	6,000	011449601	Emily Heikes
16	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Sparge 2-2	Triad Transport	5,000	1700048-15240	Emily Heikes
17	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Liquid Environmental Solutions	5,680	011449602	Emily Heikes
18	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Tank Sparge 2-2	KRD Trucking	6,500	AWS 77533	Emily Heikes
19	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 77043	Emily Heikes
20	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 77044	Emily Heikes
21	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	Heritage Transport	5,000	1699948-15240	Emily Heikes
22	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	6,000	AWS 77647	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
23	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 77045	Emily Heikes
24					**159,824**		

Loading Date 5/26/2013

0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	17,018	2013-05-26	
1	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	SET Environmental	5,500	1700080-15240	John Powell
2	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 2	SET Environmental	5,300	1700079-15240	John Powell
3	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Triad Transport	5,000	1700049-15240	John Powell
4	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	6,000	AWS 77637	John Powell
5					**38,818**		

Loading Date 5/27/2013

0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	719	2013-05-27	
1	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	SET Environmental	5,300	1700081-15240	John Powell
2	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	SET Environmental	5,500	1700082-15240	John Powell
3	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Heritage Transport	5,000	1699949-15240	John Powell
4	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	6,000	AWS 77638	John Powell
5	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Triad Transport	5,000	1700050-15240	John Powell
6	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Sparge 1	Schiber	5,300	1699951-15240	John Powell
7	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 7	Schiber	5,500	1699950-15240	John Powell
8	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 7	Neier	5,500	1699923-15240	John Powell
9	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	K&R	5,650	011449989 JJK	John Powell
10	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 7	Triad Transport	5,000	1700505-15240	John Powell
11	Non-Hazardous Leachate	Advanced Waste - Covanta Indianapolis	Tank Battery 7	KRD Trucking	6,300	AWS 77534	John Powell
12	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 7	Neier	5,200	1699924-15240	John Powell

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
13	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 7	Neier	5,500	1699925-15240	John Powell
14	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 7	Neier	5,500	1699926-15240	John Powell
15	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	Coal City Cob	5,600	AWS 77639	John Powell
16	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 7	Neier	5,000	1699927-15240	John Powell
17	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 7	Neier	5,000	1699928-15240	John Powell
18	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,340	1699929-15240	John Powell
19	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 7	Neier	5,000	1699930-15240	John Powell
20					**102,909**		

Loading Date 5/28/2013

1	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,000	011449990 JJK	John Powell
2	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086549	John Powell
3	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 7	Heritage Transport	5,000	1699942-15240	John Powell
4	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Wetterau Homestead	5,500	AWS 77640	John Powell
5	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	6,000	011449603 JJK	John Powell
6	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Tank Battery 7	Triad Transport	5,000	1695560-16209	John Powell
7	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 77046	John Powell
8	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 77047	John Powell
9	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Schiber	5,800	AWS 77641	John Powell
10	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	5,500	011449604 JJK	John Powell
11	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Schiber	5,600	AWS 77642	John Powell
12	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086550	John Powell
13	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 4	Turn Key	5,500	011449715 JJK	John Powell
14	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 4	Turn Key	5,600	011449716 JJK	John Powell

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
15	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,000	011449991 JJK	John Powell
16	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	K&R	6,000	AWS 77643	John Powell
17	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Coal City Cob	5,400	011449992 JJK	John Powell
18	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Ziron Environmental	5,500	011449605 JJK	John Powell
19	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,100	011449994 JJK	John Powell
20	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Ziron Environmental	5,500	011449606 JJK	John Powell
21	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086551	John Powell
22	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,100	011449995 JJK	John Powell
23	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,500	1699858-15240	John Powell
24	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,500	1699859-15240	John Powell
25	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,500	1699860-15240	John Powell
26	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Mid America Waste Solutions	5,200	1700103-15240	John Powell
27	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086552	John Powell
28	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,000	1699861-15240	John Powell
29	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	6,000	011449607 JJK	John Powell
30	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Ziron Environmental	5,000	011449608 JJK	John Powell
31	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,000	1699862-15240	John Powell
32	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,200	1699863-15240	John Powell
33	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	Transwood Inc	5,500	AWS 77462	John Powell
34	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	Transwood Inc	5,500	AWS 77463	John Powell
35	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 3	Transwood Inc	5,300	AWS 77048	John Powell
36	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 7	Neier	5,000	1699864-15240	John Powell
37	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Schiber	5,800	AWS 77644	John Powell

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
38	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086553	John Powell
39	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Schiber	5,600	AWS 77645	John Powell
40	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	TDR Transport	5,300	AWS 77464	John Powell
41	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,340	1699865-15240	John Powell
42	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	TDR Transport	5,300	AWS 77465	John Powell
43	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Altom	5,000	AWS 77646	John Powell
44	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086554	John Powell
45	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 3	Transwood Inc	5,600	AWS 77466	John Powell
46	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 1	Coal City Cob	6,000	011449609 JJK	John Powell
47	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 1	Schiber	5,500	AWS 77613	John Powell
48	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 1	Coal City Cob	5,400	AWS 77614	John Powell
49	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 1	Altom	5,000	AWS 77615	John Powell
50	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	K&R	6,000	011449996 JJK	John Powell
51	Non-Hazardous Leachate	Advanced Waste - Portage	Tank Battery 1	TDR Transport	5,200	AWS 77467	John Powell
52	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 3	Coal City Cob	5,600	AWS 77616	John Powell
53	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	Coal City Cob	5,600	AWS 77617	John Powell
54	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Liquid Environmental Solutions	5,680	011449610 JJK	John Powell
55	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	6,100	AWS 77618	John Powell
55					**316,320**		

Loading Date 5/29/2013

0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	15,229	2013-05-29	
1	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,000	011449997 JJK	John Powell
2	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 7	Heritage Transport	5,000	1699943-15240	John Powell

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
3	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 77049	John Powell
4	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086555	John Powell
5	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Tank Battery 8	Triad Transport	5,000	1695561-16209	John Powell
6	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	SET Environmental	5,200	AWS 77619	John Powell
7	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 77050	John Powell
8	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	6,000	011449611 JJK	John Powell
9	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,000	1699866-15240	John Powell
10	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Sparge 1	Turn Key	5,500	011449717 JJK	John Powell
11	Non-Hazardous Leachate	Metalworking Lubricants	Tank Battery 8	Metalworking Lubricants	5,500	ML 003	John Powell
12	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086556	John Powell
13	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	5,500	011449612 JJK	John Powell
14	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Coal City Cob	5,400	011449998 JJK	John Powell
15	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,000	011449613 JJK	John Powell
16	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,000	011449999 JJK	John Powell
17	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,000	011449614 JJK	John Powell
18	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,000	011450000 JJK	John Powell
19	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,000	011449615 JJK	John Powell
20	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086557	John Powell
21	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,000	011449875 JJK	John Powell
22	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 2	Turn Key	5,500	011449718 JJK	John Powell
23	Non-Hazardous Leachate for Rockford IPC	Advanced Waste - Rockford IPC	Tank Battery 6	Wayne Transports	6,100	011449876 JJK	John Powell
24	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 2	K&R	6,000	AWS 77620	John Powell
25	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Mid America Waste Solutions	5,000	1700104-15240	John Powell

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
26	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,500	1699867-15240	John Powell
27	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	K&R	6,100	AWS 77621	John Powell
28	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,500	1699868-15240	John Powell
29	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,340	1699869-15240	John Powell
30	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086558	John Powell
31	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,000	1699870-15240	John Powell
32	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	6,000	011449616 JJK	John Powell
33	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	6,000	011449617 JJK	John Powell
34	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086559	John Powell
35	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Transwood Inc	5,180	AWS 77051	John Powell
36	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,500	1699871-15240	John Powell
37	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	4,800	1699872-15240	John Powell
38	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 4	Schiber	5,500	AWS 77622	John Powell
39	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086560	John Powell
40	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	Coal City Cob	5,600	AWS 77623	John Powell
41	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,000	1699873-15240	John Powell
42	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 5	Transwood Inc	5,500	AWS 77625	John Powell
43	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 2	K&R	6,100	AWS 77624	John Powell
44	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 77052	John Powell
45	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 2	Transwood Inc	5,500	AWS 77626	John Powell
46	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	TDR Transport	4,600	AWS 77628	John Powell
47	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	TDR Transport	5,200	AWS 77648	John Powell
48					**285,849**		

Loading Date 5/30/2013

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
0	Non-Hazardous Leachate for MSD	MSD - Missouri River	AST	MSD Direct Discharge	3,337	2013-05-30	
1	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Tank Battery 8	Triad Transport	5,000	1697760-16209	Emily Heikes
2	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Tank Battery 8	Triad Transport	4,900	1695562-16209	Emily Heikes
3	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Heritage Transport	5,000	1699944-15240	Emily Heikes
4	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086561	Emily Heikes
5	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Sully	6,000	AWS 77053	Emily Heikes
6	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Ziron Environmental	5,000	011449618	Emily Heikes
7	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	6,000	011449619	Emily Heikes
8	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 3	Turn Key	5,500	011449721	Emily Heikes
9	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,400	1699907-15240	Emily Heikes
10	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086562	Emily Heikes
11	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Ziron Environmental	5,000	011449620	Emily Heikes
12	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Ziron Environmental	5,000	011449621	Emily Heikes
13	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,500	1699908-15240	Emily Heikes
14	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	5,500	011449622	Emily Heikes
15	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086563	Emily Heikes
16	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 3	Coal City Cob	5,500	AWS 77649	Emily Heikes
17	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 3	SET Environmental	5,300	AWS 77650	Emily Heikes
18	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 3	Turn Key	6,000	011449722	Emily Heikes
19	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	K&R	6,000	AWS 77651	Emily Heikes
20	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086564	Emily Heikes
21	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	5,600	011449623	Emily Heikes
22	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	K&R	6,100	AWS 77652	Emily Heikes
23	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 3	Coal City Cob	6,000	011449624	Emily Heikes
24	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,000	1699909-15240	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
25	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086565	Emily Heikes
26	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Schiber	5,800	AWS 77653	Emily Heikes
27	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Tank Battery 3	Altom	5,500	AWS 77654	Emily Heikes
28	Non-Hazardous Leachate	Advanced Waste - Crystal Springs	Sparge 1	K&R	5,700	AWS 77655	Emily Heikes
29	Non-Hazardous Leachate	Advanced Waste - New Castle	Sparge 1	Kuhnle Bros	5,000	AWS 77336	Emily Heikes
30	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 1	MBI	7,500	086566	Emily Heikes
31	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 77054	Emily Heikes
32	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	Coal City Cob	5,600	AWS 77656	Emily Heikes
33	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 1	Transwood Inc	5,245	AWS 77055	Emily Heikes
34	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 1	TDR Transport	5,200	AWS 77657	Emily Heikes
35					**201,682**		

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1	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086567	Emily Heikes
2	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	6,000	011449625	Emily Heikes
3	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Heritage Transport	5,000	1699945-15240	Emily Heikes
4	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Sparge 1	Sully	6,000	AWS 77056	Emily Heikes
5	Non-Hazardous Leachate	Heritage - Covanta Tulsa	Tank Battery 8	Triad Transport	5,000	1697763-16209	Emily Heikes
6	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,500	011449626	Emily Heikes
7	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,000	011449627	Emily Heikes
8	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	Transwood Inc	5,500	AWS 77658	Emily Heikes
9	Non-Hazardous Leachate	Metalworking Lubricants	Tank Battery 8	Metalworking Lubricants	5,500	ML 004	Emily Heikes
10	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Ziron Environmental	5,500	011449628	Emily Heikes
11	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086568	Emily Heikes
12	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	TDR Transport	4,600	AWS 77659	Emily Heikes

Load ID	Waste	Disposal Facility	Source	Transporter	Qty (gal)	Manifest No.	Clerk
13	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Sparge 1	Coal City Cob	6,000	011449629	Emily Heikes
14	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,400	1699915-15240	Emily Heikes
15	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Sparge 1	Turn Key	5,500	011449723	Emily Heikes
16	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086569	Emily Heikes
17	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 5	Transwood Inc	5,300	AWS 77660	Emily Heikes
18	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	5,400	011449630	Emily Heikes
19	Non-Hazardous Leachate	Advanced Waste - Chemworks	Sparge 1	Coal City Cob	5,500	AWS 77661	Emily Heikes
20	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,000	1699916-15240	Emily Heikes
21	Non-Hazardous Leachate	Heritage - Covanta Indianapolis	Tank Battery 8	Neier	5,500	1699917-15240	Emily Heikes
22	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	5,500	011449631	Emily Heikes
23	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086570	Emily Heikes
24	Non-Hazardous Leachate	Advanced Waste - Kankakee Metro	Tank Battery 4	Turn Key	6,000	011449725	Emily Heikes
25	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	Coal City Cob	5,600	AWS 77662	Emily Heikes
26	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086571	Emily Heikes
27	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	Coal City Cob	6,000	011449632	Emily Heikes
28	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086572	Emily Heikes
29	Non-Hazardous Leachate	Advanced Waste - Cedar Rapids	Tank Battery 4	Transwood Inc	5,200	AWS 77057	Emily Heikes
30	Non-Hazardous Leachate	Advanced Waste - Liquid Environmental	Tank Battery 4	TDR Transport	5,200	011449633	Emily Heikes
31	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	Coal City Cob	5,600	AWS 77663	Emily Heikes
32	Non-Hazardous Leachate for MSD	MSD - Bissell Point	Tank Battery 2	MBI	7,500	086573	Emily Heikes
33	Non-Hazardous Leachate	Advanced Waste - Chemworks	Tank Battery 4	Coal City Cob	5,500	AWS 77664	Emily Heikes
33					**194,300**		

APPENDIX E

DATA CORRELATIONS AND TRIGGER ASSESSMENTS

APPENDIX E

CORRELATIONS OF SITE METRICS WITH REACTION PREDICTION

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ATTACHMENT E-1

1 INTRODUCTION

1.1 PURPOSE

The purpose of the work presented in this Appendix was to identify those metrics that can be obtained at the site on a normal basis to predict the location and rate of movement of the reaction at the Bridgeton Landfill. Data that has been and will be gathered at the landfill and could potentially be used to monitor the location and progress of the reaction was examined in detail to determine how well it predicted behavior to date and how those data could be used for the purpose of triggering actions in the future.

1.2 SCOPE

The following data was examined:

- Temperature Monitoring Probe Readings (available since late fall 2012)
- Gas wellhead field monitoring data (available for wells since 2009 and earlier)
- Laboratory Gas Analysis from individual gas wells (available for some wells at dates starting as early as 2011 but monthly for most south quarry wells beginning in August 2012)
- Settlement rate data (grid survey comparisons beginning in January 31, 2013 and GPS digital terrain models back to early 2011 on a monthly basis)

The data used and the analyses and predictive capacity and relationships identified are presented and described in the subsequent sections of this appendix.

2 GENERAL DATA PRESENTATION

2.1 TMP MEASUREMENTS

TMP data has been gathered on weekly basis for each of the TMP units once they were installed. In some cases, most notably TMP-8, some of the thermocouple units have become inoperable with time. TMP data has been plotted with time along with the settlement rates for grid based surveys and gas well data (gas wellhead temperature) to identify correlations between these conditions and in-ground temperature. The maximum and average values for the TMP plotted were chosen to represent the TMP readings in the simplest fashion. TMP plots with settlement rate at the TMP are presented in Figures E-1 through E-14 and TMP plots with gas wellhead temperatures, for gas wells that are proximate to TMPs, are presented in Figures E-15 through E-22. TMP maximum temperatures were also included in plots for gas well constituents where they were proximate to gas wells as described in Section 2.2 of this Appendix. These figures are referred to in subsequent sections of this Appendix.

2.2 GAS WELL DATA

Gas wellhead data, i.e. well head temperature, and field analyzer measured CO_2, and CH_4, have been plotted along with laboratory gas analysis of CO, CO_2, H_2 and CH_4 with time. Nearby TMP maximum

temperature and settlement rate values at the gas wells have also been included. Figures E-23 through E-47 present plots of gas wells selected to cover a range of behaviors, locations relative to the reaction, and wells that are proximate to settlement fronts and TMP readings. These figures are referred to in subsequent sections of this Appendix.

3 ANALYSIS OF DATA

3.1 TMP DATA

The TMP data was analyzed to look at what in-ground temperatures were consistent with other signs of the reaction. The main indicators of the reaction are typically settlement at the ground surface, gas wellhead temperatures and CO.

3.1.1 COMPARISON TO SETTLEMENT RATE

Comparison of settlement and maximum temperature measured at a TMP location is illustrated in Figures E-1 through E-14. Three of the TMP's, TMP-7R, TMP-8, and TMP-9, as shown on Figures E-7 through E-9, respectively, have exhibited maximum temperatures in excess of 220 °F. As can be seen in Figures E-7 and Figure E-8, maximum TMP temperature and settlement rate are closely linked to the settlement rate having exceeded a value in the range of -0.04 to -0.045 ft per day. Figure 9, depicting TMP-9, does not show this correlation, but is located where the waste thickness is approximately 0.4 times the thickness of the other locations, so it is possible the similar rate of settlement at the location of TMP-9 is on the order of -0.016 to -0.018 ft per day, which appears to have been exceeded in December or January of this year. It should be noted that settlement at the TMP-9 location has been limited since those dates and temperatures of late have been falling. When looking at the Figures it should be noted that the survey data for settlement rate prior to December 12 was not done on a grid basis so actual settlement rates reported in December are considered less accurate than those reported on or after January 31, 2013, when all data was compared to a common grid location point to point.

The remaining TMPs have experienced a maximum temperature of 180 °F, as can be seen in the corresponding Figures.

It is not surprising that local settlement is related to exceedence of temperatures in excess of 220 °F. At this temperature, paper and other cellulose based materials can begin to pyrolyze, resulting in volume reduction. It can also be seen looking at Figure 8 that temperatures continued to rise after the onset of achieving 220 °F, which suggests that pyrolysis-related settlement behind the front is greater. As described in the March 29, 2013, letter to Mrs. Fitch of MDNR from Craig Almanza of Bridgeton Landfill[1] under the heading "Analysis of the Shape of the Zone of Accelerated Settlement", the settlement at any point in the area of advancing settlement includes settlement associated with volume reduction from areas as far away as 150 ft. This may well explain why there is apparently no substantive time delay between the achievement of the maximum TMP values of 220 °F and a settlement rate of -0.04 to -0.045 ft/day. This is consistent with mapping of

[1] Referred to hereinafter as Reference 1 and included in Appendix A of the North Quarry Contingency Plan Part 1.

the settlement front as a measure of the reaction advance using the -0.045 ft/day value that has been presented thus far in the project.

At shallower sections of the quarry it may be appropriate to reduce the level of settlement per day deemed as accelerated settlement to a value that is consistent with the heated zone in the shallower area compared to full quarry height locations. This would reflect the fact that settlement rate associated with the reaction is actually associated with the thickness of the waste being heated to a level that results in volume destruction, based on the TMP charts of temperature with depth.

3.1.2 Comparison to Gas WellHead Temperature

Gas wellhead temperature reflects the average temperature of the waste the gas has passed through for the zone around the well. In areas where the temperature varies significantly with direction and distance from the well, such as near a temperature front, the gas wellhead temperature can be very different than the waste temperature at any depth around the well. In areas that are not experiencing temperature changes in lateral directions, the gas wellhead value reflects the average temperature typically of the upper 75 feet of waste column, which in a decomposing landfill is cooler than landfill waste temperatures at greater depths but still well above the landfill bottom (>40 or 50'above bottom). As such the temperature difference between maximum and average TMP values compared to the gas wellhead temperature seen in Figures E-15 through E-22 is not unexpected.

For gas wells more than 100 feet from the Settlement Front or apparent heat front, such as GEW-10, GEW-39, GEW-56R and GEW-109, the wellhead temperature was found to be as much as 30 °F lower than the average nearby TMP value (GEW-10 and TMP10 – Figure E-15) but more typically 10 to 15 °F lower. Maximum TMP values for these same wells were 12 to 45 °F higher than the wellhead temperature of nearby wells. No correlation between temperature difference and distance from the TMP to the well were identified, given the greater differences were observed at GEW-10 which is within only 10 feet away from TMP-10. Differences between the TMP max and average values were typically greater if the well was north of the TMP (further from the advancing heat front) than south of the TMP (closer to the heat front). One could generally conclude that typically wellhead temperatures removed from the heat fronts could be in the range of 40 °F below the maximum temperature in the waste, but the data is limited. The significant difference between the TMP-10 and GEW-10 suggests that the TMP data represents a relatively small distance close to the TMP.

For gas wells closer than 100 feet from the Settlement Front (or heat front), such as GEW11, GIW7, and GIW-11 the variation between gas wellhead temperature and the TMP average values was typically less than was observed in the wells further away from the front. But the variation from the maximum TMP value was consistently close to thirty degrees. The only observed exception was GIW-7 which, being 51 feet away from TMP-7R, did not show a rise in temperature during the beginning of June 2013, when TMP-7R increased nearly 60 degrees in maximum and 20 degrees in average. GIW-7 is the only well near the heat front that is also within any proximity of a TMP. A plot for GIW12 is also included (Figure E-22) just to complete the set of wells close to TMPs.

However, GIW-12 has yet to reach a stable operating condition and therefore no conclusions can be drawn from it.

Generally speaking, the gas wellhead temperature can be shown not to directly reflect the maximum temperatures in the waste mass. In general it would be reasonable to suggest that in areas not within 100 feet of more of a settlement front, the wellhead temperature is likely within 40 to 45 °F of the maximum waste temperature. This would suggest that in the absence of settlement occurring at an elevated rate or significant CO concentrations, a wellhead temperature of up to 175 °F could, in the absence of other indicators, be acceptable and would indicate maximum waste temperatures in the vicinity of that well less than 220 °F. A gas wellhead temperature of 175 °F or higher could indicate the area had been likely been warmed by processes not consistent with biological degradation processes and would reflect maximum temperatures within the waste in the area of influence of the well that would exceed 220 °F.

3.1.3 Ability to Predict Location and Rate

TMP data is not able to predict rate or location that is closer than the spacing between TMP points. For example, if one looks at Figures E-7 and E-8, it is clear that the change in temperature from 180 to 190 to 220 was a gradual change that was consistent with the slope of the temperature line in advance of the change. It is apparent that some energy consuming activity is associated with this temperature rise that makes the transition faster, once the temperature transition to 220 °F is achieved the temperature continues to rise higher. Based on the behavior of TMP-7R and TMP-8 it appears that all one can conclude is that the front is either at a location or not. The rate of travel is not apparent from the TMP data alone. Review of data associated with TMP-13 does not indicate the rate the front may be advancing toward it based on measured temperature. All that could possibly be concluded is TMP-13 is warming at a very slow rate (See Figure E-13).

3.2 GAS WELL DATA

Gas well data was examined to determine what, if any, information was predictive of location and rate of movement of the reaction. Figures E-23 through E-47 contain gas well measurements and TMP data, when a TMP is nearby, along with settlement rate data based on the surveys performed at the site. In addition, a summary of gas well location relative to the settlement front, as currently defined by rate of settlement of -0.45 ft per day (1.35ft per 30 day month). Settlement rate data prior to January 31, 2013 is considered less accurate given the surveying methods used.

As explained in Section 3.1.2, the gas well data is influenced by proximity to the heat front, but not in an easily definable way. To explore the relationship, the locations of gas wells relative to the settlement front or in proximity to the front were identified. These are summarized in Table E-1 for settlement front locations as of July 2012 and later. Earlier settlement fronts have not been determined.

As can be seen in Table E-1, many of the gas wells that are within 50 feet of the settlement front as of April 15, 2013 have been inside of the gas front or within a limited distance of the settlement front since September 2012 or July 2012. It is also possible to examine wellhead temperatures within the settlement zone, as well as other gas make up.

Gas well constituents represent gas being collected at any time, not gas being produced at any specific location. When the gas being produced is constant with time, the gas collected should be similar to the gas being produced. When the gas being produced is changing with time, the gas being collected represents a mixture of gasses produced with gasses that are stored in pore spaces or diffusing from solids within the area of influence. In addition, as was mentioned in Section 3.1.2, the gas collected comes from an unknown tributary area and would be expected to include the gasses from any nearby heat affected zone prior to the heat of the reaction actually causing volume reduction at the well. Further, since the gas constituents are tracked as percent volume (dry) constituents not related to methanogenesis are amplified in concentration by the reduction in methane production that occurs when the waste mass is warmed over 160 °F. Once methane production is halted to temperature rise, the major gas constituents are typically CO_2, H_2. CO is also present but is not a major gas constituent (typically less than 1% or 10,000 ppm). Based on experience at other sites, CO concentrations are likely to remain elevated for some time even after temperatures begin to fall and settlement rates reduce. For this reason it is appropriate to examine well gas concentrations by looking at wells that have been inside or near the reaction area at times in the past, wells that have only recently been in or near the reaction area and wells that have never been proximate to the reaction area as separate sets of data. Screening for wells that have never been in the reaction area has been approximated by those wells not currently within 150 ft of any of the settlement fronts and wells that, since 2011, are not located in areas that have settled more than 5 feet, which excludes wells GEW 14a, GEW-18R, GEW-19A ,GEW-112 and GEW-45R possibly from the wells not within 150 feet of settlement fronts. GEW -24a, through 30 R in the southeast corner of the South Quarry were also eliminated from this set given their proximity to the reaction and the likelihood that added fill placed in this area had masked settlements.

Laboratory of gas analysis is available for only south quarry wells and most of that is for periods following August of 2012. Therefore, only gas wells in the south quarry were included in the analysis of gas well constituents. Field measurements of gas well constituents were not utilized for analysis of wells within the vicinity of the reaction area since they do not include any information on CO or H_2.

3.2.1 GAS WELLHEAD TEMPERATURE

3.2.1.1.1 Wells Inside or Proximate to the Settlement Fronts

Gas wellhead temperature inside or proximate to the settlement fronts was analyzed by looking at all data and filtering for CO values higher than a fixed value. The following presents the wellhead temperatures as they related to CO values. Gas wellhead temperatures below 100 °F were manually excluded from the analysis as being not representative of gas wells with any flow. It should be noted that some reported temperatures were as low as 0 °F.

CO Minimum	Average	Median	Standard Deviation	Sample Count
5000 ppm	171.5	180	24.7	109
4000 ppm	170	179	24.8	174
3000 ppm	162	170	26	270
2000 ppm	156	152	25.8	384

The results indicate that a gas well temperature above 170 is identified with CO values on average of more than 4000 ppm. Gas wellhead temperatures in excess of this value would suggest that significant waste alteration via heat is occurring. As represented in Figures E-24 through E-47, the data does have significant scatter, as would be expected given that each data point is a composite of gas produced from waste within the zone of influence of the well. The significant reduction in median temperature from CO concentration of 3000 ppm to 2000 ppm indicates that the threshold indicator is at least 3000 ppm. The minimal change between 4000 and 5000 ppm suggests that 4000 ppm could be used as a threshold for clearly being in the elevated head zone and gas wellhead temperatures in the range of 170 to 175, which could be considered indication of waste temperatures having reached 220 °F temperatures. Consistent with the comparisons of TMP values and wellhead temperatures discussed in Section 3.1.2, CO in excess of this value would suggest that significant waste alteration via heat is occurring.

3.2.1.1.2 Wells more than 150 feet from Any Settlement Front

An evaluation of the gas wellhead temperatures measured routinely at the site was performed for all the wells outside the settlement areas. The evaluation is reported in Table E-2. The average value of wellhead temperature was 107 °F with a maximum value of 155 °F associated with GEW-54 located in the south end of the North Quarry. Minimum readings of 19 °F were reported. These low readings bias downward the average value and are certainly not representative of the gas in the wells but likely a measurement taken with no or little flow in the well. Ignoring temperatures below 90 °F raises the average temperature to 113 °F. This suggests a temperature of 135 °F (the average plus 1 standard deviation) would represent a temperature at which nothing is occurring. Higher wellhead temperatures may warrant further scrutiny if other indicators of reaction are present.

TABLE E-2
FIELD MEASUREMENTS OF
OF GAS WELLS > 150 FT FROM SETTLEMENT
FRONTS

	CH4	CO2	O2	CH2/CO2	Init Temp
Average	40.62092	40.11428	0.452371	1.052027	105.0662
Median	43.6	38.9	0	1.131016	110
Std Dev	12.88234	10.44071	2.018484	0.31617	22.67967
Min	0.1	0.2	0	0.012422	19
Max	66.9	86.2	21.5	2.167857	155
Count	7749	7753	7753	7749	4395
Average Using only t>90deg					113.2069

3.2.2 GAS CONSTITUENTS

3.2.2.1 CO

3.2.2.1.1 Wells Inside or Proximate to the Settlement Fronts

Laboratory gas well sampling data was analyzed for wells inside the settlement front as of March 20, 2013, which represented the largest settlement front area to date. The statistical evaluation of the CO levels in the wells for gas samples obtained in February through April 2013, is presented in Table E-3. The CO levels averaged 3300 ppm but ranged from 170 to 6700 ppm. The median value was 2900 ppm. When compared to the sample set that includes all the data from the same wells back to August 2012, the average value of the time within the front was lower than the overall average value, shown in Table E-3, of 4460 ppm with approximately the same minimum value and 8900 maximum value. This clearly did not indicate any significant change with being within the reaction zone of high heat and not. It suggests either the area was already reacting for the full period or that wells proximate to the front have quite variable CO concentrations. This would suggest that CO values in excess of 4000 ppm are indicative, but not definitive of being within the settlement or heat front zone.

