



Spokane County
Environmental Services
Kevin R. Cooke, P.E., Director

June 30, 2017

Department of Ecology
Attn: Huckleberry Palmer
4601 N. Monroe St., Suite 202
Spokane, WA 99205-1295

RE: Colbert Landfill Remediation Project Annual Report 2017

Dear Huckleberry,

Enclosed is a copy of the Colbert Landfill Remediation Project Annual Report for April 2017.

If you have any comments or questions, please call me at (509) 238-6607.

Sincerely,

Cassandra Harvey
Water Resource Specialist

Enc.

Colbert Landfill Remediation Project

Annual Report 2017

Progress Report for

July 2016 through April 2017

Prepared by:

Spokane County Landfill Closure
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1.0 Colbert Landfill Remediation Project Summary

The Colbert Landfill Superfund site is a closed, 40-acre, municipal solid waste landfill located approximately 15 miles north of Spokane, Washington, and about 2.5 miles north of Colbert, Washington. The landfill received waste from 1968 to 1986 when it became filled to capacity. Groundwater in the vicinity of the landfill was found to be contaminated with volatile organic compounds and in 1983, the landfill was placed on the National Priorities List (NPL) by EPA. In 1989, a consent decree was executed to implement a site remedy. The site remedy includes:

- An available alternate water supply for residential wells impacted by groundwater contamination originating from the landfill.
- Institutional Controls
- Construction and operation of a pump and treat system to capture and prevent further spread of groundwater contaminants.
- Landfill closure according to the State of Washington regulations Minimal Functional Standards (WAC173-304).
- Monitoring of contaminants to protect human health and the environment at the site.

Construction of a pump and treat (P&T) system was completed in 1994. The P&T system operated successfully for 20 years. In 2014, an EPA recommended shut-down test was initiated to determine if the facility was continuing to add any significant benefit to the clean-up.

The programs currently in place include a Shut-down Test (lower aquifer) for the pump and treat system; and upper aquifer compliance groundwater monitoring (includes 1,4-dioxane monitoring and MFS monitoring of the upper aquifer); residential well monitoring (includes both upper and lower aquifers); supplemental sampling (includes both upper and lower aquifers); and landfill cover maintenance and monitoring. The groundwater monitoring programs and criteria are summarized below.

Current Monitoring Programs

Program	Aquifer	Parameters	Schedule
Shut-down Test	Lower	VOC's	Quarterly
Upper Aquifer Compliance	Upper	VOC's	Annual (Extraction wells Quarterly)
1,4-Dioxane Sampling	Upper	1,4-Dioxane	Annual
MFS Monitoring	Upper	Cl/NH3/NO2/NH3 /SO4/Fe/Mn/Zn/T OC/COD	Annual
Residential Monitoring	Lower /Upper	VOC's	Monthly/Quarterly/SemiAnnual /Annual/BiAnnual
Supplemental Sampling	Lower/ Upper	VOC's	Every five years

Program Criteria

PROGRAM	CRITERIA	TCA	DCE	DCA	TCE	PCE	MC	1,4-Dioxane	Units	
CONSENT DECREE	Performance	200	7	4050	5	0.7	2.5		ug/L	
	Evaluation	200	7	4050	5	0.7	2.5	7		
SHUT-DOWN TEST	Action Level	130	4.55	2632	3.25	0.5	1.63			
	Evaluation	200	7	4050	5	0.7	2.5			
RESIDENTIAL Monthly sampling initiated, evaluated in 12 months Exeedance requires alternative drinking w ater source be supplied	Action Level	130	4.55	2632	3.25	0.5	1.63			
	MCL	200	7	4050	5	0.7	2.5			
		Cl	Fe	Mn	Zn	TOC	COD	SO4	NO3	
MFS	(mg/L)	250	0.3	0.05	5	NA	NA	250	10	mg/L

1.1 Geology/Hydrogeology

The geology beneath the Site consists of six vertically stratified and laterally discontinuous geologic units derived from glacial and fluvial material, modified by erosional (and possibly landslide) processes, overlaid on granitic bedrock. There are two primary aquifers that include the saturated portion of the Upper Sand and Gravel Unit and the saturated portion of the Lower Sand and Gravel Unit, which are separated by a Lacustrine Unit that serves as an aquitard. The Latah Formation serves as an aquitard that underlies the Lower Sand and Gravel Aquifer at most locations. A basalt unit forms a secondary aquifer interbedded in the Latah Aquitard and is referred to as the Basalt Aquifer. The Granite Unit is an aquitard that underlies the Latah Formation and serves as the lower boundary to the regional flow system. For more information, please refer to the Phase I Engineering Report (Landau Associates 1991).

