



Jeremiah W. (Jay) Nixon, Governor • Harry D. Bozoian, Director

DEPARTMENT OF NATURAL RESOURCES

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OCT 14 2016

Ms. Erin Fanning
Division Manager
Republic Services, Inc.
13570 St. Charles Rock Rd.
Bridgeton, MO 63044

RE: Review of Detection Monitoring and Assessment Monitoring Reporting for Republic Services, Inc., Bridgeton Landfill, Permit Number 0118912, St. Louis County

Dear Ms. Fanning:

The Missouri Department of Natural Resources' Solid Waste Management Program (SWMP) has reviewed the following documents submitted concerning the groundwater sampling program of the Bridgeton Landfill:

1. "Assessment Monitoring Event Summary Report, Third Quarter 2014", received by the SWMP on October 29, 2014.
2. "Assessment Monitoring Event Summary Report, Fourth Quarter 2014", received by the SWMP on January 29, 2015.
3. "First Quarter Assessment Monitoring Event Summary", received by the SWMP on March 13, 2015.
4. "Detection Monitoring Program Groundwater Statistical Analysis Semi-Annual Report, February 2015", received by the SWMP on May 4, 2015.
5. "Assessment Monitoring Event Summary Report, Second Quarter 2015", received by the SWMP on June 26, 2015.
6. "Detection Monitoring Program Groundwater Statistical Analysis Report May 2015 Quarterly Monitoring Event", received by the SWMP on July 31, 2015.
7. "Detection Monitoring Program Groundwater Statistical Analysis Report August 2015 Quarterly Monitoring Event", received by the SWMP on November 18, 2015.
8. "Fourth Quarter 2015 Assessment Monitoring Event Summary Report", received by the SWMP on January 6, 2016.
9. "Detection Monitoring Program Groundwater Statistical Analysis Report, November / December 2015 Quarterly Sampling Event", received by the SWMP on February 23, 2016.

10. "First Quarter 2016 Assessment Monitoring Event Summary Report", received by the SWMP on April 5, 2016.

The groundwater monitoring reports and the assessment monitoring summaries were prepared and submitted by Herst and Associates and Jett Environmental Consulting on behalf of Republic Services, Inc. The following general and specific comments are related to the review and analysis of the reports:

GENERAL COMMENTS:

1. The sampling event data identifies statistically significant evidence of contamination that is impacting the quality of groundwater under and/or surrounding the Bridgeton Landfill. As a result, it is imperative that not only the Assessment Monitoring Plan (AMP) characterization continue forward, but timely actions be taken to develop and implement final corrective measure(s). Republic Services, Inc. will need to conduct both the continued characterization assessment and development of corrective measures under a parallel process as is technically feasible.

The SWMP received a letter dated August 18, 2014, concerning responses to comments on the AMP for the Bridgeton Landfill.

As part of the corrective measures to manage and mitigate the impact of the subsurface reaction event occurring in the South Quarry, Republic Services, Inc. has reported the following actions:

- a) A Progressive Cavity Pump (PCP) was installed in leachate collection sump LCS-3D in February 2014. The PCP is reported to relieve liquid pressure and ensure leachate capture near the 104 well cluster.
- b) GEW-104 and GEW-34A were equipped with Blackhawk pumps in June 2014 to allow for dual gas and liquid extraction from the well. The lateral to GEW-104 was rerouted to supply better vacuum in July 2014.
- c) A lift station and grit chamber was installed.
- d) Republic Services, Inc. installed a new leachate force main to reduce backpressure and blockages.
- e) Republic Services, Inc. has continued monitoring groundwater on a quarterly basis under the AMP.

The Response to Comments on Assessment Monitoring Plan letter, dated August 18, 2014, and received by the SWMP on August 19, 2014, references Specific Comment #2 from the July 30, 2014, letter to Republic Services, Inc. from the SWMP. The response to Specific Comment #2 states:

"The monitoring approach addressed by the assessment monitoring plan and these responses will allow Bridgeton Landfill to continue to monitor the progress of those

corrective measures in addressing exceedances in 104-SD, while evaluating additional potential corrective measures.”

The SWMP notes groundwater monitoring results continue to demonstrate detections above the MCL of volatile organic compounds (VOCs) including 1,2-dichloroethane, benzene, toluene, and xylenes. In addition, other VOCs including 2-hexanone, 4-methyl-2-pentanone, acetone, chlorobenzene, 1,4-dichlorobenzene, 1,2,4-trimethylbenzene, methyl ethyl ketone, p-isopropyltoluene, PCB Aroclor, tetrahydrofuran, and p-cresol have been historically detected in wells 104-SS and 104-SD.

The changes to the AMP in the August 18, 2014, letter appear to be in order and are hereby accepted by the SWMP.

Please submit a complete, updated AMP within 30 days of receipt of this letter describing any actions not listed in the previous plan and the additional plan updates requested herein.

2. The SWMP identified statistically significant increases (SSIs) in certain constituents found in Appendix I Constituents for Detection Monitoring, which are detailed below in the Specific Comments Section. Republic Services, Inc. is required to monitor groundwater on a quarterly basis (i.e., August, November, February, and May) until such time as notified by the department that increased sampling is no longer necessary as per 10 CSR 80-3.010(11)(C)4.D.
3. In August 2015, five (5) additional groundwater step out wells were installed by the State of Missouri; these wells are designated MO-1-SS, MO-1-SDR, MO-2-SD, MO-3-SS and MO-3-SDR. The SWMP requested Republic Services, Inc. to include these wells, at a minimum, in their quarterly monitoring network and sampling and analysis plan because these wells have preliminary data showing groundwater contamination off site.¹ Within 30 days of receipt of this letter, Republic Services, Inc. shall include, as part of Assessment Monitoring, the proposed installation of additional downgradient monitoring wells to define the rate and extent of affected groundwater documented by MO-3-SS and MO-3-SDR. Consistent with 10 CSR 80-3.010 (14)(C)5.A(I)(b), within 30 days of receipt of this letter, please provide documentation that affected off site property owners have been notified.

