

Subsurface Smoldering Event - Bridgeton Sanitary Landfill

Last Updated Mar. 15, 2014

On Dec. 23, 2010, Bridgeton/Republic reported the Bridgeton Sanitary Landfill was experiencing elevated temperatures on some gas extraction wells. The facility began testing landfill gas from the gas extraction system and found elevated hydrogen and carbon monoxide and reduced methane concentrations, which is indicative of a subsurface smoldering event (SSE). The Solid Waste Management Program began meeting with Bridgeton/Republic staff and facility consultants to gather and analyze data and information concerning the elevated temperatures at the landfill.



Note: Subsurface smoldering event or fire -- These reactions occur more slowly without a visible flame or quantities of smoke and may be deep within the landfill. Normally, an actual flame will not be observed. The only time this type of event or fire results in a visible flame or smoke is when the subsurface event or fire is excavated and exposed to the atmosphere.

The Missouri Department of Natural Resources ordered Republic Services, owner of the Bridgeton Sanitary Landfill, to research, plan, design and take corrective actions to address the SSE and associated odors. Republic Services has provided corrective action option plans for review and approval by the department. (See the Archived Reports webpage for links to these plans and associated documents.)

By spring 2011, Bridgeton/Republic began implementing a series of corrective actions to address the increased temperatures. Once Bridgeton/Republic's plans are approved by the department, Republic Services is responsible for implementing those actions timely to address the SSE and associated odors being generated from their permitted facility. The department's responsibilities consist of analysis of corrective action plans, requiring modifications, granting approval and performing oversight of such plans to ensure compliance by the property owner.

Through the winter 2011, subsidence levels at the landfill remained within the normally expected range for decomposing waste at depth, however, gas extraction wells continued to show elevated temperatures.



Photo of Bridgeton Landfill Apr. 25, 2012

Beginning in Jan. 2012 and continuing through July, 2013, Bridgeton/Republic added approximately 11 acres of HDPE flexible membrane liner and significant volumes of soil to the landfill cap to assist in controlling odors generated by the SSE.

By spring 2012, subsidence levels at Bridgeton began to exceed those levels expected for decomposing waste at depth and an increase in odors was noticed with some odor complaints being filed by nearby residents and businesses.

In April 2012, the Solid Waste Management Program contracted with landfill fire and slope stability technical experts, Stark Consultants Inc., Timothy D. Stark, PhD, PE, principal, and Hammer Consulting

Services, Todd Thalhamer, PE, principal, to confirm the presence of an SSE at Bridgeton. The SSE reaction has caused increased odors to be generated from the decomposition of waste above the level expected through routine decomposition, rapid settlement - more than expected for waste decomposing at depth, heat in gas extraction wells, increased generation of various landfill gases including hydrogen and has resulted in changes to the characteristics of the leachate generated by the landfill. To date, all landfill data indicates the SSE is contained in the solid waste cell and has not impacted the adjacent radioactive cell. At this time, the department required Republic Services to timely implement alternatives with consideration given to minimizing disruption to nearby residences and businesses surrounding the landfill. Republic's experts and the department's experts have continued to monitor the elevated temperatures within the compacted waste mass.



Note: Landfill leachate is generated from liquids existing in the waste as it enters a landfill or from rainwater that passes through the waste within the facility.

Bridgeton/Republic staff began meeting, in person or via teleconference, at least monthly with the Solid Waste Management Program. The meetings and conference calls have provided an opportunity to review of any odor concerns received, analysis of Bridgeton/Republic's corrective action measures including data such as well temperatures, carbon monoxide and leachate output, use of odor neutralizing agents, daily landfill cap inspections, upgrading of the methane gas collection system, leachate management system enhancements, leachate constituents and review and supplement of the facility's operations and maintenance program and incident management plan. These meetings provide for a review and assessment of the physical landfill property and odors. Note: In 2013, Missouri Department of Health and Senior Services, St. Louis County Department of Health - Solid Waste and Air Programs and the Pattonville and Robertson Fire Protection Districts joined the meetings and, as needed, Hazardous Waste Program staff have also participated.