The Upper Sand and Gravel Unit aquifer (Upper Aquifer) is unconfined with a water table that lies approximately 90 ft below the ground surface. Groundwater flow in this aquifer is generally north to south, changing to the southeast approximately 1 mile south of the Site. The direction of flow appears to be influenced by the topography of the upper surface of the Lacustrine Aquitard (Landau Associates 1991).

The Lower Sand and Gravel Unit aquifer (Lower Aquifer) is confined to the west of the landfill and unconfined to the east of the landfill. To the west of the landfill, the Upper and Lower aquifers are separated by the Lacustrine unit, which causes the confined conditions in that area. Groundwater flow in the Lower Aquifer is predominantly toward the west with discharge to the Little Spokane River.

1.2 Shut-down Test-Lower Aquifer

A pump and treat system was successfully operated from 1994 through March 31, 2014 to prevent further spread of groundwater contamination emanating from the landfill. A shut-down test for the lower aquifer pump and treat system was deemed appropriate for the site after a Remedial System Evaluation (RSE) was performed as recommended in the 2009 Five Year Review (EPA). The RSE recommendation stated that with the extensive groundwater monitoring programs in place and with concentrations having decreased substantially after 20 years of operation, the current pump and treat system may not be adding significant benefit to the overall protectiveness of the remedy and that a shut-down test would help determine its efficacy. The shut-down test procedures are outlined in the *Final Work Plan, Groundwater Pump and Treat System Shut-down Test, Colbert Landfill CERCLA Site, Spokane County Utilities/ Landau Assoc. 2013*. See Section 2 of this report for more details. The upper aquifer monitoring wells are governed by the Consent Decree compliance, Post Closure (MFS), and 1,4-dioxane sampling programs and are not included in the Shut-down test work plan.

1.3 Upper Aquifer Monitoring

1.3.1 Compliance Monitoring (VOC's)

The compliance monitoring sampling program is outlined in the Consent Decree and performed according to the Colbert Landfill Operations and Maintenance manual (*Colbert Landfill Operations and Maintenance Manual, 1998*). During implementation of the lower aquifer system Shut-down Test, the compliance monitoring will only apply to the upper aquifer. Per conditions set forth in the consent decree (Appendix B, page V-7), the south system extraction wells are not required to be in operation and have been on stand-by status since 2004, and therefore are included in the compliance monitoring program.

1.3.2 1, 4-Dioxane Sampling

During the 2005 (3rd) Five Year Site Review, EPA specified an additional constituent (1,4-Dioxane) for evaluation at the Colbert Landfill site. After extensive monitoring in both the upper and lower aquifers, it was determined that an ongoing monitoring program would apply to selected wells in the upper aquifer only. The selected upper aquifer well locations are sampled for 1,4-dioxane according to the *1,4-Dioxane Work Plan for the Colbert Landfill (December 2007)*.

1.3.3 Minimal Functional Standards Post Closure

The landfill was closed pursuant to requirements of the Minimal Functional Standards for Solid Waste Handling (MFS, WAC173-304). Lower aquifer locations, as outlined in the MFS Groundwater Monitoring Plan (Landau Assoc., 1996), require no additional monitoring after the 2 year monitoring period, which ended in January 1999. Monitoring for the upper aquifer continue according to the *Colbert Landfill Operations and Maintenance Manual, 1998*, and the *MFS Groundwater Monitoring Plan, 1996*.

1.4 Residential Well Monitoring

The Consent Decree specified that domestic wells within the vicinity of the landfill be monitored to protect human health. Domestic well locations and schedules for this program were selected by

proximity to landfill contamination and are evaluated on a regular basis to accommodate any changes in groundwater contamination. This program includes well locations in both the upper and lower aquifers. Sampling for this program is done in accordance with the *Quality Assurance and Field Sampling Plan-Colbert Residential Well Sampling, 1991* and is governed by the Consent Decree.