TABLE E-3A
ANALYSIS OF WELL INSIDE MARCH 20, 2013
SETTLEMENT FRONT - SAMPLE DATES 2/13 TO 5/13

	CO	CO2	H2	CH4	CO2/CO	CH4/CO2
Average	0.332	62.226	20.484	6.845	507.150	0.114
Min	0.017	43.000	0.000	0.150	103.125	0.002
Max	0.670	72.000	34.000	26.000	3176.471	0.433
STD Deviation	0.211	6.220	9.452	8.061	760.966	0.138
MEDIAN	0.290	63.000	23.000	3.700	206.897	0.056

TABLE E-3B
ANALYSIS OF WELLS INSIDE MARCH 20. 2013
SETTLEMENT FRONT - SAMPLE DATES 8/12 TO 5/13

	CO	CO2	H2	CH4	CO2/CO	CH4/CO2
Average	0.446	61.319	21.304	5.502	276.275	0.100
Min	0.015	35.000	0.000	0.150	78.652	0.002
Max	0.890	73.000	32.000	32.000	3176.471	0.627
STD Deviation	0.209	7.746	7.262	6.532	507.410	0.129
MEDIAN	0.450	64.000	23.000	2.800	132.653	.041

3.2.2.1.2 Wells more than 150 feet from Any Settlement Front

The laboratory gas well sampling data for the wells that had not been within a 150 of settlement front are presented in Table E-4, shown below.

TABLE E-4
LABORATORY GAS ANALYSIS
GAS WELL NOT WITHIN 150 FT OF
SETTLEMENT FRONTS

STATISTICS	C02	METHANE	HYDROGEN	CO	CO2/CO	METH/CO2
Count	46	46	47	68.00	46	46
Average	54.74	22.90	6.40	0.07	3034	0.478
Maximum	76.00	46.00	28.00	0.33	16296	1.212
Minimum	21.00	3.10	0.00	0.00	185	0.051
Median	56.50	24.00	0.00	0.01	1135	0.450
Standard Deviation	14.25	14.17	8.51	0.09	3799	0.350

The data shows that CO values within the areas that have not been within or near settlement front limits in the past are on average approximately 700 ppm, but do have numerous values in excess of this value. The average plus one standard deviation of data range could be adopted as a reasonable indication that some heating of the waste, worthy of exploration, is warranted. This would correspond to a CO value of 1600 ppm. The complete set of well samples used is provided in Attachment E-1.

3.2.2.2 H_2

3.2.2.2.1 Wells Inside or Proximate to the Settlement Fronts

The laboratory gas well sampling data for wells within or proximate to settlement fronts indicates a wide range of H_2 partial volumes, as can be seen in Table E-3. The data is so variable that it cannot be used an indicator, other than to suggest that higher than 20 percent hydrogen seems to be strongly related with significant warming. However, it does not, as is apparent in Figure E-41 (GEW-38), relate to settlement rate, maximum TMP temperature, CO level, or wellhead temperature. GEW-38 is within 100 feet of the settlement front. Figure E-34 (GEW 63) also depicts a well proximate to the settlement front. It is approximately 57 feet from the location of the front as of May 2013. It does indicate an increase in H_2, but it occurred in 2011, well in advance of any significant increase in well temperature or CO level. This can be compared to Figure E-37 (GEW-69R) which has been within the settlement front for a significant time and exhibited H_2 levels comparable to the previous two wells mentioned. Wells that have moved in and out of settlement fronts, such as GEW-12A and GEW-32R (Figures E-24 and E-27, respectively), show that H_2 values are not related to settlement rate or wellhead temperature.

Average values of H_2 within the heat front or proximate to, as reported in Tables E-3A and E-3B, are 20% to 21%. but as described above, significant variation exists. A median value of 23% was found in both the post January 2013 sample subset and the full sample of wells within the March 2013 settlement front limits. A median value of 26% was found for wells within the settlement front limits as of February through April samples. However no definitive value is apparent.

3.2.2.2.2 Wells more than 150 feet from Any Settlement Front

The laboratory gas well sampling data for the wells that had not been within a 150 of settlement front are presented in Table E-4. The data shows that H_2 values within the areas that have not been within or near settlement front limits in the past are on average approximately 6.4%, but do have numerous values in excess of this value. The median plus one standard deviation of data range is 8.5%. This is significant and is not recommended as a target for an indication that no heating is likely to occur. It is likely that the values of hydrogen are reflective of the ease in which it migrates within the waste mass and the fact that values are heavily weighted to samples only taken in the south quarry.

3.2.2.3 CH_4

3.2.2.3.1 Wells Inside or Proximate to the Settlement Fronts

Wells near, or within, the settlement fronts exhibit reduced Methane concentrations as the waste is warmed, which is to be expected given the relatively low temperature at which methanogenesis is impeded. All of the wells that eventually are in warmed areas exhibit low methane levels. While this would be predictive of the area eventually being warmed, it does not indicate when that may occur or if it would eventually be warmed to a temperature that would result in significant volume reduction of the waste. This is evident in Figures E-31 and E-33, all near but not within settlement fronts. Methane concentrations in GEW-38 (Fig.E-31) have fallen to less than 5%, while in GEW-56R (Figure E-33), located about the same distance from the front and exhibiting similar maximum TMP temperatures, the methane contractions are in excess of 20% at present. The wells have markedly different behavior and either may or may not be warmed to a maximum waste temperature of 220 °F.

Laboratory analysis of gas well samples for methane of the same well and date sets described in Section 3.2.2.1.1 shows the methane content averaged between 4% and 6%, but had significant deviations from average, with maximum values of 32% and minimum values of 0.15%. The median value was less than 4%. The data shows no specific trend other than it diminishes with time as the well spends more time in the heated zone, which, as noted above, is expected given the negative impact of increased temperature on methanogenesis. The statistical results are presented in Tables E-3A and E-3B.

3.2.2.3.2 Wells more than 150 feet from Any Settlement Front

The analysis of wells for methane concentration from laboratory gas samples indicated the average methane content was 23%, with significant variability, as can be seen in Table E-4. The standard minimum and maximum values were 3% and 46%, respectively. This suggests that methane content is not a reliable measure for determining if no reaction processes are ongoing. Field measurements of methane indicated a higher average, 40.6%, but a large range (0.1% to 67%) suggesting that field measures of methane are not definitive.

3.2.2.4 Gas Ratios

3.2.2.4.1 Wells Inside or Proximate to the Settlement Fronts

As can be seen in Tables E-3A and E-3B, the gas ratios of CO_2/CO and CH_4/ CO_2, are consistently lower than those for areas outside any reaction affected areas. However, there is still no clear value that can be identified. Other screening suggested that CO_2/CO below 115 were definitely associated with wells within the settlement fronts, but wide variation exists inside the fronts. This is apparent with the lack of significant difference between the well data sets for the periods containing the full range of data and only the months near or within the March 20. 2013 fronts.

The CH_4/ CO_2 ratio shows similar noisiness with no clear difference between sample sets.

3.2.2.4.2 Wells more than 150 feet from Any Settlement Front

The minimum ratio of CO_2/CO, using laboratory gas samples, was 165 and the median value was 480. Average and maximum values were very high given the very low levels of CO measured and the number of Non Detects (which were assigned 10000 as a ratio). Ratios of less than 115 were found to be indicative of substantial heating. The geometric mean of the values was 825 suggestive of a CO value of 700 ppm which is lower than the median 900 ppm measured. It is suggested that the median ratio of 480 would be more appropriate which suggests a CO value of greater than 1300 ppm would be present.

The ratio of Methane to CO_2 was also calculated utilizing the field measured values. As can be seen in Table E-4, the ratio varied from greater than 1.2 to a minimum of 0.045. The average less one standard deviation would be approximately 0.13. It should be noted that this metric is very noisy as far as data is concerned, as can be seen in the Figures E-24 through E-47. It is not recommended for use for any decisions.

Given the noisy nature of the field data and the fact that no field measurement of CO is possible, field data for gas ratios was not analyzed statistically.

3.3 Settlement Rate Data

Settlement rate data has been collected at the site on approximately a monthly basis since 2012. The data collected prior to December 2012 was analyzed and reported in the January 3, 2013 submittal to the MDNR. This report identified a rate of -0.045 ft per day of elevation change as the likely measure of accelerated settlement for the site. Changes in the survey method to improve the comparison month to month were made starting in December 2012 for a portion of the South Quarry and completed by the January 31, 2013 survey. From that date on, settlement maps have been prepared on a monthly basis and the settlement front identified as the location of the boundary between areas settling faster and slower than the aforementioned rate. The demarcation has been seen to be useful in tracking the expansion of the reaction-affected areas, that is, expansion of elevated temperature into areas previously not warmed to above 220 °F.

The correlation between the settlement front and temperature is apparent in Figure E-7 and E-8. It does not appear that there is any significant time lag between the onset of maximum TMP temperatures of 220 °F and settlement rate increase above the threshold of 0.04 to 0.045 ft per day, or an equivalent rate at TMP 9 corrected for depth, as described in Section 3.1.1. In addition, while the data correlating the settlement rate to a TMP maximum temperatures is limited to the three points where the settlement front has encountered a TMP, it is consistent at all three. At the same

time the TMPs not indicating temperatures above 220 °F have not experienced high settlement rates since the use of the more accurate grid survey, which is further support for the correlation at all TMP locations.

At the present time there are 14 TMPs, of which only three have reached a maximum temperature of 220 °F. The remaining 11 TMPS are between the North Quarry and the area that has reached temperatures of 220 °F. The relationship between settlement rate and TMP maximum temperature will, if the reaction continues to progress to the north, be able to be tested and refined as needed. The relationship can continued to be tested as a timely indicator of the reaction by the insertion of TMPs in the apparent path of the progress of the reaction as appropriate based upon progression.

4 CONCLUSIONS

4.1 DETERMINATION OF THE LOCATION OF THE REACTION FRONT

The measurements that best indicate the zone of the reaction front are those measurements of temperature from the TMPs considered together with the monitoring of surface settlement. Together, identifying the rate of surface settlement relative to TMPs which have reached 220 degrees Fahrenheit, we can best identify the location of the reaction front. The current data available identifies the settlement rate for areas that are full depth of the quarry, as an elevation drop of approximately -0.45 ft per day or -1.35 ft per 30 day period. If the reaction moves into areas with waste thicknesses that are significantly less than the current 220 to 260 feet, the value should be adjusted downward to reflect the portion of the waste mass between 50 and 150 feet that is less than 60 feet above the quarry floor. These above measures are useful in identify advancing fronts and so have been proposed for the purpose of developing trigger lines for contingent future actions on site. However it should be noted that these are not relevant for identifying retreating fronts, because the heat stays in the waste long after the elevated temperatures are reached.

Following review of the extensive data available from gas wells, it appears these values are highly variable and should be considered useful as general temporal indicators. As an indicator parameter, the gas well data can be evaluated in conjunction with other relevant data. The best gas well indicators appear to be CO and wellhead temperatures. It would appear that CO values of above 4000 ppm and gas wellhead temperatures higher than 175 degrees Fahrenheit are likely good indicators that wells are within or proximate (within 50 feet of) the heat front.

Other data can be used as indications of trends, such as rising hydrogen concentrations or falling methane concentrations, but the data does not support any specific values that would be useful as a trigger mechanism.

In conclusion, the extensive data collected at Bridgeton Landfill throughout the progression of the SSE has allowed for a site-specific detailed evaluation of predictive, responsive, and trend reflecting conditions related to the SSE. Based upon this evaluation, a firm basis has been established for the selection of trigger points for identification of the location and movement of the SSE, as well as information for the assessment of general trends within the waste mass.

4.2 Areas Not Involved in the Reaction Front or Proximate to the Front

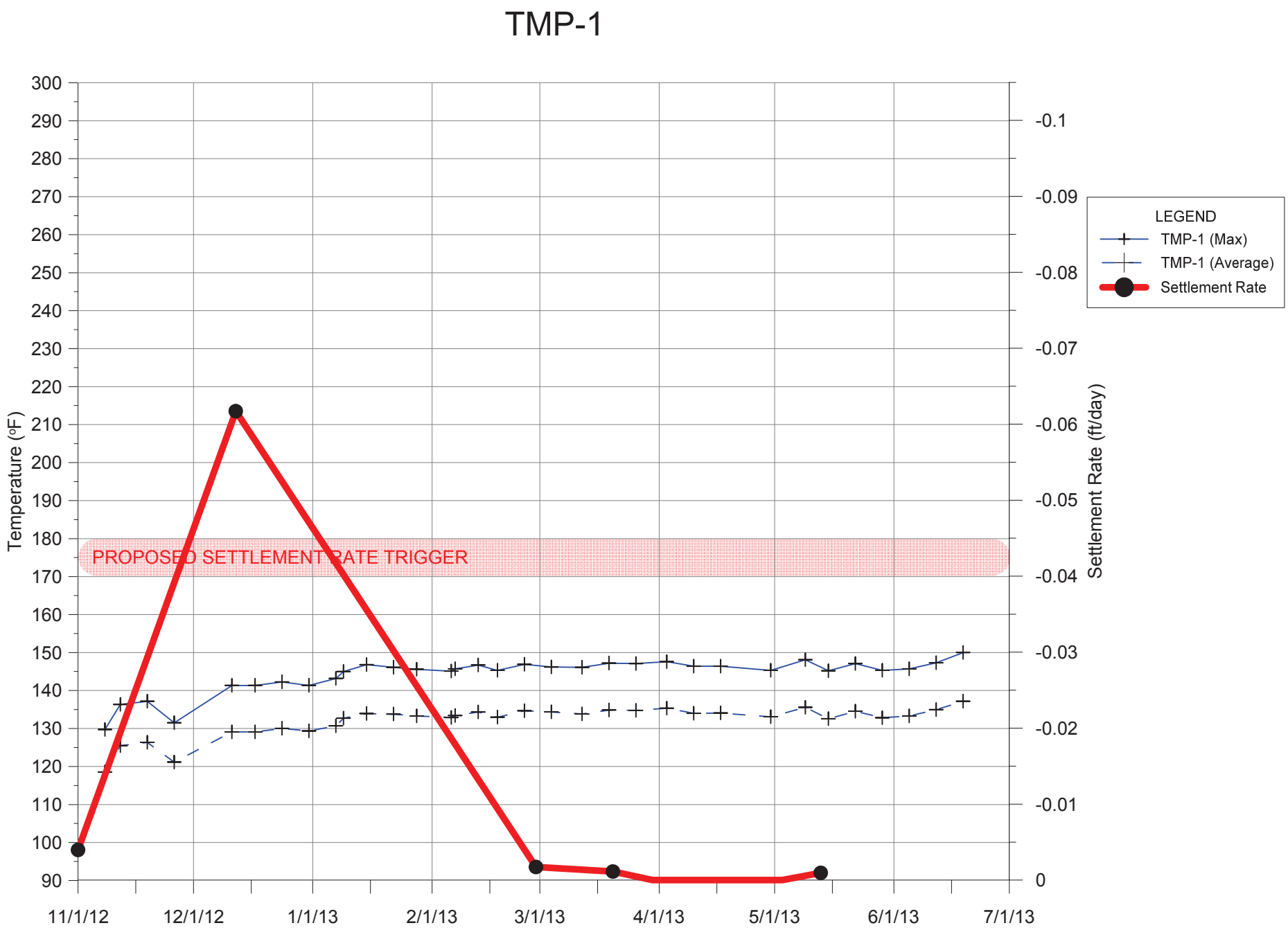
Analysis of the available data suggests that gas well CO levels under 1600 and wellhead temperatures of under 135 are indicative of the conditions at the site that are far removed from the areas that have been heated to 220 °F. If isolated wells are higher than these values they should be monitored for trends. If they are within 200 feet or less of the settlement front, then exceeding these values can be expected.

GAS WELL LOCATION in or PROXIMATE to SETTLEMENT FRONTS

	September 2012	March 2013	May 2013	February 2013	July 2012	October 2012	February 2013	April	April	November 2012	March	February 2013	March
Name	within 25 ft	inside front	inside front	within 25 ft	within 25 ft	within 25 ft	inside front	inside front, plus 50 ft	inside front	inside front	between front and 25 ft	between 25 and 50 ft of front	between 25 and 50 ft of front
Name	September 2012 - within 25 ft	March 2013 - inside front	May 2013 - inside front	February 2013 - within 25 ft	July 2012 - within 25 ft	October 2012 - within 25 ft	February 2013 - inside front	April - inside front, plus 50 ft	April - inside front	November 2012 - inside front	March - between front and 25 ft	February 2013 - between 25 and 50	March - between 25 and 50 ft of front
GEW-104				X				X	X		X	X	
GEW-12a	X					X	X			X			
GEW-15								X					X
GEW-31R					X	X							
GEW-32R					X	X	X	X		X			
GEW-33R				X		X	X	X		X	X	X	
GEW-36								X			X		
GEW-37								X			X		
GEW-38								X					
GEW-57B	X	X		X	X	X	X	X	X	X			
GEW-57R	X	X		X	X	X	X	X	X	X			
GEW-58	X	X	X	X	X	X	X	X	X	X		X	
GEW-59R	X	X	X		X	X	X	X	X	X			
GEW-60R	X			X	X	X	X	X		X			X
GEW-61R	X	X			X	X	X	X	X	X			
GEW-62R	X				X	X	X	X		X	X		
GEW-64				X	X	X		X	X		X		
GEW-65A	X	X		X	X	X	X	X	X	X		X	
GEW-66	X	X			X	X	X	X	X	X			
GEW-67	X	X			X	X	X	X		X		X	
GEW-68								X					
GEW-69R		X					X	X	X				
GEW-70R	X	X				X	X	X	X	X			
GEW-71	X	X				X	X	X	X	X			
GEW-72R		X					X	X					
GEW-74	X	X				X	X	X	X				
GEW-75	X	X				X	X	X	X	X			
GEW-76R		X					X	X	X				
GEW-79R		X					X	X	X				
GEW-82R				X				X	X		X		
GEW-83	X	X			X	X	X	X	X	X			
GEW-84	X	X				X	X	X	X	X			
GEW-85	X	X		X	X	X	X	X	X	X			
GEW-90	X	X	X			X	X	X	X	X			
GIW-5								X				X	X
GIW-6								X					
GIW-7								X					
GIW-8								X					
GIW-9								X					
HT-1	X				X	X	X	X		X	X		
TMP-15		X	X			X	X	X	X				
TMP-7R								X					
TMP-8		X	X				X	X	X				

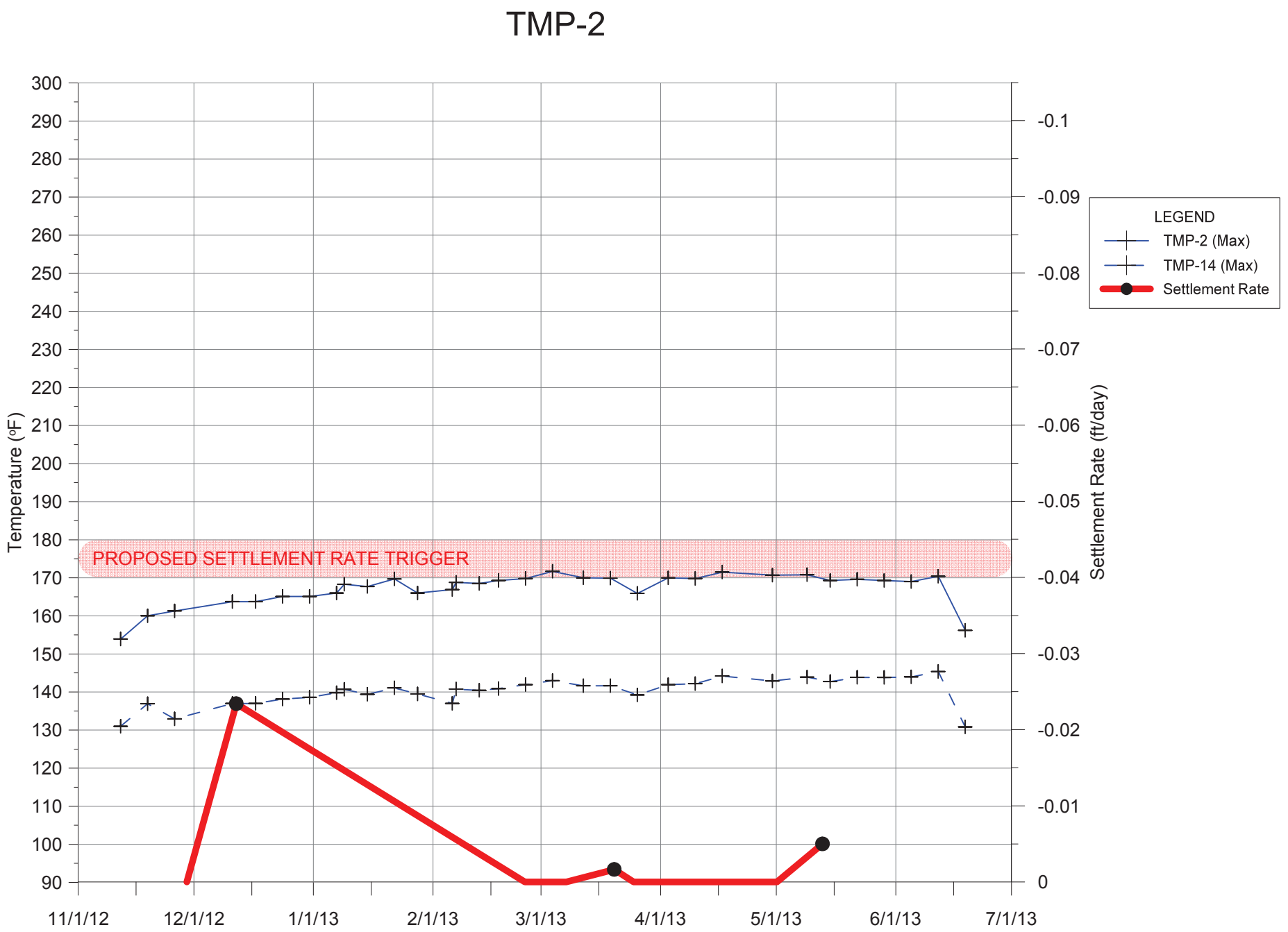
TABLE E-1

FIGURES



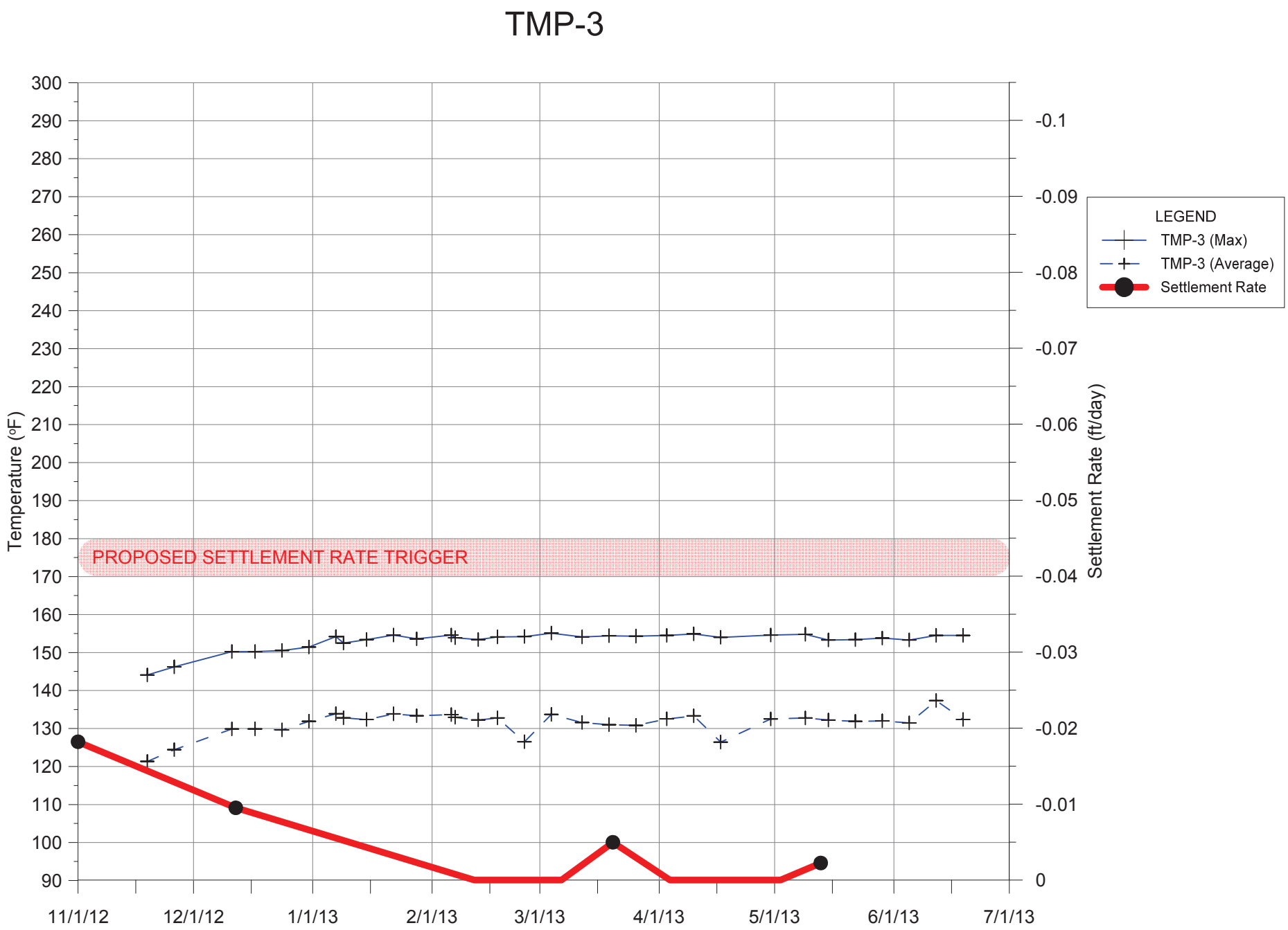
TMP TEMPERATURE AND
SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-1



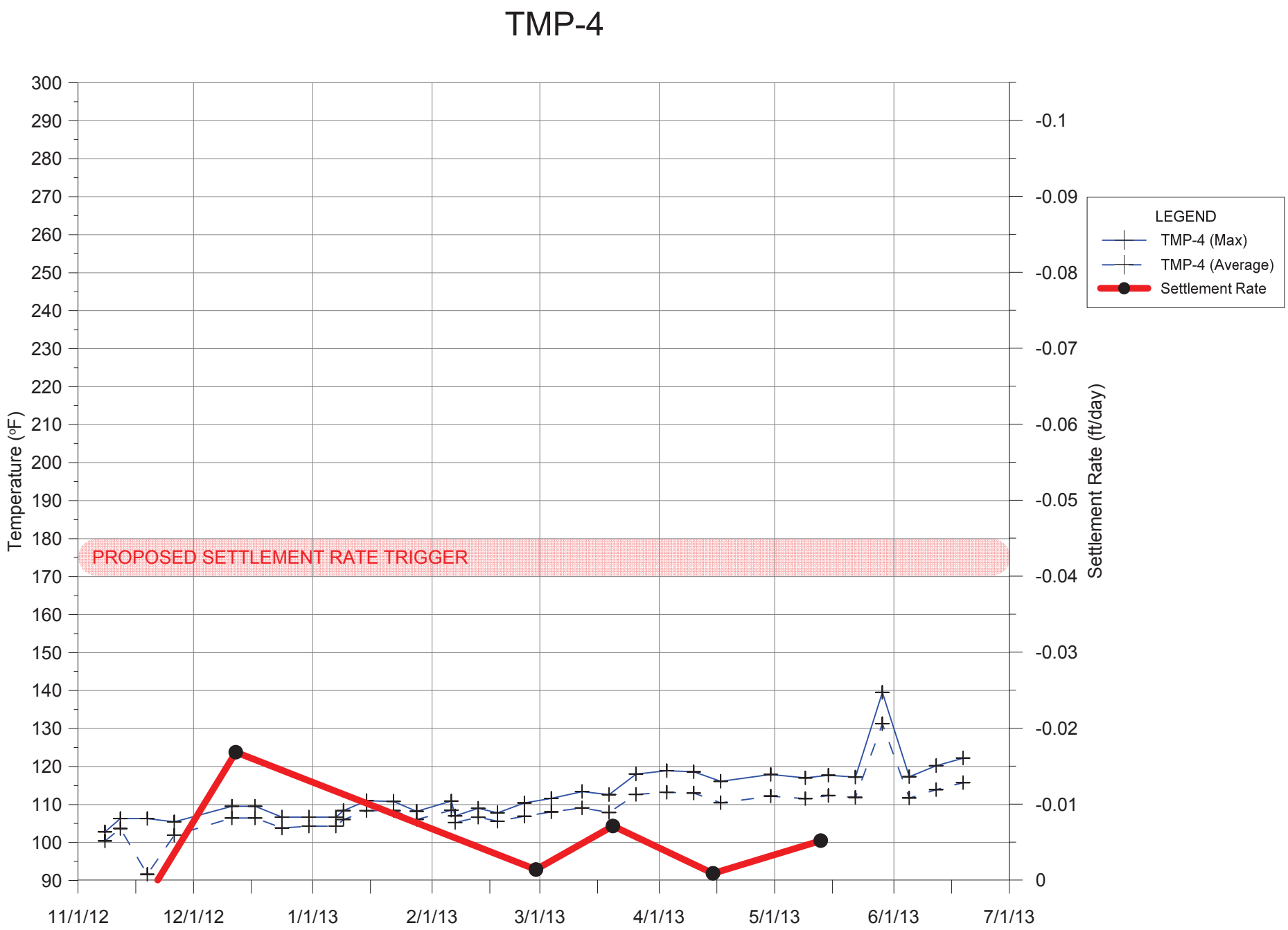
TMP TEMPERATURE AND
SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-2



