Bridgeton Landfill, LLC
13570 St. Charles Rock Road
Bridgeton, Missouri 63044

October 7, 2013

Ms. Charlene S. Fitch, P.E.
Chief Engineering Section
Missouri Department of Natural Resources
1738 East Elm Street
Jefferson City, Missouri 65101

Dear Ms. Fitch:

North Quarry Action Plan

and

North Quarry Contingency Plan – Part 1 and 2
Response to September 17, 2013 MDNR Comments
Bridgeton Landfill, Bridgeton, Missouri
Permit No. 0118912

Bridgeton Landfill herewith submits a newly created North Quarry Action Plan (NQAP) that replaces all previous submission of a North Quarry Contingency Plan (NQCP). The NQAP is a product of voluntary actions by Bridgeton Landfill, formed in coordination with MDNR, AGO, and EPA and publicly announced on Friday, September 20, 2013, to install the final protective elements of the physical infrastructure required by the step-wise process being formed in the prior NQCP process. Relevant design and construction plans and monitoring features of the NQCP have been moved into this newly assembled NQAP or the previously submitted O&M Plan.

The NQAP confirms the commitments Bridgeton Landfill made to a series of efforts that will provide positive isolation and containment of the North Quarry area. Proactive performance of these actions eliminates the need for trigger criteria, triggering events, and contingent actions, but incorporates the approved monitoring protocol and technical comments to work plans. Consistent with the approval of MDNR, the following significant efforts will be undertaken by Bridgeton Landfill:

1. Enhancement of the gas collection and control system (GCCS) in the North Quarry in a manner that would allow the system to accommodate and perform in the conditions that would exist if an SSE were present;
2. Completion of a synthetic (EVOH) cap over the North Quarry area to provide environmental containment and odor control should an SSE be present in the North Quarry; and

3. Pre-design investigation; design and construction of an Isolation Barrier that separates the North Quarry from radiologically-impacted material (RIM) in the West Lake OU-1 Area 1 unit, under the United States Environmental Protection Agency ("U.S. EPA") Superfund Program.

Details and schedules for these actions are provided in the NQAP that is transmitted by this letter.

While TMP data will no longer be needed for trigger evaluation, Bridgeton Landfill is prepared to proceed with installation of three new temperature monitoring probes (TMPs) as requested by the MDNR in a letter dated August 27, 2013, in advance of and/or concurrent with the NQAP pending responses from MDNR on this matter. The MDNR-requested locations for the three new TMPs are nearby the active SSE and therefore create a risk of causing odor during the construction activities, and pose a damage risk to the recently installed South Quarry EVOH cap. Due to the fact that these TMPs will not "trigger" a response action under the NQAP, Bridgeton Landfill has proposed new locations for the three additional TMPs that are outside the location of the South Quarry EVOH cap and north of any measured SSE activity. This will allow Bridgeton Landfill to alleviate the concern of EVOH cap damage and minimize the risk of an odor causing event. Bridgeton Landfill has previously discussed this approach with MDNR and would like to secure confirmation that we should move forward with the TMPs and that the alternate location further north is approved for installation to move further away from the active SSE activity.

Response to Comments

On September 17, 2013 we received your letter which provided comments on our August 13, 2013 submittal of the revised "Bridgeton Landfill North Quarry Contingency Plan – Part 1 (Plan)," and our July 26, 2013 submittal of the Bridgeton Landfill North Quarry Contingency Plan – Part 2 (Plan)." As a result of Bridgeton Landfill's commitment to perform the efforts described in the NQAP, many of the comments contained in the September 17, 2013 MDNR comment letter are no longer applicable. On September 26, 2013, Bridgeton Landfill and the MDNR discussed and agreed to the comments that were still relevant and need to be addressed. Those comments have been excerpted from the comment letter and provided below along with responses (MDNR comments in italics and our responses in regular font) and, where appropriate, guidance to the appropriate section or location in the North Quarry Action Plan where the comment is addressed.

COMMENTS ON REVISED PART 1

General:

Comment 1. Republic should continue to research, evaluate and test other alternatives for mitigating the SSE heating front including, but not limited to, inert gas injection or cryogenic pellets as potential "hot" spot treatments for the North Quarry.

RESPONSE:

Bridgeton Landfill has completed its research on cryogenic pellets. Bridgeton Landfill, along with MDNR and their contact, have invested considerable time attempting to gather information on the requested technology. No references have been provided by

the technology provider, making Bridgeton Landfill concerned about whether the technology has ever been used in real application. There are many other unresolved questions that Bridgeton Landfill has about the technology, but most concerning of all the information verbally reported to Bridgeton Landfill by the technology provider that a high risk of explosion exists in the presence of magnesium or magnesium compounds. Bridgeton Landfill has reported to the St. Louis Metropolitan Sewer District (MSD) that magnesium is present in the leachate. In light of this serious worker safety risk, the risk of exacerbating problems within the landfill waste mass, and without viable data and references, Bridgeton Landfill does not find the use of cryogenic pellets as a viable alternative for managing the issues pertaining to the landfill SSE.

Bridgeton Landfill has also completed its research on inert gas injection. Inert gas providers have confirmed the following facts:

- The cooling capacity of dry gas is significantly less effective than liquid options (i.e. cooled water),
- The supplies of gas necessary to provide a long-term cooling barrier are not commercially available, and
- That utilization of inert gas at depth ranging deeper that 30 – 35 feet have not proven to be effective due to the inability to provide effective control of the gas delivery within the waste mass.