As part of Assessment Monitoring and interim corrective measures, within 45 days of receipt of this letter, Republic Services, Inc. shall provide a review, technical analysis, trend plots and narrative discussion of historical groundwater monitoring data collected from monitoring wells (e.g., PZ-205-AS) located near the north and south quarry that are not currently part of the detection or assessment monitoring network. The information shall include an evaluation of the adequacy of the detection and assessment monitoring

¹ Although access to MO-1-SS, MO-1-SDR and MO-2-SD is limited to State employees and contractors, split samples from those wells have been consistently and timely provided to Bridgeton Landfill and Republic Services, Inc. Access to MO-3-SS and MO-3-SDR is not so limited.

well network including monitoring well spacing, screen intervals and possible data gaps. The technical analysis shall discuss in detail the effects of secondary permeability and rock fractures on groundwater flow and the ability to effectively monitor groundwater at the Bridgeton Landfill. The technical analysis shall include several north-south and east-west subsurface profiles that show the north and south quarry bottom elevation, leachate extraction well screen elevations, leachate elevations, groundwater monitoring well screen elevations, groundwater elevations, gas monitoring probe elevations/depths, gas extraction well elevations/depths and ground surface elevations. Several of the profiles shall extend to the west and include data within the alluvium located downgradient of the north and south quarry. A discussion of groundwater flow from the monitored rock intervals and into alluvium shall be provided. The technical analysis shall discuss the need for groundwater monitoring in the alluvium and the potential for impacts to groundwater in areas with substantial landfill gas migration. It is well documented in the solid waste industry that areas with substantial gas migration also commonly exhibit impacts to groundwater.

4. The piezometer groundwater elevations indicate many of the groundwater elevations (depicted in feet above mean sea level) in the piezometers have increased over the past several years. Comparing the piezometer groundwater elevations to the levels in the leachate sumps indicates an inward gradient for portions of the landfill, but an outward gradient appears to exist in other areas of the landfill. The Potentiometric Surface Maps included in the groundwater sampling reports and the Remedial Investigation Addendum West Lake Landfill Operable Unit 1, prepared in July 2016, makes mention of the groundwater gradient as being inward into the landfill, but does not provide complete evidence that this is still true throughout the landfill. Some areas appear to show an outward gradient toward the Missouri River. Republic Services, Inc. must demonstrate the groundwater gradient is inward and groundwater flow is actually going into the landfill throughout the landfill. The demonstration must include consideration of extraction well efficiency (i.e., ratio of the drawdown in the waste mass to the drawdown inside the well), hydraulic properties of the waste, specific capacity, documentation of radius of influence inside the waste mass, and leachate level/elevation monitoring in the waste mass outside of the leachate extraction wells. Please provide such evidence within 90 days of receipt of this letter. The difference in leachate elevation of over one-hundred-seventy (170) feet between LCS-5A and LCS-6B is also very puzzling. Within 45 days of receipt of this letter, please provide an explanation of why such a difference in leachate elevation exists.
5. When concentrations of any constituents listed in Appendix II are above the groundwater protection standards, Republic Services, Inc. is required to provide the department a report assessing potential corrective measures, characterize the nature and extent of the release and continue assessment monitoring per the groundwater quality assessment plan and implement a corrective action program. Republic Services, Inc. was to have initiated an assessment of corrective measures for the constituents, which are detailed in the July 30, 2014, letter, and submit a report describing the assessment of corrective

measures to the SWMP within 90 days as per 10 CSR 80-3.010(11)(C)6.(I) and 10 CSR 80-3.010(12).

The SWMP received a letter dated August 18, 2014, concerning responses to comments on the corrective measures, and received the Corrective Actions report on October 28, 2014.

As part of the interim corrective measures, within 45 days of receipt of this letter, Republic Services, Inc. shall provide a stand-alone technical report that demonstrates the current status and effectiveness of leachate and landfill gas extraction source control measures. The analysis should include a technical discussion of gas generation rates/volumes, gas extraction rates/volumes, leachate generation rates/volumes, leachate extraction rates/volumes from each of the six leachate sumps, gas extraction wells, and condensate collection points. Information should include a detailed description and technical basis for current actions and future actions that are planned to achieve effective source control. Additional recommendations for improvements to the leachate and gas extraction systems shall be included. The report should document that all reasonable and prudent steps are now being taken to control landfill gas and leachate migration.

6. Should additional constituents listed in Appendix II be identified in future assessment sampling events as being above the groundwater protection standards, those additional constituents will need to be added to the corrective action plan. Republic Services, Inc. must then immediately initiate an assessment of corrective measures and submit to the SWMP, within 90 days of receipt of this letter, a report describing such assessment as per 10 CSR 80-3.010(11)(C)6.(I) and 10 CSR 80-3.010(12).
7. With the requirement for a corrective action plan, Republic Services, Inc. will also need to develop and submit a cost estimate worksheet and establish applicable financial assurance.
8. Sampling events have confirmed the presence of 1,2-dichloroethane, arsenic, and benzene in monitoring wells 104-SS and 104-SD. Benzene, in particular, has shown a rapid increase in concentration well in excess of the MCL. Therefore, Republic Services, Inc. must comply with the corrective action requirements for the constituents 1,2-dichloroethane, arsenic, and benzene as per 10 CSR 80-3.010(11)(C)6.(I) and 10 CSR 80-3.010(12).