On June 20, 2012, Bridgeton Sanitary Landfill submitted a request to the department for modifications to their gas collection and control system.

On July 11, 2012, the Department of Natural Resources issued a letter to Bridgeton Sanitary Landfill providing comments on the landfill's June 20 submittal and providing comments based upon a visit to the landfill on June 14 where observations were made as to the physical changes at the landfill, the status of the SSE, and the need for gas system expansion, gas migration and odor control.

On July 23, 2012, the Solid Waste Management Program issued a notice of violations, or NOV, to Bridgeton/Republic for violating the section of the law (260.210.1.(4) RSMo) that prohibits the storage or disposal of solid waste in any manner that creates a public nuisance or adversely affects public health. The reaction, an SSE or smoldering fire, is a violation of Missouri's Solid Waste Management Law and regulations. Data provided by landfill staff indicated an SSE has and continues to occur in the landfill. The SSE has created odors that are migrating off-site and have resulted in numerous odor concerns. These odors continue to cause a nuisance. If emissions from the SSE are not controlled or conditions intensify further, these emissions could potentially pose a risk to public health.

On Aug. 3, 2012, SCS Engineers submitted for Bridgeton Landfill responses to department comments on the proposed expansion to the landfill gas collection and control system. **On Aug. 14**, Bridgeton Landfill submitted a request for a change to a submitted letter modification requesting expansion of the gas monitoring probe network. **On Aug. 22**, department staff once again visited the landfill observing continued physical conditions, changes to infrastructure and met with landfill staff to move forward on corrective actions to control the SSE including odors. **On Aug. 30**, the department approved the Bridgeton revised request for modification to the gas monitoring probe permit. After Bridgeton provided responses to the department's other comments by way of an Oct. 3, 2012 letter, the modification to the gas extraction system at the Bridgeton Sanitary Landfill with certain conditions was approved.

On Aug. 16 and 17, 2012, Solid Waste Management Program staff oversaw and evaluated the sampling process of Bridgeton/Republic's contractor as they completed a comprehensive air sampling. An air sampling report was submitted on Oct. 21, 2012 for Bridgeton/Republic by their contractor. The report characterizes the upwind, downwind and source air and is available on the Archived Reports webpage.

On Dec. 6, 2012, landfill incident training was provided by the department's contractor to local emergency responders, St. Louis County Health department staff, Bridgeton/Republic staff and department staff with specific training directed to SSE issues.

As odors continued to persist on Feb. 1, 2013, the Missouri Department of Natural Resources issued an Order to Republic/Bridgeton, stating the department would immediately begin collecting air sampling data at the landfill. The Order also instructed the company to pay for costs associated with this data collection and to provide the department access to the facility property for data collection operations. The department then issued a Request for Proposal for air sampling and laboratory analytical services to evaluate conditions around the landfill. In March 2013, the department contracted with SWAPE, LLC to conduct air sampling and laboratory analytical services to assist in collecting and evaluating the air quality and emissions surrounding the landfill property. The Missouri Department of Health and Senior Services has assisted the department by providing reviews of the air sampling laboratory analytical reports and continuous air monitoring data which are included on the Archived Reports page and Bridgeton Home page.

On March 25, 2013, Bridgeton/Republic submitted to the department a plan to install a synthetic cap system over the entire South Quarry to assist in addressing the increased odors due to the SSE.

On March 27, 2013, Attorney General Chris Koster filed a lawsuit seeking to ensure Republic Services and Bridgeton Sanitary Landfill completed promised actions to address environmental and odor problems at the facility related to the SSE.