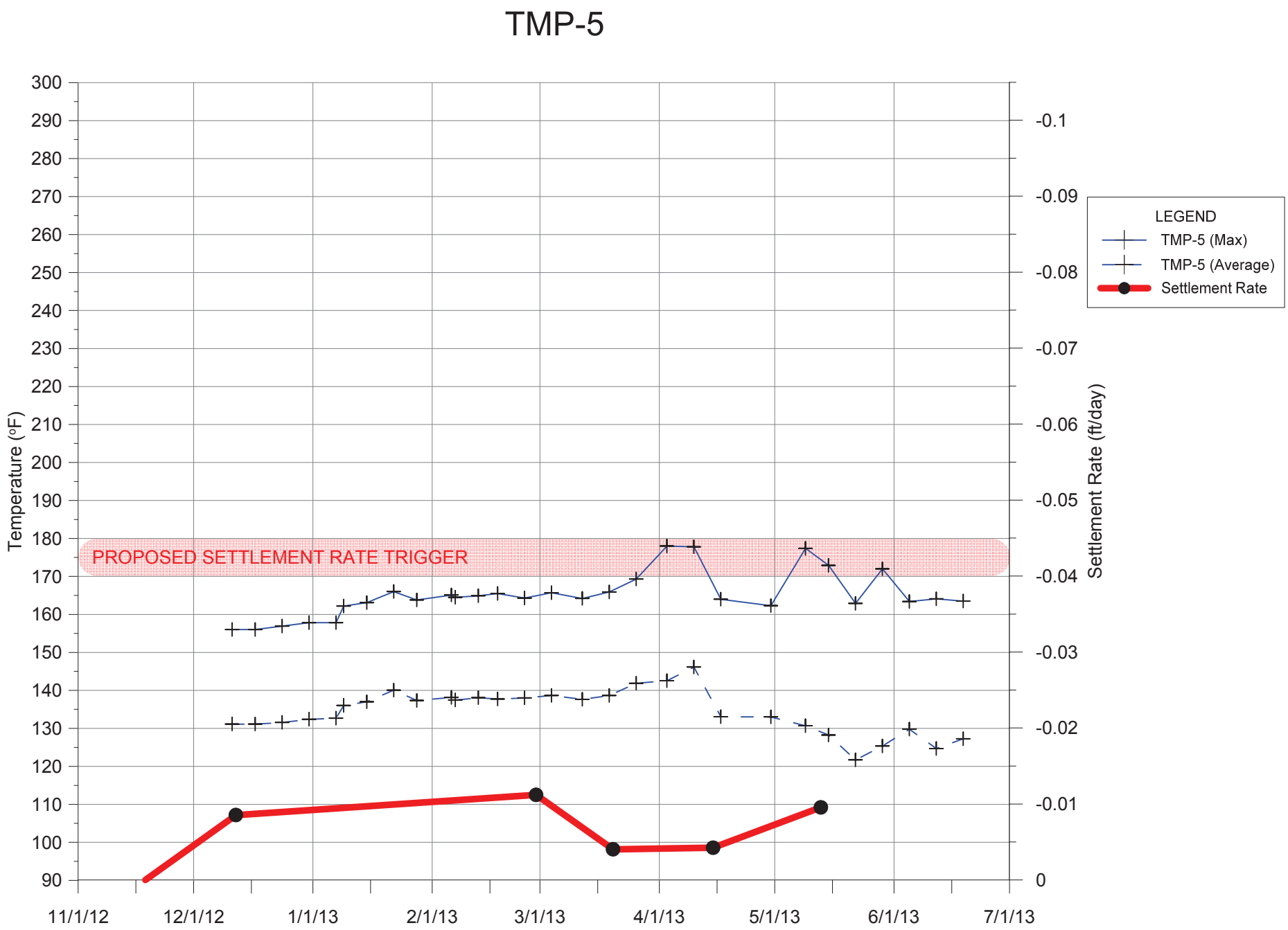
TMP TEMPERATURE AND
SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-3



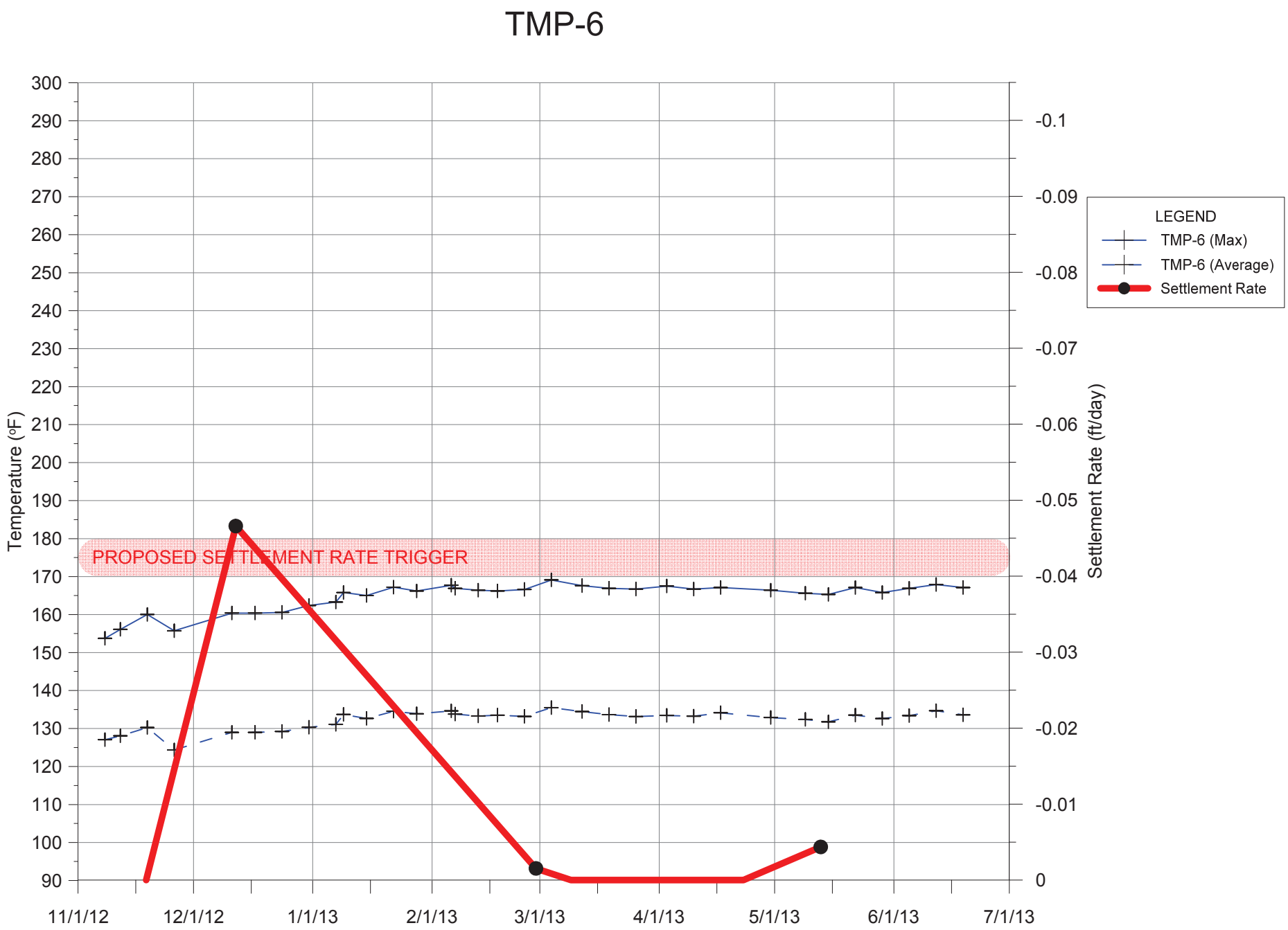
TMP TEMPERATURE AND
SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-4



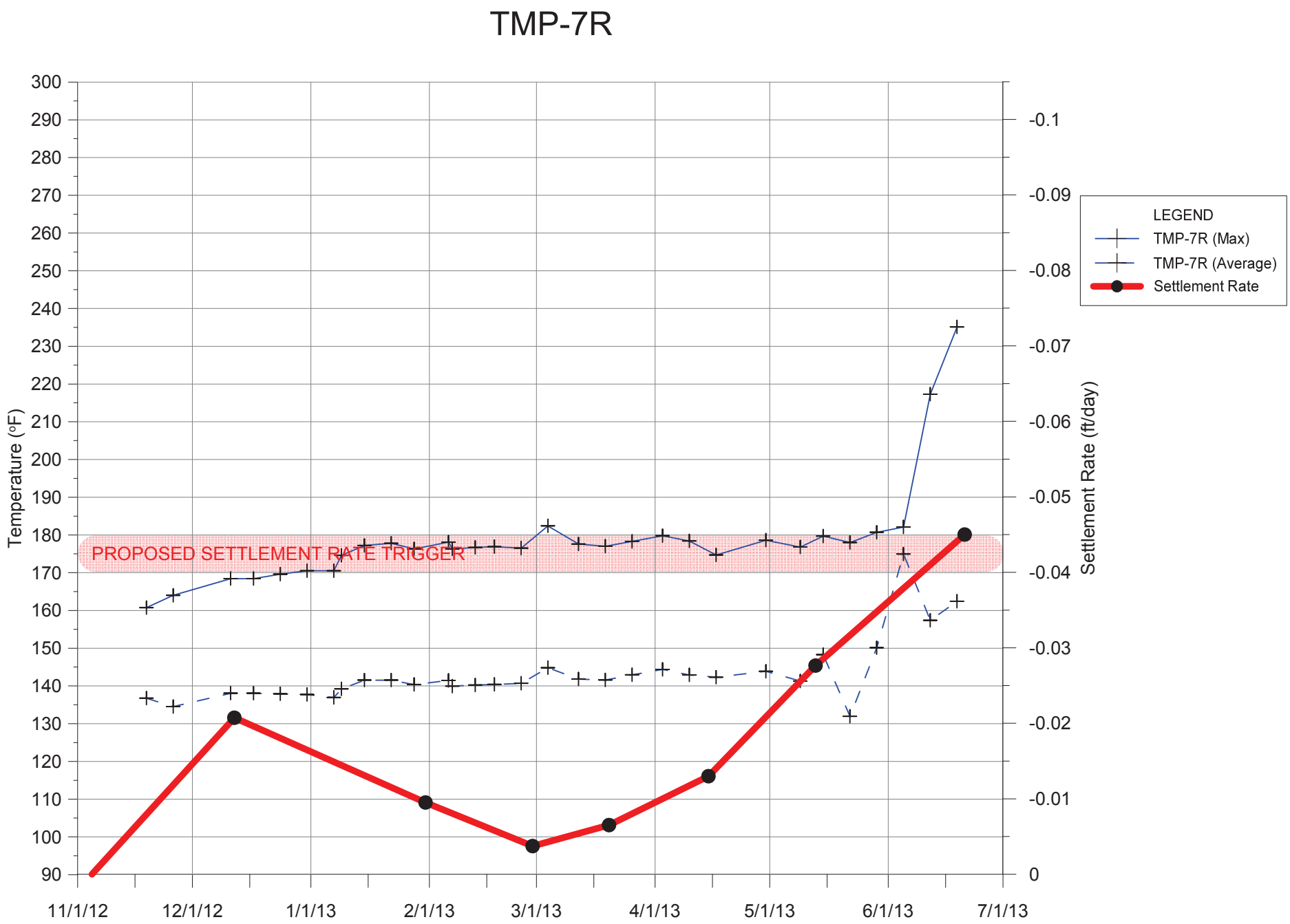
TMP TEMPERATURE AND
SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-5



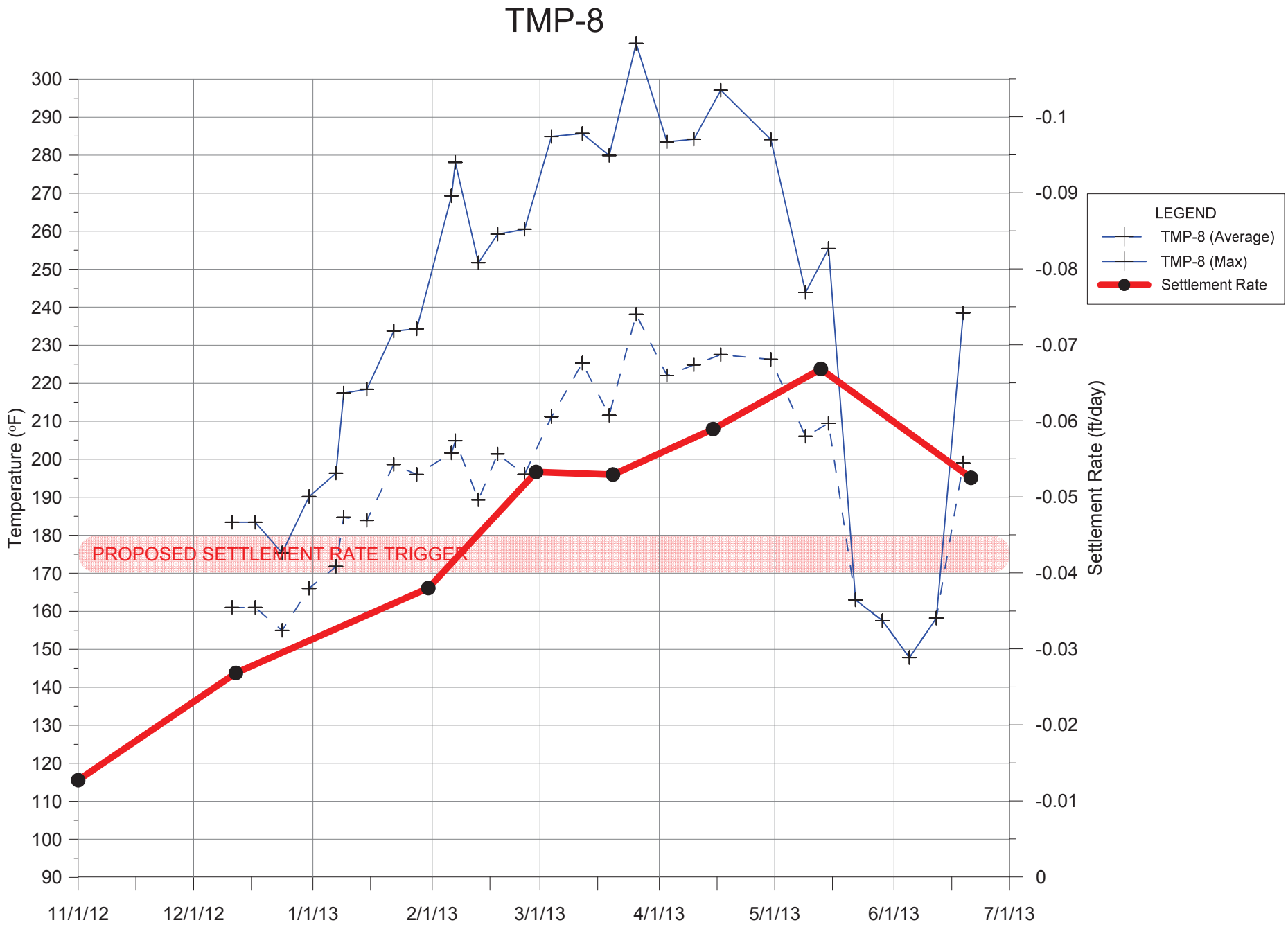
TMP TEMPERATURE AND
SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-6



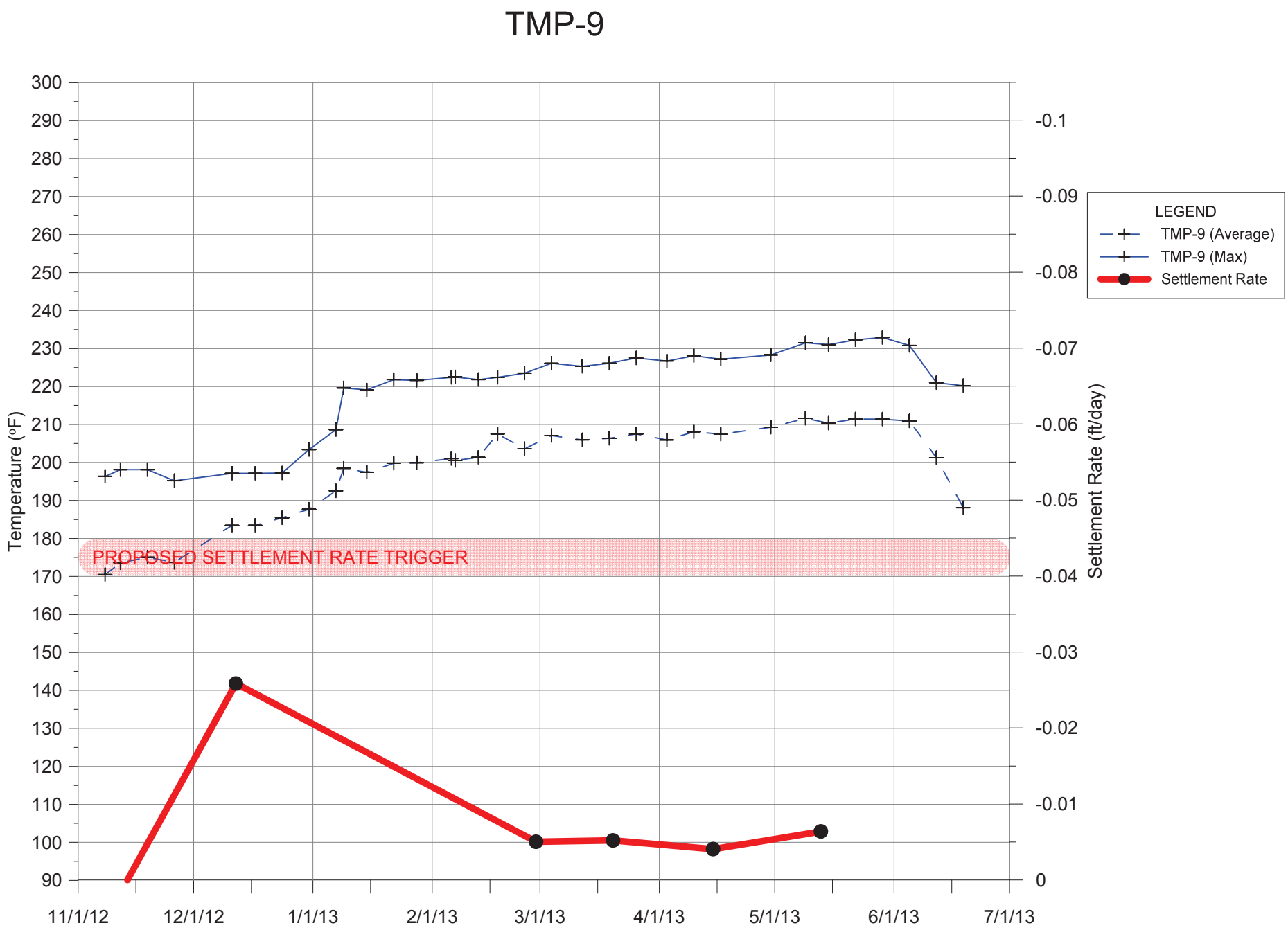
TMP TEMPERATURE AND
SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-7



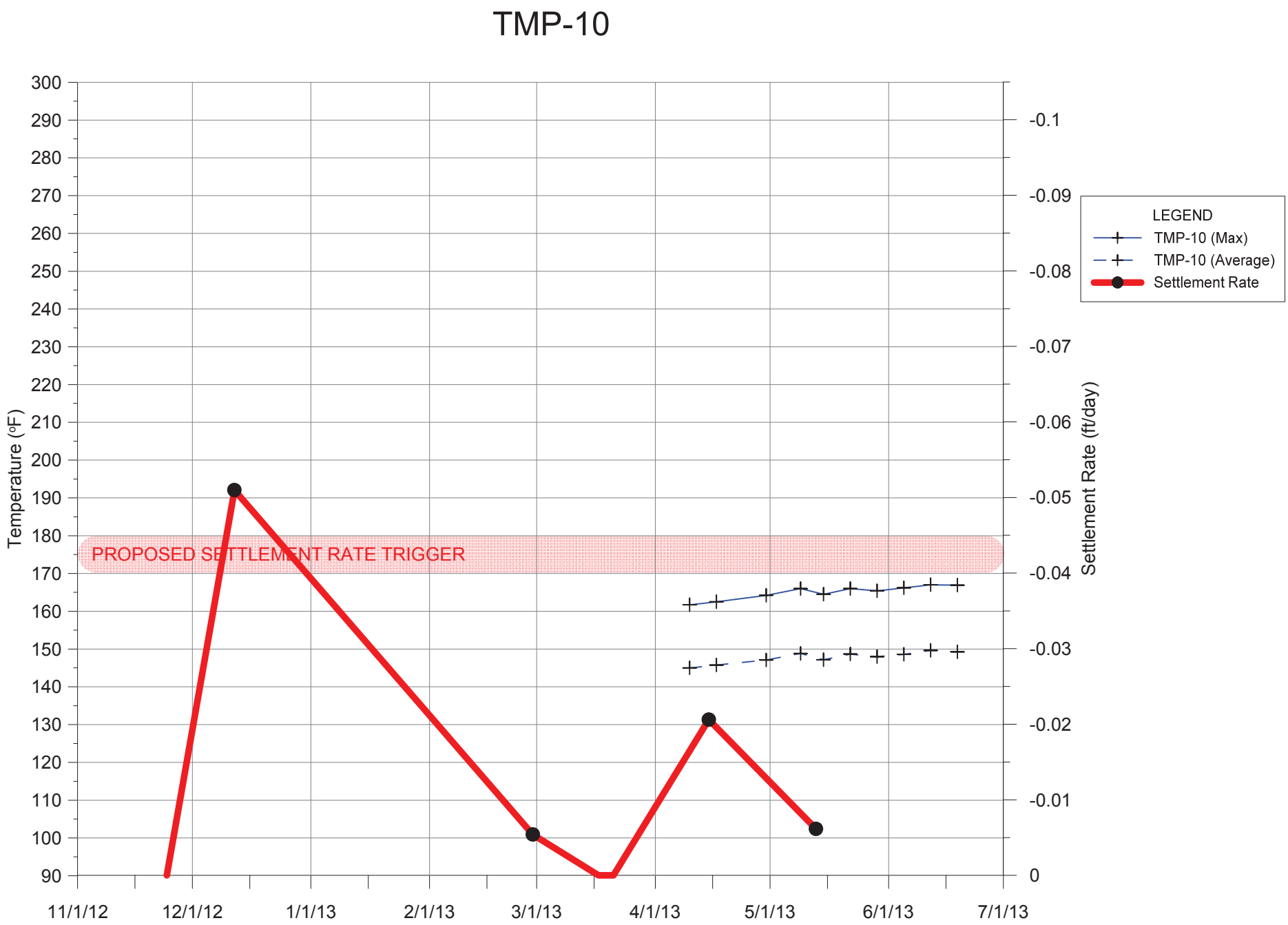
TMP TEMPERATURE AND
SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-8



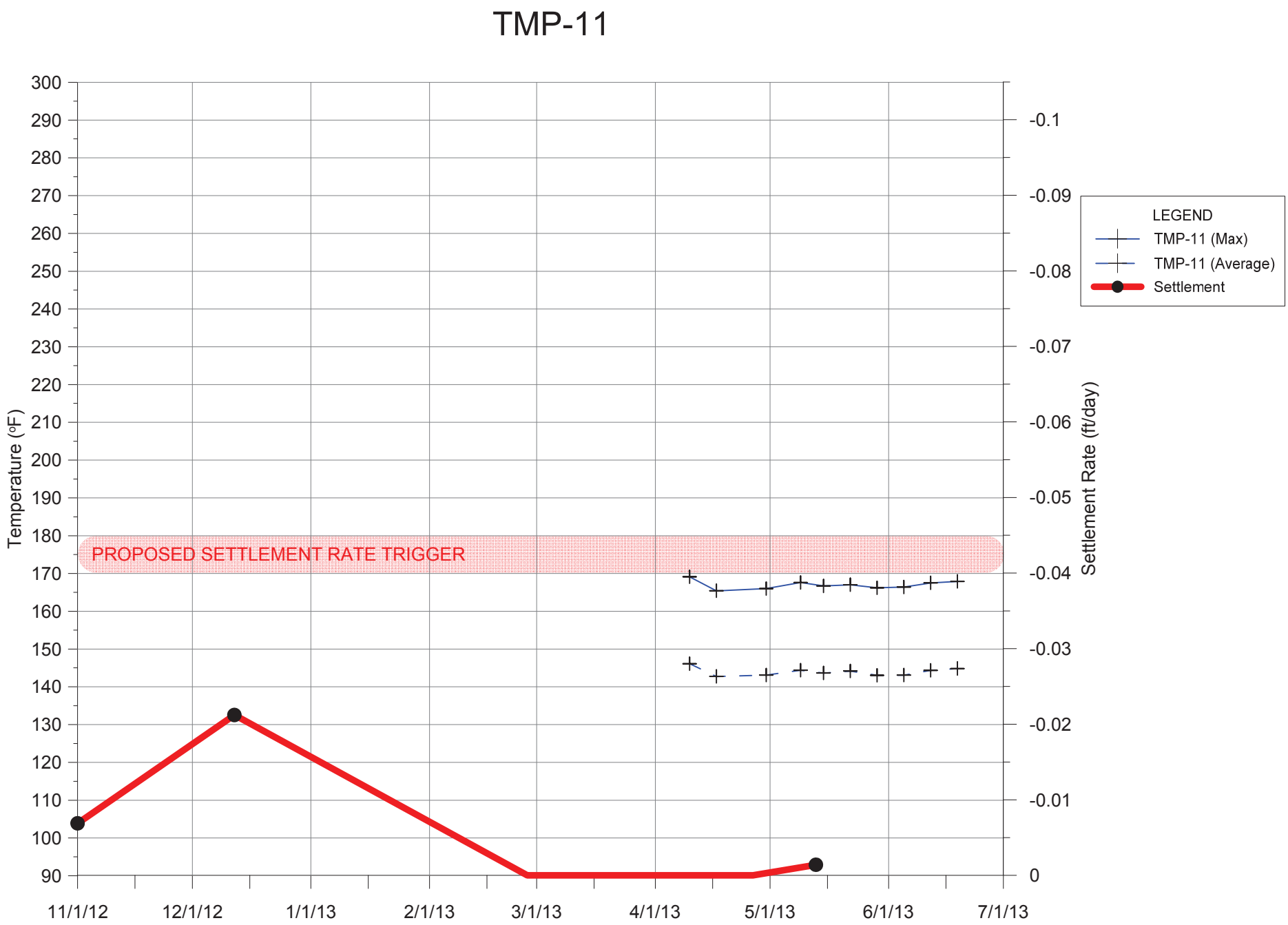
TMP TEMPERATURE AND
SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-9



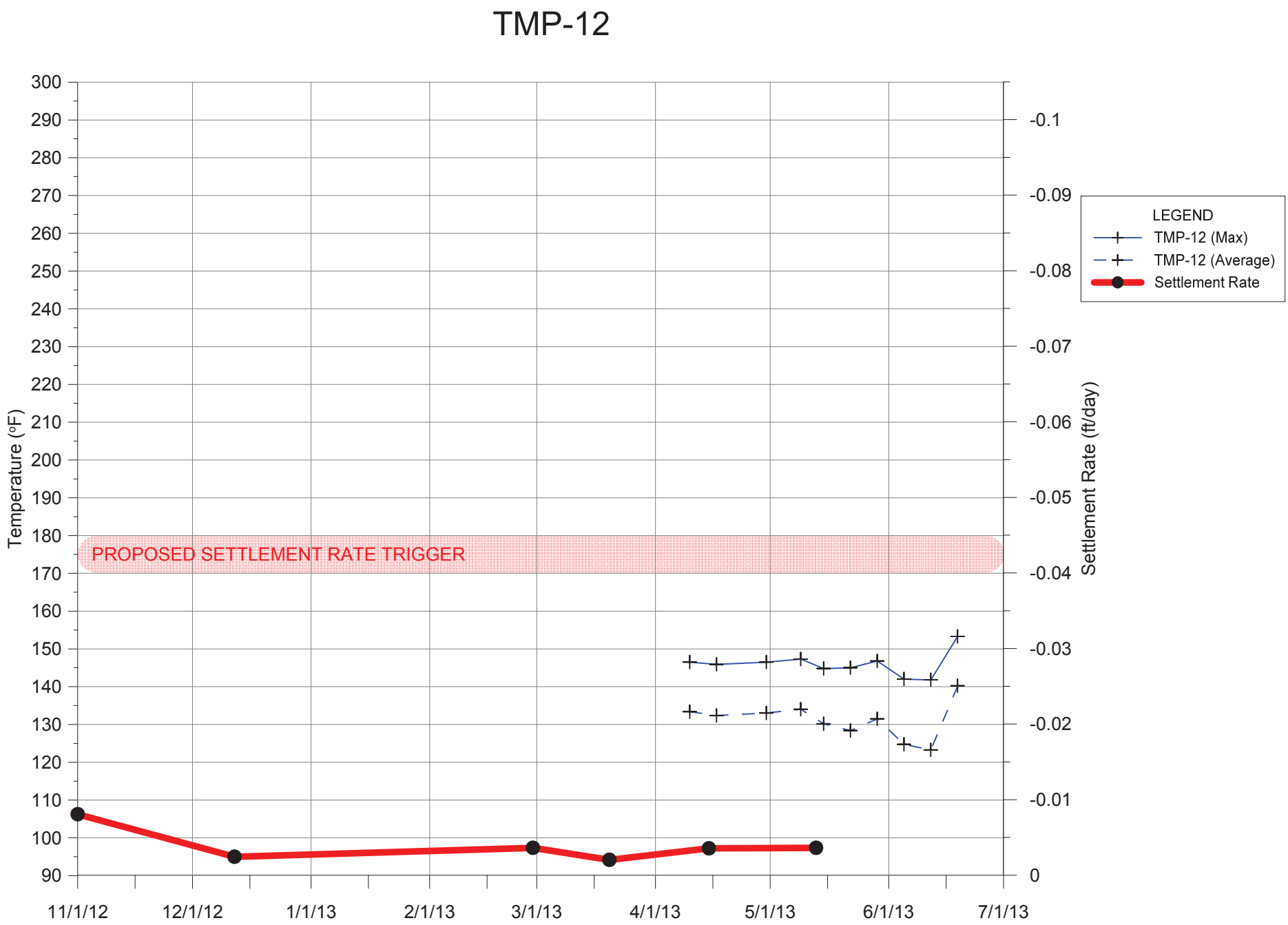
TMP TEMPERATURE AND
SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-10