An additional significant concern with the approach is:

- Injecting inert gas into the landfill will further degrade the btu quality of the landfill gas extracted from the landfill such that the flare will not burn and control air contamination.

Bridgeton Landfill does not find inert gas injection viable due to the reasons above. Additionally, using inert gas injection for the purposes of displacing a fuel source of oxygen and methane, which has been done at other forms of shallow landfill fires, is not applicable in this particular situation. The current SSE is deep seated in the anaerobic portion of the landfill and not driven by a fuel source of oxygen and methane, but rather is related to an exothermic reaction, and on-going pyrolitic activity, or a combination of both. In all cases, the SSE is occurring in the absence of oxygen. Therefore, inert gas injection is not necessary to "crowd out" the available oxygen. Finally and most critically, Bridgeton Landfill does not intent to proceed with inert gas injection for all the reasons above, most notably due to the potential detrimental impact of inert gas on flare operations could impede the ability to maintain appropriate and efficient gas control, a critical operational measure for control of the SSE and its impacts.

Comment 3 Section 5.3 states that conditions will be monitored in the entire North Quarry area using gas wellhead temperature and carbon monoxide (CO) values, as appropriate. If any gas extraction well exhibits a well head temperature above 145° F, then monthly CO laboratory testing and weekly Draeger Tube® testing will be performed on that gas well.

The procedures for use and the accuracy range and specifications for the Draeger Tubes®

need to be provided for review and comment. Below is a table of Draeger Tubes® with measuring ranges known to us. The one with an acceptable range has been highlighted in yellow and marked with a *.

Draeger-Tube	Measuring Range:
Carbon Monoxide 2/a	Measuring Range: 2-300ppm
Carbon Monoxide 5/c	Measuring Range: 5-700 ppm (**SE** Certified)
Carbon Monoxide 8/a	Measuring Range: 8-150 ppm
*Carbon Monoxide 10/b	Measuring Range: 10-30,000 ppm
Carbon Monoxide 0/3%/b	Measuring Range: **03 – 7 Vol%**

RESPONSE:

Bridgeton Landfill will continue to operate and monitor the North Quarry in accordance with the requirements of the New Source Performance Standards (NSPS). In addition, as previously requested and approved by MDNR, Bridgeton Landfill will perform carbon monoxide monitoring as described in Section 2.3 of the NQAP (laboratory analyses for carbon monoxide for a well that exhibits wellhead temperature >145° F, which would be ceased after the wellhead temperature reverts to <140° F).

Comment 5 Figure 4, Resubmittal of Plan View of Contingent Actions, dated August 13, 2013, details the proposed North Quarry GCCS enhancements. During our review, it appeared the North Quarry GCCS design has areas where gaps in well coverage may exist. Republic will need to review and provide the calculations used for the proposed design to ensure spacing and radius of influence is adequate given conditions that may exist if the North Quarry is impacted by the SSE. Regarding the vertical design of GEWs, additional GEWs will need to be installed to within 15 feet of the bottom of the landfill unless justification is provided for a different depth.

RESPONSE:

Calculations justifying the relative radius of influence of extraction wells and accompanying spacing of extraction wells under the anticipated SSE conditions are presented in "Appendix D – Design Calculations". A conservative well spacing of approximately 150 feet has been utilized for additional proposed wells. Potential gaps in coverage have been addressed with this resubmittal. In all, Bridgeton Landfill will be adding 21 more gas extraction wells to the existing system in the North Quarry. Additionally, the subsurface collectors integrated into the temporary capping system will provide supplemental gas extraction capacity. Modifications to the design are included on Sheets 2A, 2B and 2C of the Proposed North Quarry GCCS Enhancements.

The design of additional and/or replacement extraction wells has been modified to extend to 140 feet in depth or to within 15 feet of the bottom of waste, whichever is less. Gas collection below 140 feet deep is extremely limited due to the density of the waste and the corresponding extremely-low gas permeability. Additionally, the waste deposited in the base of the North Quarry is the oldest (circa 1979), and presumably the most highly-decayed, material in the disposal area; gas generation from this part of the disposal area is anticipated to be minimal at this time.

APPENDIX F: VERIFICATION PROCEDURES OF TMP MEASUREMENTS

From review of data provided on a weekly and monthly basis, it appears the Omega switches used on the temperature monitoring probes (TMPs) have been problematic and may have resulted in variable readings. As some of these TMPs will serve as a triggering element, use of an enhanced system for logging temperature readings from the TMPs is needed.

RESPONSE:

Because the gas system expansion and cap installation are being performed without waiting for any triggering conditions, and because the MDNR-approved monitoring protocol for the North Quarry relies upon gas extraction wells, the TMPs are used only for supplemental monitoring and are no longer needed for monitoring of a triggered event. As such, additional TMPs (beyond those described in the NQAP) will not be installed and no effort will be made to replace or repair failing units or intervals.

Bridgeton Landfill is in the process of modifying the existing TMP reading physical apparatus to eliminate the use of Omega switches. The agreed-upon new TMPs will incorporate the new readout structures as well as several below-grade changes intended improve the function of the TMPs as detailed in Appendix C of the NQAP. Detailed procedures for reading and verifying the TMPs has been provided in Volume 1 of the Operation, Maintenance, and Monitoring (OM&M) Plan that was submitted on September 13, 2013.