On April 9, 2013, Republic Services completed installation of a total of 40 additional gas extraction wells in the South Quarry area of the landfill. The wells are operated to decrease the amount of landfill gas and associated odors escaping to the atmosphere. Also, Republic Services reported five additional temperature monitoring probes (TMPs) were completed bringing the total TMPs in the neck area to 14. These TMPs are monitoring temperatures in the waste mass within the neck between the south and north quarries to determine any northward progression of the SSE. (Note: Due to pressure in the waste mass from the SSE, Republic Services/Bridgeton was unable to install TMP-15.)

Temperature Monitoring Probes

Bridgeton/Republic has installed temperature monitoring probes, or TMPs, for two purposes:

- As a way to track the movement of the SSE towards the narrow area of the landfill that lies between the North and South quarries.
- To monitor and determine the impact that the operation of the Gas Interceptor Well Plan has on the heat and gasses generated by the SSE.

TMPs consist of thermocouples set in a vertical column every 20 feet in depth in the waste mass. The TMP then provides for measurement of subsurface waste temperatures.

Note: TMP reports submitted by Republic Services can be found on the Archived Reports webpage.

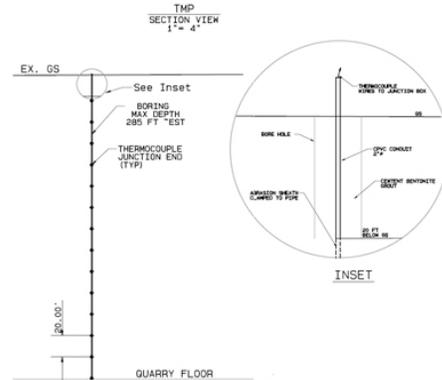


Photo of TMPs after installation at Bridgeton Landfill (left) and plan view of TMP as submitted to the department (right).



Photos of TMPs at Bridgeton Landfill on Nov. 5, 2013 (left) and Dec. 19, 2013 (right).

Gas Interceptor Wells

To minimize or stop movement of subsurface heat from the South Quarry to the North Quarry, additional special purpose, gas interceptor wells are being installed by Republic Services Inc. There are two rows of gas interceptor wells. The first row of wells is planned approximately 50 feet north of the first line of temperature monitoring probes (TMPs 7R, 8, and 9). The second row of interceptor wells are being installed 50 feet north of the first row of wells, and staggered in between the first row of wells. The interceptor wells are specially designed gas extraction wells that operate to create a low pressure area vacuum curtain or “wall” that allows the landfill gasses and the heat associated with the subsurface smoldering event to safely be destructured through the landfill’s gas collection and control system. As designed, the gas interceptor well plan will result in temperatures at TMPs 7R, 8 and 9 continuing to rise as the heat and gasses move towards the interceptor wells. For this reason, it is expected the temperature range at these TMPs (7R, 8 and 9) will be outside the range normally encountered in a sanitary landfill. Additionally, TMPs are being placed to the north of the gas interceptor wells to monitor and determine if heat passes through the gas interceptor wells. (See map of TMPs and gas interceptor well locations on the Archived Reports webpage.)

Based upon landfill-specific operating parameters, listed in the Clean Air Act’s New Source Performance Standards and the department’s experience overseeing landfills, the following values are considered guidelines for interpreting temperature data. Temperature Monitoring Probe Installation Plans and Expansion Plans are available on the Archived Reports Webpage.

Normal operating temperature	<131 degrees Fahrenheit
High operating temperature (Clean Air Act requires additional extraction well monitoring to be conducted within this range)	>131 degrees Fahrenheit to ~160 degrees Fahrenheit
Temperature range not normally encountered	>200 degrees Fahrenheit



Photos of Bridgeton Landfill's gas interceptor wells and TMPs.

On May 13, 2013, Attorney General Chris Koster outlined the terms of a First Agreed Order reached with the Bridgeton Landfill/Republic Services. Under the agreement, the landfill owners provided temporary accommodations for residents most affected by landfill odors and agreed to reimburse state agencies for continuous monitoring and sampling of the air and ground at the site under the terms of the Order.