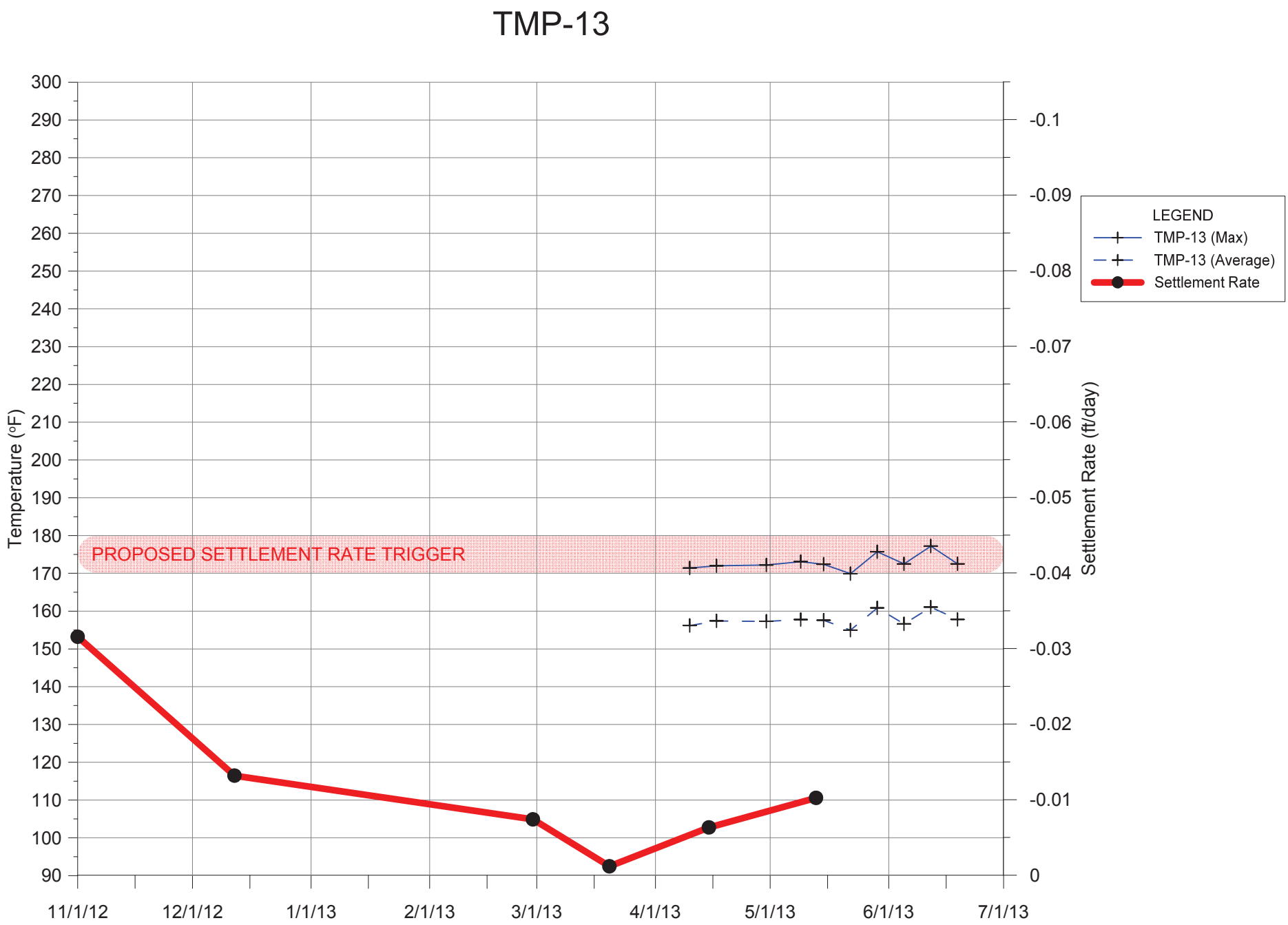
TMP TEMPERATURE AND
SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-11



TMP TEMPERATURE AND
SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-12



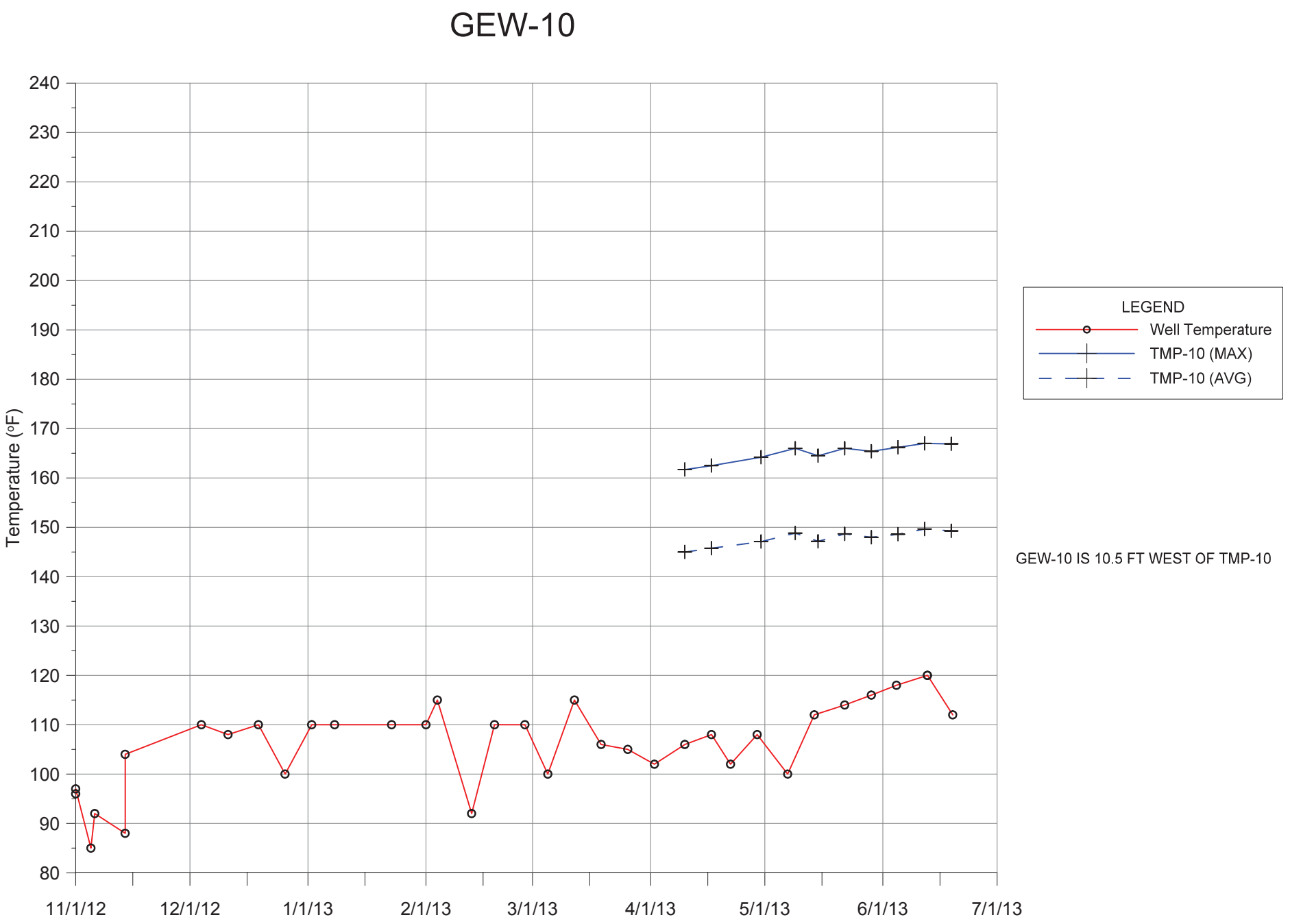
TMP TEMPERATURE AND
SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-13

TMP-14

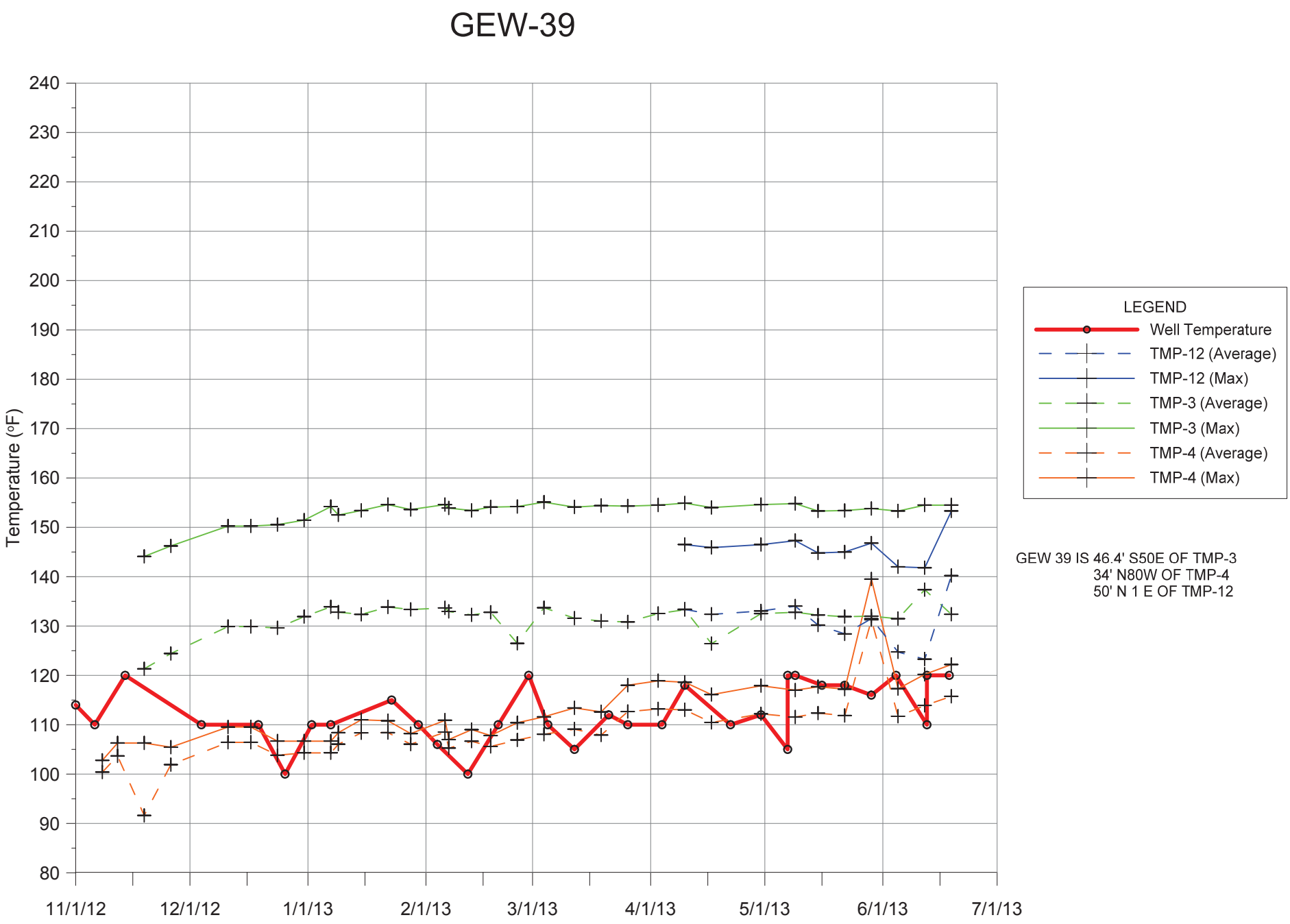
TMP TEMPERATURE AND
SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-14