SPECIFIC COMMENTS:

Tables I and II list the organic and inorganic constituent-well pairs that have exceeded the predicted limits and are trending upwards:

Table I – Organic Constituents

WELL	ORGANIC CONSTITUENT	DATE	UNITS	RESULT	PQL	MCL
104-SS	1,4-Dichlorobenzene	5/28/2014	ug/L	6.8	5.0	
104-SS	1,2,4-Trimethylbenzene	9/24/2014	ug/L	6.3	5.0	
104-SS	1,2,4-Trimethylbenzene	9/24/2014	ug/L	5.5	5.0	
104-SS	Benzene	5/28/2014	ug/L	1200	25	
104-SS	Benzene	9/24/2014	ug/L	1500	50	
104-SS	Ethylbenzene	5/28/2014	ug/L	24	5.0	
104-SS	Ethylbenzene	9/24/2014	ug/L	29	5.0	
104-SS	p-Isopropyltoluene	9/24/2014	ug/L	10	10	
104-SS	PCB Aroclor	9/24/2014	ug/L	0.18	0.1	
104-SS	Tetrahydrofuran	9/24/2014	ug/L	2000	700	
104-SS	Toluene	9/24/2014	ug/L	130	5.0	
104-SS	Toluene	5/28/2014	ug/L	87	5.0	
104-SS	Xylenes	5/28/2014	ug/L	59	5.0	
104-SS	Xylenes	9/24/2014	ug/L	65	5.0	
104-SD	Acetone	9/24/2014	ug/L	11/23	10	
104-SD	Benzene	5/28/2014	ug/L	1300/1300	25	
104-SD	Benzene	9/24/2014	ug/L	1200/1200	20	
104-SD	Ethylbenzene	5/28/2014	ug/L	20/20	5.0	700
104-SD	Ethylbenzene	9/24/2014	ug/L	13/13	5.0	700
104-SD	p-cresol	9/24/2014	ug/L	21/240	10/100	
104-SD	Phenol	9/24/2014	ug/L	ND/26	10	
104-SD	Tetrahydrofuran	9/24/2014	ug/L	63/58	25	
104-SD	Toluene	5/28/2014	ug/L	73/73	5.0	1000
104-SD	Toluene	9/24/2014	ug/L	34/33	5.0	1000
104-SD	Xylenes	5/28/2014	ug/L	46/48	5.0	10000
104-SD	Xylenes	9/24/2014	ug/L	25/25	5.0	10000
104-SS	Benzene	11/20/2014	ug/L	1280	50.0	
104-SS	Ethylbenzene	11/20/2014	ug/L	20.2	5.0	700
104-SS	Toluene	11/20/2014	ug/L	106	5.0	1000
104-SS	Xylenes	11/20/2014	ug/L	47.7	5.0	10000
104-SD	Benzene	11/20/2014	ug/L	820/825	50	
104-SD	Ethylbenzene	11/20/2014	ug/L	11/10	5.0	700
104-SD	Tetrahydrofuran	11/20/2014	ug/L	231/211	100	
104-SD	Toluene	11/20/2014	ug/L	36.5/34.4	5.0	1000
104-SD	Xylenes	11/20/2014	ug/L	21.0/20.2	5.0	10000
104-SS	1,2,4-Trimethylbenzene	2/3/2015	ug/L	5.5	5.0	
104-SS	Benzene	2/3/2015	ug/L	1020	125	

104-SS	Ethylbenzene	2/3/2015	ug/L	22.6	5.0	700
104-SS	p-Isopropyltoluene	2/3/2015	ug/L	5.5	5.0	
104-SS	Toluene	2/3/2015	ug/L	91.9	5.0	1000
104-SS	Xylenes	2/3/2015	ug/L	49.9	5.0	10000
104-SD	Acetone	2/3/2015	ug/L	542/520	10	
104-SD	Ethylbenzene	2/3/2015	ug/L	10/10.6	5.0	700
104-SD	P-cresol	2/3/2015	ug/L	34.0/51.8	5.0	
104-SD	Tetrahydrofuran	2/3/2015	ug/L	420/414	200	
104-SD	Toluene	2/3/2015	ug/L	26.1/27.2	5.0	1000
104-SD	Xylenes	2/3/2015	ug/L	20.4/21.0	5.0	10000
104-SD	Benzene	5/14/2015	ug/L	935	50.0	
104-SD	Ethylbenzene	5/14/2015	ug/L	20.3	5.0	700
104-SD	Toluene	5/14/2015	Ug/L	71.3	5.0	1000
104-SD	Xylenes	5/14/2015	Ug/L	32.8	5.0	10000
104-SS	Benzene	5/14/2015	Ug/L	672/673	50.0	
104-SS	Ethylbenzene	5/14/2015	Ug/L	93.4/10.4	5.0	700
104-SS	p-cresol	5/14/2015	Ug/L	20.4/38.6	10.1	
104-SS	Tetrahydrofuran	5/14/2015	Ug/L	301/304	100	
104-SS	Toluene	5/14/2015	Ug/L	25.1/27.6	5.0	1000
104-SS	Xylenes	5/14/2015	ug/L	22.7/24.6	5.0	10000
114-AS	Chlorobenzene	8/24/2015	ug/L	49.6		
114-AS	p-Dichlorobenzene	8/24/2015	ug/L	5.6		
104-SS	Benzene	8/25/2015	ug/L	357		
104-SS	Ethylbenzene	8/25/2015	ug/L	13.2		700
104-SS	Toluene	8/25/2015	ug/L	14.7		1000
104-SS	Xylenes	8/25/2015	ug/L	21.2		10000
104-SD	Benzene	8/25/2015	ug/L	1300/1300		
104-SD	Ethylbenzene	8/25/2015	ug/L	20/20		700
104-SD	Toluene	8/25/2015	ug/L	73/73		1000
104-SD	Xylenes	8/25/2015	ug/L	46/48		10000
114-AS	Benzene	11/20/2015	ug/L	9.1 ug/L		
114-AS	Chlorobenzene	11/20/2015	ug/L	67.9 ug/L		
114-AS	p-Dichlorobenzene	11/20/2015	ug/L	7.1 ug/L		
104-SD	Benzene	11/18/2015	ug/L	640ug/L		
104-SD	Ethylbenzene	11/18/2015	ug/L	5.4 ug/L		700
104-SD	M+p-cresols	11/18/2015	ug/L	67.6 ug/L		
104-SD	(methyl tertiary butyl ether) MTBE	11/18/2015	ug/L	5.4 ug/L		
104-SD	Tetrahydrofuran	11/18/2015	ug/L	1560 ug/L		
104-SD	Toluene	11/18/2015	ug/L	10.5 ug/L		1000
104-SD	Xylenes	11/18/2015	ug/L	19.1 ug/L		10000
104-SS	Benzene	11/18/2015	ug/L	469 ug/L		
104-SS	Ethylbenzene	11/18/2015	ug/L	8.7 ug/L		700
104-SS	Toluene	11/18/2015	ug/L	5.2 ug/L		1000
104-SS	Xylenes	11/18/2015	ug/L	23.1 ug/L		10000