APPENDIX G: STANDARD OPERATING PROCEDURES FOR MANAGEMENT OF A LOCAL SUBSURFACE OXIDATION EVENT

Pursuant to Appendix G, the facility has the opportunity to adjust the GCCS and take other mitigative actions between the period the temperature in the well reaches the New Source Performance Standard (NSPS) 131° F and the trigger criteria is reached at 180° F and 1,500 ppm carbon monoxide. At the point an isolated subsurface oxidation event triggers the criteria in Table 1, construction or installation of the agreed upon engineered controls based on the location of the event is required.

RESPONSE:

Although no longer relevant to trigger criteria, and therefore not part of the NQAP, Bridgeton Landfill has included the procedures for management of a local subsurface oxidation event in Volume 2 of the OM&M Plan that was submitted on September 13, 2013.

APPENDIX H: ANALYSIS OF RATE OF SSE MOVEMENT

The calculation for installation of engineered controls is based on the average movement since January 31, 2013, of 0.49 feet per day using three (3) northern vectors. The Department requires the rate of movement to be calculated on the maximum movement rate to ensure an adequate factor of safety.

A NE vector movement rate was calculated at a maximum rate of 1.77 feet per day (between March 20th and April 15th, 2013) in the South Quarry. Since the gas interceptor wells (GIWs) were activated the maximum movement rate has slowed to 0.87 feet per day (between May 13th and June 21st, 2013). Without additional settlement data being provided since June 21ST and with the potential for the reaction accelerating once outside the radius of the GIWs, northward movement of the reaction could increase through the balance of the neck. The Department for planning purposes and to ensure an adequate factor of safety requires use of a reaction rate of movement of 2 feet per day, as the potential rate, once outside the confluence of the engineered controls in the 'neck' based on the data provided.

As stated in our July 24, 2013, comment letter, the Department is concerned whether adequate time exists, given landfill conditions in the neck, for installation of the cooling point system and the system becoming operational and achieving the desired temperature before the SSE reaches the system. Please provide verification and the calculations and assumptions used to show the proposed installation and operational timeframes are achievable using the movement rate established by the Department.

RESPONSE:

Construction of the enhanced GCCS and the EVOH cap will be initiated immediately upon approval of the design plans contained within this response. As a result, triggered actions are no longer part of the NQAP. Please refer the construction schedule in Table 1 of the NQAP. All scheduled activities are dependent upon approval by MDNR of the construction plans.

COMMENTS ON CONTINGENCY PLAN – PART 2

TEMPERATURE MONITORING PROBES (TMPs)

APPENDIX B: INSTALLATION PLAN FOR CONTINGENT TEMPERATURE MONITORING PROBES (TMPs)

TMPs planned for installation along Trigger Line 2 have been eliminated. Please revise to reflect the most up to date information. Appendix B will need to be revised to reflect the modifications as described in the Revised Part I or as discussed with Department staff. The balance of the comments on this Appendix B will relate to technical aspects of the probes.

1. *Republic staff and contractors have stated that Temperature Monitoring Probes (TMPs) have a limited operational lifetime.*

2. *Any TMPs incorporated into Trigger Line 1 as well as TMP-1, -2, -3 and -4 which have components that fail from the ground's surface to the depth or elevation shown in Table 2 are required to be reinstalled to ensure adequate coverage of the trigger line and for evaluation of the cooling points planned for installation near TMP-1, -2, -3 and -4.*

3. *Due to operational issues with TMPs and given the value of the data provided by the TMPs, Republic should reconsider the construction design based on site specific conditions and experience gained at other landfills experiencing SSEs. We suggest incorporating alternating sand layers between the grouted thermocouple layers to help with durability and limit wire stress to extend the operational life cycle of the TMP.*

4. *Explain what steps are planned for installation of all future TMPs to minimize resistance. Resistance has been given as the reason for the majority of the readings not being provided on certain thermocouples or an entire TMP;*

5. *Section 1.3 indicates the thermocouples will be installed as the casing is removed, while Section 1.4 appears to imply that the thermocouples will be installed as the drill rod is removed. Please clarify the procedure and whether the drill tip is sacrificed during the installation.*

RESPONSE:

See response to Part 1 – Appendix F comment provided earlier in this letter.

APPENDIX C: CONSTRUCTION PLAN FOR CONTINGENT NORTH QUARRY TEMPORARY CAP AND ENHANCED GAS MANAGEMENT SYSTEM

Appendix B- Construction Plans for North Quarry — EVOH Geomembrane Cap and Cap Integrity System

1. *The "Installation schedule" for this Appendix C is missing from the submittal and needs to be submitted to the Department for review. Also, note the Table of Contents for Appendix C lists section 4 and 4.1 as the "Installation schedule" and shows an "Error! Bookmark not defined" related to the section. As a result of Section 4 being missing, Sections 5 and 6 have moved forward one section and are misnumbered when compared to the Table of Contents.*

RESPONSE:

The installation schedule has been removed from Appendix C of the NQCP and placed in revised form as Table 1 of the new NQAP. The table of contents has been updated to account for this. The Construction Quality Control and Surveying section in the report remains as Section 4.1 and the Operations Maintenance Plan

section in the report remains as Section 5.1.