1.5 Supplemental Sampling

Supplemental sampling occurs every five years and is intended to collect additional data from monitoring and residential wells not regularly sampled. Although there are no criteria for monitoring or reporting associated with supplemental sampling, data collected helps provide a more accurate snapshot of groundwater flow and contamination throughout the area.

1.6 Landfill Operations and Maintenance

In 1997, the landfill closure construction (cover system and components) was completed as part of the MFS requirements. The landfill gas collection and treatment system is monitored and maintained on a regular basis as outlined in the *Operations and Maintenance Manual for Colbert Landfill Closure, CH2MHill, May 1997*.

2.0 Shut-down Test

A shut-down test of the Colbert Landfill Groundwater Pump and Treat facility was initiated April 1, 2014 when all lower aquifer extraction wells were turned off and placed in standby mode. The shut-down test was deemed appropriate for the site after a Remedial System Evaluation (RSE) was performed as recommended in the 2009 Five Year Review (EPA). The shut-down test is performed according to the *Final Work Plan, Groundwater Pump and Treat System Shut-down Test, Colbert Landfill CERCLA Site, Spokane County Utilities/ Landau Assoc. 2013*.

2.1 Shut-down Testing Locations and Schedule

The lower aquifer wells selected as monitoring locations for the Colbert Landfill pump and treat system shut-down test include: the compliance monitoring well clusters (CD-41, CD-42, CD-43, CD-44, CD-45, and CD-48), monitoring well CD-49, and the lower aquifer extraction wells (CP-E1, CP-E2, CP-E3, CP-W1, CP-W2, and CP-W3). Locations are presented in Figure 2-1. Collection of groundwater samples from the shut-down locations was performed as outlined in Table 2-1.

2.2 Shut-down Test Monitoring

The lower aquifer extraction wells, the compliance monitoring well clusters (CD-41, CD-42, CD-43, CD-44, CD-45, and CD-48) and monitoring well CD-49 were sampled according to the *Colbert Landfill Operations and Maintenance Manual, 1998*. Field parameters were taken and VOC samples were collected. There were no problems/issues associated with sampling during the reporting period.

2.2.1 Groundwater Elevations

Groundwater elevations for the reporting period are shown in Table 2-2 and in Figure 2-2. Estimated groundwater contours and flow are shown in Figure 2-3. Elevations in the lower aquifer were significantly higher during the April/May sampling round due to an unseasonably wet winter, but measurements were otherwise consistent and followed typical seasonal variation with levels slightly higher in the spring and slightly lower during the fall. Extraction well hydrographs show the anticipated increase in groundwater levels at the immediate vicinity of those wells in April 2014 when the system was shut down.

2.2.2 Field Parameters

Field parameters taken at the shut-down test locations are shown in Table 2-2. The highest conductivities were mostly seen in the east system extraction wells. Conductivity values in monitoring wells ranged from 392 to 1219 umhos/cm. Measurements of pH ranged from 6.74 to 7.94, with the lowest pH values generally found in the east system extraction wells.

2.2.3 Constituents of Concern (COC's)

Constituent of concern concentrations for Shut-down Test locations are presented Table 2-4. Concentrations versus time for Shut-down locations are presented in Figure 2-4. All detected concentrations found in the shut-down test compliance wells were well below any applicable criteria. Criteria are shown in Table 3-2. The COC's found in the shut-down program criteria dependent wells were TCA and DCE and at low concentrations. Although concentrations found

were well are far below any criteria, monitoring well CD-49 was kept on a quarterly sampling schedule to better evaluate the increasing TCA concentrations found in this well. See Figure 2-9 for the estimated TCA plume boundaries in the lower aquifer.

Lower aquifer extraction wells are not criteria dependent locations, and therefore actions during the shut-down test are not governed by COC concentrations in these wells. Analytical results from the extraction well sampling are shown in Table 2-5. Time versus concentration plots are found in Figure 2-5 through Figure 2-8. In general, concentrations of COC's have remained relatively stable in east system wells and have significantly increased in CP-W3. Concentrations in CP-W2, after noticeably decreasing three months after the wells were inactivated, have remained low.