TEMPERATURE COMPARISON
BRIDGETON LANDFILL

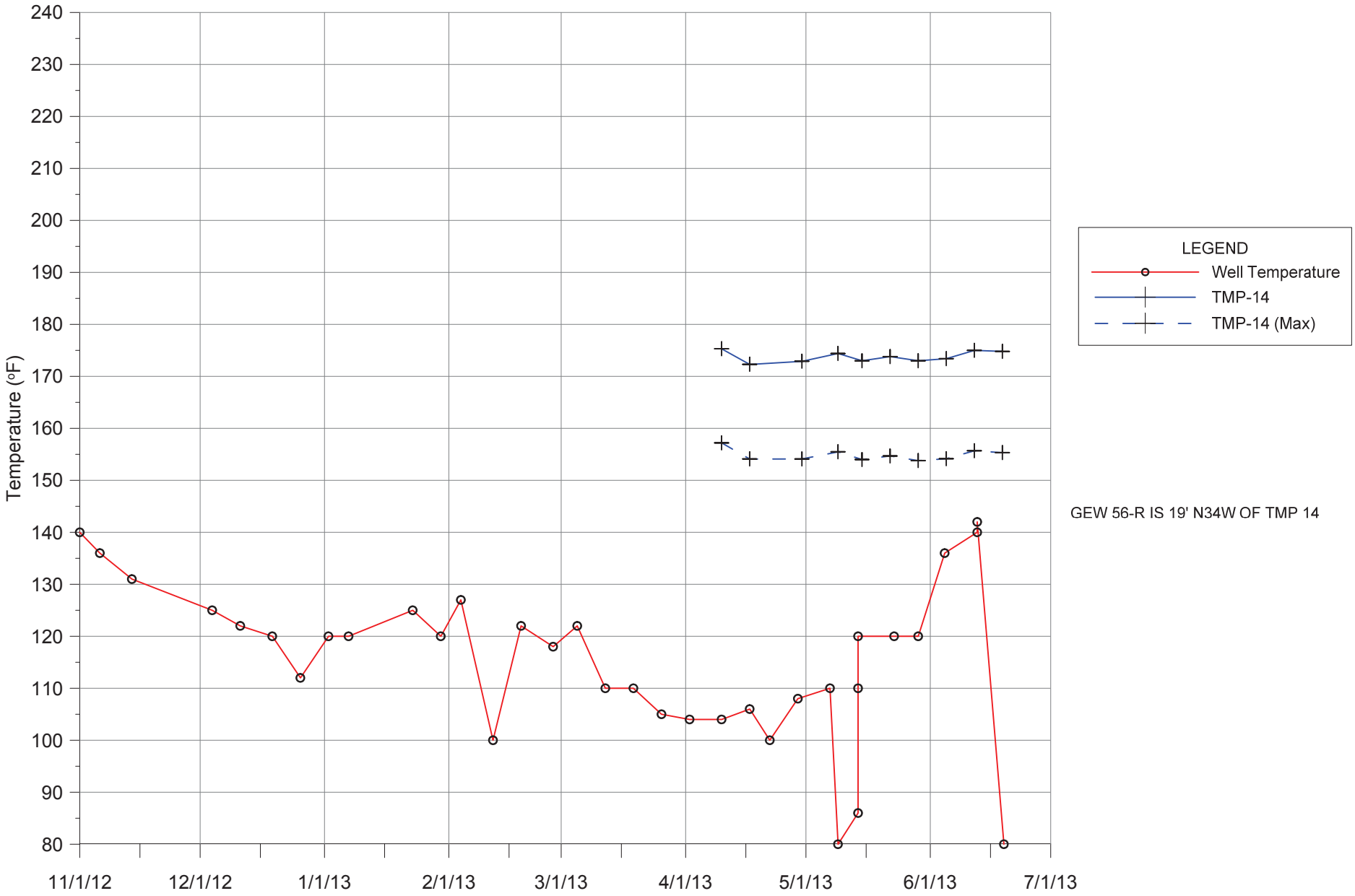
FIGURE E-15



TEMPERATURE COMPARISON
BRIDGETON LANDFILL

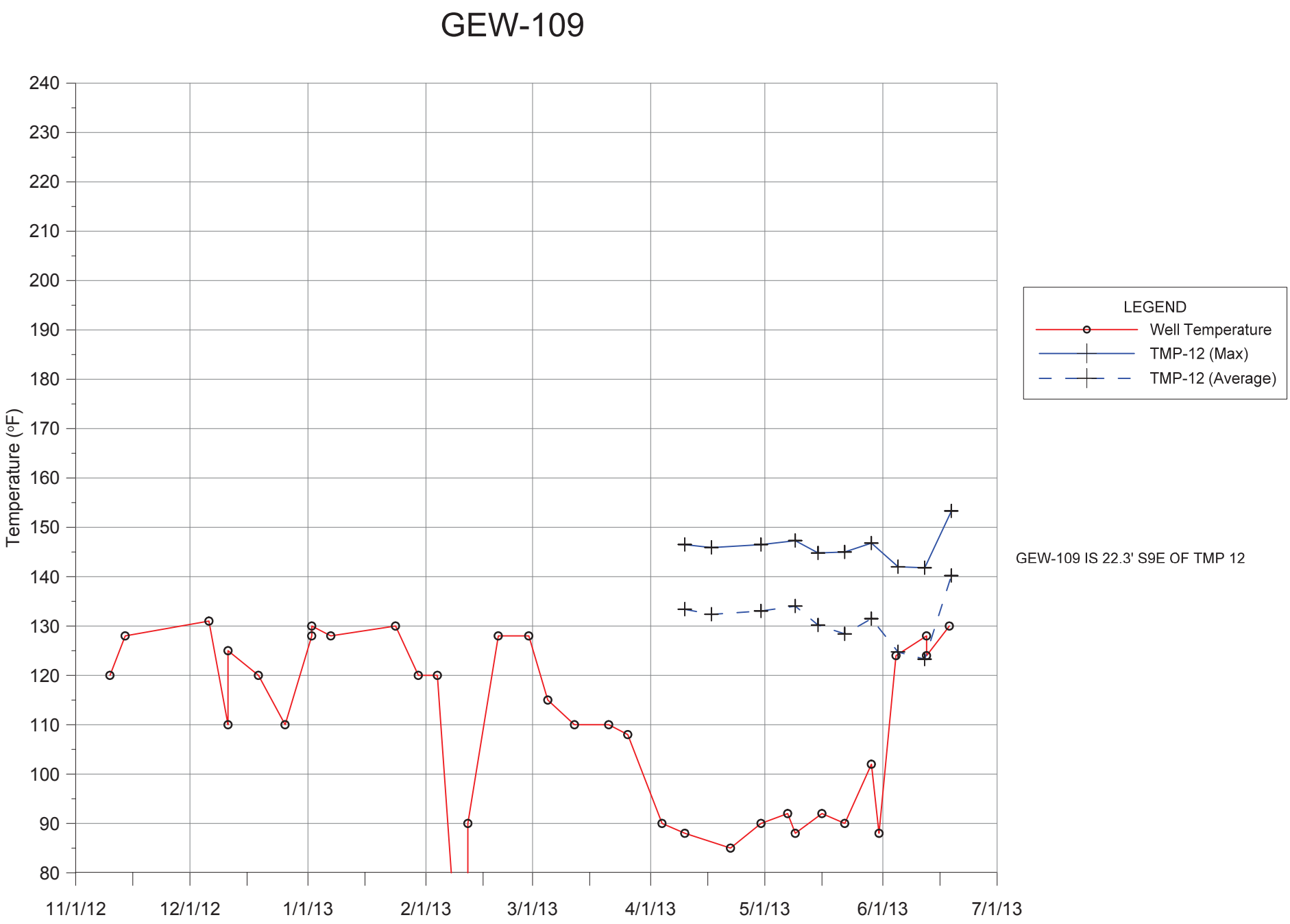
FIGURE E-16

GEW-56R



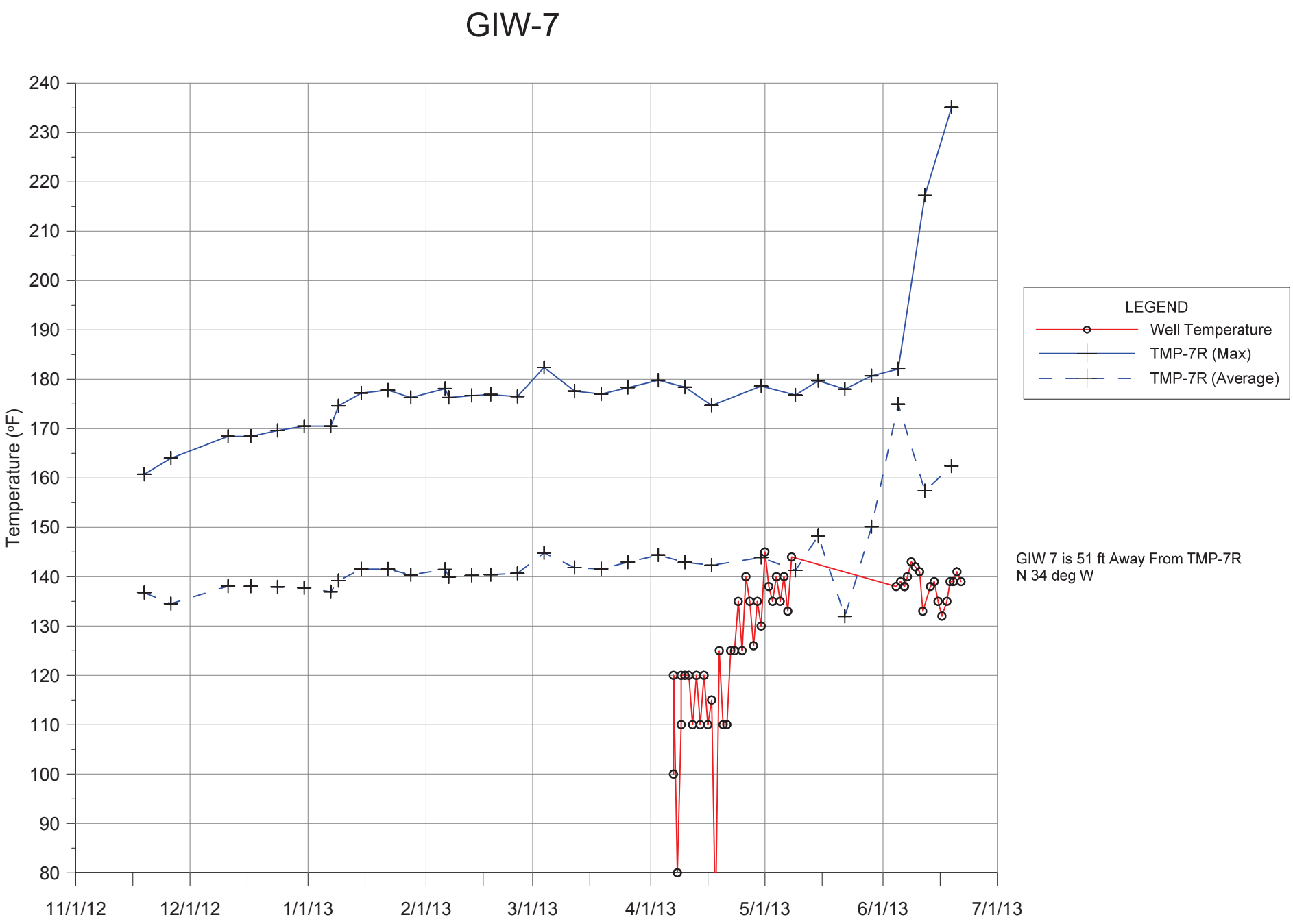
TEMPERATURE COMPARISON
BRIDGETON LANDFILL

FIGURE E-17



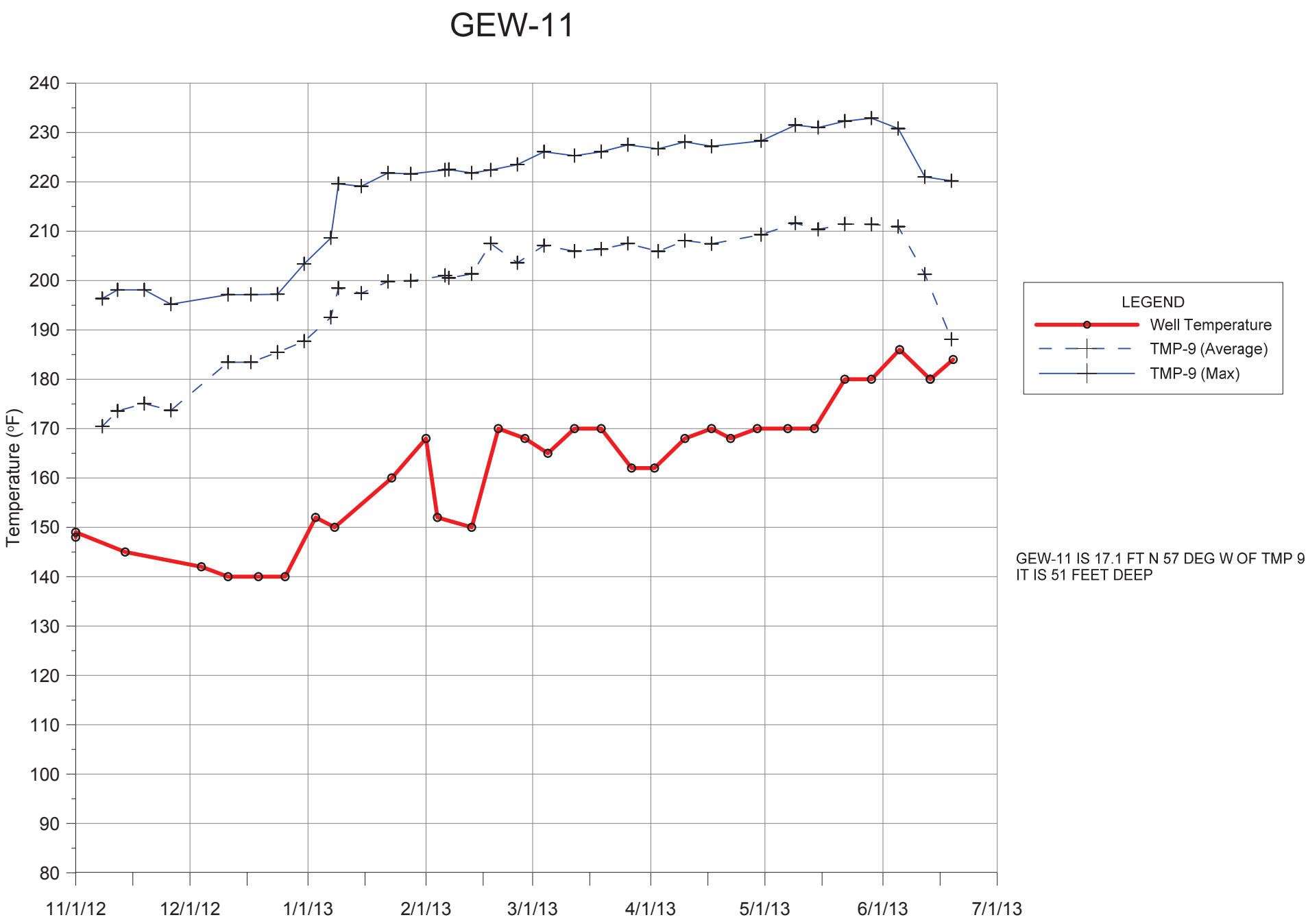
TEMPERATURE COMPARISON
BRIDGETON LANDFILL

FIGURE E-18



TEMPERATURE COMPARISON
BRIDGETON LANDFILL

FIGURE E-19



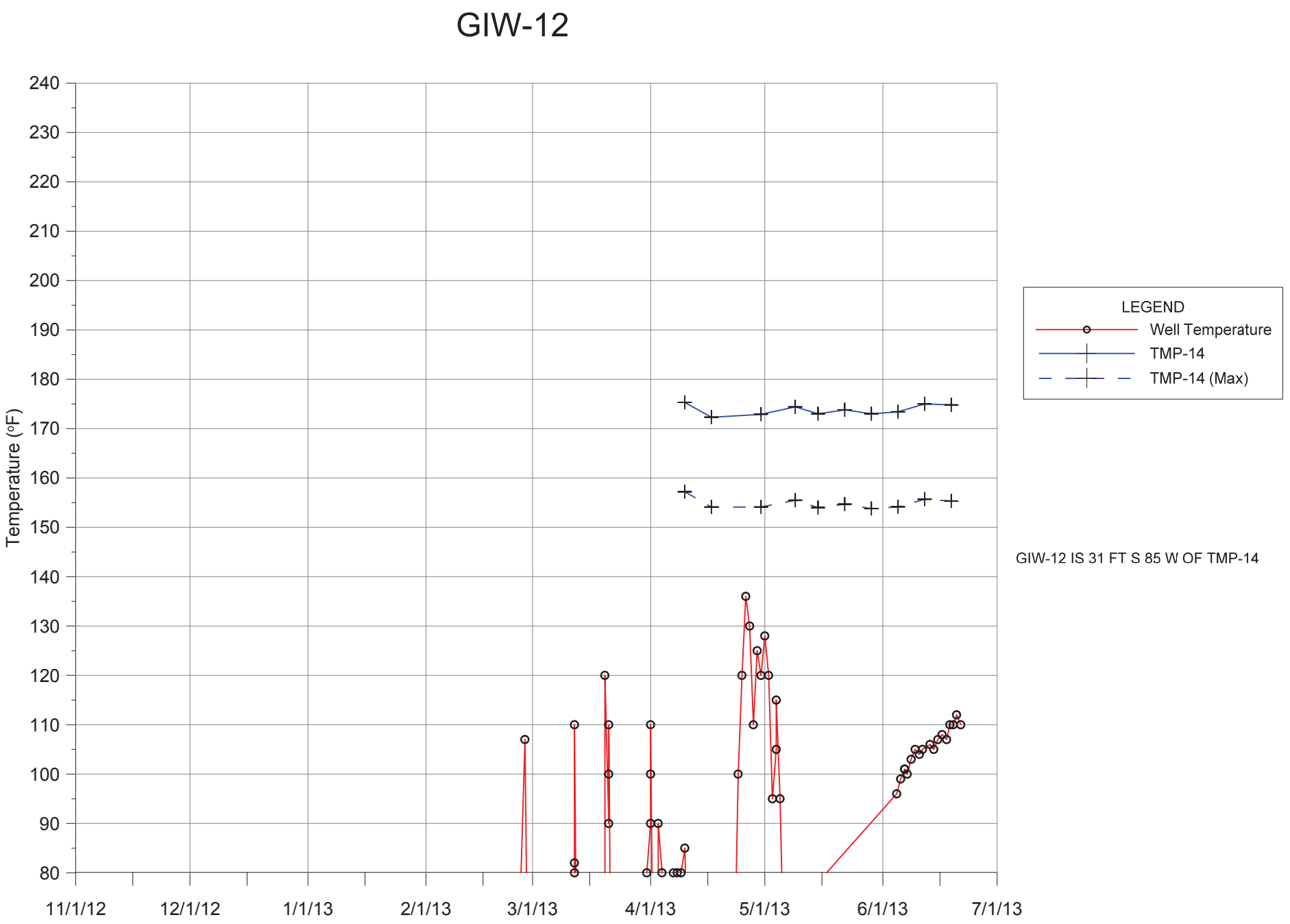
TEMPERATURE COMPARISON
BRIDGETON LANDFILL

FIGURE E-20

GIW-11

TEMPERATURE COMPARISON
BRIDGETON LANDFILL

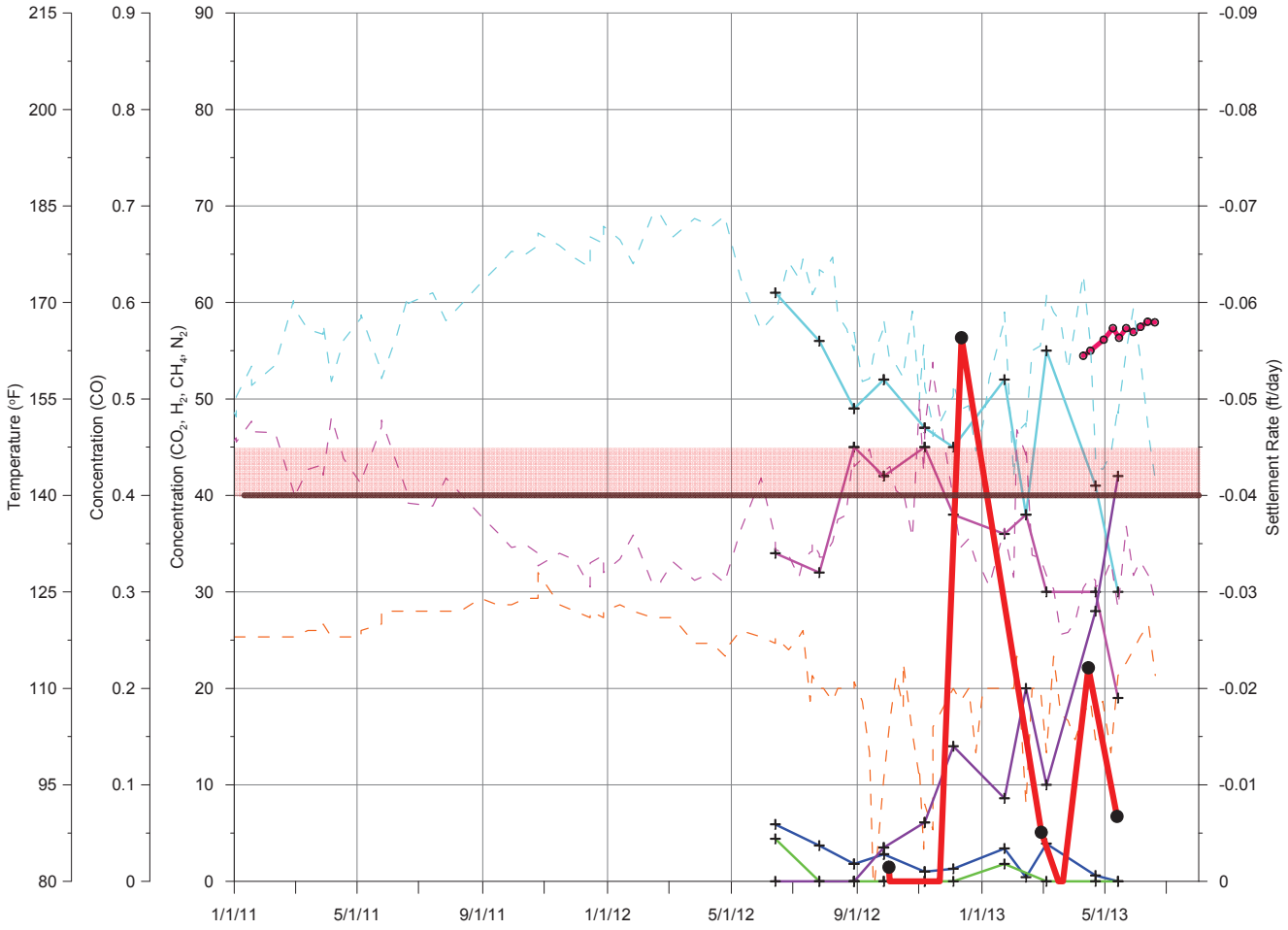
FIGURE E-21



TEMPERATURE COMPARISON
BRIDGETON LANDFILL

FIGURE E-22

GEW-10



PROPOSED TRIGGER LEGEND

- CO
- Settlement Rate

LEGEND

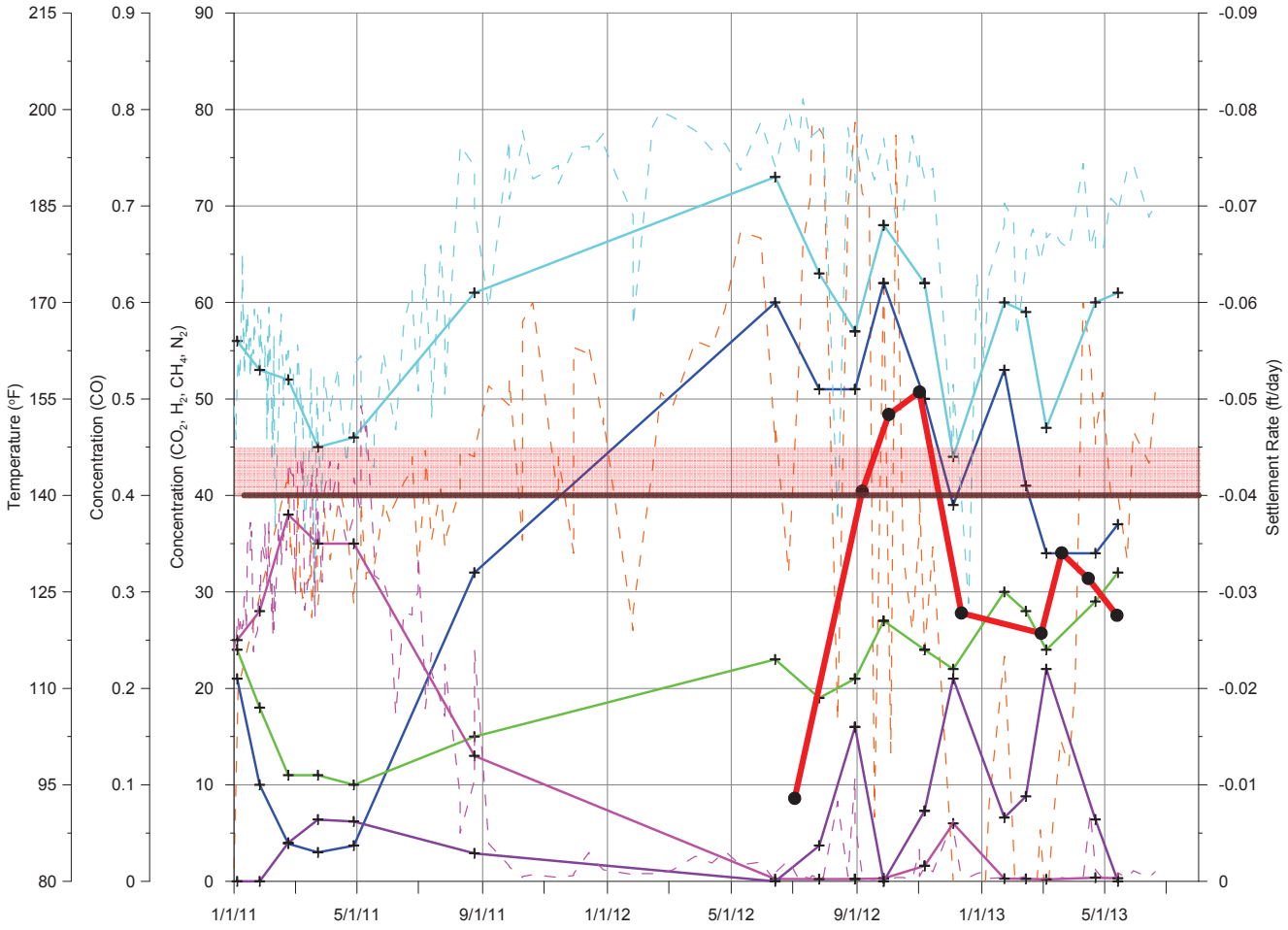
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- TMP-10
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-23

GEW-12A



PROPOSED TRIGGER LEGEND

- CO
- Settlement Rate

LEGEND

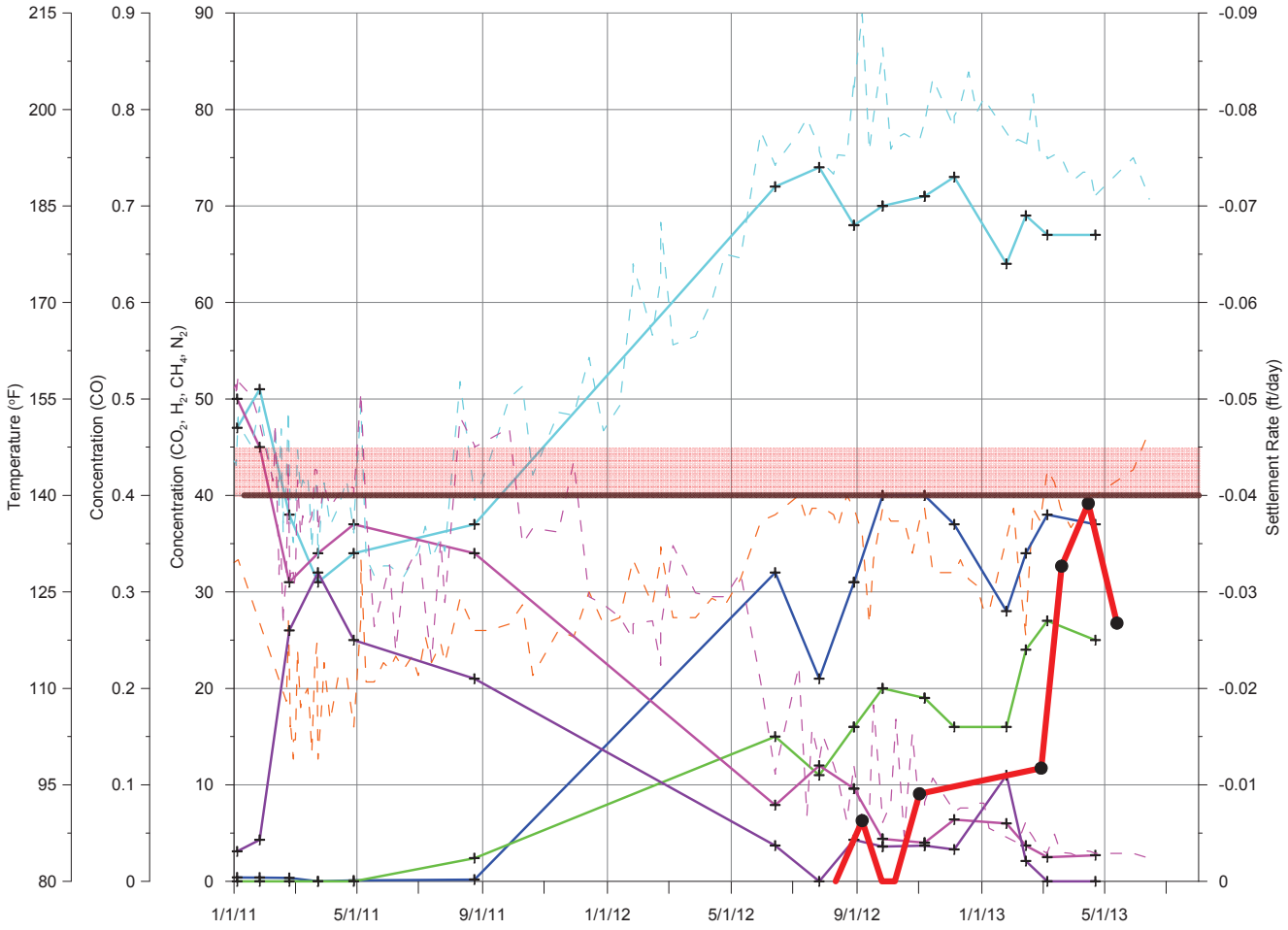
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-24

GEW-15



PROPOSED TRIGGER LEGEND

- CO
- Settlement Rate

LEGEND

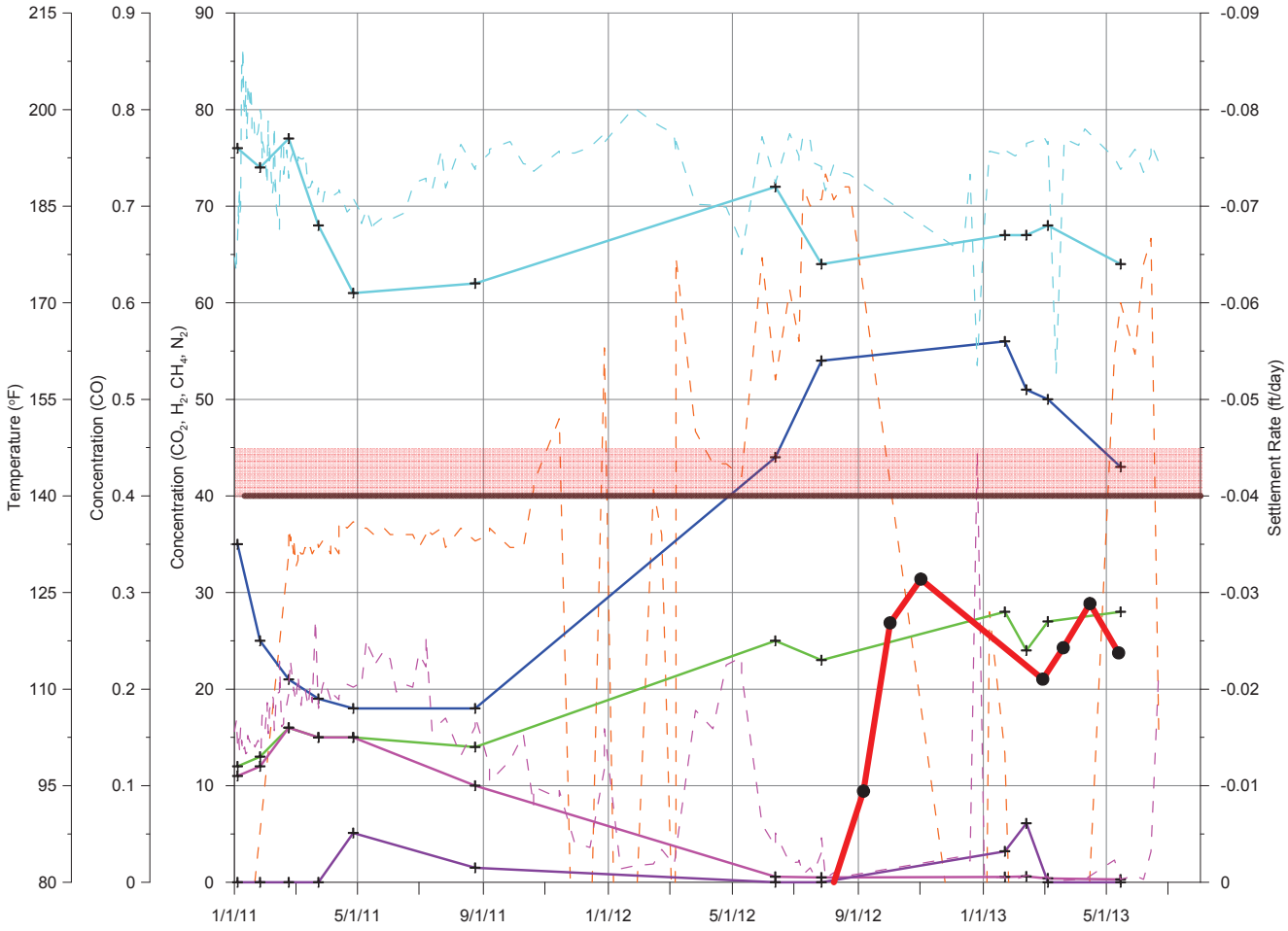
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-25

GEW-31R



PROPOSED TRIGGER LEGEND

- CO
- Settlement Rate

LEGEND

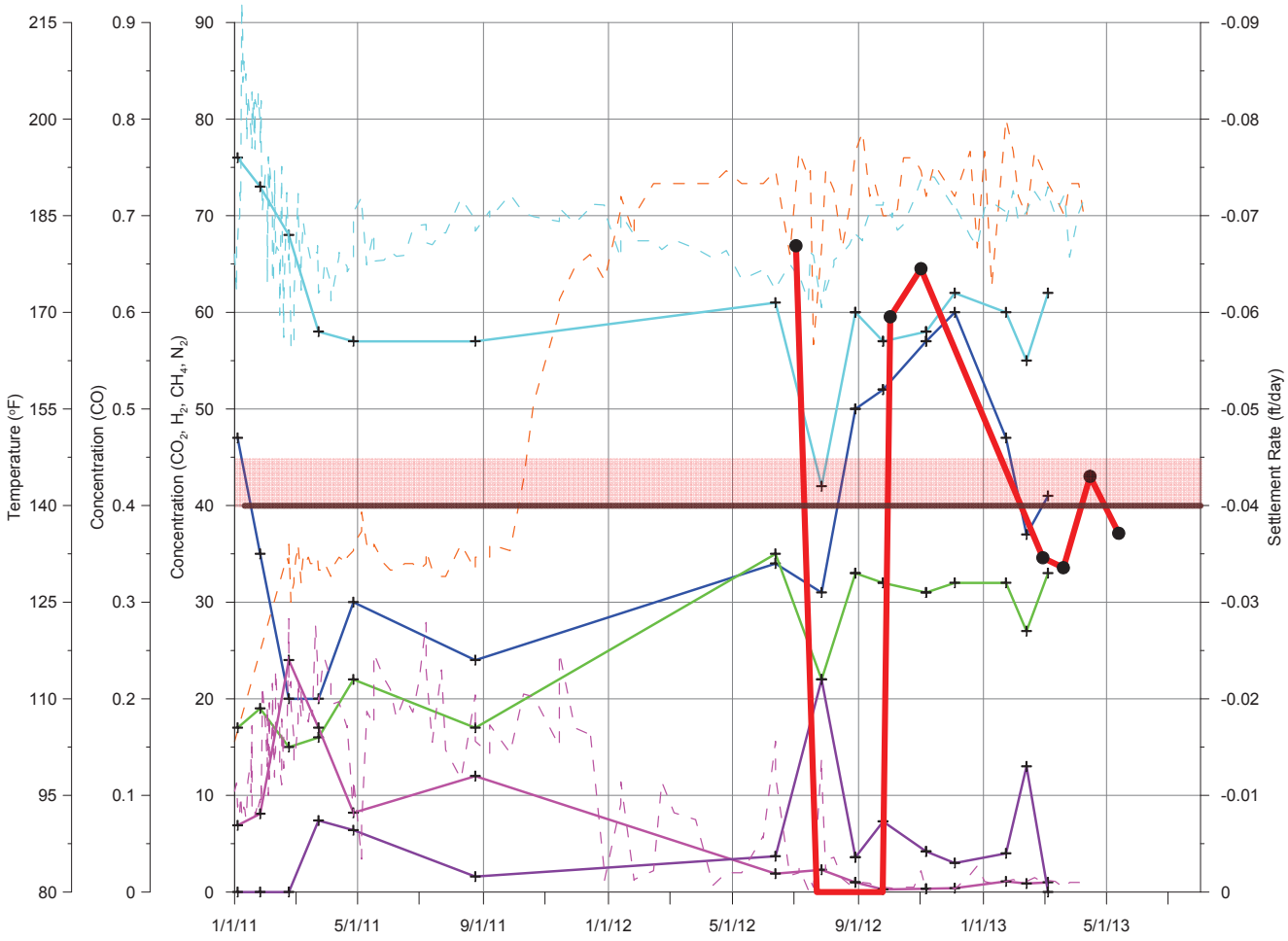
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-26

GEW-32R



PROPOSED TRIGGER LEGEND

- CO
- Settlement Rate

LEGEND

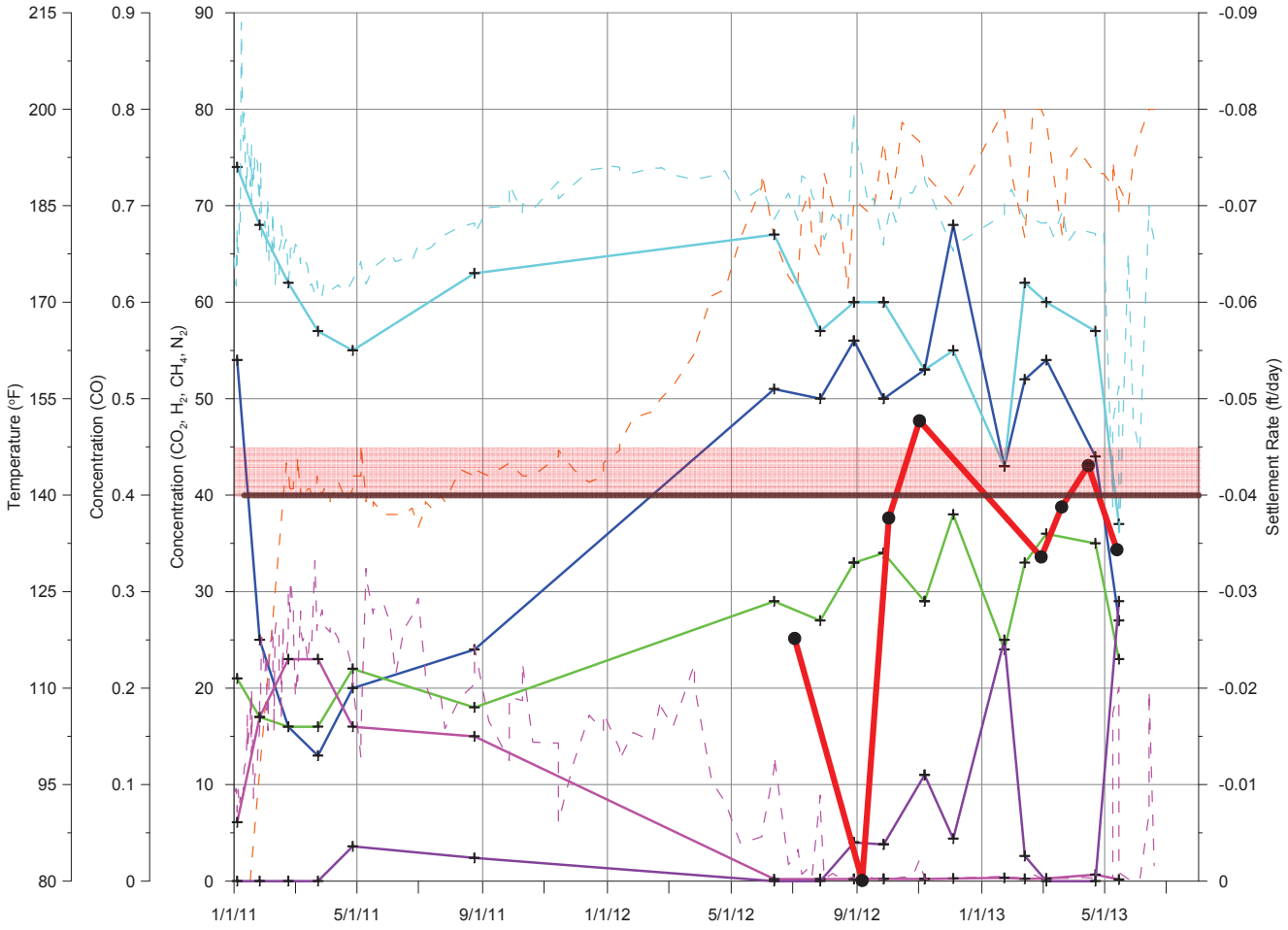
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-27

GEW-33R



PROPOSED TRIGGER LEGEND
- CO
- Settlement Rate

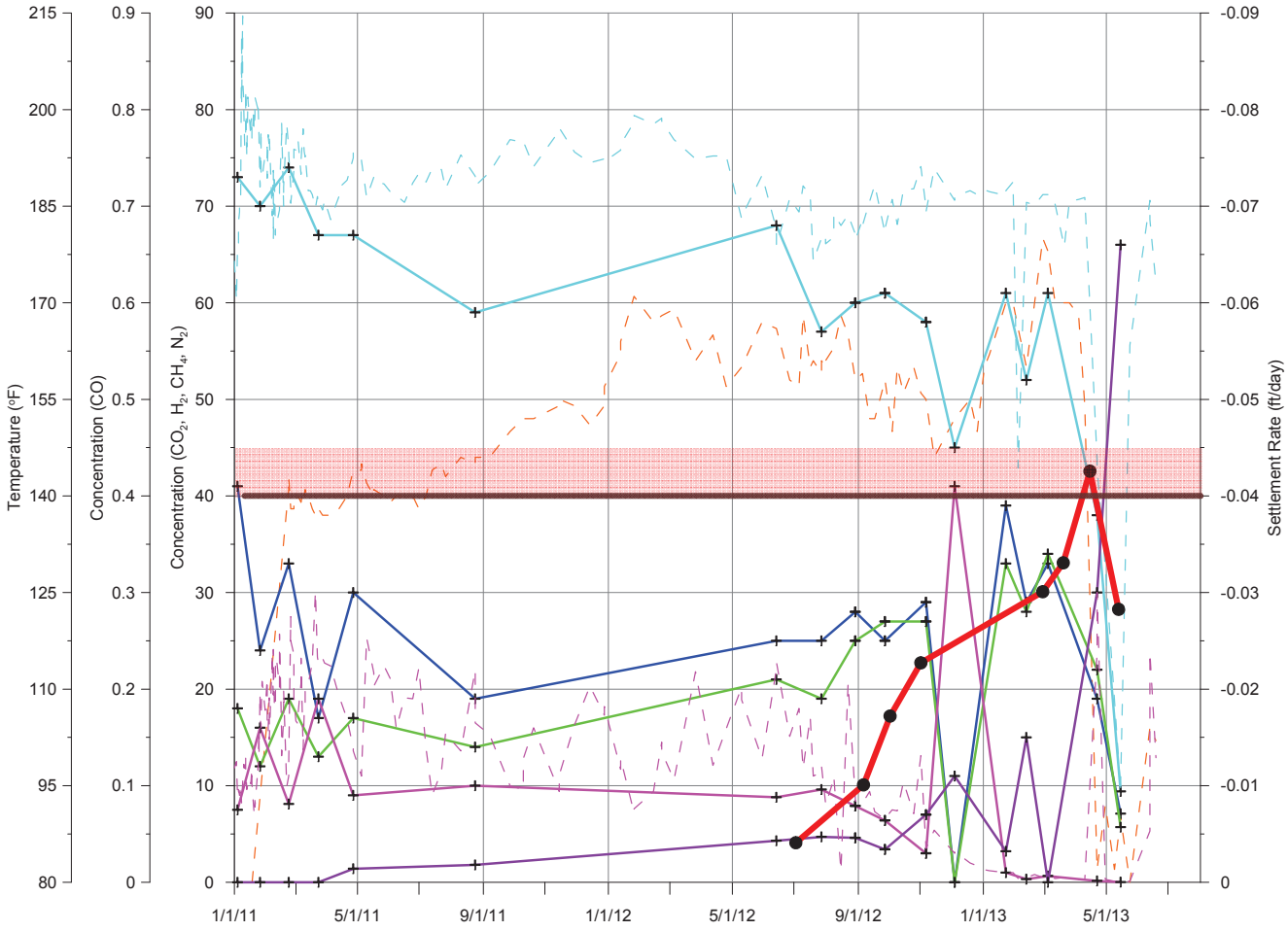
LEGEND
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-28