2. *The approved South Quarry Capping Plan Construction Quality Control and Surveying Section (the equivalent of Section 4) provided settlement in the South Quarry is to be monitored on a monthly basis. Section 4 of the North Quarry Cap Integrity System omitted this provision. The monthly monitoring method is to be used in the North Quarry. Additionally, gas well temperature monitoring is required on at least a monthly basis and carbon monoxide readings as agreed to with the Department to track the advancement of the SSE.*

RESPONSE:

Provisions for surveying and monitoring the North Quarry cap were provided in Volume 1 of the OM&M plan which was submitted on September 13, 2013. This does not include settlement monitoring in the North Quarry but does include gas well temperature monitoring as required by NSPS along with carbon monoxide testing when a gas extraction well meets certain temperature criteria, as described in Section 2.3 of Volume 1 of the OM&M Plan, consistent with the framework finalized in the above Revised Part 1, Comment 3, Section 5.3, and response.

3. *The Department's request in Comment 4 from the July 24, 2013, letter as follows requires response "Due to the continuing nature of the SSE, Republic Services must provide an evaluation of the current on-site soil resources and the logistical plans that are in place to ensure timely application of those soils to an SSE outbreak, if one were to occur." Work on the site during the South Quarry capping was stated as using a significant amount of soil. The Department needs to know that sufficient soil resources remain on-site and available should an SSE outbreak occur. Given the characteristics of an SSE, we need to know that an area containing soil and the volume immediately available is identified to allow the facility to take appropriate mitigative actions should an incident occur without delay and that such information is kept up-to-date as part of the Contingency Plan.*

RESPONSE:

Bridgeton Landfill has submitted and MDNR has approved an Incident Management Plan for the facility requiring that a sufficient soil stockpile be maintained for this purpose; and that material that is removed will be replenished as needed to restore to a minimum 10,000 cubic yard quantity. Bridgeton Landfill will continue to work cooperatively with MDNR to update that Incident Management Plan as appropriate based upon site conditions.

4. *Section 4.1 states that a "detailed construction quality assurance/quality control" plan has been prepared in a separate document. However, that document was not a part of the submittal. The QA/QC plan needs to be submitted for Department review.*

RESPONSE:

The QA/QC Plan, entitled, Temporary Cap and Cap Integrity System Construction Quality Assurance Plan, dated April 2013, revision 1 May 7, 2013 was prepared by Weaver Boos Consultants and submitted to MDNR and the St. Louis County Health Department on May 7, 2013 in response to comments from MDNR and St. Louis County Health Department. A copy of this document has now been added as Appendix E of the Construction Plan.

5. *Section 5.1 states an Operations Maintenance & Monitoring Plan will be prepared under a separate cover. As a reminder, the "Final Operations Maintenance and Monitoring Plan Manual" pursuant to Section 17.0 of the First Agreed Order is required to be submitted within forty-five days (i.e., September 20) of completion of the work under the "Ethylene Vinyl Alcohol (EVOH) Capping Plan for South Quarry." Should the North Quarry Capping System and GCCS enhancement be triggered the Operations Maintenance & Monitoring Plan sections specific to the North Quarry will need to be updated to include any additional site specific issues such as items related to construction and maintenance of the isolation barrier, etc.*

RESPONSE:

The OM&M Plan was submitted to MDNR in advance of the deadline under the Agreed Order. As noted within that Plan, the OM&M Plan will be updated periodically or as a result of a major control feature change or expansion. See Section 6.0 of Volume 1 of the OM&M Plan for the procedures.

7. *Plan sheet 1 indicates a proposed relocation of Outfall 001. Any outfall modifications need to be submitted and approved by the Department's Water Protection Program.*

RESPONSE:

The proposed outfall 001 has been revised to outfall 007 and outfall 001 has been omitted to be consistent with the Missouri State Operating Permit # MO-0112771, effective April 22, 2011. Similar changes have been made to Plan Sheet 7 and Figure 1 of the Appendix D Stormwater Management Design Report. Plan Sheet 7 has been revised to show the location where a new proposed outfall is required for drainage of the proposed cap subareas N2-NE1 and N2-NE2. A note has been added to Plan Sheet 7 for this stating PROPOSED OUTFALL TO BE SUBMITTED AND APPROVED BY MDNR's WATER PROTECTION PROGRAM.

8. *Plan sheet 1 shows the solid waste boundary. As clarification, please be aware that the identified boundary is the solid waste boundary for permit number 0118912. Permit number 0118906 was issued on January 22, 1979, and encompasses part of the North Quarry as well as the area to the northwest of the 0118912 permit.*

RESPONSE:

The legend of Plan Sheet 1 includes a description of the solid waste boundary as, SOLID WASTE PERMIT 118912. The boundary for Permit number 118906 is included on Plan Sheet 1A.

9. *Plan sheet 1A does not indicate existing "black" HDPE layer locations within the South Quarry. Due to the recent decision to cap these areas with EVOH liner, please indicate the proposed locations of the new liner on all applicable sheets.*

RESPONSE:

The existing black HDPE liner is now being capped over to the top edge of the perimeter channel with EVOH liner. Plan Sheets 1 – 7 have been revised to show these areas in red hatching and a description for this has been added to the legends.