2.3 Data Evaluation

Data indicates a slight shift in plume concentrations toward the western edge of landfill, evident by the emerging concentrations of TCA and DCE found in CD-49 and increasing concentrations (rebound) found in CP-W3. Supplemental sampling wells in the center of the landfill showed significant TCA concentrations and indicated a more connective plume than historically mapped. TCA data for supplemental sampling can be found in Table 5-3.

2.4 Program Changes or Modifications

No criteria were exceeded during the reporting period. As stated in the work plan, sampling at the lower aquifer compliance monitoring wells is now on an annual schedule and will be sampled again in April 2018. The exception to this is monitoring well CD-49. Quarterly sampling will continue at CD-49 to observe the increasing trend in concentrations. If concentrations continue to increase at a steady rate, the sampling frequency at well clusters CD-43 and CD-42 will be re-evaluated.

Quarterly sampling will continue at the extraction wells, as running the wells periodically will assist with preventive maintenance and provide indicators for any possible changes in COC concentrations near the landfill boundaries.

2.5 Cost Savings

Typical electrical costs associated with operating the pump and treat system for the lower aquifer on a continual basis for a period of one year were approximately \$59,000. From May 2016 through April 2017 the cost for electricity at the facility during the second year of the shut-down test was \$16,150.

Increases in lab costs were minimal when compared to the savings in electricity. The estimated lab cost for the additional sampling rounds was \$6,200. Labor costs for additional sampling rounds were estimated to be approximately \$4,000.

Typical Annual Electrical Costs		\$60,000
Electrical Costs for Third Year of Shut-down Test		-\$16,150
Additional Lab Cost Associated with Shut-down Test		-\$6,200
Estimated labor costs for additional sample rounds		-\$4,000
Estimated Total Cost Savings		\$35,150