Table II – Inorganic Constituents

WELL	INORGANIC CONSTITUENT	DATE	UNITS	RESULT	MCL
114-AS	Arsenic	9/2014	mg/L	0.21	0.01
114-AS	Phosphorus	9/2014	mg/L	1.9	
105-SS	Calcium	9/2014	mg/L	92	
105-SS	Chloride	9/2014	mg/L	78	
105-SS	Magnesium	9/2014	mg/L	48	
105-SS	Sulfate	9/2014	mg/L	80	
105-SS	Total Dissolved Solids	9/2014	mg/L	508	
106-SS	Chloride	9/2014	mg/L	24	
106-SS	Iron	9/2014	mg/L	1.3	
106-SS	Sodium	9/2014	mg/L	18	
109-SS	Total Organic Carbon	9/2014	mg/L	31	
110-SS	Total Organic Carbon	9/2014	mg/L	66	
205-SS	Total Organic Carbon	9/2014	mg/L	34	
104-SD	Barium	9/2014	mg/L	0.71	2
104-SD	Chloride	9/2014	mg/L	210	
104-SD	Magnesium	9/2014	mg/L	65	
104-SD	Sodium	9/2014	mg/L	150	
104-SD	Specific Conductance, Field	9/2014	Umhos/cm	1457	
104-SD	Total Dissolved Solids	9/2014	mg/L	1100	
104-SD	Total Organic Carbon	9/2014	mg/L	140	
106-SD	Ammonia	9/2014	mg/L	73	
106-SD	Barium	9/2014	mg/L	1.4	2
111-SD	Total Organic Carbon	9/2014	mg/L	30	
114-AS	Arsenic	11/2014	mg/L	0.193	
105-SS	Calcium	11/2014	mg/L	85.8	
105-SS	Chloride	11/2014	mg/L	88.3	
105-SS	Sulfate	11/2014	mg/L	83.3	
105-SS	Total dissolved solids	11/2014	mg/L	627	
115-SS	Manganese	11/2014	mg/L	0.0985	
201A-SS	Chloride	11/2014	mg/L	4.5	
104-SD	Barium	11/2014	mg/L	0.489	2
104-SD	Chloride	11/2014	mg/L	592	
104-SD	Magnesium	11/2014	mg/L	62.1	
104-SD	Sodium	11/2014	mg/L	115	
104-SD	Specific conductance, field	11/2014	Umhos/cm	1688	
104-SD	Total dissolved solids	11/2014	mg/L	1220	
104-SD	Total organic carbon	11/2014	mg/L	46.5	
106-SD	Ammonia	11/2014	mg/L	52.6	
106-SD	Barium	11/2014	mg/L	0.924	2
106-SD	Total hardness	11/2014	mg/L	838	
114-AS	Phosphorus	2/2015	mg/L	1.9	
105-SS	Calcium	2/2015	mg/L	87	

105-SS	Chloride	2/2015	mg/L	78	
105-SS	Sulfate	2/2015	mg/L	71.9	
106-SS	Chloride	2/2015	mg/L	22.1	
115-SS	Manganese	2/2015	mg/L	0.0643	
201A-SS	Chloride	2/2015	mg/L	4.1	
104-SD	Barium	2/2015	mg/L	0.0492	
104-SD	Chloride	2/2015	mg/L	241	
104-SD	Magnesium	2/2015	mg/L	58.7	
104-SD	Sodium	2/2015	mg/L	120	
104-SD	Specific Conductance, Field	2/2015	Umhos/cm	1550	
104-SD	Total Dissolved Solids	2/2015	mg/L	1070	
104-SD	Total Organic Carbon	2/2015	mg/L	46.2	
106-SD	Ammonia	2/2015	mg/L	64.2	
106-SD	Barium	2/2015	mg/L	1.14	
106-SD	Calcium	2/2015	mg/L	176	
106-SD	Hardness, total	2/2015	mg/L	1100	
106-SD	Iron	2/2015	mg/L	11.8	
106-SD	Magnesium	2/2015	mg/L	160	
114-AS	Phosphorus	8/2015	mg/L	1.9	
105-SS	Chloride	8/2015	mg/L	79.6	
105-SS	Sulfate	8/2015	mg/L	73.6	
105-SS	TDS (total dissolved solids)	8/2015	mg/L	564	
106-SS	Chloride	8/2015	mg/L	25.3	
106-SS	Iron	8/2015	mg/L	1.83	
115-SS	Manganese	8/2015	mg/L	0.0776	
104-SD	Barium	8/2015	mg/L	0.491	
104-SD	Chloride	8/2015	mg/L	252	
104-SD	Magnesium	8/2015	mg/L	60.8	
104-SD	Sodium	8/2015	mg/L	138	
104-SD	Specific conductance, field	8/2015	Umhos/cm	1905	
104-SD	TDS	8/2015	mg/L	1090	
104-SD	TOC (total organic carbons)	8/2015	mg/L	84.4	
106-SD	Ammonia	8/2015	mg/L	135	
106-SD	Barium	8/2015	mg/L	1.37	
106-SD	Boron	8/2015	mg/L	3.68	
106-SD	Calcium	8/2015	mg/L	153	
106-SD	Hardness	8/2015	mg/L	985	
106-SD	Magnesium	8/2015	mg/L	147	
100-SS	Boron	11/2015	mg/L	0.158	
105-SS	Calcium	11/2015	mg/L	90.9	
105-SS	Chloride	11/2015	mg/L	76.3	
105-SS	Magnesium	11/2015	mg/L	48	
105-SS	Sulfate	11/2015	mg/L	69.5	
105-SS	TDS	11/2015	mg/L	556	
106-SS	Chloride	11/2015	mg/L	23.3	

