

Bridgeton Landfill, LLC

13570 St. Charles Rock Road
Bridgeton, Missouri 63044

Mr. Chris Nagel
Missouri Department of Natural Resources
1738 East Elm Street
Jefferson City, Missouri 65101

July 17, 2014

Dear Mr. Nagel:

**Thalhamer Data Review
Bridgeton Landfill, Bridgeton, Missouri
Permit No. 0118912**

On June 20, 2014, you provided Bridgeton Landfill with a memo from Todd Thalhamer which was dated June 15, 2014. The memo summarized Mr. Thalhamer's interpretation of data (from the June 10, 2014 Weekly Data Submittal and the May and June 2014 Monthly Data Submittals) relative to the location and movement of the SSE. Bridgeton Landfill believes that it is necessary to provide a response to Mr. Thalhamer's interpretations and concerns because we believe them to be misleading and incorrect.

For more than a year and a half Bridgeton Landfill has collected and reported an extensive volume of data in order to carefully and comprehensively assess the location, extent and impact of the reaction occurring deep within the South Quarry. We have worked with MDNR to develop this monitoring and reporting protocol, and to update it as appropriate to ensure that we are able to work together utilizing the best available information. That extensive data continues to show that the reaction remains a subsurface reaction, contained in the South Quarry, and that it is not progressing into the North Quarry. We are discouraged that MDNR or any consultant working for MDNR would issue findings and conclusions that do not properly account for all available data. We are providing this response in order to supplement the limited data relied upon by Mr. Thalhamer with the additional data that should be included as part of any assessment.

The following paragraphs attempt to address his observations, conclusions, and concerns.

"Subsurface Fire/Smoldering Event Continues to Expand in the South Quarry"

The reaction is not a subsurface fire, but rather an exothermic reaction occurring in the absence of oxygen (a necessary component for fire). The term SSE (subsurface smoldering event) was developed by MDNR and adopted in the May 2013 Agreed Order, and that term will be used to refer to the reaction that is occurring.

We disagree that the active SSE is expanding, but believe that it is moving. The direction of movement of the active SSE is indicated by the movement of the areas exhibiting large settlement. While settlement may not be a good early indicator of the genesis of an SSE—an ongoing SSE does result in volume reduction which is reflected as settlement at the ground surface. When the SSE moves, areas

with accelerated settlement (previously defined as greater than 1.35 feet per month) are observed over or adjacent to the area of the active SSE. The map provided in Attachment A shows locations for the areas within which accelerated settlement is occurring. It can be seen that the total area affected by accelerated settlement is shrinking and that the location of the accelerated settlement (and—correspondingly—the active SSE) is moving away from the North Quarry and further south into the South Quarry.

Evidence that the SSE is not expanding, enlarging, or intensifying is provided by the rate of settlement that is occurring. The rate of settlement—expressed as cubic yards per day—is an indicator of the size and activity level of the SSE. As shown on the graph in Attachment B, the rate of settlement in the past seven months has been very steady. This suggests that the SSE is not expanding.

“Subsurface Fire/Smoldering Event is Past the Last Line of Gas Interceptor Wells/Temperature Concerns”

We agree that temperature in the neck is gradually warming. We do not agree that the SSE is moving toward the neck, let alone “through the neck.” The warming in the area is likely the result of conduction and convection of heat from the active reacting area in the southern portion of the South Quarry. As we have noted in earlier reports, the compact waste material is a good insulator and maintains and transfers heat very slowly to surrounding waste. Even if the SSE were to cease reacting today, temperatures in the neck area—well removed from the SSE—would increase for some period of time before they started to drop. Further, the warming in this area has been gradual over time – very different from sudden and larger temperature increases observed in areas affected by the active SSE.

Specific examples referenced by Mr. Thalhamer as “Temperature of Concerns”:

Neck Area:

“GEW-38 above 190° F.” Bridgeton Landfill notes that this well temperature has been pretty steady with minor fluctuations and a gradual maximum temperature rise from 184° F in October 2013 to 192° F in May 2014 (eight months). See table in Attachment C.

“GEW-109 above 165° F.” Bridgeton Landfill notes that this well temperature has been pretty steady with minor fluctuations and a maximum temperature decrease from 172° F in October 2013 to 166° F in May 2014 (eight months). See table in Attachment C.

“GIW-1, -2, -3, -9, -10, -11, -12, and -13 temperatures above 165° F to 200° F.” Bridgeton Landfill has observed gradually rising temperatures in these GIWs; however, many of these wells have had elevated temperatures since early 2013. We believe that the gradual warming is due to the conduction of heat as explained prior in this letter. Higher gas temperatures at a given gas flow rate result in more heat being removed from the landfill in the area of the GIWs—this is the proper function and operation of these wells. Graphs for these GIWs are provided in Attachment D.

North Quarry

“GEW-53 and GEW-54 above NSPS temperature threshold of 131° F.” These gas wells have historically operated at temperatures greater than 131° F. This condition exists at many landfills that do not have an SSE or reaction occurring. The temperatures in these wells have been pretty steady with minor fluctuations and a gradual maximum temperature decreases from 142° F in October 2013 to 137° F in May 2014 (eight months) for GEW-53, and from 144° F in October 2013 to 138° F in May 2014 (eight months) for GEW-54. See table in Attachment C.

South Quarry

“GEW-15, -16R, -18R, -21A, -34A, -57A, -58, -65A, -71, -72RR, -77, -81, -86, and -100. SEW 13, 63, 74 temperatures over 190° F.” Bridgeton Landfill does not understand the nature of the concern with these wells. They are all located in the South Quarry, south of the neck area and are most definitely impacted by the SSE. Wellhead temperatures over 190° F have existed in many of these wells for many months as would be expected based on their location.

Oxygen Readings

Mr. Thalhamer notes several wells that exhibit maximum oxygen readings over 5% at the wellhead. All of the wells noted by Mr. Thalhamer are in the South Quarry.

On June 24, 2013, Bridgeton Landfill replied in a letter to MDNR regarding Mr. Thalhamer’s previous concern on this issue (included with this letter as Attachment E). As explained in that letter, these oxygen levels do not represent elevated oxygen in the waste mass, but are due to well operational issues that result in zero landfill gas flow so that the readings obtained are affected by ambient air in the wellhead. It should be noted that all of the gas wells referenced by Mr. Thalhamer are in the South Quarry which is covered by a flexible membrane liner which prevents air from being pulled into the waste mass. The Monthly Data Submittals reviewed by Mr. Thalhamer contain these explanations for such oxygen readings, again stating that they are not representative of oxygen present in the waste mass.