Figure 2-1 Shut-down Test Locations

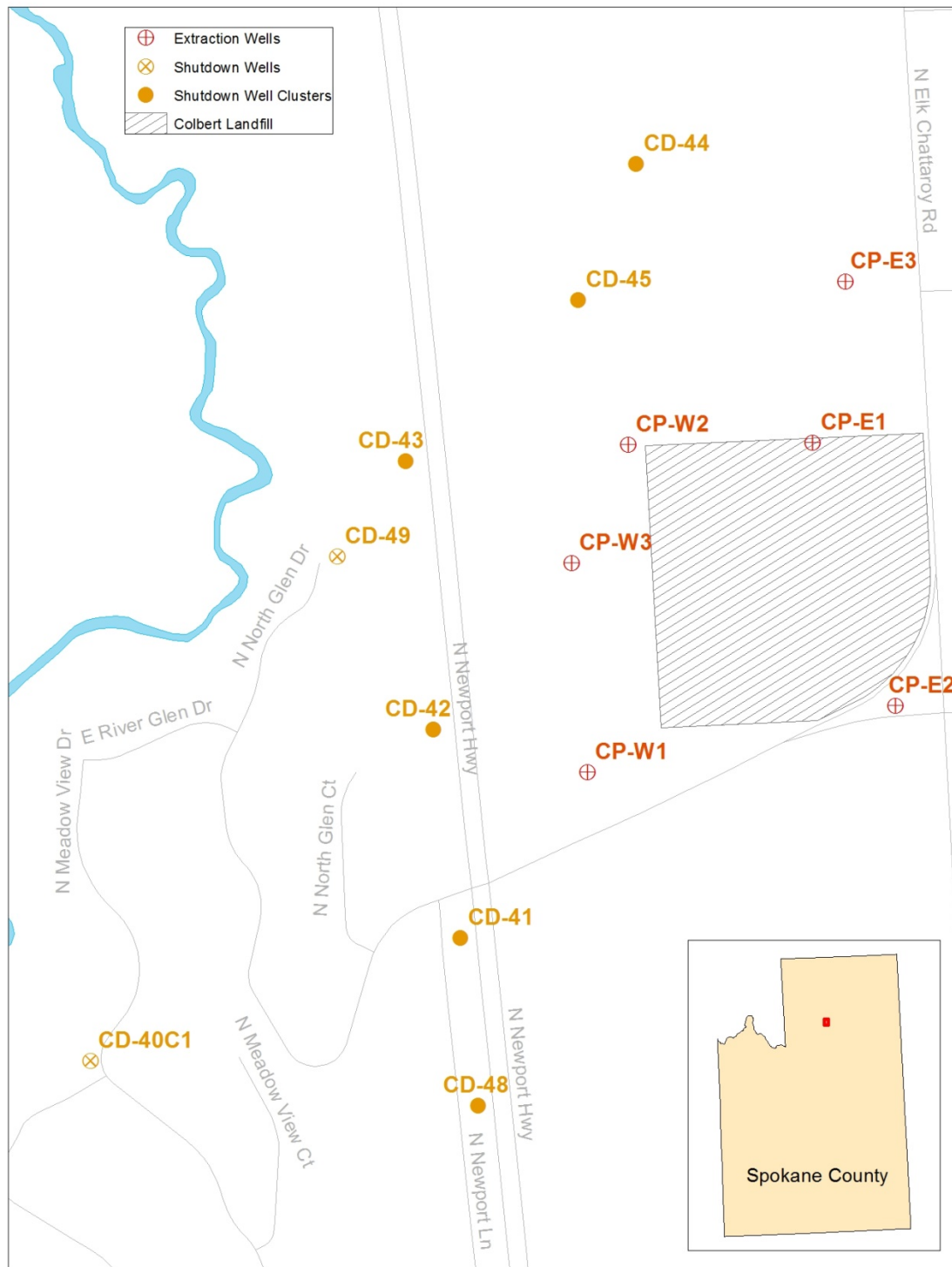


Table 2-1 Colbert Landfill Shut-down Test Sampling Schedule Year 2 (May 2016 through April 2017)

System	Well ID	Monitoring Frequency		Shut-down Criteria Applies?
		Water Levels	Sampling	
West	CD-40C1	Quarterly	Annual	Yes
	CD-41C2	Quarterly	Annual	
	CD-41C3	Quarterly	Annual	
	CD-42C1	Quarterly	Annual	Yes
	CD-42C2	Quarterly	Annual	
	CD-42C3	Quarterly	Annual	
	CD-43C1	Quarterly	Annual	Yes
	CD-43C2	Quarterly	Annual	
	CD-43C3	Quarterly	Annual	
	CD-44C1	Quarterly	Annual	Yes
	CD-44C2	Quarterly	Annual	
	CD-44C3	Quarterly	Annual	
	CD-45C1	Quarterly	Annual	Yes
	CD-45C2	Quarterly	Annual	
	CD-45C3	Quarterly	Annual	
	CD-48C1	Quarterly	Annual	Yes
	CD-48C2	Quarterly	Annual	
	CD-48C3	Quarterly	Annual	
	CD-49	Quarterly	Quarterly	Yes
	CP-W1	Quarterly	Quarterly	No
	CP-W2	Quarterly	Quarterly	
	CP-W3	Quarterly	Quarterly	
East	CP-E1	Quarterly	Quarterly	No
	CP-E2	Quarterly	Quarterly	
	CP-E3	Quarterly	Quarterly	