115-SS	Manganese	11/2015	mg/L	0.0821	
201A-SS	Nitrate/nitrite	11/2015	mg/L	0.37	
104-SD	Barium	11/2015	mg/L	0.553	
104-SD	Chloride	11/2015	mg/L	253	
104-SD	Magnesium	11/2015	mg/L	65.9	
104-SD	Nickel	11/2015	mg/L	0.0640	
104-SD	Sodium	11/2015	mg/L	162	
104-SD	Specific conductance, field	11/2015	Umhos/cm	2070	
104-SD	TDS	11/2015	mg/L	1100	
104-SD	TOC	11/2015	mg/L	98.7	
106-SD	Ammonia	11/2015	mg/L	83.4	
106-SD	Barium	11/2015	mg/L	1.38	
106-SD	Calcium	11/2015	mg/L	145	
106-SD	Hardness	11/2015	mg/L	848	
106-SD	Magnesium	11/2015	mg/L	118	

Table III includes the exceedances of the Groundwater Protection Standards as reported in the Annual Assessment Monitoring Reports.

Table III

Date	Well	Constituent	MCL	GWPS	Concentration	Units
9/24/2014	PZ-104-SS	Sulfide	NE	RL	3.1	mg/L
9/24/2014	PZ-104-SS	Benzene	5	5	1500	ug/L
11/20/2014	PZ-104-SS	Benzene	5	5	1280	ug/L
2/3/2015	PZ-104-SS	Benzene	5	5	1020	ug/L
5/14/2015	PZ-104-SS	Benzene	5	5	935	ug/L
9/24/2014	PZ-104-SD	Arsenic	10	10	15	ug/L
2/3/2015	PZ-104-SD	Arsenic	10	10	13.2/13.6	ug/L
9/24/2014	PZ-104-SD	Nickel	NE	10	55/55	ug/L
11/20/2014	PZ-104-SD	Nickel	NE	10	25.8/<25.0	ug/L
2/3/2015	PZ-104-SD	Nickel	NE	10	29.7/34.2	ug/L
5/13/2015	PZ-104-SD	Nickel	NE	10	22.1/22.1	ug/L
9/24/2014	PZ-104-SD	Acetone	NE	RL	11.0/23.0	ug/L
9/24/2014	PZ-104-SD	Benzene	5	5	1200/1200	ug/L
11/20/2014	PZ-104-SD	Benzene	5	5	820/825	ug/L
2/3/2015	PZ-104-SD	Benzene	5	5	542/520	ug/L
5/14/2015	PZ-104-SD	Benzene	5	5	672/673	ug/L
9/24/2014	PZ-104-SD	p-Cresol	NE	RL	21/240	ug/L
2/3/2015	PZ-104-SD	p-Cresol	NE	RL	34.0/51.8	ug/L
5/13/2015	PZ-104-SD	p-Cresol	NE	RL	20.4/38.6	ug/L
9/24/2014	PZ-104-SD	Phenol	NE	RL	<10/26	ug/L
9/25/2014	PZ-210-SS	Benzene	5	5	10	ug/L