10. *Plan sheets 3 and 4B do not indicate subgrade strip drains for the area on 1B adjoining phase 2. Explain why this location is not incorporated into the proposed design or include these features on the applicable plan sheets.*

RESPONSE:

The subgrade strip drains are set back approximately 100 feet from the Phase 1 – Phase 2 interface. This setback is to minimize the potential for air intrusion along the strip drains, in the event that the Phase 1 cap is installed before the Phase 2 cap and an exposed edge is present.

11. *On plan sheet 6, please clarify if Note 3 references the "North" or "South" Quarry and verify the amount of wellhead risers stated in the legend. In addition, include an explanation as to why the Air & Force Main (A&FM) is not connected to PS-27 or CS-1, or include these features on the applicable plan sheets.*

RESPONSE:

On Plan Sheet 6, Note 3 has been revised to reference the North Quarry. The number of wellhead risers in the legend has been revised to 36 for North Quarry. The Air & Force Main (A&FM) is now shown extended to PS-27 and CS-1.

12. *Plan sheet 7 shows the existing channel of the proposed northeast detention pond will discharge to and reach Outfall 004. In addition, explain why the channels within N1B-N2 and N1B-E only have 0.08% and 0.02% channel slopes, respectively. Additionally, the subarea naming on the map requires review to ensure the naming is consistent*

with the subareas listed on the table. As needed, please revise any discrepancies, such as including Subarea NW-NW2, which does not currently appear to be listed on the map.

RESPONSE:

On Plan Sheet 7, a label has been added to the discharge of the proposed northeast detention basin to state, PROPOSED DISCHARGE TO BE ROUTED TO PROPOSED NORTH DETENTION BASIN AND THEN TO REACH OUTFALL 004. In the Bridgeton North Quarry Cap Stormwater Summary table on Plan Sheet 7, the channel slopes of N1B-N2 and N1B-E have been revised to 8.00% and 0.20% respectively. The subareas shown on the map and in the Bridgeton North Quarry Cap Stormwater Summary table have been reviewed and the table has been revised so that subarea N1B-S23 is now N1B-S2 and the two channels listed as N2-NW2 are now N2-NW1 and N2-NW2 so the map and table are consistent. Similar changes have also been made to Figure 1 included with the Appendix D Stormwater Management Design Report.

13. *The Perimeter Sump Schedule for the North Quarry is missing from the submittal. Plan sheet 8 appears to include the Perimeter Sump Schedule for the South Quarry.*

RESPONSE:

The perimeter sump schedule has been revised for the North Quarry sumps on Plan Sheet 8.

Appendix C: Landfill Gas Collection and Control System (GCCS) Evaluation

1. *The Table of Contents does not include an Appendix D, however a title page for Appendix D – Proposed Wellfield Modifications is included between Appendices B and C, but does not contain any information. Modify to either include any wellfield modifications or this page may be removed from future submittals.*

RESPONSE:

There was no Appendix D in the original submittal. An "Appendix D – Design Calculations" has been added to the GCCS Evaluation to address the MDNR's comments presented under Revised Part 1, Item 5. The title page referencing Appendix D has been appropriately located within the document.

2. *Section 5 recommends if the SSE moves into the North Quarry, that the GCCS be enhanced, in part by, replacing well pumps, header lines, flare modifications, etc. or adding new GEWs. It appears these replacements and modifications would be triggered by Trigger Line 1. However, some of these replacements and modifications appear to be routine maintenance that should be occurring (i.e., replacements of GEWs 8, 40-43, 5355). Which replacements and modifications fall outside the*

category of routine maintenance and are properly categorized as enhancements to the GCCS?

RESPONSE:

As described in the North Quarry Action Plan, the referenced work is to be completed without triggering and upon approval of the MDNR and consistent with the schedule provided as Table 1 of the NQAP.

3. *Section 3.2.2 describes how the estimate for gas production in the North Quarry when impacted by the SSE was developed using a ratio for the current condition in the South Quarry. Please state and provide a professional opinion that the current production and/or collection of gas in the South Quarry is either at or already past its peak generation. This explanation must include, at a minimum, the reasons why gas production will not continue to increase in the South Quarry.*

RESPONSE:

In the monthly report submitted on September 20, 2013, it was noted that gas production volume had stabilized after a short-term increase that occurred with completion of the cap construction (due to additional shallow gas picked up by the sub-cap gas collectors). The revised Section 3.2.2 includes discussion of another facility experiencing a similar SSE where landfill gas production decreased 15-20% per year for the first three years after completion of a temporary FML cap; we expect similar behavior at the Bridgeton Landfill.

Appendix A: Wellfield Data

1. *There appear to be differences between the as-builts provided and the proposed design plans. Can you provide clarification on the wellfield table data presented in the submittal explaining how these results were calculated or determined and why, in principle, the measured existing conditions of these wells differ from the approved construction detail documents (e.g., wells measure refuse depths farther than the recorded boring depths, measured more perforated pipe than installed, etc.). Additionally, provide the status of each well -- whether any of the wells have already been impacted or compromised by effects of the SSE, e.g., steam, pressure, increased leachate, etc., and establish a schedule for repair or replacement, if deemed necessary.*

RESPONSE:

The as-built data for each well, including the boring depth, length of perforated casing and length of solid casing, has been updated to reflect documentation provided in the Revised Gas Collection and Control System Report, Appendix C prepared by Aquaterra, September 2009. Field measurements for each well, including the measured depth to bottom/refusal and depth to liquid, reflect data provided by Bridgeton in June 2013. Wells that have been measured at depths exceeding the original "boring depth" are assumed to have been raised with solid

casing at some point in time. These wells include GEW-6, 8, 42R, 43R, 45R, 47R, 49, 51, 52 and 55. The average differential in depth for these wells is approximately four (4) feet. A number of wells were measured at a current depth less than that of the original "boring depth". These wells are assumed to be silted in or pinched at the measured depths.