Figure 2-2 Lower Aquifer Groundwater Elevations

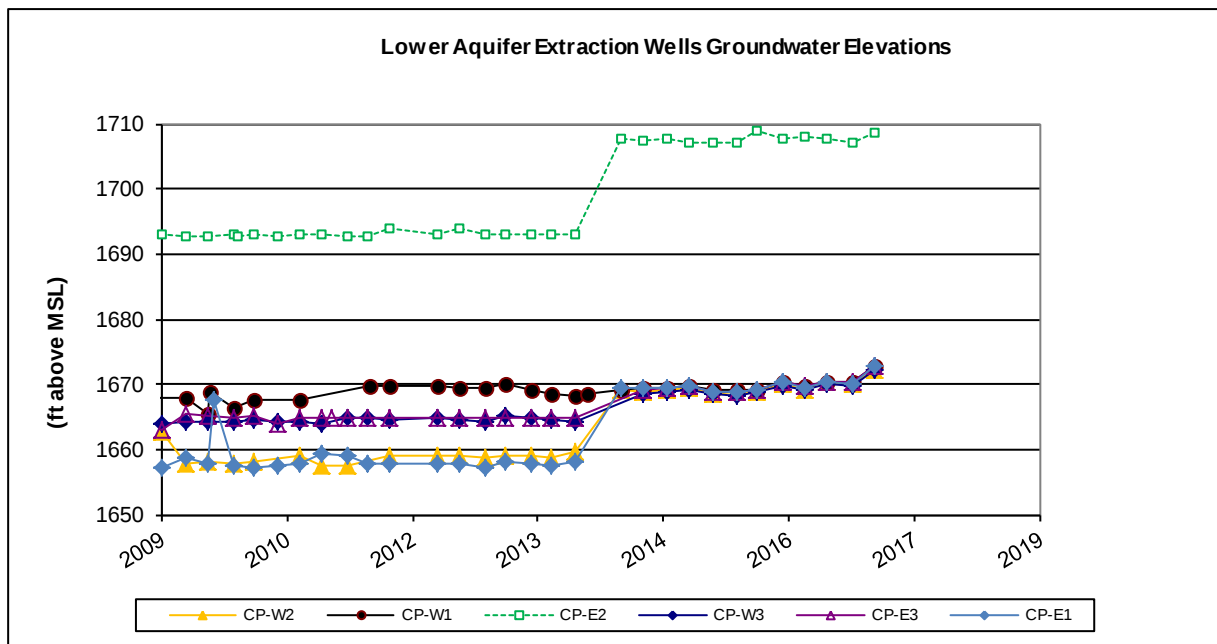
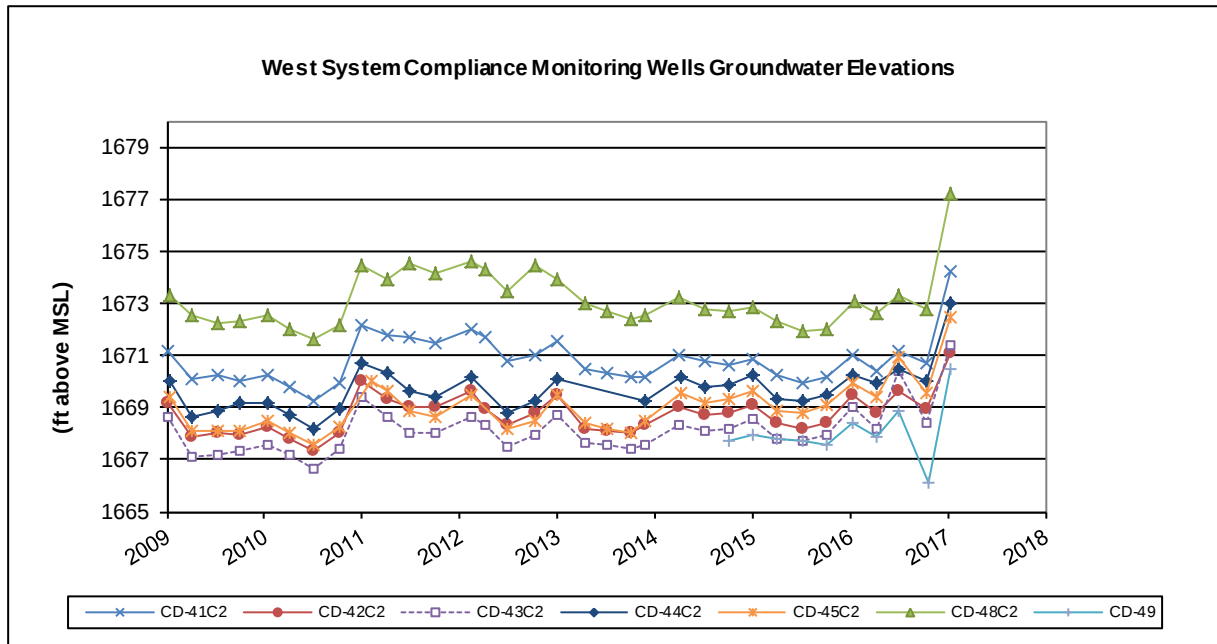