TMP Concerns

As noted in the Weekly Data Submittals and ongoing discussions with MDNR, many of the TMP intervals have been adversely affected by the landfill conditions. Thermocouples and their fragile wire leads were not intended and are not suited to survive on a long-term basis buried in solid waste material that settles and shifts and contains gas and liquid. In fact TMP-13 that Mr. Thalhamer is “most concerned about” has experienced compromised intervals all year, as noted in the weekly reports provided to MDNR. By the time of the June 10, 2014, weekly report, no TMP graph was even included for TMP-13 since it was determined that all intervals had become compromised. Even without these documented data issues, it is not proper to rely on any one monitoring point alone given the expansive monitoring network in place at the Bridgeton Landfill.

It is true that reported temperatures of some of the shallower TMP intervals have increased in recent months. This may be due to compromised or failing units, or may be due to shallow migration of warm gas that is moving through the upper waste layer – which is the most gas permeable waste layer. Bridgeton Landfill does not believe, as stated by Mr. Thalhamer in Item 4 of this portion of his letter, that the SSE is migrating vertically and will result in a “subsurface fire/smoldering event daylighting under the flexible membrane cap.” Even if this unlikely event were to occur, the facility has developed an Incident Management Plan that specifically addresses adequate means for responding, controlling, and rapidly extinguishing such a surface fire; the IMP was developed in concert with first responders and with Mr. Thalhamer. MDNR acknowledged the sufficiency of these surface fire response procedures in its June 20, 2014, letter.

Recent Data Not Available to Mr. Thalhamer

The second paragraph of Mr. Thalhamer’s memo states “until additional carbon monoxide sampling is performed in the neck, I am not able to conclusively state that the subsurface fire/smoldering event is past the GIW system.” Mr. Thalhamer makes this statement even though three rounds of site-wide carbon monoxide testing during this calendar year have each confirmed the absence of carbon

monoxide in the North Quarry – including the neck wells in the North Quarry – and reflected the consistency of current North Quarry conditions with those documented in June 2013 sampling.

Since the time of Mr. Thalhamer’s review, Bridgeton Landfill has received the results of carbon monoxide sampling on ten gas extraction wells in the “neck area.” Some of these wells are in the North Quarry and others in the South Quarry. The results continue to indicate very steady levels of carbon monoxide in the South Quarry neck area, while no carbon monoxide is detected in the North Quarry neck area wells. See Attachment F for a table with these results.

In conclusion, the data, facility observations, and experience with similar reactions support the following conclusions:

1. The SSE is confined to the South Quarry.
2. The active SSE is not expanding, but is moving to the south.
3. While temperatures in the neck area are warming slowly, this is not an indication that the SSE is moving into the neck area, let alone through the neck area.
4. The SSE is not prone to “daylighting under the flexible membrane cap.” However, Bridgeton Landfill has an Incident Management Plan—developed in concert with the first responders and Mr. Thalhamer—that specifically addresses adequate means for responding, controlling, and rapidly extinguishing a surface fire.
5. The most recent carbon monoxide testing data in the neck area (not available for review by Mr. Thalhamer before his memo was prepared) indicates that the neck area results are stable.

If you need additional information, please contact me at (314) 744-8165.

Sincerely,
Bridgeton Landfill, LLC


Brian Power
Environmental Manager

Attachments:

- A – Map with Direction of SSE Movement
- B – Graph of Settlement Volume
- C – Table with Maximum Monthly Wellhead Temperatures
- D – GIW Wellhead Temperature Graphs
- E – June 13, 2013 Letter Response to Thalhamer Data Review
- F – North Quarry and Neck Area Carbon Monoxide Results

ATTACHMENT A

MAP WITH DIRECTION OF SSE MOVEMENT



SEPTEMBER 23, 2013

JUNE 15, 2014

APPROXIMATE QUARRY WALL LOCATION

LEGEND

	TOPOGRAPHY (2' CONTOUR)
	TOPOGRAPHY (10' CONTOUR)
	SEPTEMBER 23, 2013 SETTLEMENT FRONT
	JUNE 15, 2014 SETTLEMENT FRONT

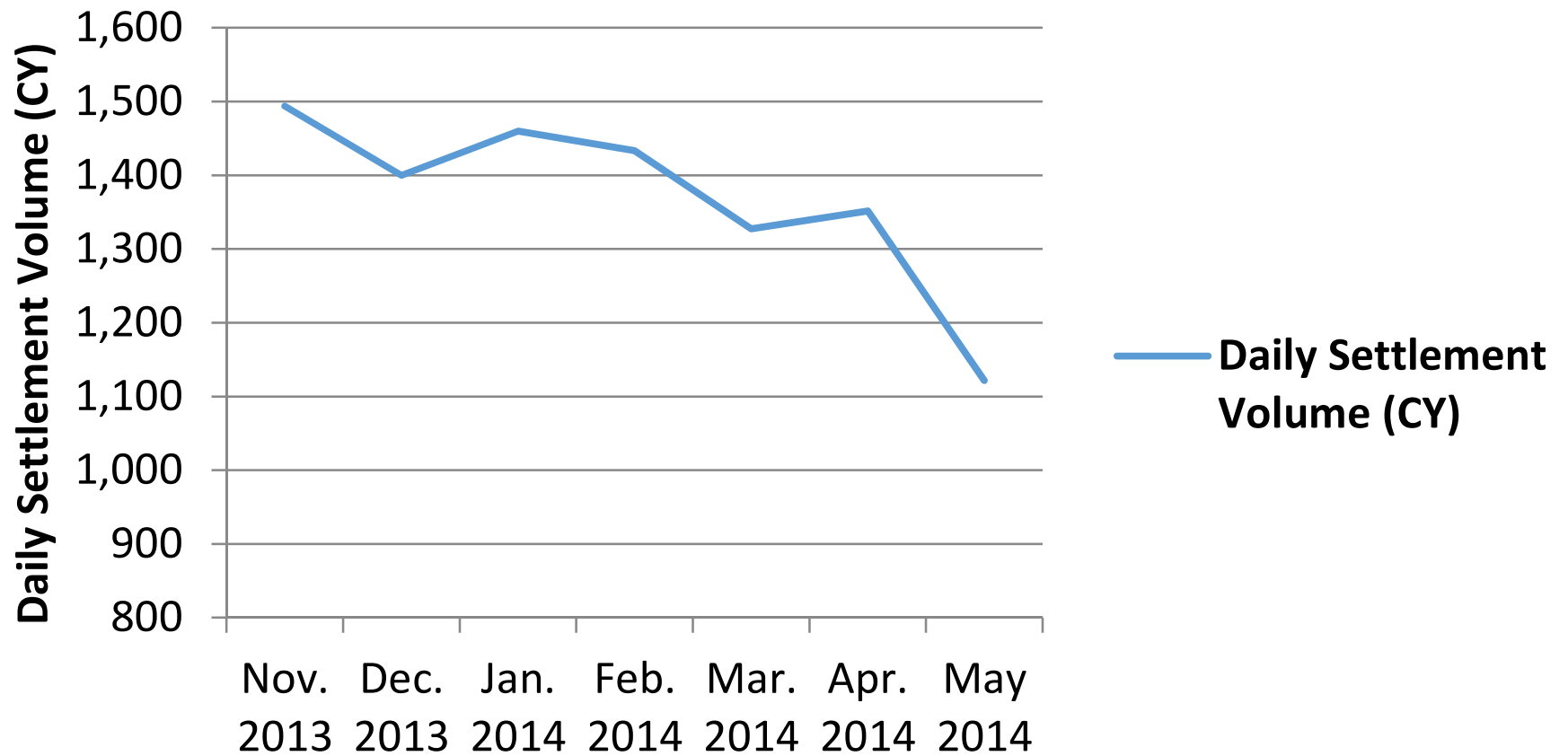
- GENERAL NOTES:**
- 1.) TOPOGRAPHY SHOWN BASED ON PHOTOGRAPHY DATED 3-20-2014.
- SETTLEMENT NOTES:**
- 1.) DRAWING DEPICTS THE LOCATION OF SETTLEMENT ACTIVITY THAT IS 1.35 FT PER 30 DAYS - INDICATIVE OF THE SETTLEMENT FRONT BASED ON THE ANALYSIS OF SURVEY DATA IN 2012.
 - 2.) THE SEPTEMBER 23, 2013 SETTLEMENT FRONT WAS DEVELOPED BY COMPARING THE SURVEY FROM AUGUST 17, 2013 TO THE SURVEY FROM SEPTEMBER 23, 2013 AND PLACING A BOUNDARY AROUND THE AREA THAT SHOWED SETTLEMENT OF 1.35 FT OR GREATER PER 30 DAYS.
 - 3.) THE JUNE 15, 2014 SETTLEMENT FRONT WAS DEVELOPED BY COMPARING THE SURVEY FROM MAY 15, 2014 TO THE SURVEY FROM JUNE 15, 2014 AND PLACING A BOUNDARY AROUND THE AREA THAT SHOWED SETTLEMENT OF 1.35 FT OR GREATER PER 30 DAYS.