On May 17, 2013, the synthetic cap and cap integrity system were approved by the Department of Natural Resources. Construction of the cap and related system began as the RCPs were abandoned and perimeter collection sumps were put into place. The planned construction project for the interim capping system was initially expected to take approximately 3 months to complete.



Photos of SC-4 before abandonment with FML cover bulged and during construction activities in May, 2013.

On June 3, 2013, Bridgeton/Republic completed abandonment of 6 reinforced concrete pipes (RCP) and installation of 25 perimeter collection sumps in the South Quarry of the Bridgeton Landfill, a part of the new interim capping system.



Photos of installation of perimeter collection sumps at Bridgeton Landfill during May and June, 2013.

On Aug. 9, 2013, Bridgeton/Republic notified the department that as of Aug. 7, 2013 the interim capping system on the South Quarry was complete.



Photos of Bridgeton Landfill Aug. 2013



On Aug. 19, 2013, Bridgeton Landfill notified the department from ongoing review of landfill operations that some areas of the previously installed HDPE liner were not as effective at capturing odors as the EVOH material in the new South Quarry cap. As a result of the review, the facility will be covering the 7.5-acre HDPE liner with the new EVOH material as well as extending its use into other strategic areas to target smaller sources of odor. Bridgeton Landfill also continues preparation work for the facility's planned construction of an enhanced leachate-treatment system and installation of a candlestick flare system that will improve efficiency of the landfill's existing gas collection and control system.

At the end of Aug. 2013, the department's contract with SWAPE, LLC ended. The department has continued to directly conduct weekly air sampling and continuous air monitoring activities using department staff.

On Aug. 27, 2013, the Department provided notice to Republic Services of the need for three additional TMPs. Republic Services plan for installation of the additional TMPs is available on the Archived Reports webpage.



Photos of progressive cavity pump being tested in GIW-5 and GIW in settlement area Nov. 5, 2013.

On Sept. 14, 2013, Bridgeton/Republic informed the department they received and have begun installing the additional 7.5 acres of EVOH liner over existing HDPE liner at Bridgeton Landfill for more effective odor control. As the new EVOH material is being placed over existing material, odors are not anticipated. However, some short-term odors may be generated as gas extraction wells in the placement area are prepared for installation of the new material. On Thursday and Friday, residents downwind from the landfill reported some slight to moderate odors during work hours.

On Sept. 20, 2013, Bridgeton/Republic announced it plans to begin installing additional upgrades and remediation at the Bridgeton Landfill, including the installation of an isolation barrier between the Bridgeton and West Lake Landfills.

On Oct. 23, 2013, the department issued a comment letter with conditional approval of Republic Services' Bridgeton Landfill North Quarry Action Plan. The plan is available on the Archived Reports webpage.

On Nov. 1, 2013, Bridgeton/Republic began installation of 30 new landfill gas extraction wells in the North Quarry of Bridgeton Landfill. Bridgeton/Republic Services notified the department the potential exists for some odor releases during drilling operations for the remaining wells over the next 30 days. To assist in controlling odors released during these construction activities, Bridgeton/Republic uses a vacuum box on drilling equipment along with odor neutralizers.

As of Dec. 6, 2013, Bridgeton Landfill advised the department that 23 of 30 additional North Quarry gas extraction wells have been drilled.

As of Dec. 12, 2013, Bridgeton/Republic advised the department a pump malfunction due to recent freezing temperatures resulted in a leachate release (approx. 40,000 gallons) earlier in the day. During the clean-up process, there exists the potential for some odors off-site.

As of Dec. 15, 2013, the department and Bridgeton/Republic have yet to agree on the location of the three additional TMPs. Bridgeton/Republic initially notified the department that they were unable to install the requested TMPs due to pressure at the requested locations. Following additional discussions on Nov. 12, 2013, Bridgeton/Republic provided an amended North Quarry Action Plan response incorporating new locations for the additional three TMPs. Republic Service's submitted North Quarry Action Plan response is available on the Archived Reports webpage. The department is responding to Bridgeton/Republic concerning the positioning of these TMPs.