Figure 2-3 Lower Aquifer Groundwater Contours

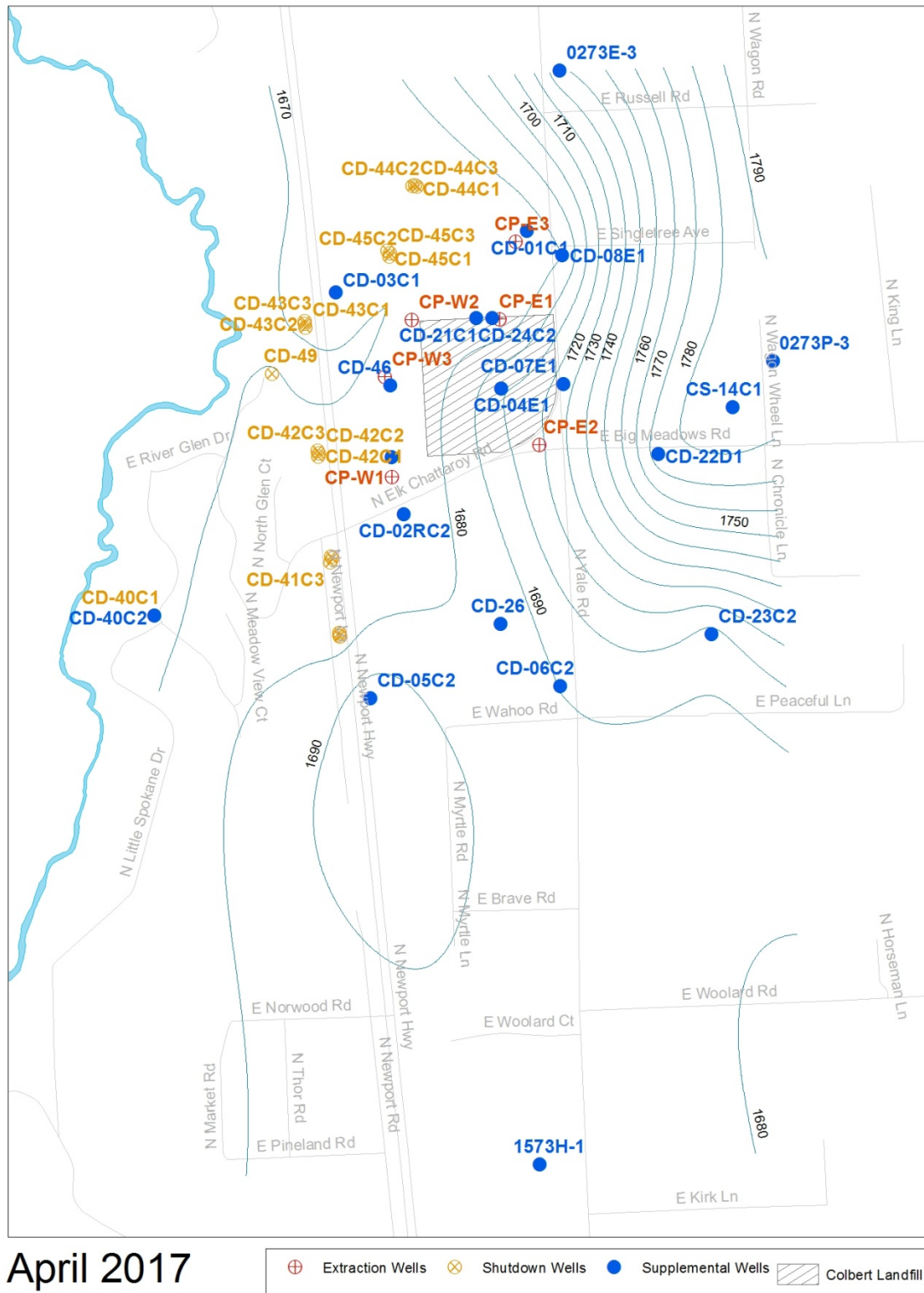


Table 2-2 Shut-down Test Location Field Parameters

StationID	SampleDate	WtrElev	FieldTemp	FieldPH	FieldConductivity	FieldTurbidity	Aquifer	Program
CD-40C1	4/19/17	1662.77	10.6	7.95	417	0.14	low er	SD
CD-41C1	4/18/17	1674.19	11.6	7.71	392	0.11	low er	SD
CD-41C2	4/18/17	1668.82	11.7	7.84	405	0.08	low er	SD
CD-41C3	4/18/17	1674.31	12.3	7.68	459	0.1	low er	SD
CD-42C1	4/18/17	1672.3	12.2	7.73	460	0.09	low er	SD
CD-42C2	4/18/17	1671.07	12.3	7.8	453	0.09	low er	SD
CD-42C3	4/18/17	1672.33	12.5	7.78	397	0.77	low er	SD
CD-43C1	4/18/17	1671.03	9.7	7.84	434	0.1	low er	SD
CD-43C2	4/18/17	1671.36	10.8	7.75	379	0.14	low er	SD
CD-43C3	4/18/17	1672.42	11.5	7.69	295	0.36	low er	SD
CD-44C1	4/19/17	1673.02	16.9	7.22	481	0.14	low er	SD
CD-44C2	4/19/17	1673	0.09	7.21	462	0.09	low er	SD
CD-44C3	4/19/17	1673.11	11.4	7.2	459	0.44	low er	SD
CD-45C1	4/19/17	1672.5	10	7.4	489	0.1	low er	SD
CD-45C2	4/19/17	1672.5	10.6	7.34	470	0.17	low er	SD
CD-45C3	4/19/17	1672.67	10.5	7.65	327	0.26	low er	SD
CD-48C1	4/18/17	1676.78	11.5	7.63	467	0.1	low er	SD
CD-48C2	4/18/17	1677.22	11.4	7.71	475	0.13	low er	SD
CD-48C3	4/18/17	1676.48	11.6	7.71	445	0.12	low er	SD
CD-49	7/13/16	1667.84	13	7.64	468	0.09	low er	SD
CD-49	10/5/16	1668.9	12.1	7.85	497	0.21	low er	SD