BRIDGETON LANDFILL, LLC 13570 SAINT CHARLES ROCK ROAD BRIDGETON, MISSOURI 63044	BRIDGETON LANDFILL SETTLEMENT MONITORING	Engineering for a Better World FEEZOR ENGINEERING, INC.	DATE: JULY 2014 DESIGNED BY: DMK APPROVED BY: ALK	DRAWING NO.: 001
PROJECT NUMBER: BT-021 FILE PATH: S:\BRIDGETON LANDFILL\SETTLEMENT FRONT MONITORING			REVISION	DATE

ATTACHMENT B

GRAPH OF SETTLEMENT VOLUME

Daily Settlement Volume (CY)



ATTACHMENT C

TABLE WITH MAXIMUM MONTHLY WELLHEAD TEMPERATURES

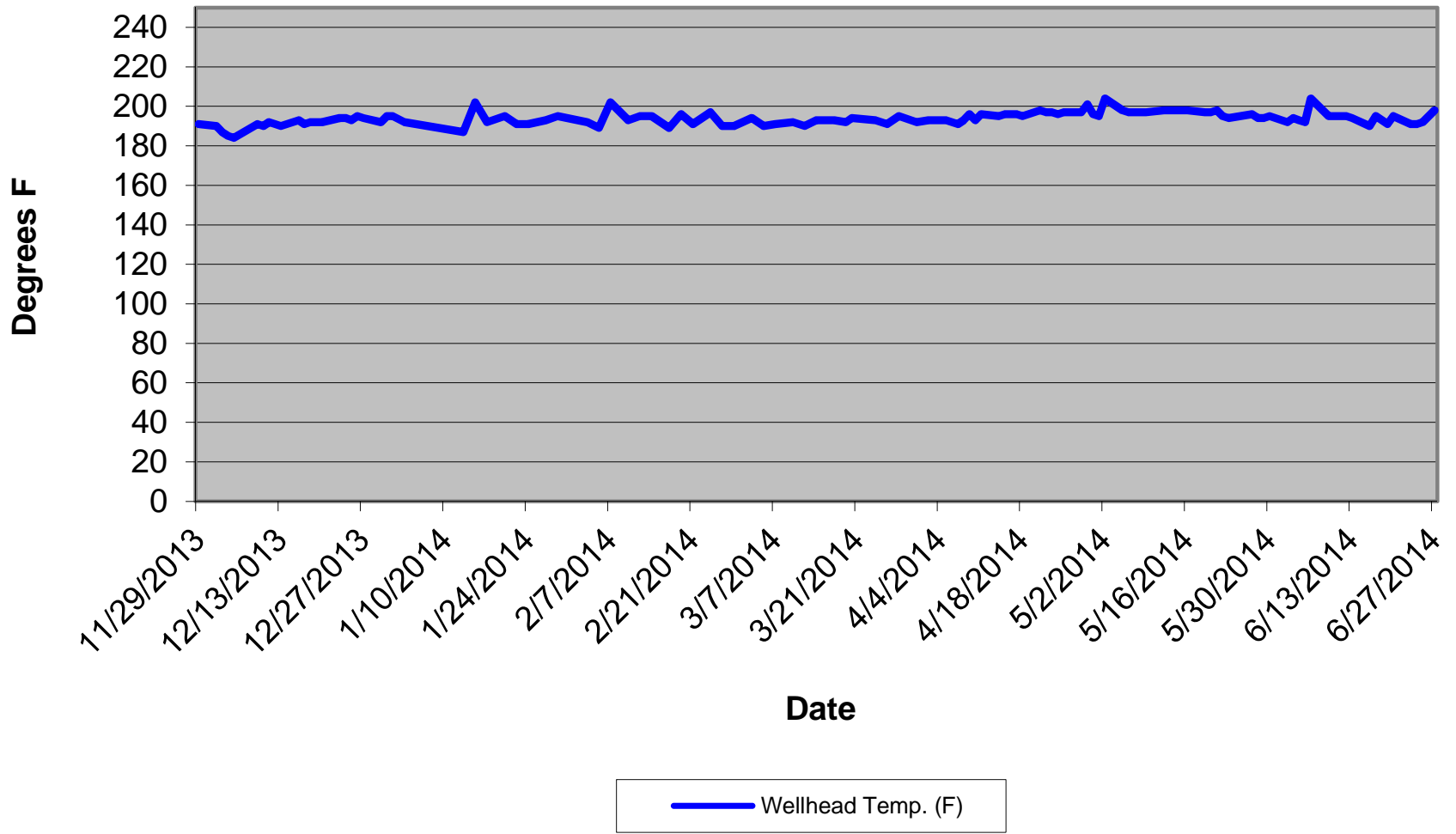
BRIDGETON LANDFILL
SELECT GAS EXTRACTION WELL TEMPERATURE DATA

	Maximum Initial Wellhead Temperature (deg. F)							
Well Name	Oct. 2013	Nov. 2013	Dec. 2013	Jan. 2014	Feb. 2014	Mar. 2014	Apr. 2014	May 2014
<i>Neck Area</i>								
GEW-38	184	179	181	181	186	190	189	192
GEW-109	172	170	174	162	167	170	122	166
<i>North Quarry</i>								
GEW-53	142	133	128	137	132	138	139	137
GEW-54	144	148	136	142	140	138	138	138