GEW-36



PROPOSED TRIGGER LEGEND

- CO
- Settlement Rate

LEGEND

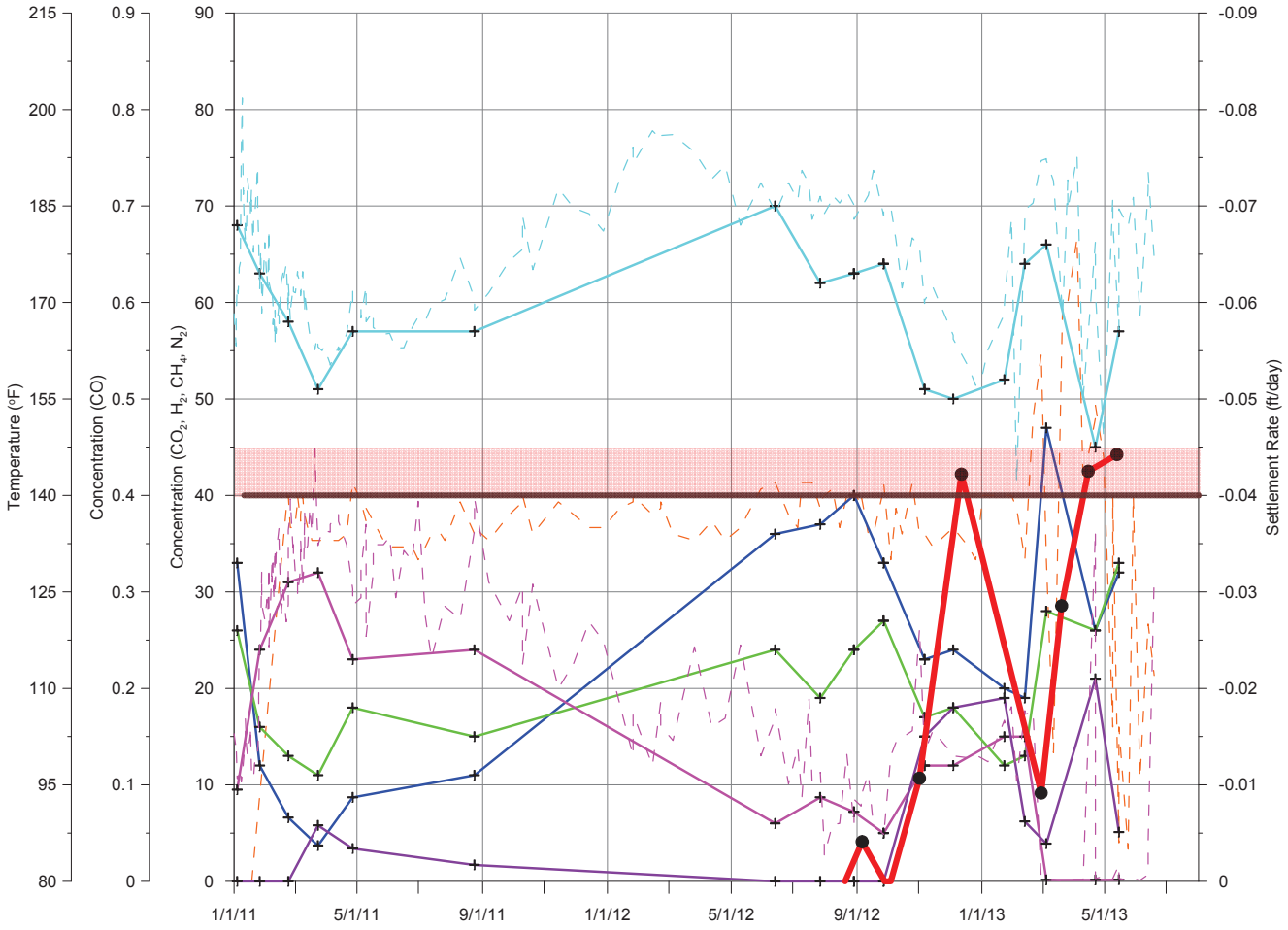
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-29

GEW-37



PROPOSED TRIGGER LEGEND

- CO
- Settlement Rate

LEGEND

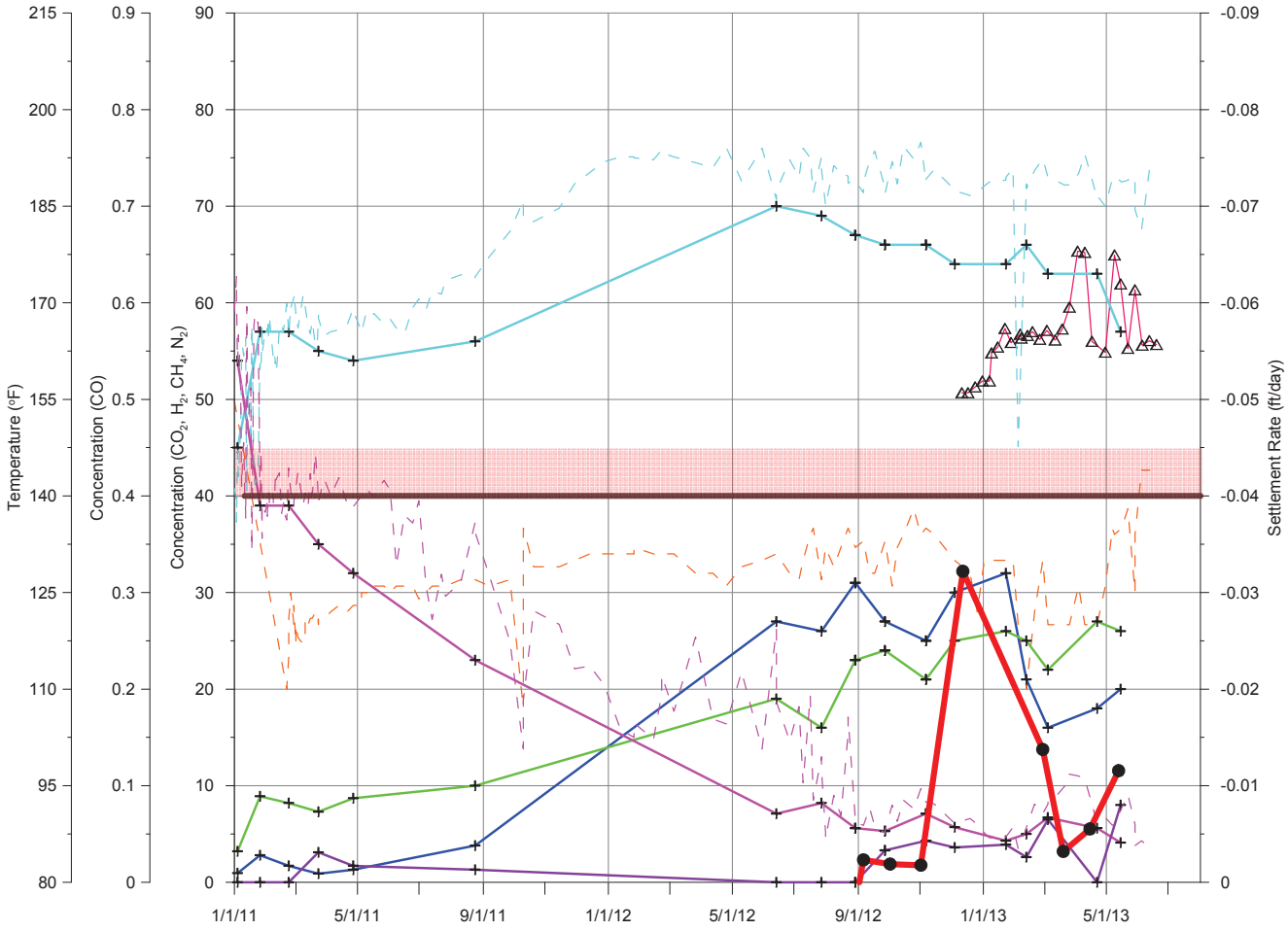
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-30

GEW-38



PROPOSED TRIGGER LEGEND

- CO
- Settlement Rate

LEGEND

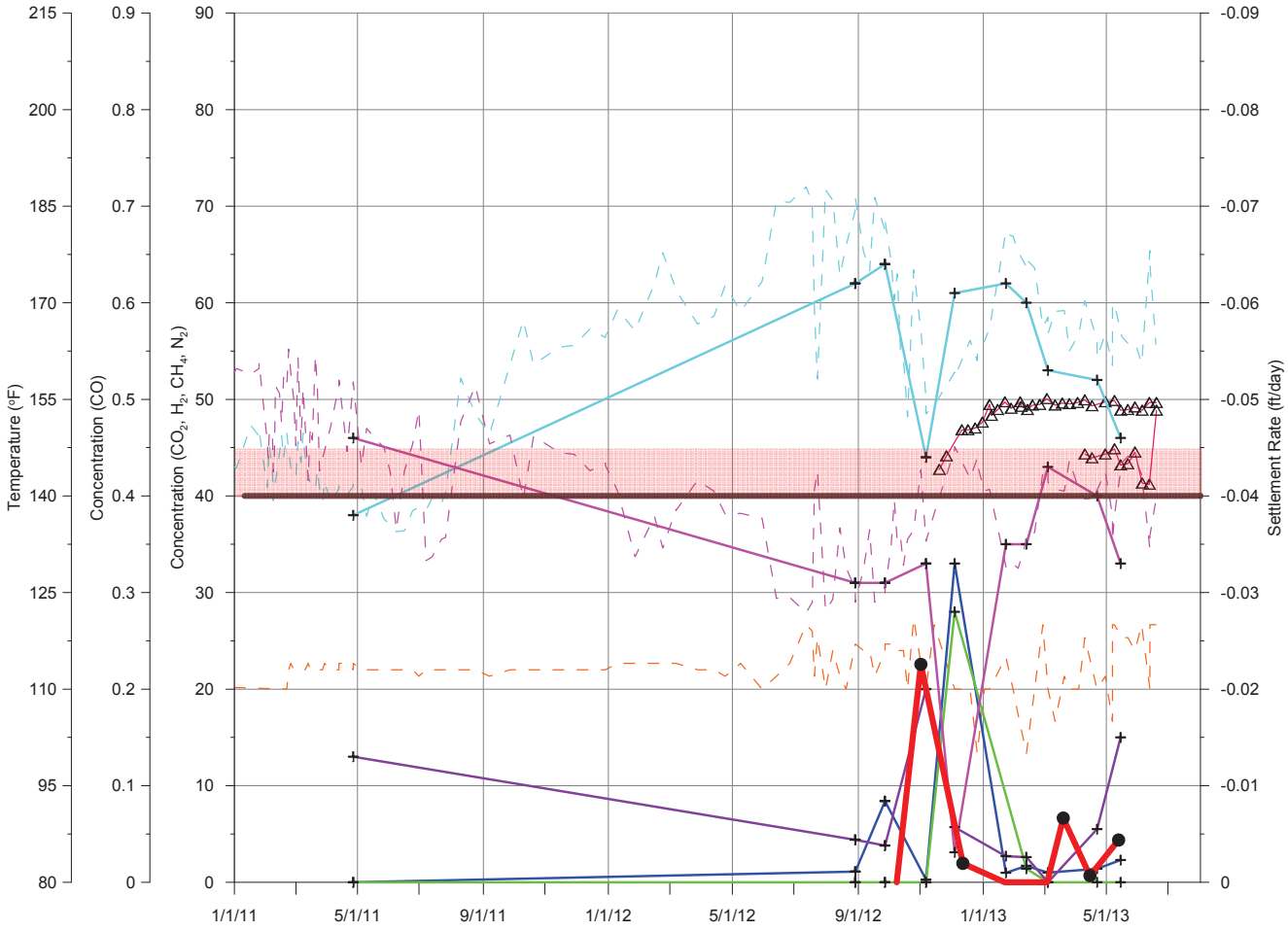
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi
- TMP-5

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-31

GEW-39



PROPOSED TRIGGER LEGEND

- CO
- Settlement Rate

LEGEND

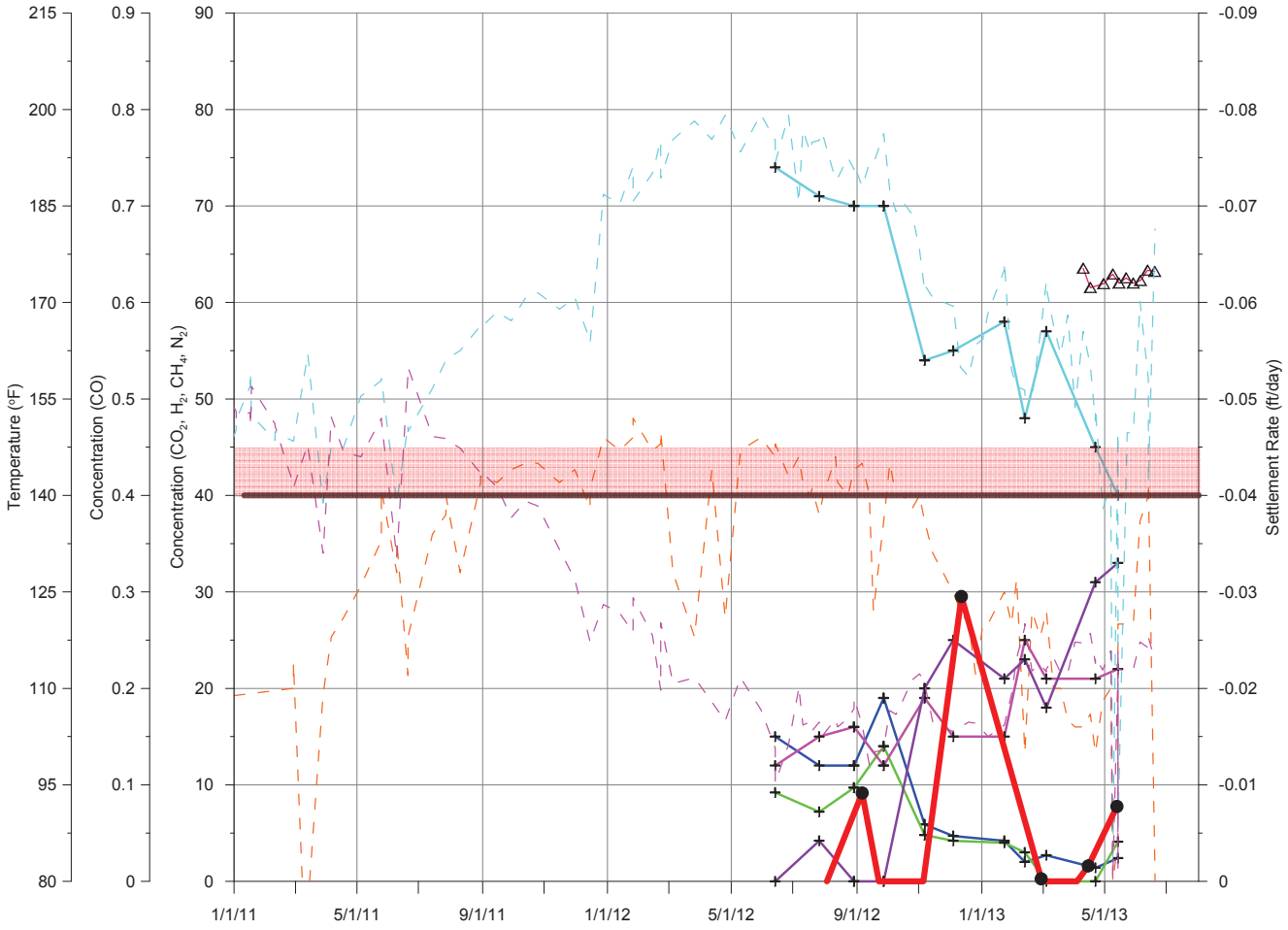
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi
- TMP-3
- TMP-12

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-32

GEW-56R



PROPOSED TRIGGER LEGEND

- CO
- Settlement Rate

LEGEND

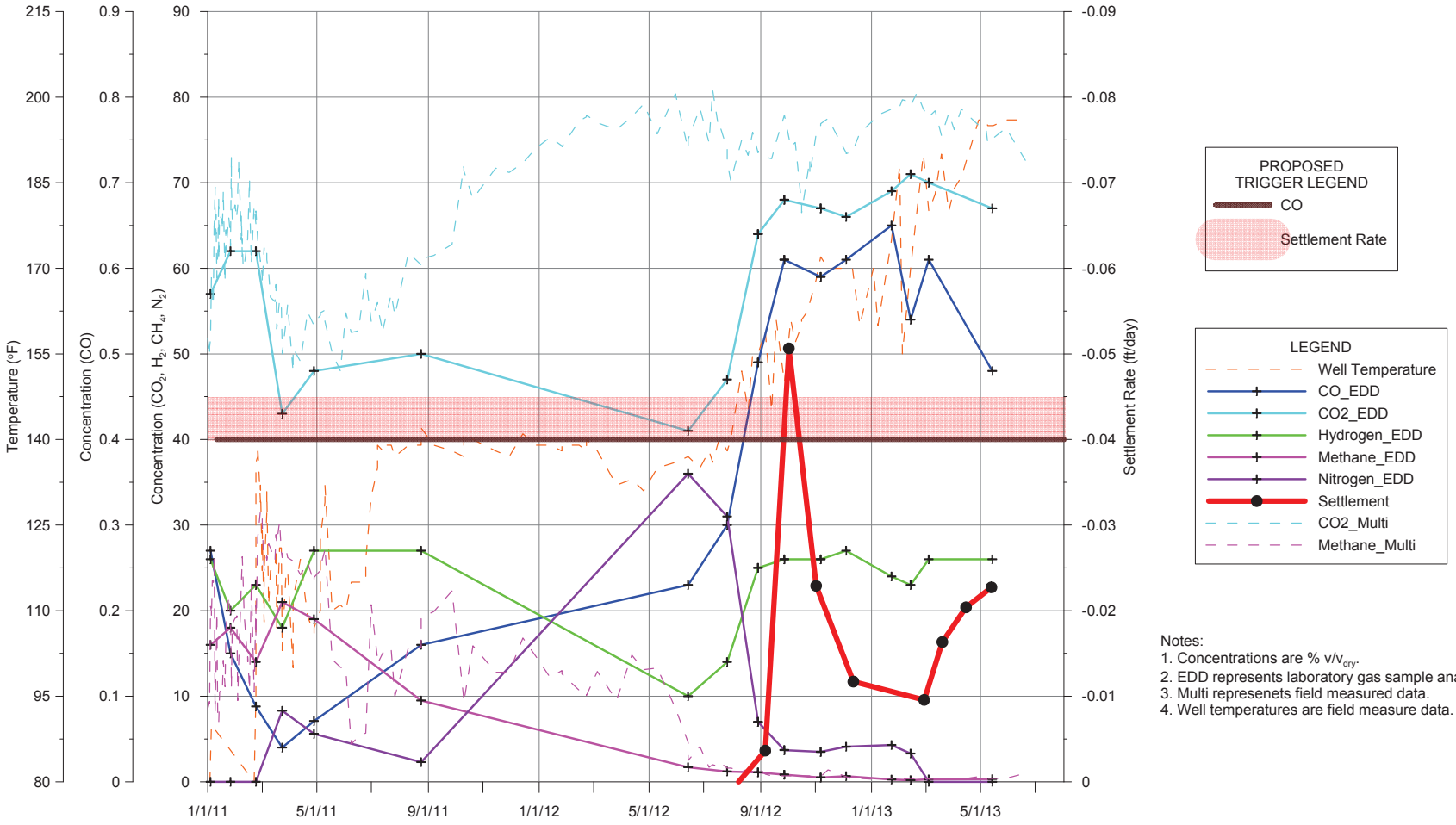
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi
- TMP-14

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-33

GEW-63

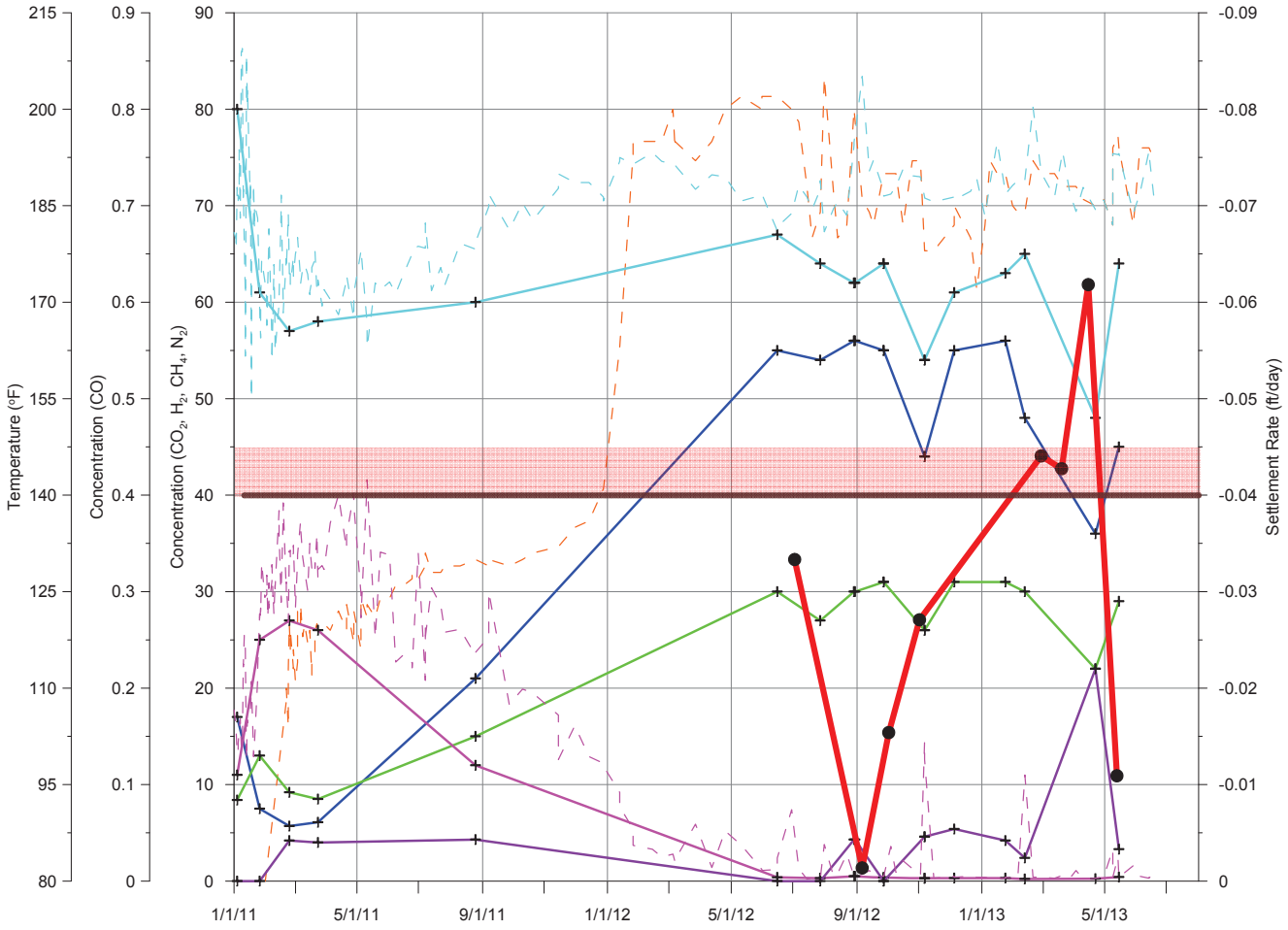


Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-34

GEW-64



PROPOSED TRIGGER LEGEND

- CO
- Settlement Rate

LEGEND

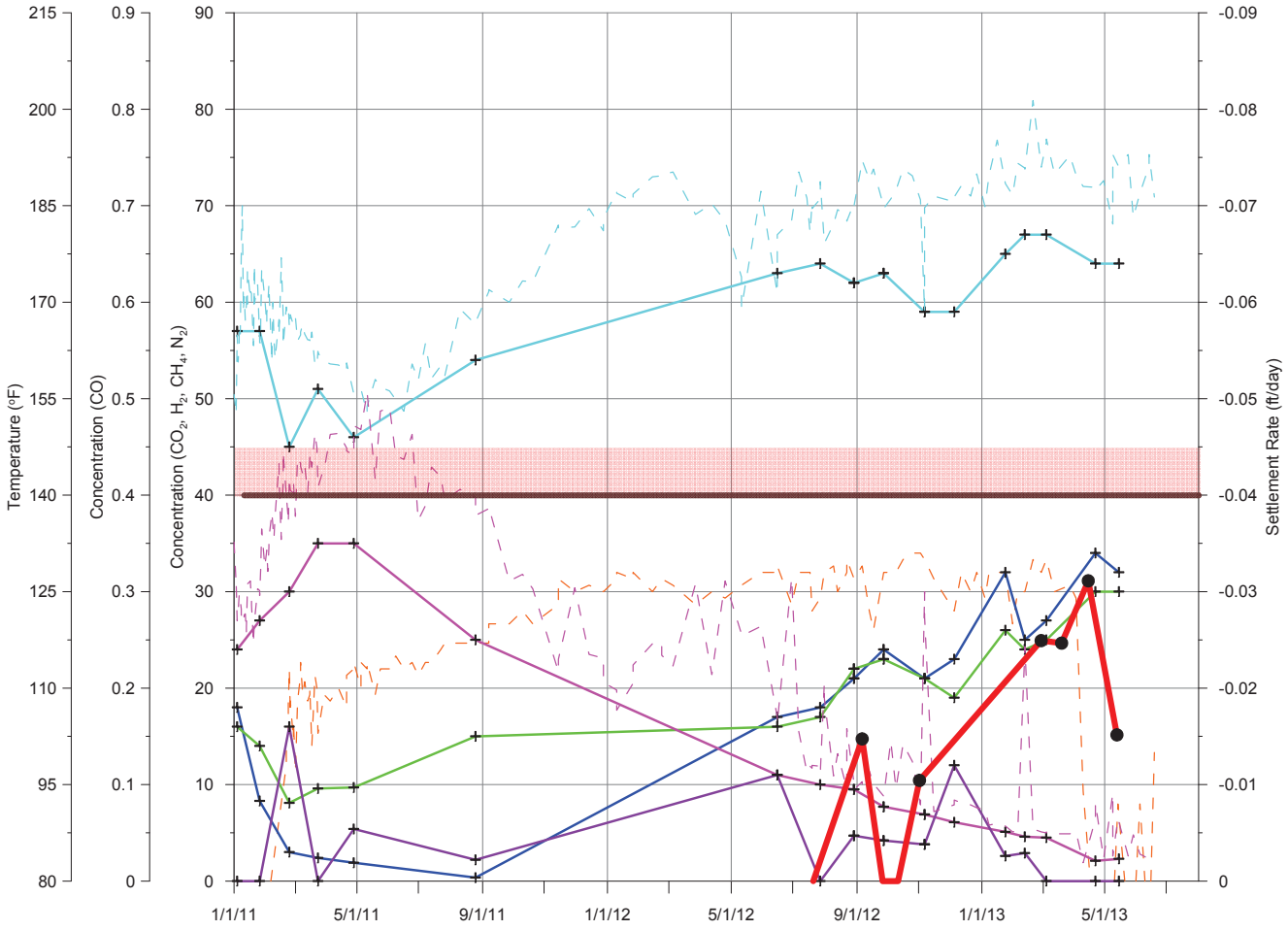
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-35