9/25/2014	PZ-210-SD	Lead	15	NE	29	ug/L
9/25/2014	PZ-210-SD	Benzene	5	5	12	ug/L
11/22/2014	PZ-210-SD	Benzene	5	5	6.1	ug/L
2/3/2015	PZ-210-SD	Benzene	5	5	5.2	ug/L
9/25/2014	PZ-211-SD	Beryllium	4	NE	4.8	ug/L
11/19/2014	PZ-211-SD	Beryllium	4	NE	19.9	ug/L
9/25/2014	PZ-211-SD	Lead	15	NE	50	ug/L
11/19/2014	PZ-211-SD	Lead	15	NE	244	ug/L
9/24/2014	PZ-104-SS	1,2,4-Trimethylbenzene	NE	RL	6.3	ug/L
2/3/2015	PZ-104-SS	1,2,4-Trimethylbenzene	NE	RL	5.5	ug/L
9/24/2014	PZ-104-SS	p-Isopropyltoluene	NE	RL	10	ug/L
2/3/2015	PZ-104-SS	p-Isopropyltoluene	NE	RL	5.5	ug/L
9/24/2014	PZ-104-SS	Tetrahydrofuran	NE	RL	2000	ug/L
9/24/2014	PZ-104-SD	Tetrahydrofuran	NE	RL	63/58	ug/L
11/20/2014	PZ-104-SD	Tetrahydrofuran	NE	RL	231/211	ug/L
2/3/2015	PZ-104-SD	Tetrahydrofuran	NE	RL	420/414	ug/L
5/13/2015	PZ-104-SD	Tetrahydrofuran	NE	RL	301/304	ug/L
9/25/2014	PZ-210-SS	Tetrahydrofuran	NE	RL	27	ug/L
11/19/2014	PZ-212-SD	Beryllium	4	NE	27.5	ug/L
11/19/2014	PZ-212-SD	Cadmium	5	NE	67.2	ug/L
2/3/2015	PZ-212-SD	Cadmium	5	NE	11.3	ug/L
11/19/2014	PZ-212-SD	Lead	15	NE	250	ug/L
2/3/2015	PZ-212-SD	Lead	15	NE	55.8	ug/L
9/25/2014	PZ-210-SD	Sulfide	NE	RL	3.4	mg/L
9/25/2014	PZ-211-SD	Sulfide	NE	RL	2.6	mg/L
5/1/2014	PZ-104-SS	Benzene	5	5	1200	ug/L
5/1/2014	PZ-104-SD	Benzene	5	4	1300/1300	ug/L
11/18/2015	PZ-104-SD	Arsenic	10	10	22.5/22.6	ug/L
12/3/2015	PZ-212-SD	Arsenic	10	10	10.2	ug/L
12/3/2015	PZ-212-SS	Cobalt	NE	RL	5.8	ug/L
11/18/2015	PZ-104-SD	Vanadium	NE	RL	16.8/17.9	ug/L
12/3/2015	PZ-212-SS	Vanadium	NE	RL	14.6	ug/L
3-Dec	PZ-212-SD	Vanadium	NE	RL	17.3	ug/L
11/18/2015	PZ-104-SS	Benzene	5	5	469	ug/L
11/18/2015	PZ-104-SD	Benzene	5	5	640/569	ug/L
11/18/2015	PZ-104-SD	p-Cresol	NE	RL	67.6/65.8	ug/L
12/3/2015	PZ-212-SD	p-Cresol	NE	RL	45.3	ug/L
12/3/2015	PZ-212-SD	Phenol	NE	RL	25.7	ug/L
11/18/2015	PZ-104-SD	Tetrahydrofuran	NE	RL	1560/1630	ug/L

GROUNDWATER REPORTS

2014 REPORTS

May 2014 Sampling Event

The SWMP's statistical analysis of inorganic constituents from the May 2014 sampling event generally concurs with the results reported by your consultant. Detections were found in groundwater wells in three zones (Alluvial, St. Louis Formation and Salem Formation).

During the May 2014 sampling event there were twenty-nine (29) results that exceeded the intra-well prediction limits. They were: total arsenic and total phosphorus for well 114-AS; total barium, total calcium, chloride, total magnesium and sulfate for well 105-SS; chloride and total iron for well 106-SS; nitrate/nitrite for well 109-SS; total barium, chloride, total magnesium, total sodium, field specific conductance, and total dissolved solids for well 104-SD; and total barium, total boron, total calcium, chemical oxygen on demand (COD), chloride, total hardness, total iron, total magnesium, total phosphorus, total dissolved solids, and total organic carbon at well 106-SD.

The report notes fourteen (14) of the exceedances observed in the May 2014 sampling event served as confirmatory events for the October 2013 sampling event. The SWMP agrees with this assessment. Please provide a list of the groundwater protection standards established due to the confirmed SSIs for the above-listed constituent-well pairs within 30 days of receipt of this letter.

The SWMP agrees overall with the statistical trend analysis of the exceeding constituents.

September 2014 Sampling Event

The SWMP's statistical analysis of inorganic constituents from the September 2014 sampling event generally concurs with the results reported by your consultant. Detections were found in groundwater wells in three zones (Alluvial, St. Louis Formation and Salem Formation).

During the September 2014 sampling event there were forty-nine (49) results that exceeded the intra-well prediction limits. They were: total arsenic, total phosphorus, and total organic carbon (TOC) for well 114-AS; TOC for well 100-SS; total calcium, chloride, total magnesium, sulfate and total dissolved solids (TDS) and TOC at 105-SS; chloride, total iron, total sodium, and TOC at 106-SS; TOC at 109-SS; TOC at 110-SS; total magnesium and TOC at 115-SS; TOC at 201A-SS; nitrate/nitrite and TOC at 205-SS; TOC at 100-SD; total barium, chloride, total chromium, total magnesium, total sodium, field specific conductance, TDS, and TOC at 104-SD; ammonia, total barium, total boron, total calcium, COD, chloride, total chromium, total cobalt, total hardness, total iron, total magnesium, total nickel, total phosphorus, total sodium, field specific conductance, TDS, TOC, and total vanadium at 106-SD, and TOC at 111-SD.

The report notes twenty-six (26) of the exceedances observed in the September 2014 sampling event served as confirmatory events for the May 2014 sampling event. The SWMP agrees with this assessment. Please provide a list of the groundwater protection standards established due to

the confirmed SSIs for the above-listed constituent-well pairs within 30 days of receipt of this letter.

Third Quarter 2014 Assessment Monitoring Event Summary Report

The report notes that assessment wells 104-SS, 104-SD, 104-KS, 209-SD, 210-SS, 210-SD, 211-SS and 211-SD exhibited detection of new Appendix II constituents and/or non-Appendix II constituents during the September 2014 assessment event. Total barium, sulfide, 1,2,4-trimethylbenzene, 1,4-dichlorobenzene, benzene, ethylbenzene, p-isopropyltoluene, PCB aroclor 1221, tetrahydrofuran, toluene, and total xylenes were detected at 104-SS. Total arsenic, total barium, total chromium, total nickel, total vanadium, acetone, benzene, ethylbenzene, p-cresol, phenol, tetrahydrofuran, toluene, and total xylenes were detected at 104-SD. Total barium was detected at 104-KS. Total barium and total cadmium were detected at 209-SS. Total barium, total nickel, and total zinc were detected at 209-SD. Total barium, benzene, and tetrahydrofuran were found at 210-SS. Total arsenic, total barium, total beryllium, total cadmium, total chromium, total copper, total lead, total nickel, sulfide, total vanadium and benzene were detected at 210-SD. Total barium was detected at 211-SS. Total arsenic, total barium, total beryllium, total cadmium, total chromium, total copper, total lead, total nickel, total selenium, sulfide and total zinc were detected at 211-SD.