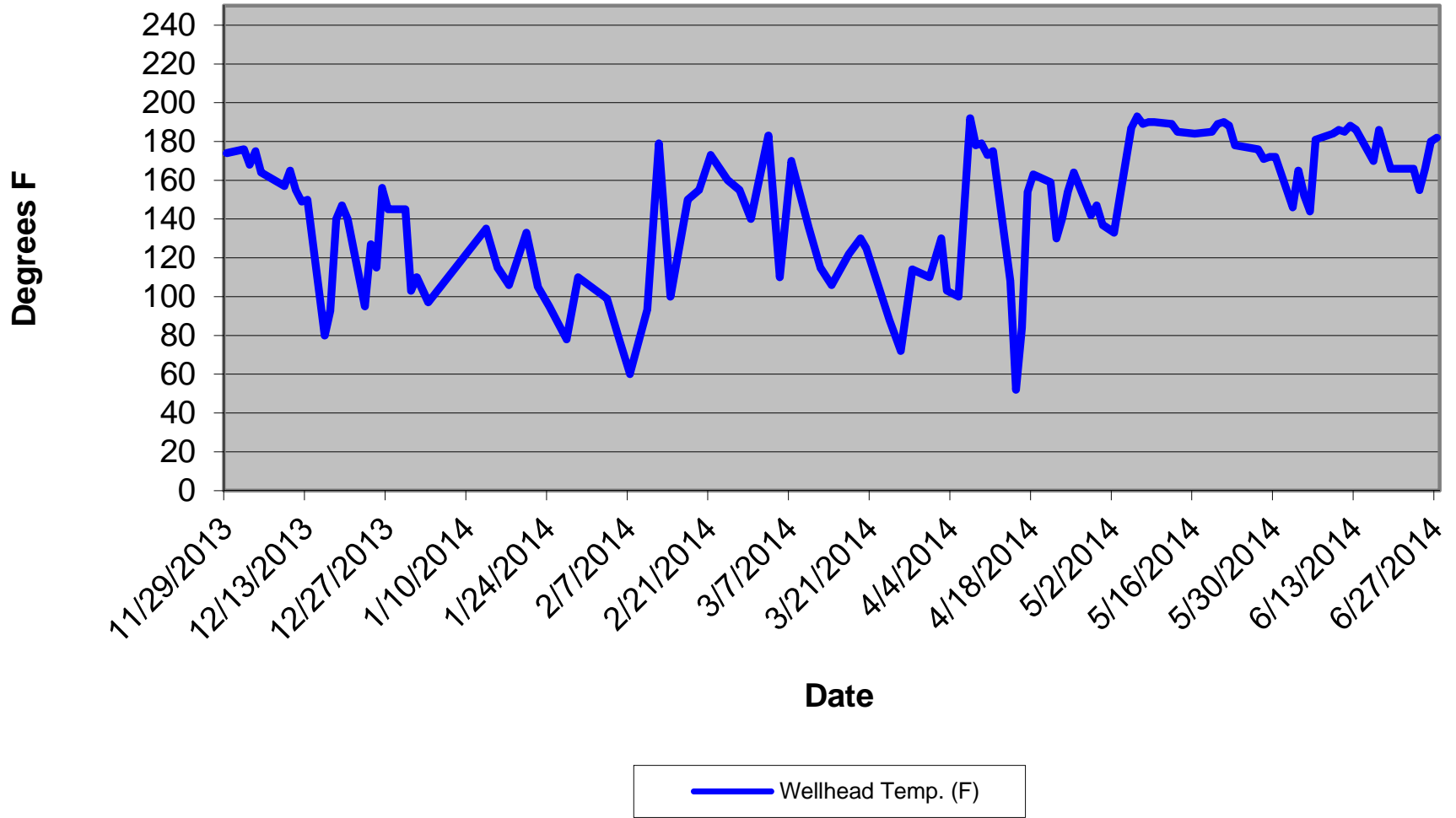
ATTACHMENT D

GIW WELLHEAD TEMPERATURE GRAPHS

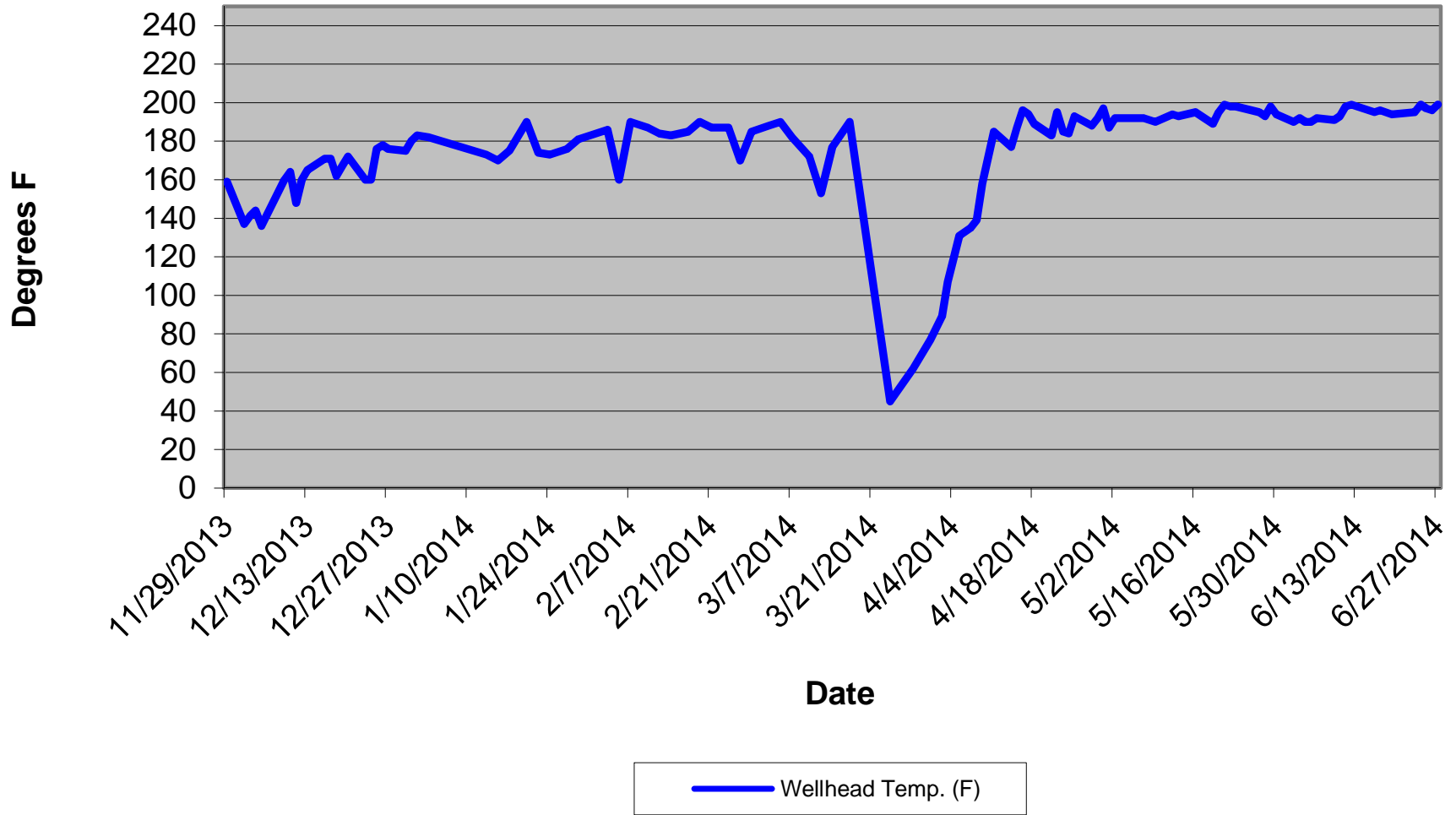