GEW-68



PROPOSED TRIGGER LEGEND

- CO
- Settlement Rate

LEGEND

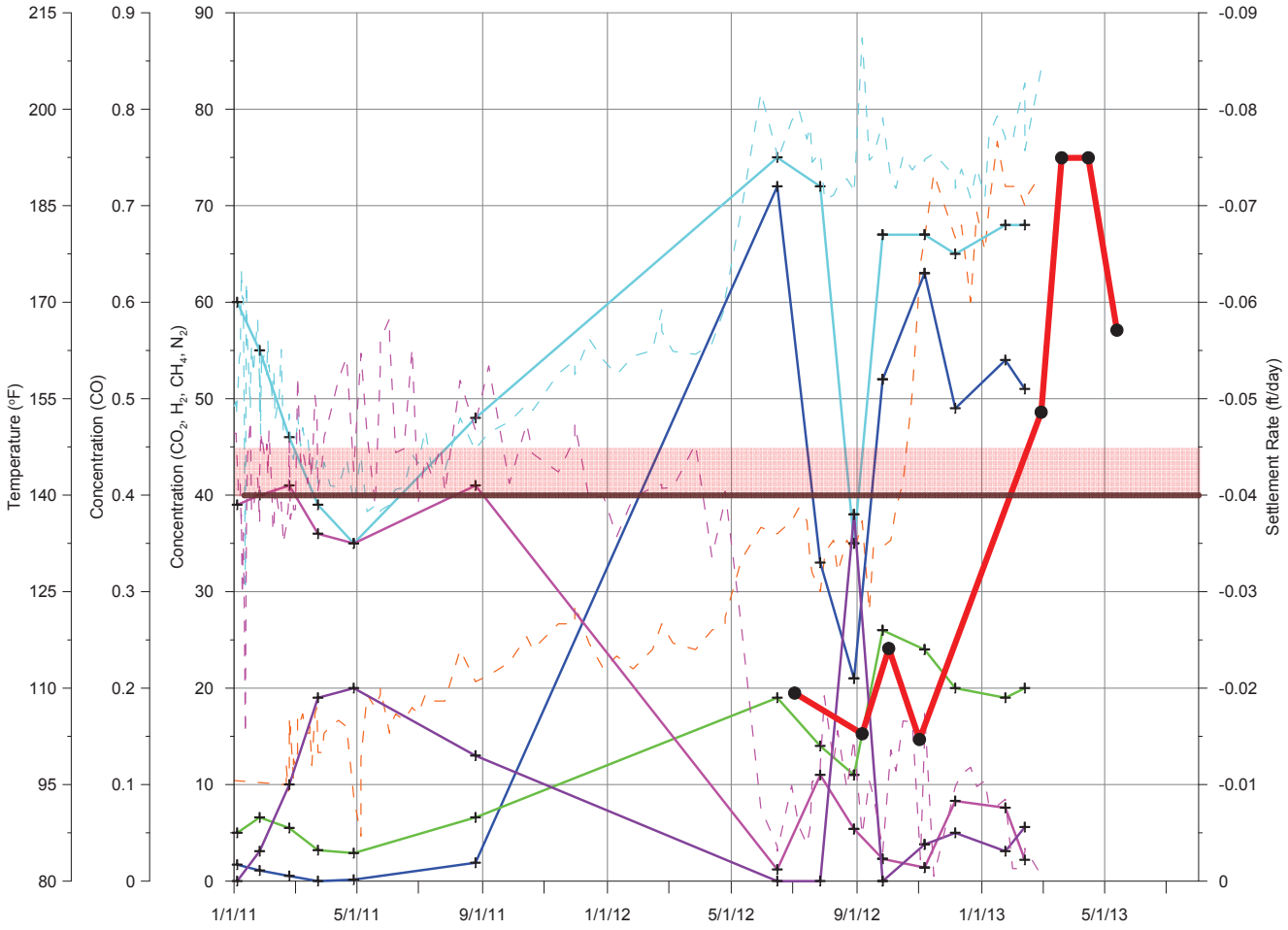
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-36

GEW-69R



PROPOSED TRIGGER LEGEND
- CO
- Settlement Rate

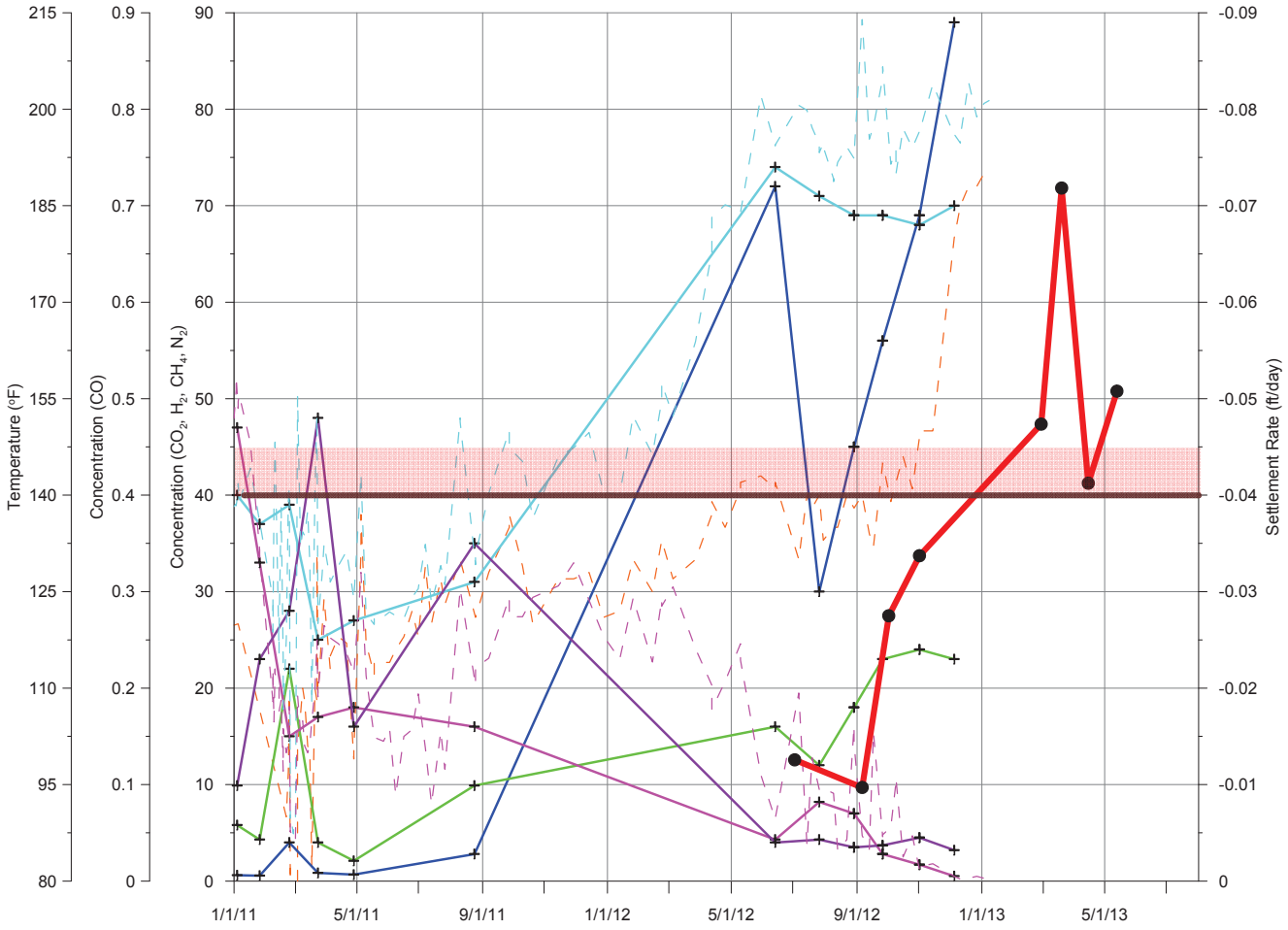
LEGEND
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-37

GEW-72R



PROPOSED TRIGGER LEGEND
- CO
- Settlement Rate

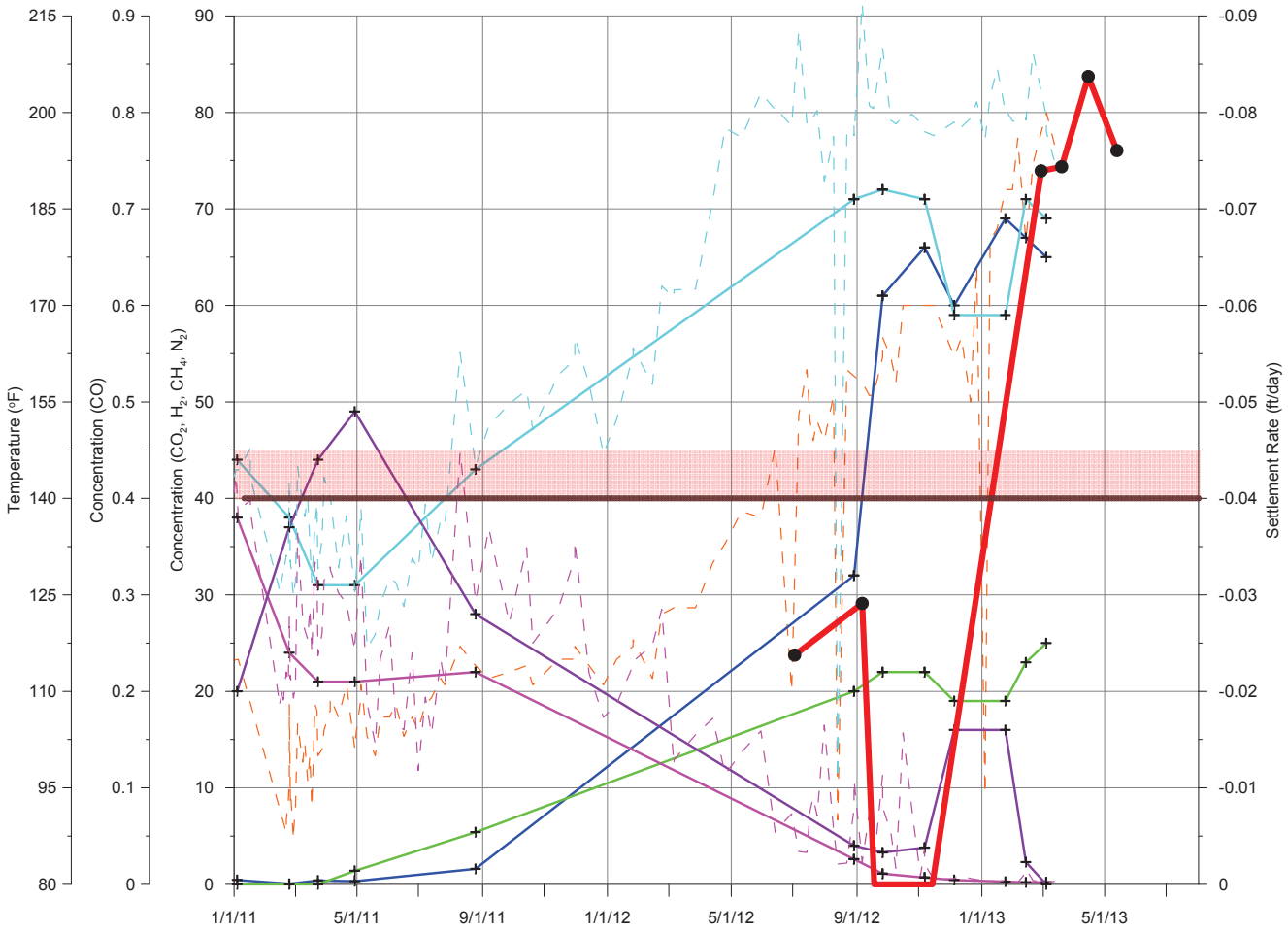
LEGEND
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-38

GEW-76R



PROPOSED TRIGGER LEGEND
- CO
- Settlement Rate

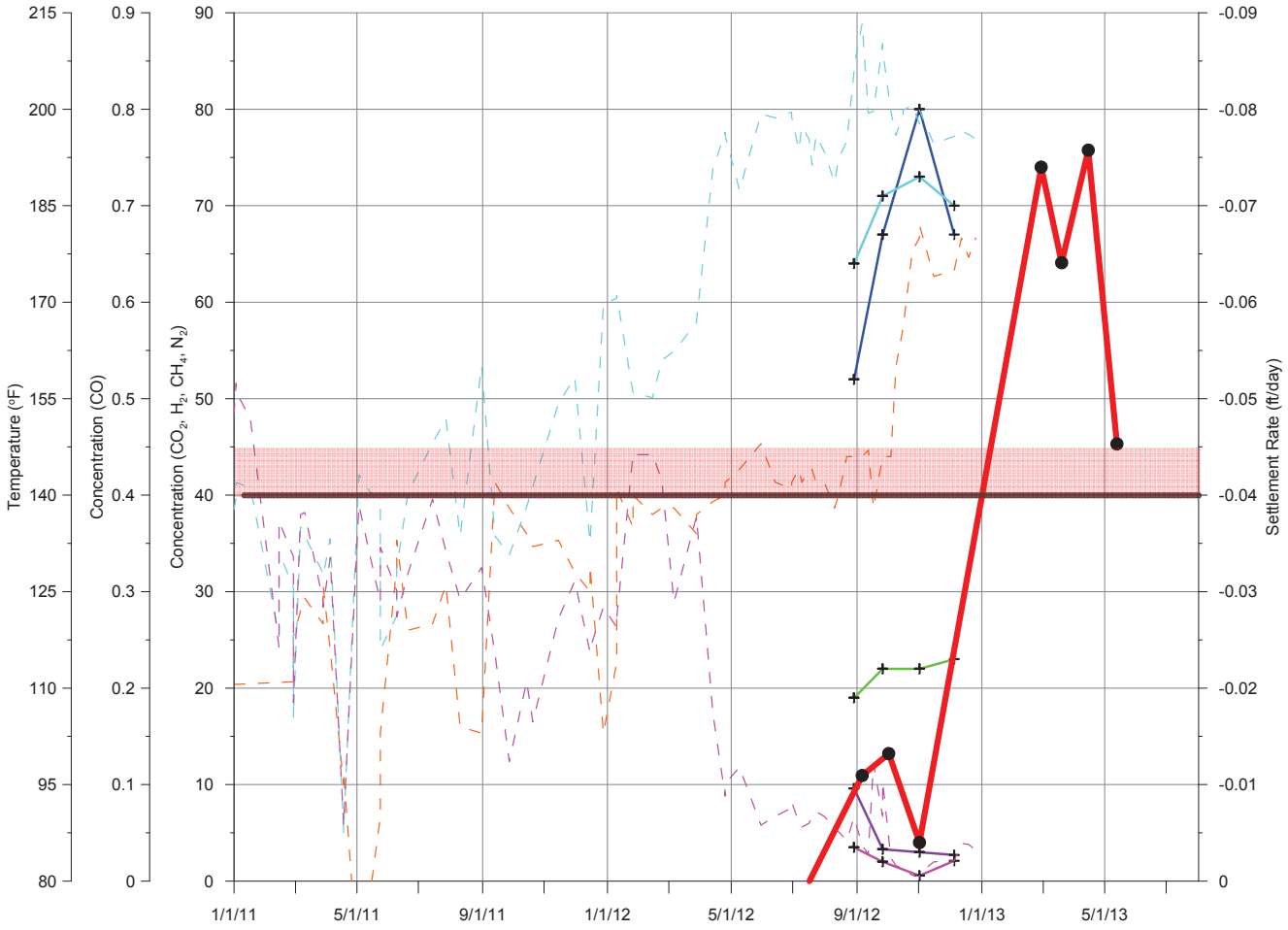
LEGEND
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-39

GEW-79R



PROPOSED TRIGGER LEGEND
- CO
- Settlement Rate

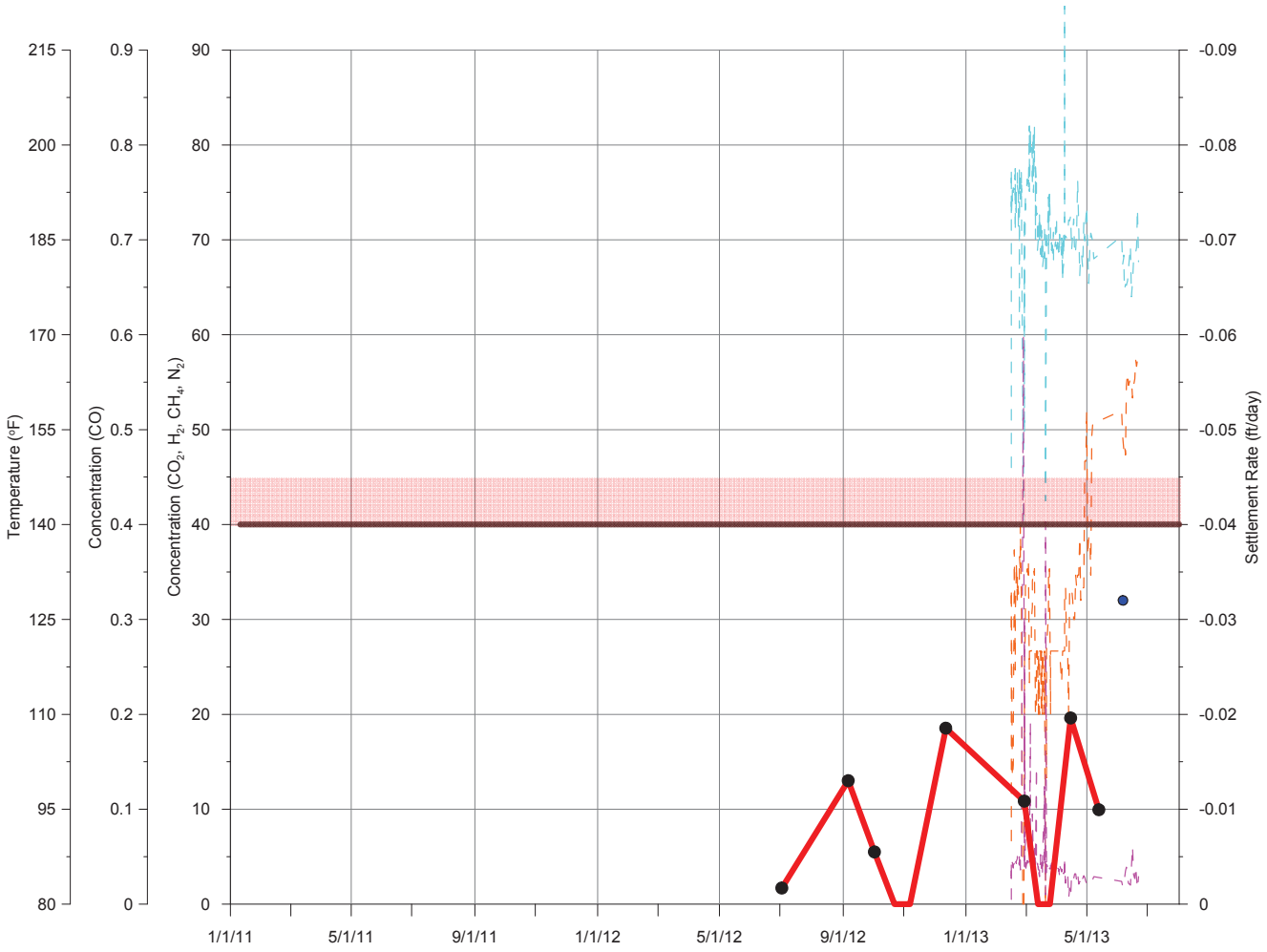
LEGEND
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-40

GIW-03



PROPOSED TRIGGER LEGEND
- CO
- Settlement Rate

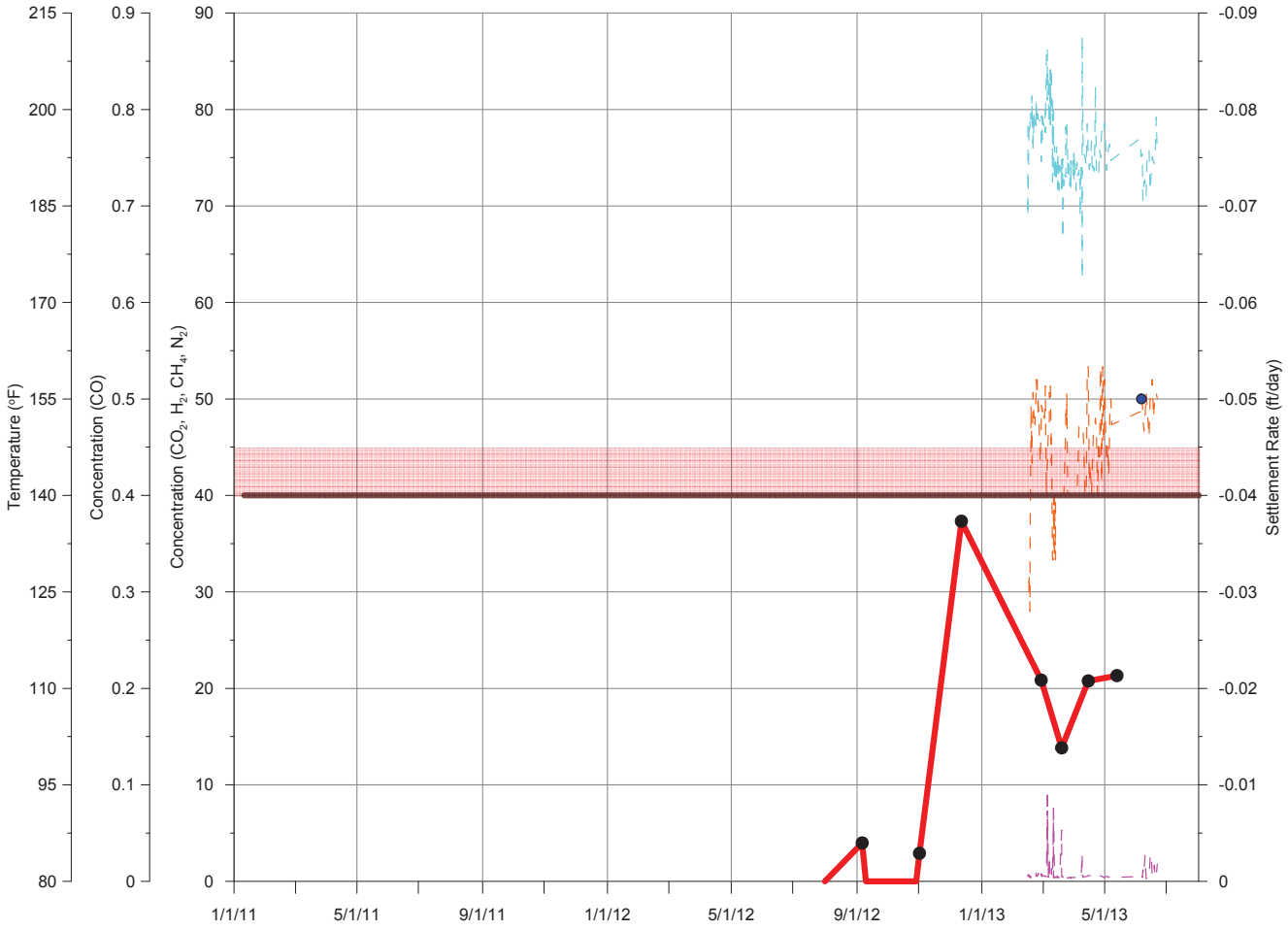
LEGEND
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-41