As of September 2013:

- All wells in this evaluation were monitored with oxygen levels below 0.5% and temperatures below 150°F.
- Five (5) wells, GEW-6, 44, 47R, 49 and 50 had measured levels of Balance Gas above 20% (by volume). The highest temperature noted in any of these wells was 120°F.
- All wells were being operated at vacuum applications between 3.5 inches of water column and 0.1 inches of water column.

2. *Due to concerns related to the overdrawing of the GCCS during an SSE and given well issues have been noted and/or resolved, the SWMP must be immediately notified when higher oxygen values (> 5% by volume) are determined to exist within the North Quarry wellfield. Our July 3, 2013, letter, set forth that due to the ongoing SSE, the oxygen levels in all the GEWs must be minimized (less than one percent by volume). In addition, please revise your color coordination system to reflect the values submitted (i.e., oxygen column) which does not appear to be consistent.*

RESPONSE:

Provisions for operating, maintaining, and monitoring the GCCS are provided in Volumes 1 and 2 of the OM&M Plan which was submitted on September 13, 2013. With the elimination of the trigger criteria and the proactive undertaking of actions as set forth in the NQAP, the requirements for notification will revert to NSPS-directed notification procedures.

3. *Section 3.2.1 states that the wellfield data indicates typical LFG constituent concentrations and does not indicate the presence of an SSE. Over the past 2 years periodically, seven wells in the North Quarry have exceeded the NSPS reporting limits (GEW-1, -40, -41R, -43R, -53, -54, and -55). Additionally, there are two wells (GEW-47R and -49) that have a methane concentration less than 40%, with balance gas above 30%. These percentages are not typical and require careful monitoring.*

RESPONSE:

The operating data for the noted wells has been trended for the time period August 2011 through September 2013. The plots for this data are provided in Appendix E of the revised Evaluation. A discussion of these trends is provided in Section 3.2.1.

With respect to wells GEW-47R and GEW-49, the trend lines for both temperature and balance gas has remained relatively in unison over this time period, with changes generally consistent with modifications to the applied vacuum on the extraction well. This general interaction is consistent with anticipated wellfield operations. The relatively low levels of methane identified may be the result of a lack of degradable organic material and methanogenisis in the areas surrounding the wells due to the advanced age of the waste. The North Quarry was in operation several years prior to the South Quarry, with waste near the base of the North Quarry presumably the oldest within the disposal area and the least likely to have retained a significant organic fraction to this point.

4. *Table 1 indicates that GEW-3 and GEW-46R have a water column within the well greater than 50% of the perforated screen. Please indicate when additional pumps will be installed into these two wells.*

RESPONSE:

A review of the updated wellfield monitoring data and well as-built data indicates that GEW-3 has a pump installed and is in operation. A pump is proposed for installation in GEW-46 and will be installed as soon as the necessary components can be procured, but not later than January 1, 2014.

5. *Please clarify why only some wells' flow data was provided for the May and June 2013 periods, Republic should provide for all wells not included in the May and June 2013 data, a listing of when the well flows were last taken and a specific date for future reporting.*

RESPONSE:

Appendix A has been amended with wellfield data from September, 2013, including wellhead flows. Wellfield data is acquired and reported each month – future reporting will be conducted in accordance with the existing schedule.

Appendix B: LandGem Models

1. *The narrative indicated the North Quarry began accepting waste in 1955 and this date was used in the LandGEM for calculations; however, Appendix E, Gamma Cone Penetration Test Health and Safety Plan stated the North Quarry area began filling in 1974, contradicting the models. The 1974 estimation is supported by the earliest permitted waste areas near the North Quarry which began in 1976. In addition, the South Quarry would have begun accepting waste around 1985, not 1955 as used in the models.*

RESPONSE:

The period of operation in both the North Quarry and South Quarry have been corrected. Historical waste intakes were provided by site personnel and previous

reports by others. Although year-to-year records of waste placement are not readily available, select milestones can be determined based upon the referenced reports:

- 1979 – Waste placement begins in the North Quarry under Permit #118906
- 1980 – Operations expanded under Permit #118909
- 1985 – Waste placement begins in the South Quarry under Permit #118912
- 1995 – Volume estimates of fill in place and remaining airspace were compiled by Aquaterra.
- 2009 – The GCCS Design Plan was updated by Aquaterra. An estimation of total LFG production, utilizing the USEPA Landfill Gas Emissions Model (LandGEM) was provided in that update, including estimated annual waste intakes.