GIW-1 Wellhead Temperatures



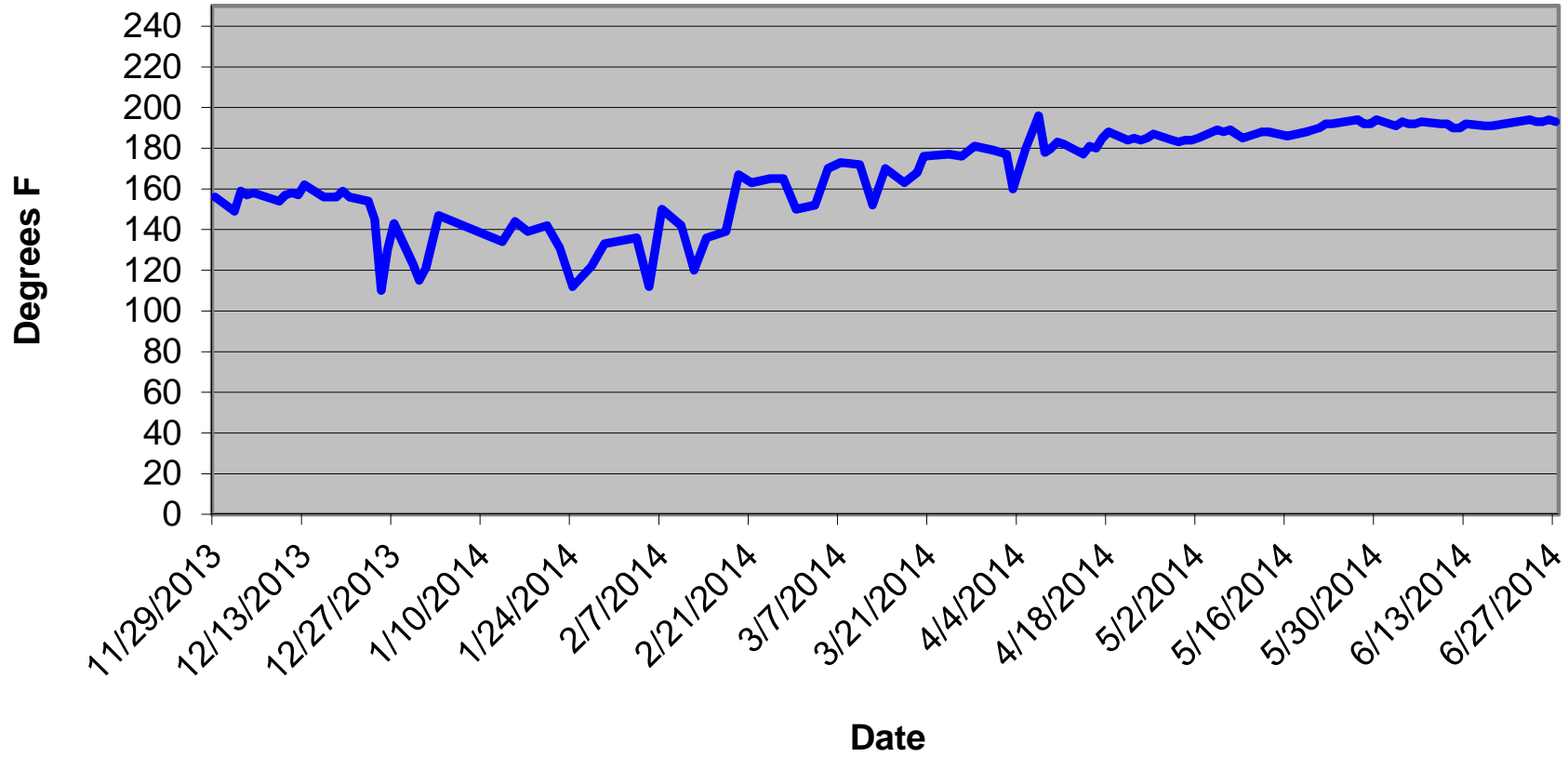
GIW-2 Wellhead Temperatures



GIW-3 Wellhead Temperatures