GIW-04



PROPOSED TRIGGER LEGEND

- CO
- Settlement Rate

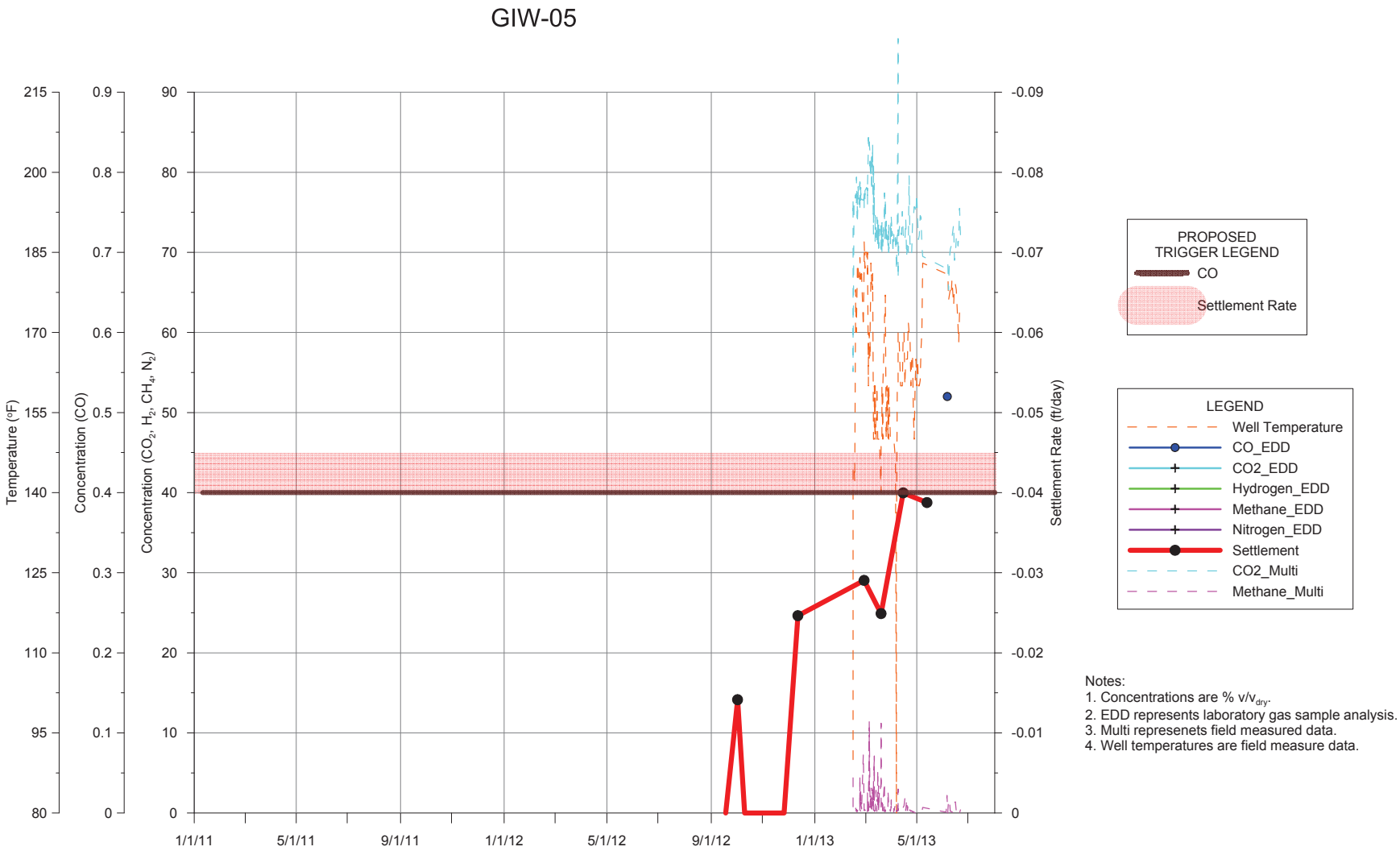
LEGEND

- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-42

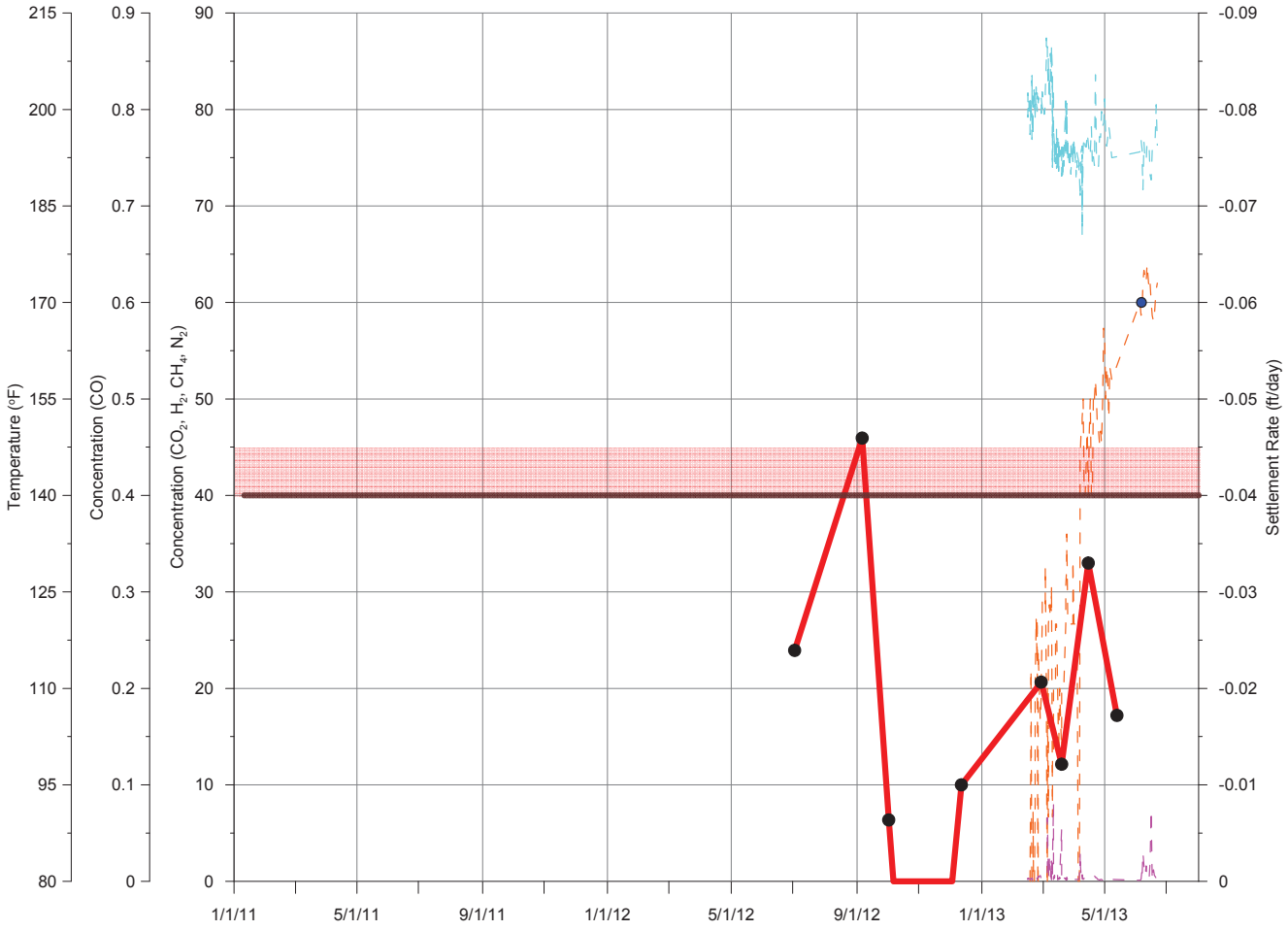


Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-43

GIW-06



PROPOSED TRIGGER LEGEND

- CO
- Settlement Rate

LEGEND

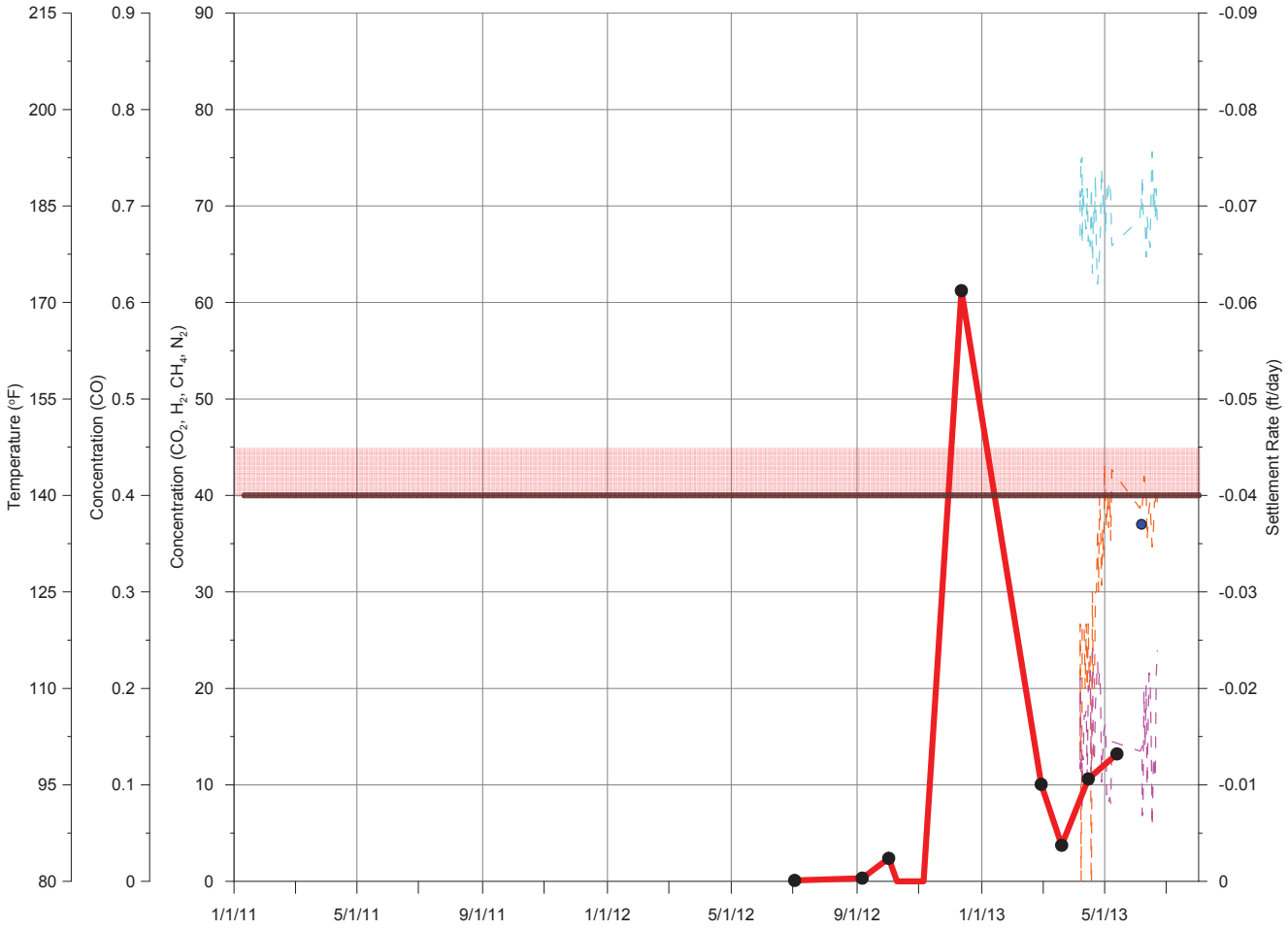
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-44

GIW-07



PROPOSED TRIGGER LEGEND
- CO
- Settlement Rate

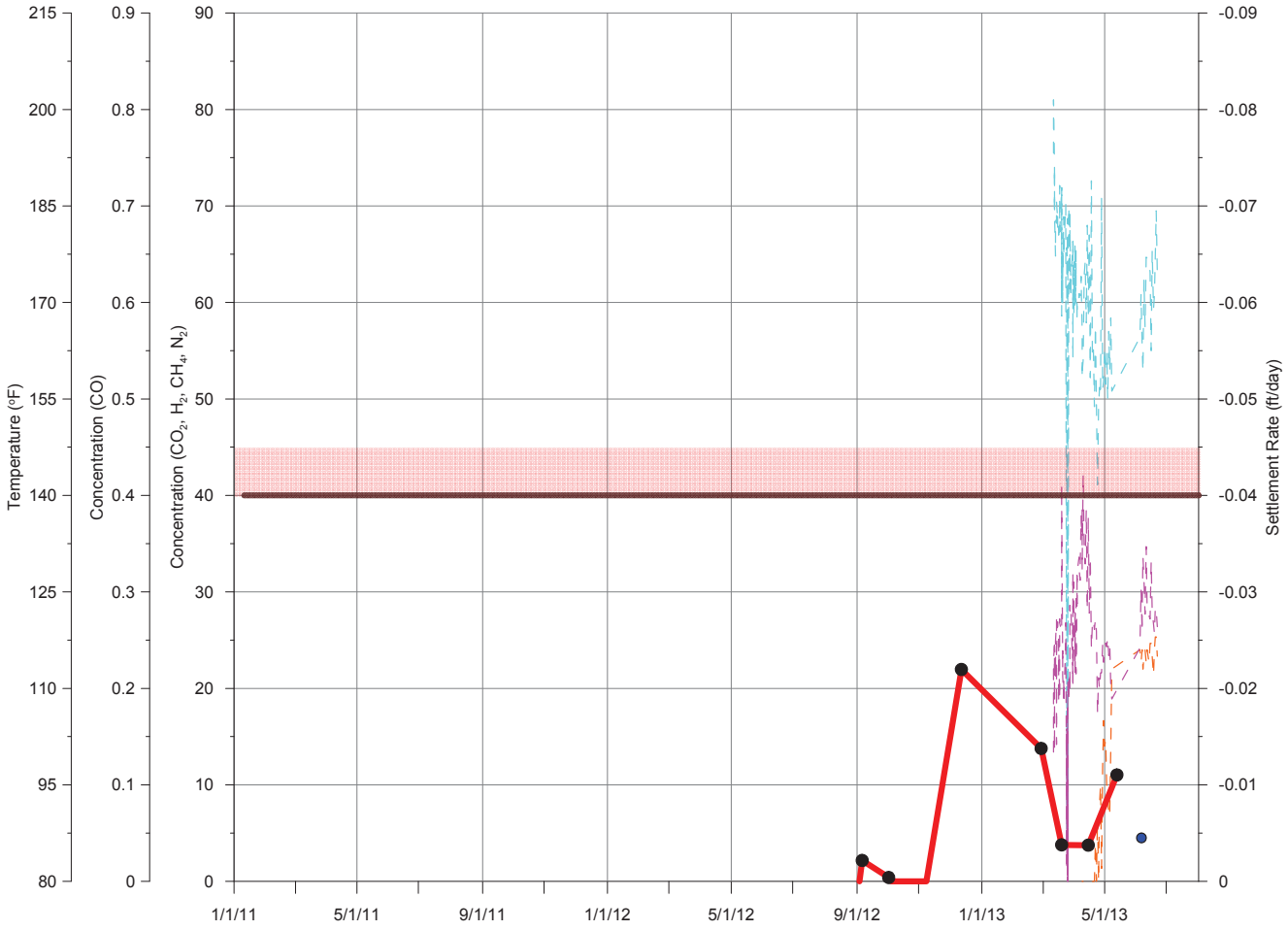
LEGEND
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-45

GIW-08



PROPOSED TRIGGER LEGEND
- CO
- Settlement Rate

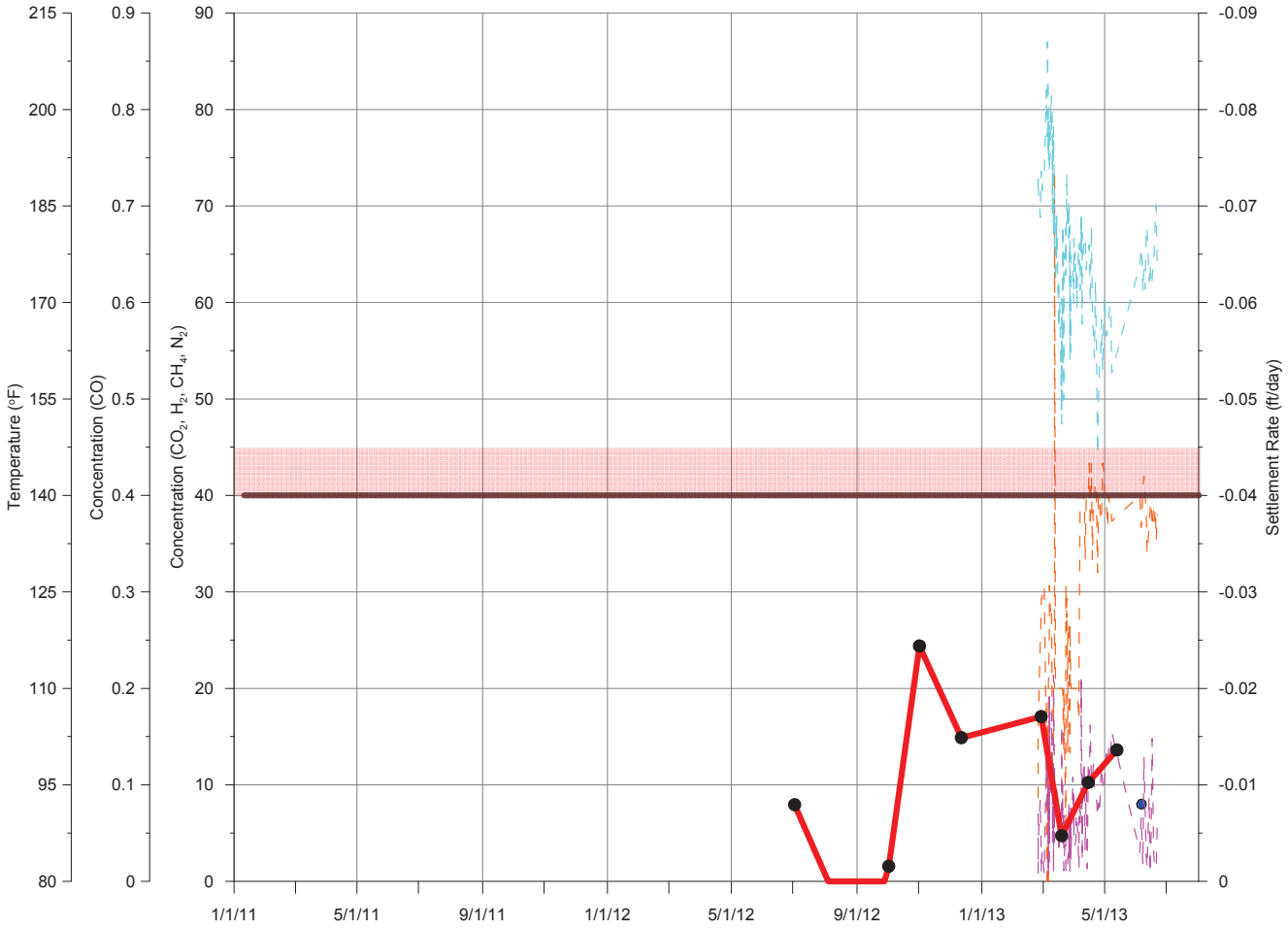
LEGEND
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-46

GIW-09



PROPOSED TRIGGER LEGEND
- CO
- Settlement Rate

LEGEND
- Well Temperature
- CO_EDD
- CO2_EDD
- Hydrogen_EDD
- Methane_EDD
- Nitrogen_EDD
- Settlement
- CO2_Multi
- Methane_Multi

Notes:
1. Concentrations are % v/v_{dry}.
2. EDD represents laboratory gas sample analysis.
3. Multi represenets field measured data.
4. Well temperatures are field measure data.

GAS CONCENTRATIONS,
TEMPERATURE, AND SETTLEMENT RATE
BRIDGETON LANDFILL

FIGURE E-47

ATTACHMENT E-1

		Wells used for Lab Gas Analysis of GAS WELLS not within 150 ft of a reaction							
	Row Labels	**Max of Carb**	**Max of Meth**	**Max of Hydr**	**Max of Nitrog**	**Max of Oxygen/A**	**Max of Ca**	**co2/co**	**Meth/CO2**
6/7/2013	GEW-01						0		
6/7/2013	GEW-02						0		
6/6/2013	GEW-03						0		
6/7/2013	GEW-04						0		
6/7/2013	GEW-05						0		
6/7/2013	GEW-06						0		
6/7/2013	GEW-07						0		
6/7/2013	GEW-08						0		
6/6/2013	GEW-09						0		
6/13/2012	GEW-10	61	34	4.4	0	0	0.059	1033.9	0.557377
7/26/2012	GEW-10	56	32	0	0	0	0.037	1513.5	0.571429
8/29/2012	GEW-10	49	45	0	0	0	0.018	2722.2	0.918367
9/27/2012	GEW-10	52	42	0	3.5	0	0.028	1857.1	0.807692
11/6/2012	GEW-10	47	45	0	6.1	1.7	0.01	4700	0.957447
12/4/2012	GEW-10	45	38	0	14	1.7	0.013	3461.5	0.844444
1/23/2013	GEW-10	52	36	1.8	8.6	0.92	0.034	1529.4	0.692308
2/13/2013	GEW-10	38	38	0	20	3.5	0.0042	9047.6	1
3/5/2013	GEW-10	55	30	0	10	1.5	0.039	1410.3	0.545455
4/22/2013	GEW-10	41	30	0	28	0	0.006	6833.3	0.731707
5/14/2013	GEW-10	30	19	0	42	8.3	0	10000	0.633333
4/22/2013	GEW-110	62	8.8	19	8.8	0	0.094	659.57	0.141935
5/14/2013	GEW-110	67	5.3	21	4.4	0	0.17	394.12	0.079104
2/12/2013	GEW-20a	41	17	0	33	8.5	0.02	2050	0.414634
3/6/2013	GEW-20a	21	6.7	0	57	16	0.017	1235.3	0.319048
4/25/2013	GEW-20a	36	4.3	3.7	43	12	0.092	391.3	0.119444
5/14/2013	GEW-20a	37	6.3	0	42	11	0.084	440.48	0.17027
2/12/2013	GEW-22R	76	14	7.6	2	0.53	0.15	506.67	0.184211
3/6/2013	GEW-22R	73	13	8.3	4	0	0.17	429.41	0.178082
4/25/2013	GEW-22R	53	5.9	8.8	25	7	0.16	331.25	0.111321
5/14/2013	GEW-22R	74	8.1	14	0	0	0.19	389.47	0.109459
2/12/2013	GEW-23a	65	25	6.6	3.2	0.64	0.084	773.81	0.384615
3/6/2013	GEW-23a	65	23	6.9	3.9	0	0.089	730.34	0.353846

wells used for analysis of lab. gas for GAS Wells not within 150 ft of settlement fronts

4/25/2013	GEW-23a	70	16	10	0	0	0.15	466.67	0.228571
5/14/2013	GEW-23a	57	14	8.5	16	4.3	0.091	626.37	0.245614
4/27/2011	GEW-39	38	46	0	13	0.83	0	10000	1.210526
8/29/2012	GEW-39	62	31	0	4.4	0	0.011	5636.4	0.5
9/27/2012	GEW-39	64	31	0	3.8	0	0.084	761.9	0.484375
11/6/2012	GEW-39	44	33	0	20	1.4	0.0027	16296	0.75
12/4/2012	GEW-39	61	3.1	28	5.7	1.6	0.33	184.85	0.05082
1/23/2013	GEW-39	62	35	0	2.7	0.69	0.0098	6326.5	0.564516
2/12/2013	GEW-39	60	35	1.4	2.6	0.6	0.017	3529.4	0.583333
3/5/2013	GEW-39	53	43	0	0	0	0.01	5300	0.811321
4/22/2013	GEW-39	52	40	0	5.5	0	0.014	3714.3	0.769231
5/15/2013	GEW-39	46	33	0	15	3.1	0.023	2000	0.717391
4/27/2011	GEW-40	33	40	0	22	0.98	0	10000	1.212121
6/6/2013	GEW-40						0		
4/27/2011	GEW-41R	29	32	0	33	1.1	0	10000	1.103448
6/1/2013	GEW-41R			0	0	0	0		
4/27/2011	GEW-42R	33	35	0	32	1.2	0	10000	1.060606
6/7/2013	GEW-44						0		
6/7/2013	GEW-47R						0.01		
6/7/2013	GEW-48						0		
6/7/2013	GEW-49						0		
6/7/2013	GEW-50						0		
6/7/2013	GEW-51						0		
6/7/2013	GEW-52						0		
6/7/2013	GEW-53						0.0044		
6/7/2013	GEW-54						0.0044		
6/6/2013	GEW-55						0		
2/12/2013	GEW-77	68	6.9	20	3.4	0.95	0.29	234.48	0.101471
3/6/2013	GEW-77	68	6.4	23	0	0	0.31	219.35	0.094118
4/25/2013	GEW-77	67	4.9	25	0	0	0.31	216.13	0.073134
5/14/2013	GEW-77	66	4.7	25	0	0	0.29	227.59	0.071212
2/12/2013	GEW-80	73	11	11	3	0.85	0.18	405.56	0.150685
3/6/2013	GEW-80	74	10	13	0	0	0.21	352.38	0.135135
4/25/2013	GEW-80	71	8.1	17	0	0	0.23	308.7	0.114085
5/14/2013	GEW-80	71	7.9	17	0	0	0.21	338.1	0.111268

wells used for analysis of lab. gas for GAS Wells not within 150 ft of settlement fronts

6/6/2013	GIW-13						0.086		

APPENDIX F

VERIFICATION PROCEDURES FOR TMP MEASUREMENTS

Procedures for Verification of TMP Readings

General

The strings of T type thermocouples at the site are quality controlled strings of thermocouple 20 gauge Copper/Constantan thermocouple wire, with factory fabricated sealed junctions at the ends in the ground. The resistance of the wire, in ohms per foot, is 0.298. The thermocouple wire is coated with Teflon, which provides protection up to 500 °F. The thermocouple itself is rated to 750 °F. At the ground surface the thermocouple wires (two per thermocouple unit within the TMP location) are connected to a rotary switch that is inside a NEMA weatherproof rated enclosure mounted above the ground surface. A readout device, purchased from Omega Engineering of the HH800 series is connected to the rotary switch to take readings. Resistance readings can also be taken for each unit through the rotary switch, which is low resistance. Temperature readings are actually voltage differences across the two sides of the thermocouple wire and are read to the nearest microvolt to achieve readings accurate to ±2 °F

Potential Problem in Obtaining Accurate Readings

The following things can result in poor quality readings

1. Not setting the thermocouple readout device to the correct setting. The device must be set to a type T thermocouple type. Failure to have the correct setting results in very different temperatures being associated with the voltage difference being converted by the readout device to temperature.
2. Not have clean connectors to the leads to the switch. This increases the resistivity at the readout end and can lead to erroneous readings. Make sure the contact surfaces are clean and dry.
3. Condensate or corrosion can occur within the rotary switch. This results in incorrect readings by raising resistance or even providing continuity across multiple thermocouples. The enclosure containing the switch must be well ventilated and dry. If condensate or corrosion is present the switch can be cleaned or replaced. Resistance readings at periodic intervals and whenever questionable readings are obtained can identify these problems.
4. Damage associated with abrasion or stretching or breaking of the thermocouple wire or its insulation can occur. This will result in either resistance that exceeds the nominal values foot of wire due to work hardening of the wire, very high resistance due to wire breakage or very low resistance do to insulation damage at shallower depth than the tips. Resistance readings at periodic intervals and whenever questionable readings are obtained can identify these problems.

Reading Verification

Verify Resistance

Resistance readings should be taken at monthly intervals for each thermocouple probe. A multimeter calibrated with a quality resister of 50 ohm should be used. Additional readings should be taken whenever readings appear questionable or a large change in readings occurs. Values will be plotted with depth and units exceeding 1.3times the theoretical resistance are considered marginal. Units with 1.65 times the nominal resistance values, corrected for the switch, will be considered unacceptable for use.

If readings are high, the switch unit should be inspected and the resistance at the thermocouple lead (for one or two units that read high) be checked bypassing the switch. If the switch is seen to be the issue it should be cleaned or replaced to reduce the measured resistance in the switch to a few ohms or less.

Verifying Readings

If the resistance readings are acceptable, the temperature readings should be repeated within 24 hours to identify they are representative. This verification should include double checking the readout is set to the correct thermocouple type.

Identifying Unacceptable readings

Readings that do not stabilize to within 4 degrees over a period of 30 seconds and show rapid fluctuation are not acceptable and should be indicated as readings failed to stabilize. In some cases this has been associated with problems with corrosion or moisture in the rotary switch and the switch should be cleaned or replaced. Verification that the switch is the problem can be obtained by reading the problem unit without the rotary switch, connecting directly to the leads.

APPENDIX G

STANDARD OPERATING PROCEDURE FOR MANAGEMENT OF A LOCAL SUBSURFACE OXIDATION EVENT

Subsurface Oxidation (SSO - Potential Landfill Fires)

Typical Symptoms

Dramatic localized landfill settlement,

Charred or cracked surface cover,

Stressed or dead vegetation in an area that is otherwise properly vegetated,

Smoke or smoky odor emanating from the landfill surface or wellhead,

Drastic or unusual increase in flowing gas temperature,

Abnormal discoloration of wellhead/riser assembly,

Abnormally high CO and Ammonia (NH_3) concentration in LFG,

Deformed riser pipes.

Notification

Notify OM&M Manager immediately after identifying any potential SSO.

Initial Investigation

Health and Safety Considerations

- Consult HASP for procedures related to landfill fires.
- Under no circumstances shall an initial investigation be conducted without first consulting the HASP and implementing appropriate controls and procedures.
- Do not breathe landfill gas or smoke. Stand upwind of emissions.
- Wear appropriate PPE. Burns may be caused by hot PVC / HDPE / steel.
- **Do not drive heavy equipment / vehicles near well or depression until ground stability has been verified.**
  - The burned waste mass may give way and equipment/personnel may fall into sinkhole.

Do not change the condition of the well during the initial investigation.

Conduct physical inspection.

- Inspect the nearest extraction well to the potential SSO location.
- Inspect all wells within 500 feet of nearest extraction well to the potential SSO location.

Inspect the landfill surface within 500 feet of nearest extraction well to the potential SSO location.

Visibly inspect for large localized settlement, cracks, holes, collapse, missing components, or areas that could be sources of air intrusion into the waste mass:

Monitoring ports,

Well casing,

Hoses,

Erosion ruts,

Dry soil cracks,

Manways,

Lift stations,

Sumps,

Leachate cleanout risers.

Measure gas quality, pressure and temperature, at all wells within 500 feet of nearest extraction well to the potential SSO location.

Special precautions may be necessary to address high gas temperatures.

Measure CO concentrations with colorimetric tubes (Draeger tubes) at all wells within 500 feet of nearest extraction well to the potential fire location.

Gas temperature and other interference gasses can affect the accuracy of the measurement; therefore, the results of any CO monitoring should be expressed qualitatively only.

Infrared Thermometer Survey

Use an IR laser thermometer to measure the temperature of the ground surface in the area of the suspected SSO.

Shallow fires or fires that have consumed large amounts of trash will produce elevated surface temperatures. Extreme caution must be taken in these areas due to the likelihood of the ground giving way.

Data Analysis

Determine the state of the SSO.

Analyze temperature gradient between monitored wells.

Analyze oxygen gradient between monitored wells.

Analyze nitrogen to oxygen ratio gradient between monitored wells.

If nitrogen is not measured directly, assume balance gas is nitrogen.

Analyze pressure gradient between monitored wells.

Analyze methane to CO_2 ratio gradient between monitored wells.

Removing the Oxygen from the Fire

The key to stopping a SSO once it has begun is to completely restrict oxygen form entering the smoldering waste mass (snuff out the fire). Once the initial investigation has been performed, and a general sense of the extent of the SSO has been determined, safely begin to restrict further oxygen intrusion using the following method:

Shutdown well(s) that is believed to have been the cause of the SSO.

Shutdown all wells in surrounding area (within the approximately 300 feet of suspect well(s)).

Cap or repair any item identified during the physical inspection that may be contributing to oxygen intrusion.

Carefully add additional cover to areas that show cap integrity issues, if necessary. Work slowly and pay special attention to the ground surface as material placement commences.

During cover placement activities, there should be a minimum of two people available; the equipment operator, and a line-of-sight person on the ground that is responsible for watching the ground surface as the equipment operator places the soil.

Use a low ground pressure (LGP) machine, if available. If LGP machine is not available, use the lightest machine with the widest tracks available. Do not use rubber tired machines to place cover material.

Slowly push soil into the area and compact with the bucket or tracks of the equipment.

Note: Closing wellhead valves to minimize vacuum in the area of concern may cause vacuum levels to increase within the main header. This will redistribute the overall vacuum applied to the wellfield and may cause higher vacuums to other wells in the GCCS. Carefully watch for redistribution of vacuum, and adjust prime mover vacuum set-point accordingly. If greater than 10 percent of the total wells in the wellfield are closed to remediate the SSO, a complete retune of the wellfield may be warranted.

Things to Avoid

Flushing the well with water. Flushing the well with water can potentially clog the well.

Excavating soil in the SSO area. Do not excavate in the SSO area. Excavation will allow additional oxygen to enter the already smoldering waste mass and can potentially auto-ignite.

Venting. Do not remove the wellhead to vent the well. Wellfields are typically under negative pressure. Residual vacuum exists in the

waste mass for a period of time when wells are closed. If the wellhead is removed to vent, it is highly possible that the residual vacuum in the area will pull ambient air into the waste mass adding oxygen to the SSO.

Dry ice application. While dry-ice may have a temporary cooling effect on the physical well casing, it will have little to no effect extinguishing the SSO. In order to apply the dry ice to the well, the wellhead has to be removed, allowing oxygen a pathway to the waste mass (see above).

Introduction of water into open cap fissures. Applying water to open fissures in the cap where an SSO exists can create a plume of highly odorous steam. It is also dangerous to bring a heavy, rubber tired water truck to the area to apply water. The steam created can be dangerous to workers in the immediate area. If an open cap fissure exists in an SSO area, it shall be safely filled with soil. Removing the pathway for oxygen intrusion is the most effective way to put out the SSO.

Continued Monitoring

Monitor the wells closest to the suspected SSO area and adjacent wells at least once a day for at least two weeks.

Monitor for gas quality, temperature, and CO.

As the SSO subsides, residual CO will remain in the waste mass for weeks and possibly months. Elevated CO levels are not a reliable indicator that an SSO is still in progress. However, CO levels should generally decline with time if the fire has been extinguished.

Once SSO indicators are no longer noted, monitor the well and adjacent wells once a week for at least 4 months before returning to normal monitoring schedule.

Repairs

Repairs should be made to the SSO area, as necessary

Visual Inspection

O&M Provider shall visually inspect the following,:

Wellheads and lateral piping,

Cover soil and geosynthetics, and

Other items within SSO area.

Provide findings to, and generate repair options for, OM&M Manager.

OM&M Manager shall facilitate repairs, as required.

Timeline

It is important that a structured SSO monitoring plan, and diligent adherence to the plan be carried out to return the normal wellfield operations as soon as possible; however, it is advisable to take time and slowly ensure the SSO is fully extinguished, and that the bacteria population in the area has recovered and is consistently producing gas.

The severity of the SSO, the age of the waste, moisture content, and a number of other variables will all determine how long it takes the wellfield to regain compliance with the SOP. Experience has shown that the timeline from the point when the SSO is identified and extinguished to the point when the wellfield resumes normal operations can vary from 2 to 3 weeks up to (in some serious SSO situations) 1 year or more.