November 2014 Sampling Event

The SWMP's statistical analysis of inorganic constituents from the November 2014 sampling event generally concurs with the results reported by your consultant. Detections were found in groundwater wells in three zones (Alluvial, St. Louis Formation and Salem Formation).

During the November 2014 sampling event there were twenty-six (26) results that exceeded the intra-well prediction limits. They were: total arsenic for well 114-AS; total calcium, chloride, sulfate and TDS at 105-SS; nitrate/nitrite and total vanadium at 110-SS; total magnesium and total vanadium at 115-SS; chloride at 201A-SS; sulfate at 205-SS; total barium, chloride, total magnesium, total sodium, field specific conductance, TDS, and TOC at 104-SD, and ammonia, total barium, total calcium, chloride, total hardness, total magnesium, field specific conductance, and TDS at 106-SD.

The report notes twenty-one (21) of the exceedances observed in the November 2014 sampling event served as confirmatory events for the September 2014 sampling event. The SWMP agrees with this assessment. Please provide a list of the groundwater protection standards established due to the confirmed SSIs for the above-listed constituent-well pairs within 30 days of receipt of this letter.

Fourth Quarter 2014 Assessment Monitoring Event Summary Report

The report notes that assessment wells 104-SD and 211-SD as well as background well 212-SD exhibited detection of new Appendix II constituents and/or non-Appendix II constituents during the November 2014 assessment event. Tetrahydrofuran was detected at 104-SD. Total

beryllium, total copper, total lead, and total zinc were detected at 211-SD. Total beryllium, total cadmium, total lead, and total zinc were detected at 212-SD.

2015 REPORTS

February 2015 Sampling Event

The SWMP's statistical analysis of inorganic constituents from the February 2015 sampling event generally concurs with the results reported by your consultant. Detections were found in groundwater wells in three zones (Alluvial, St. Louis Formation and Salem Formation).

During the February 2015 sampling event there were twenty-eight (28) results that exceeded the intra-well prediction limits. They were: total phosphorus for well 114-AS; total calcium, chloride, and sulfate at 105-SS; chloride at 106-SS; total manganese at 115-SS; chloride at 201A-SS; total copper and total vanadium at 205-SS; total barium, chloride, total magnesium, total sodium, field specific conductance, TDS, and TOC at 104-SD; ammonia, total barium, total calcium, COD, chloride, total hardness, total iron, total magnesium, and field specific conductance at 106-SD, and total arsenic, total chromium, and total vanadium at 111-SD.

The report notes nineteen (19) of the exceedances observed in the February 2015 sampling event served as confirmatory events for the November 2014 sampling event. The SWMP agrees with this assessment. Please provide a list of the groundwater protection standards established due to the confirmed SSIs for the above-listed constituent-well pairs within 30 days of receipt of this letter.

First Quarter 2015 Assessment Monitoring Event Summary Report

The report notes assessment wells 104-SS, 104-SD, 209-SD, and 210-SD exhibited detections of new Appendix II constituents and/or non-Appendix II constituents during the February 2015 assessment event. P-isopropyltoluene was detected at 104-SS. P-cresol and tetrahydrofuran were detected at 104-SD. Total cadmium was detected at 209-SD. Total lead was detected at 210-SD. Background wells 212-SS and 212-SD exhibited detections of new Appendix II constituents/or non-Appendix II constituents during the February 2015 assessment event. Total zinc was detected at 212-SS. Total cadmium, total copper, total lead, and total zinc were detected at 212-SD.

Second Quarter 2015 Assessment Monitoring Event Summary Report

The report notes that assessment wells PZ-104-SD, PZ-104-KS, and PZ-210-SD exhibited detections of new Appendix II constituents and/or non-Appendix II constituents during the May 2015 assessment event. Total copper, p-cresol, and tetrahydrofuran were detected at PZ-104-SD. Total copper was detected at PZ-104-KS and at PZ-210-SD. In addition to detections in the assessment wells, the background wells, PZ-212-SS and PZ-212-SD exhibited detects of new Appendix II constituents and/or non-Appendix II constituents. Total zinc was detected at PZ-212-SS. Total cadmium, total copper, total lead and total zinc were detected at PZ-212-SD.

August 2015 Assessment Monitoring Event

The SWMP's statistical analysis of inorganic constituents from the August 2015 sampling event generally concurs with the results reported by your consultant. Detections were found in groundwater wells in three zones (Alluvial, St. Louis Formation and Salem Formation).

During the August sampling event, there were twenty-six (26) results that exceeded the intra-well prediction limits. Nineteen were also observed for the May 2015 sampling event. They were: total phosphorus for well 114-AS; chloride, sulfate and TDS for well 105-SS; chloride and total iron for well 106-SS; ammonia, and total manganese for well 115-SS; total barium, chloride, total magnesium, total sodium, field specific conductance, TOC and TDS for well 104-SD, and total ammonia, total barium, total boron, total calcium, total hardness, total magnesium, total nickel, total sodium, specific conductance, and TDS at well 106-SD.