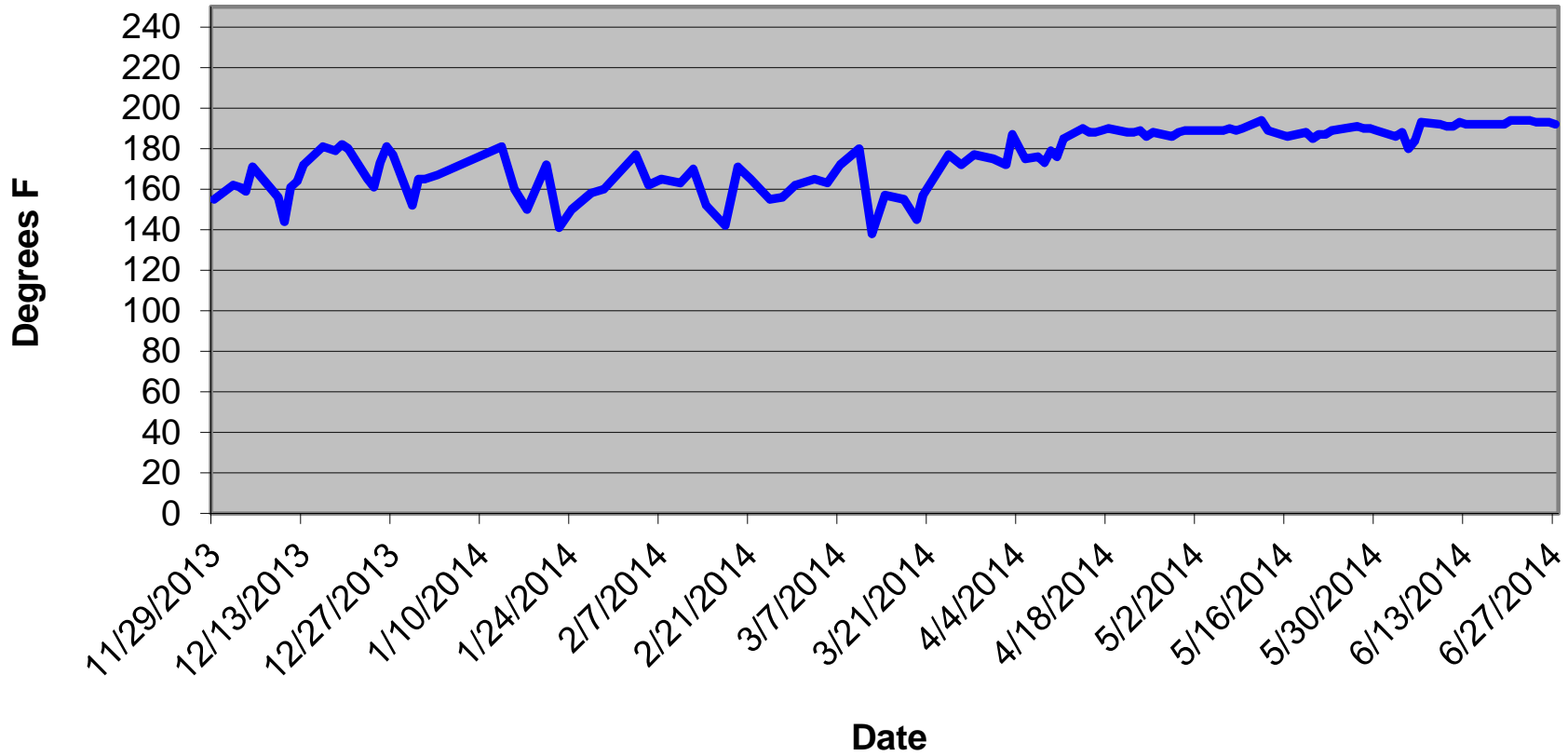


GIW-9 Wellhead Temperatures



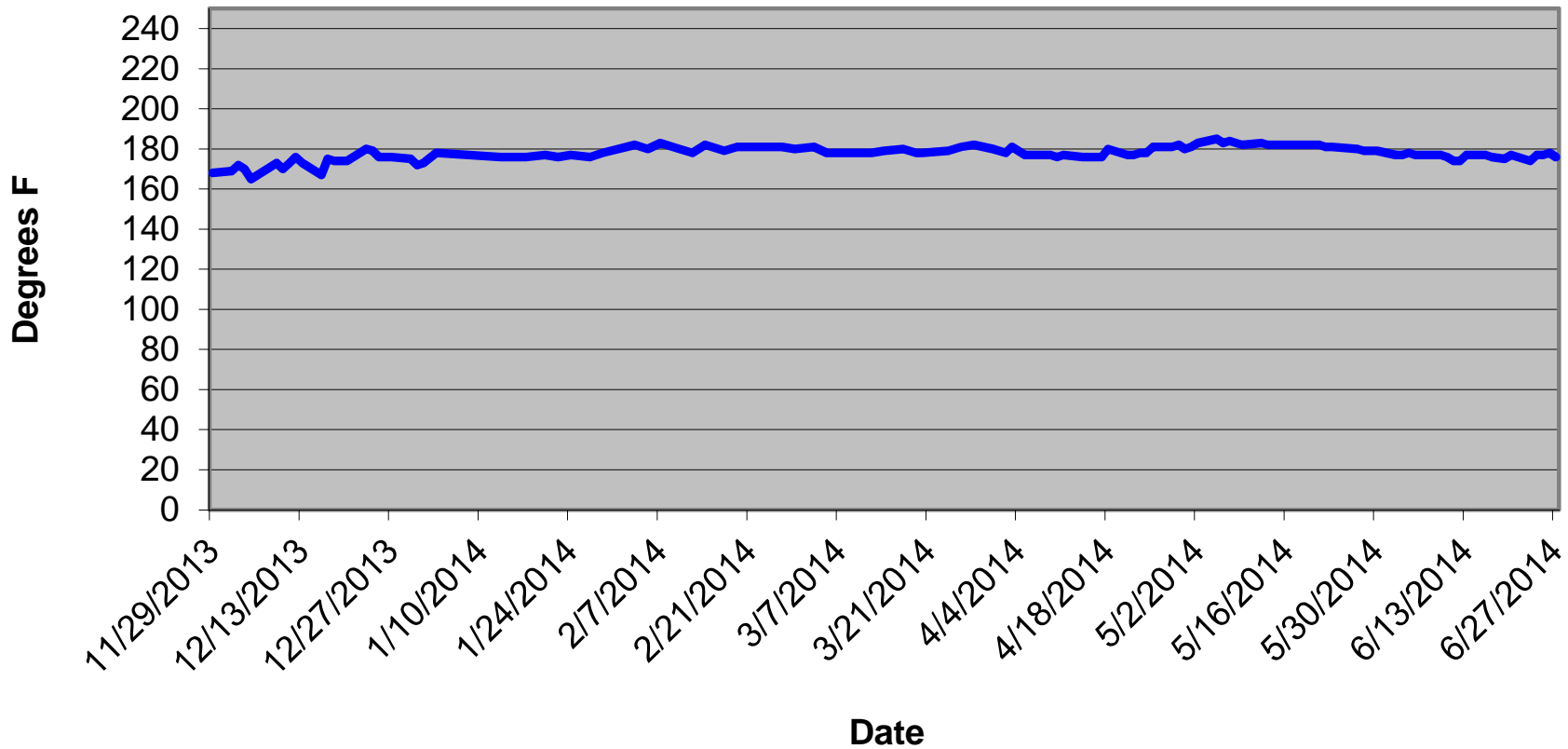
Wellhead Temp. (F)