Excerpts from these sources have been compiled to generate an approximation of the historical waste intake relative to the North and South Quarry Areas. It is estimated that approximately 3.5 million cubic yards (cyds) were deposited in the North Quarry while approximately 12.5 million cyds were deposited in the South Quarry over the operational life of this facility. An overall waste density of approximately 1,629 lb/cyd (0.815 ton/cyd) was calculated by comparing the mass included in the LandGEM for the 2009 GCCS Design Plan to the volumetric projection compiled in 1995. A Table has been provided in the Appendix B presenting the North Quarry and South Quarry fill volumes for the years 1979 to 2004.

2. *The LandGEM Emissions Models for the North and South Quarries do not accurately portray actual conditions. The mean average of waste accepted appears to be incorrect, which is supported by the Waste Tonnage reports submitted to the SWMP for the South Quarry which documented that waste accepted consistently increased from 1996 through 2001, which eclipsed 1,1 million tons in 2001, A linear progression model would be more accurate.*

RESPONSE:

The LandGEMs for the North and South Quarries have been revised to reflect the data presented above. Revisions to the Evaluation regarding this Item can be found in Sections 3.2.1, 3.2.2 and 3.2.3 as well as Appendix B.

3. *Revise the LandGEM Emissions Model graphs (Cubic Meters per Year and User Specified Unit) to show methane curves for the North and South Quarries.*

RESPONSE:

The stoichiometric composition of landfill gas from anaerobic decomposition is approximated as 50% methane and 50% carbon dioxide. On a volumetric basis,

the LandGEM projection of each of these components is identical. As such, the curve represented in the LandGEM graphics (Cubic Meters per Year and User Specified Unit) for carbon dioxide also represents methane. The methane curve is overlain graphically by the carbon dioxide curve, and thus not visible under these conditions. Note that the methane curve is visible in the mass rate graphic (Megagrams per Year) since the unit weights of methane and carbon dioxide are different.

The printing of the LandGEM output files is controlled within the model itself, and not user-adjustable.

4. *The LandGEM models will need to be recalculated in order to verify the current and proposed North Quarry GCCS and facility flare capacity is sufficient to maintain current and future conditions, with and without the presence of an SSE in the North Quarry.*

RESPONSE:

The LandGEM projections have been recalculated with revisions provided in Sections 3.2.1, 3.2.2 and 3.2.3. The total, anticipated gas generation rate has been compared to the existing and proposed flare facility capacity (Section 5.5). These comparisons indicate that the flare facility capacity is sufficient to maintain current and future anticipated conditions, both with and without the presence of an SSE in the North Quarry.

Appendix C: Construction Plan for Contingent North Quarry Enhanced GCCS

1. *The plan sheet legends and symbols need to be modified to clearly differentiate landfill infrastructure, such as PEWs, GEWs, and PEW and/or GEW Combo.*

RESPONSE:

The plan sheet legends and symbols have been modified as noted and are consistent with previous submittals.

2. *A Well Schedule for the proposed extraction wells for the Enhanced North Quarry GCCS, as noted in Detail 1 on Sheet 3 was provided. Well depths were limited to 100 feet while the North Quarry is much deeper. GCCS wells are routinely installed to within 15 feet of the bottom of the landfill; please explain why the depth of the wells is limited to 100 feet.*

RESPONSE:

The design of additional and/or replacement extraction wells has been modified to extend to 140 feet in depth or to within 15 feet of the bottom of waste, whichever is less. Gas collection below 140 feet deep is extremely limited due to the density of

the waste and the corresponding extremely-low gas permeability. Additionally, the waste deposited in the base of the North Quarry is the oldest (circa 1979), and presumably the most highly-decayed, material in the disposal area; gas generation from this part of the disposal area is anticipated to be minimal at this time.

Appendix D: Stormwater Management Design Report

1. *Please clarify by explaining how the basin detention times were calculated within the narrative's Tables. The Department is under the impression the indicated detention times represent the time span between peak inflow and peak outflow, and not the time elapsed for a basin to discharge when it is at the event calculated peak capacity.*

   RESPONSE:

   The detention time included in the table is the difference between the peak inflow and peak outflow. An additional parameter for the elapsed time to drain the basin has been added to each of the Tables 2, 3 and 4 for the proposed north, northeast and southwest basins. The hydrographs showing the time for the basins to drain are included in the stormwater model outputs in Appendices B, C and D for the proposed north, northeast and southwest basins respectively.

2. *Section 3 states that contingency plans for on-site management of stormwater which comes in contact with waste are available. These plans need to be provided for review by the Department. Additional stormwater management plan(s) will need to be submitted to the Department for review to accommodate the potential time span that waste may be uncovered due to the excavation of the isolation barrier.*

   RESPONSE:

   A contingency plan for the on-site management of stormwater which comes in contact with waste will be included in the isolation break design submittal. The west edge of the North Quarry cap phase 1 has been designed with a diversion channel to divert as much stormwater as possible from the isolation break construction.

3. *The North Quarry south drainage area incorporates the previously approved and capped South Quarry north drainage area within the calculations as they both discharge to the existing North Detention Basin. Please explain why the South Quarry north drainage area decreased from 5.76 acres in the South Quarry plan to 3.95 acres in the North Quarry plan. In addition, please explain why the southwest detention basin increased in capacity.*

   RESPONSE:

   Additional field inspection and surveying was performed for the North Quarry

stormwater design which resulted in a refined drainage area map. A portion of the north drainage area that was previously believed to drain to the south was found to drain to the west thus the revised drainage area to the south was reduced. The initial capacity of the southwest basin was based on a preliminary conservative volume and the revised southwest basin capacity included for the North Quarry design is based on the actual basin size from survey data.