The report notes that eight of the exceedances observed in the August 2015 sampling event served as confirmatory events for the May 2015 sampling event. Only three of the new exceedances observed for the May 2015 event were confirmed for the August 2015 event: TDS at PZ-105-SS, total iron at PZ-1106-SS, and TDS at PZ-106-SD. Five new exceedances that were observed for the May 2015 event were not confirmed for the August 2015 event. The SWMP agrees with this assessment. Please provide a list of the groundwater protection standards established due to the confirmed SSIs for the above-listed constituent-well pairs within 30 days of receipt of this letter.

The SWMP agrees overall with the statistical trend analysis of the exceeding constituents.

November/December 2015 Sampling Event

The SWMP's statistical analysis of inorganic constituents from the November/December 2015 sampling event generally concurs with the results reported by your consultant. Detections were found in groundwater wells in three zones (Alluvial, St. Louis Formation and Salem Formation).

During the November/December 2015 sampling, twenty-seven (27) results exceeded the intra-well prediction limits. Twenty-one (21) exceedances were also observed for the previous monitoring event in August 2015. They were: chloride, sulfate, and TDS at PZ-105-SS; chloride at PZ-106-SS; ammonia and total manganese at PZ-115-SS; total barium, chloride, total chromium, total magnesium, total sodium, field specific conductance, TDS, and TOC at PZ-104-SD; and ammonia, total barium, total calcium, total hardness, total magnesium, field specific conductance, and TDS at PZ-106-SD.

The November/December 2015 event served as a confirmatory event for the seven new prediction limit exceedances that were observed for the August 2015 event. The confirmations were chloride at PZ-105-SS; ammonia at PZ-115-SS; chromium at PZ-104-SD, and calcium at PZ-106-SD. The remaining three new exceedances of the August 2015 sampling event were not confirmed. The February 2016 sampling event will be used to confirm the five new exceedances for the November/December 2015 sampling event. Please provide a list of the groundwater protection standards established due to the confirmed SSIs for the above-listed constituent-well pairs within 30 days of receipt of this letter.

Piezometers PZ-212-SD and PZ-212-SS do not appear on the Potentiometric Surface Map in Appendix B. Please note the appropriate locations on the map and resubmit.

The SWMP agrees overall with the statistical trend analysis of the exceeding constituents.

The Potentiometric Surface Map incorrectly indicates the direction of North. Please correct this on future maps.

Fourth Quarter 2015 Assessment Monitoring Event Summary Report

Samples were taken in November and December 2015 from the facility assessment wells 104-SS; 104-SD; 209-SS; 209-SD; 210-SS; 210-SD; 211-SS, and 211-SD, and the background wells 212-SS and 212-SD. The assessment wells were sampled for the twenty-five (25) Appendix II constituents and seven non-Appendix II constituents. The two background wells were also sampled for 1-chlorobutane to determine background levels. Assessment well 104-SD was the only well with detections. MTBE, p-cresol, and tetrahydrofuran were detected in well 104-SD. The SWMP has no comments on this sampling at this time.

2016 REPORT

First Quarter 2016 Assessment Monitoring Event Summary Report

Samples were taken in March 2016 from the facility assessment wells: 104-SS; 104-SD; 104-KS; 209-SD; 210-SS; 210-SD; 211-SS, and 211-SD, and the background wells 212-SS and 212-SD. The samples served as the fourth round of sampling for 1-chlorobutane (n-butyl chloride) as required by the 2013 Assessment Monitoring Plan, and 1-chlorobutane was not detected above the reporting limit in any of the wells tested. Assessment sampling will continue on a semi-annual basis following the schedule provided. The SWMP has no comments on this sampling at this time.

CONCLUSION

In conclusion, Republic Services, Inc. must provide the following:

- Within 30 days of receipt of this letter, please provide submittal of the proposed installation of additional downgradient monitoring wells as part of assessment monitoring.
- Within 45 days of receipt of this letter, please provide submittal of a review, technical analysis, trend plots and narrative discussion of historical groundwater monitoring data as part of the assessment monitoring and interim corrective measures.
- Within 45 days of receipt of this letter, please provide submittal of a technical report as part of the interim corrective measures that demonstrates the status and effectiveness of leachate and landfill gas extraction source control measures.
- Within 30 days of receipt of this letter, please provide an alternate source demonstration to explain the background well detections in the submitted reports.
- Within 30 days of receipt of this letter, please provide a list of the groundwater protection standards established due to the confirmed SSIs for the listed constituent-

Ms. Erin Fanning
Bridgeton Landfill
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well pairs for the following sampling events: May 2014; September 2014; November 2014; February 2015; November/December 2015, and the August 2015 Assessment Monitoring Event not included in Table III of this letter.

- With the requirement for a corrective action plan, Republic Services, Inc. will also need to develop and submit a cost estimate worksheet and establish applicable financial assurance.
- Consistent with 10 CSR 80-3.010 (14)(C)5.A(I)(b), within 30 days of receipt of this letter, please provide documentation that affected off site property owners have been notified.
- Republic Services, Inc. must demonstrate the groundwater gradient is inward and groundwater flow is actually going into the landfill throughout the landfill. Please provide such evidence within 90 days of receipt of this letter.
- The difference in leachate elevation of over one-hundred-seventy (170) feet between LCS-5A and LCS-6B is puzzling. Within 45 days of receipt of this letter, please provide an explanation of why such a difference in leachate elevation exists.
- Piezometers PZ-212-SD and PZ-212-SS do not appear on the Potentiometric Surface Map in Appendix B of the November/December 2015 Sampling Event. Please note the appropriate locations on the map and resubmit.

If you should have any questions about this letter, please contact Mr. Brian D. Newby at 573-526-3940 or P.O. Box 176, Jefferson City, MO 65102-0176.

Sincerely,

SOLID WASTE MANAGEMENT PROGRAM



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

CSF:bnl

c: Mr. Nick Bauer, Republic Services, Inc.
Mr. Chris Nagel, Director, SWMP
Compliance/Enforcement Section, SWMP