GIW-10 Wellhead Temperatures



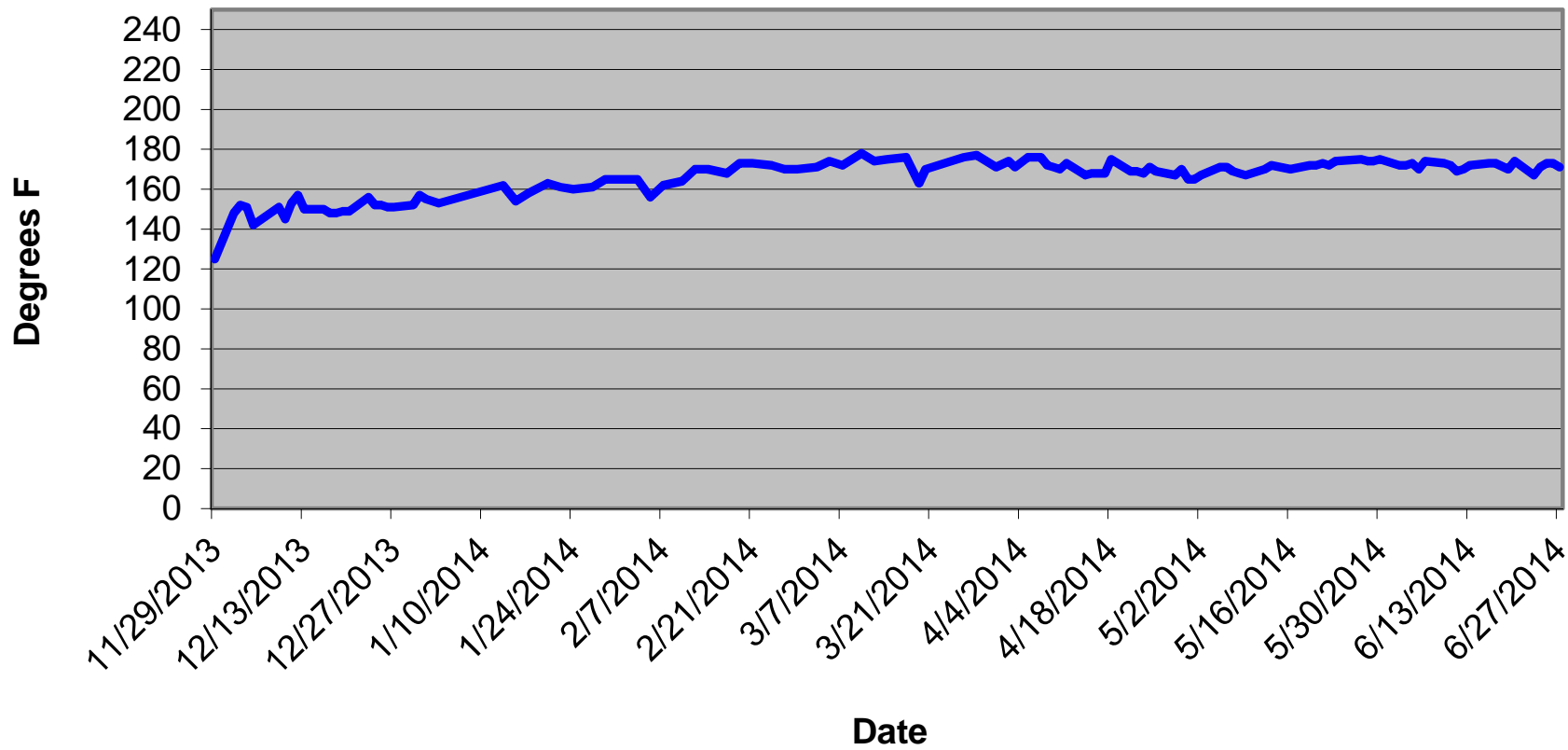
Wellhead Temp. (F)

GIW-11 Wellhead Temperatures



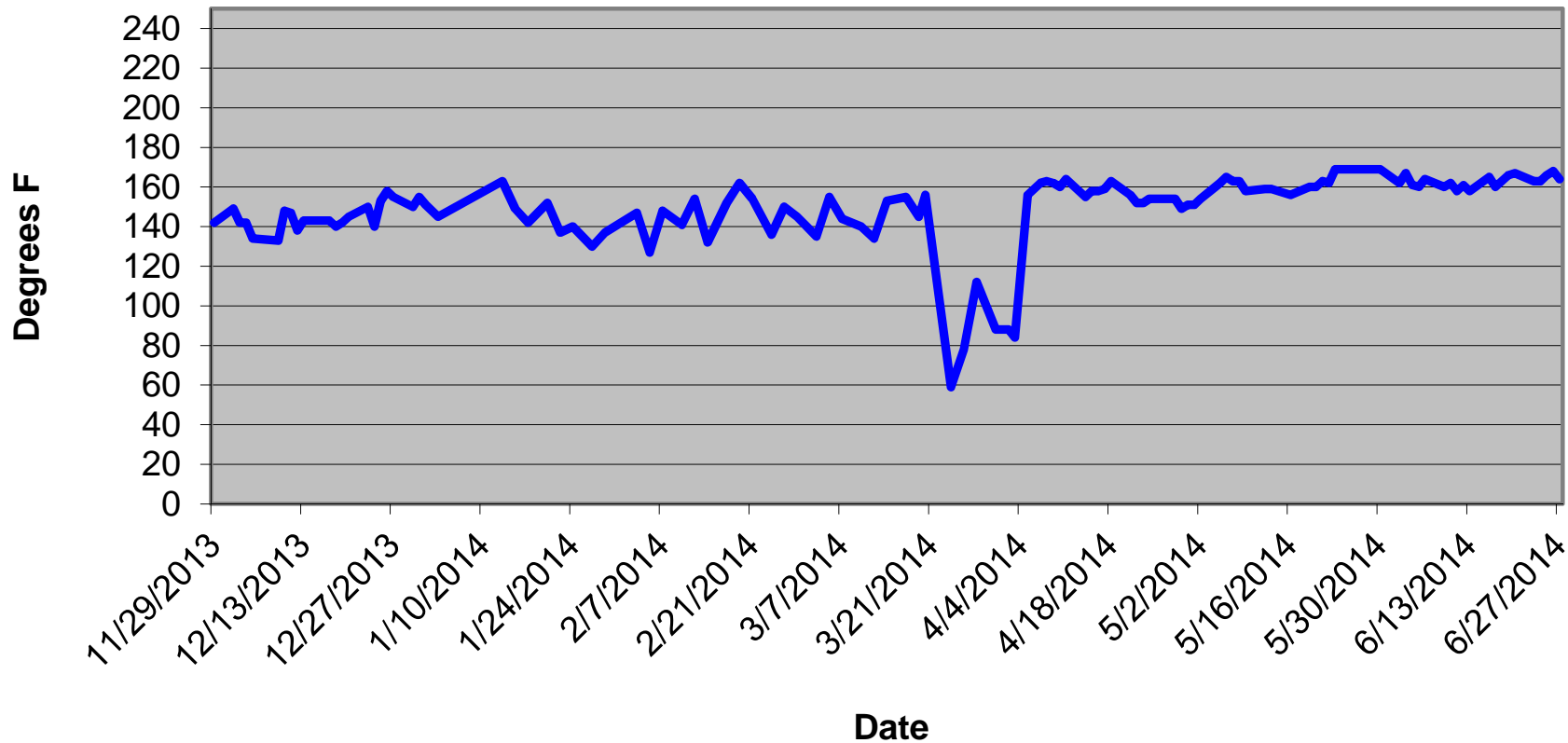
Wellhead Temp. (F)