4. *The North Quarry west drainage area will discharge in the southwest detention basin and Outfall 003. However, the calculations did not show the added runoff from the west drainage area flowing through the existing South Quarry west area channels. Please verify that the increased runoff will not overflow these existing channels.*

RESPONSE:

Previously, the stormwater calculations for the north quarry drainage area in Appendix D included the flow through the South Quarry but no output was provided for the South Quarry except for the southwest detention basin. The output has now been revised to include the flow through the existing South Quarry. The flow through the south quarry is controlled by culverts. The output shows that some stormwater will overtop the culverts but will still drain to the southwest detention basin outfall as designed; this potential occurrence has been reviewed and approved by the City of Bridgeton. The output also incorporates the field changes made to the Old St. Charles Rock Road and southwest detention basin during construction of the South Quarry cap which are included in the South Quarry documentation report.

5. *Please review the entire plan (i.e., narrative, plan sheets, calculation results) and revise minor discrepancies, such as incorrect naming of areas and nodes, reaches or culverts shown on the plan sheets that are not used in HydroCAD or vice versa, etc.*

RESPONSE:

The entire plan has been reviewed including narrative, plan sheets and calculation results and the following changes have been made:

Narrative

1. Added revision date to report cover
2. Section 1 Introduction, revised outfalls
3. Section 2 Stormwater Management Design, revised phase and isolation break discussion
4. Tables 2, 3, 4, added time for detention basins to drain
5. Figure 1 of the narrative was updated as follows:
    a. Outfalls were revised

b. Stormwater summary table was revised
c. Phases were revised
d. Notes were added to the proposed northeast basin outfall and
e. Existing drainage channels were added
f. The northwest drainage area label was changed from NE to NW
g. Labels for CV-1, CV-2 and CV-3 for the proposed north detention basin were added
h. Existing HDPE geomembrane areas to be capped over with EVOH liner were added

Stormwater revisions for the Construction Plans for the North Quarry – EVOH Geomembrane Cap and Cap Integrity System

1. Outfalls were revised for Stormwater revisions made to Plan Sheets 1 -7
2. Plan Sheet 7 was also updated with the following:
   a. Stormwater summary table was revised
   b. Phases were revised
   c. Notes were added to the proposed northeast basin outfall and
   d. Proposed drainage channels were added
   e. The northwest drainage area label was changed from NE to NW
   f. Labels for CV-1, CV-2 and CV-3 for the proposed north detention basin were added
   g. Existing HDPE geomembrane areas to be capped over with EVOH liner were added

Calculations

1. Appendix C, changed:
   a. Channel designation N1B-N@ to N1B-N2
   b. Channel designation N1B-N3 to N1B-E
   c. Culvert C-15 to C-5
   d. Culvert C-19 to C-10
2. Appendix D, changed:
   a. Channel designation 8R to N1B-W2
   b. Channel designation N1B-W1
   c. Channel designation (new Reach) to N1-W
   d. Culvert C-1 to C-3
   e. Added output for west side culverts of South Quarry (Existing 10" HDPE, Existing 48" CMP, Existing 36" Box Culvert, Proposed CV-7)

All narrative sections, plan sheets and calculations have been rechecked and are believed to be consistent.

APPENDIX F: BIRD MITIGATION PLAN

1. *As stated, a specific bird hazard and mitigation plan will be prepared and submitted for review in conjunction with the design and construction details of the Isolation Break Design Plan. The existing measures and plan provided are adequate for the potential of installing the GCCS expansion and cap related activities in the North Quarry, if triggered.*

2. A *separate review and comments were provided on the bird hazard and mitigation plan on August 28, 2013, by officials of Lambert-St. Louis International Airport and their concerns, if any, will need to be addressed to allow for approval of this plan.*

RESPONSE:

Bridgeton Landfill is revising a DRAFT Bird Mitigation Plan for submittal to the Airport Authority and included that submittal as Appendix D of the NQAP.

OVERALL COMMENTS

1. *This submittal was posted on an FTP site. When downloaded and printed, numerous sections had alpha and special characters missing; this makes review and reading the documents difficult. For future submissions, the Department is requiring 2 hard copies be submitted as well as an electronic copy on an FTP site. The hard copies will need to be in our office within 3 working days of the submittal/resubmittal being posted on the FTP site. In addition, for resubmittals, please provide a red lined version showing all changes clearly marked within the document to expedite the review process.*

RESPONSE:

Hard copies will be submitted as requested. Calculations, narratives, and drawings have been redlined or annotated as appropriate to facilitate your review.

2. *Please ensure all your engineering consultants are provided with the same information detailing the locations of the wells, TMPS and GIWs, as well as any other infrastructure on site. Currently, wells and other landfill infrastructure at the facility appear to move from one consultant's submittal to the next making review unnecessarily difficult.*

RESPONSE:

All technical contributors have shared the same base maps and as-built maps for the figures included in the NQAP.

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

Sincerely,

Bridgeton Landfill, LLC

Brian J. Power

Brian Power
Environmental Manager

cc: Mr. Chris Nagel
Mr. Aaron Schmidt