GIW-12 Wellhead Temperatures



Wellhead Temp. (F)

GIW-13 Wellhead Temperatures



Wellhead Temp. (F)

ATTACHMENT E

JUNE 13, 2013 LETTER RESPONSE TO THALHAMER DATA REVIEW

Bridgeton Landfill, LLC

13570 St. Charles Rock Road
Bridgeton, Missouri 63044

Mr. Aaron Schmidt
Missouri Department of Natural Resources
1738 East Elm Street
Jefferson City, Missouri 65101

June 24, 2013

Dear Mr. Schmidt:

**Gas Wellfield Management
Bridgeton Landfill, Bridgeton, Missouri
Permit No. 0118912**

At the June 18, 2013 Team Bridgeton meeting, you referred to comments in the report "Data Evaluation of the Subsurface Smoldering Event at the Bridgeton Landfill" prepared by Todd Thalhammer, P.E. dated June 17, 2013. The referenced comments are found in the "General Comments and Concerns on the Landfill Data" section of the report and deal with Mr. Thalhammer's concern with what he sees as "overpull" of the gas extraction wellfield.

We do not believe that a systemic condition of overpull exists in the wellfield, but remain open to discussing this further to answer any questions and offer the following comments in response to the concerns raised in Mr. Thalhammer's report:

1. The report references several incidents where inlet gas to the flare contained more than 5% oxygen and cites that as evidence that the "facility is overdrawing the gas collection and control system." However, it should be noted that the gas collected at the flare includes gas from many locations other than the GEW and GIW wells in the wellfield. About 50 PEW (perimeter extraction wells) are installed outside the limits of waste in soil and rock materials for the purpose of limiting methane migration. These wells draw primarily ambient air with high oxygen levels but do not draw oxygen into the waste material. Also, there are a number of "odor control" devices that contribute gas to the flare inlet, such as "bubblesuckers" (features that remove shallow gas from under sections of synthetic liner material), sump collectors, shallow horizontal trenches, and leachate vessels; each of these allow ambient air into the gas collection system, without pulling oxygen into waste material.
2. Table 4 of the report lists gas wells from April that had peak oxygen level over 5%. There are many reasons that this can occur, and the details of these specific incidents can be investigated. Generally speaking, the presence of a high water level in a gas well can limit or prevent landfill gas from reaching the wellhead where oxygen is measured. In such cases, the field instrument pulls a vacuum on the wellhead which may allow air to infiltrate the wellhead causing oxygen readings that are not representative of oxygen levels in the waste mass. In other cases, It is

possible that settlement causes the solid casing portion of the gas well to pull away from the soil creating a "short-circuit" of air to migrate down along the casing and to enter the top of the well screen (which is usually shallow and well above the reaction area); again, this would not be representative of the oxygen content in the waste mass.

We agree with MDNR and Mr. Thalhammer regarding the importance of minimizing oxygen intrusion into the waste mass, and will continue to remain diligent while also exerting efforts to maximize gas removal in an attempt to control odor. We have reinforced our procedures to assure follow-up and trouble-shooting for GEW and GIW wells that indicate presence of oxygen; these may result in earlier introduction of a pump into a well, greater attention to surface seals, etc. Addition of the EVOH cap should allow better surface seal eliminating one of the above-mentioned variables.

If you need additional information, please contact Michael R. Beaudoin of CEC at 248-804-8022 or myself at 314-744-8195.

Sincerely,

Bridgeton Landfill, LLC

 FOR

Craig Almanza
Area Environmental Manager

cc: Mr. Chris Nagel, Chief, MDNR-SWMP

ATTACHMENT F

NORTH QUARRY AND NECK AREA CARBON MONOXIDE RESULTS

**BRIDGETON LANDFILL NORTH QUARRY AND NECK AREA CARBON
MONOXIDE ANALYSES**

<i>Gas Well</i>	<i>June 6, 2013 Sample</i>	<i>January 24, 2014 Sample</i>	<i>March 25, 2014 Sample</i>	<i>May 22-23, 2014 Sample</i>	<i>June 25, 2014 Sample, Neck</i>
	ppm	ppm	ppm	ppm	ppm

North Quarry Gas Extraction Wells

GEW-1	ND	ND	ND	ND	
GEW-2	ND	180	ND	ND	
GEW-3	ND	ND	ND	ND	
GEW-4	ND	ND	ND	ND	
GEW-5	ND	ND	ND	ND	
GEW-6	ND	ND	ND	ND	
GEW-7	ND	ND	ND	ND	
GEW-8	ND	ND	ND	ND	ND
GEW-9	ND	ND	ND	ND	ND
GEW-40	ND	ND	ND	ND	ND
GEW-41R	ND	ND	ND	ND	
GEW-42R	ND	ND	ND	ND	
GEW-43R	ND	ND	ND	ND	
GEW-44	ND	ND	ND	ND	
GEW-45R	ND	ND	ND	ND	
GEW-46R	ND	ND	ND	ND	
GEW-47R	100	36	ND	ND	
GEW-48	ND	ND	ND	ND	
GEW-49	ND	ND	ND	ND	
GEW-50	ND	ND	ND	ND	
GEW-51	ND	120	120	ND	
GEW-52	ND	ND	ND	ND	
GEW-53	44	120	150	ND	
GEW-54	44	24	ND	ND	
GEW-55	ND	32	30	ND	ND

South Quarry/Neck Area (closest sampling date to North Quarry event possible)

GEW-10	370	180	300	63	ND
GEW-38	2700	2400	2000	2400	2300
GEW-39	630	260	280	280	260
GEW-56R	230	2900	690	440	ND
GEW-109	1500	1300	1900	1700	1500
GEW-110	920	460	NA	NA	880

 = Neck Area Well designated June 2014