CD-49	1/24/17	1666.09	10.3	7.94	505	0.21	low er	SD
CD-49	4/19/17	1670.51	12.5	7.58	505	0.09	low er	SD
CP-E1	7/13/16	1669.59	12.5	6.74	1110	1.69	low er	SD
CP-E1	10/5/16	1670.22	12.2	6.86	1200	0.89	low er	SD
CP-E1	1/18/17	1670.15	10.7	6.84	1219	0.84	low er	SD
CP-E1	4/20/17	1672.75	11.7	6.79	1018	2.05	low er	SD
CP-E2	7/12/16	1708.11	13.7	6.85	1181	1.45	low er	SD
CP-E2	10/5/16	1707.76	13.1	7	1120	0.68	low er	SD
CP-E2	1/18/17	1707.1	10.1	7.06	1091	1.62	low er	SD
CP-E2	4/20/17	1708.49	12.9	6.97	1030	1030	low er	SD
CP-E3	7/12/16	1669.66	12.2	7.01	801	0.97	low er	SD
CP-E3	10/5/16	1670.49	12	7.13	779	1.07	low er	SD
CP-E3	1/18/17	1670.24	10.6	7.15	794	0.89	low er	SD
CP-E3	4/20/17	1672.84	11.4	7.5	747	8.51	low er	SD
CP-W1	7/12/16	1669.6	12	7.69	522	1.12	low er	SD
CP-W1	10/5/16	1670.27	11.8	7.77	506	0.34	low er	SD
CP-W1	1/18/17	1670.22	10.4	7.75	500	0.29	low er	SD
CP-W1	4/20/17	1672.82	11.2	7.65	472	0.81	low er	SD
CP-W2	7/13/16	1669.27	10.4	7.7	488	0.78	low er	SD
CP-W2	10/5/16	1670.24	10.1	7.78	516	0.61	low er	SD
CP-W2	1/18/17	1669.91	9.5	7.8	527	0.59	low er	SD
CP-W2	4/20/17	1672.34	9.7	7.67	475	2.2	low er	SD
CP-W3	7/13/16	1668.99	12.2	7.3	709	0.77	low er	SD
CP-W3	10/5/16	1669.92	11.6	7.34	807	0.61	low er	SD
CP-W3	1/18/17	1669.72	10.4	7.44	823	0.41	low er	SD
CP-W3	4/20/17	1672.07	11.1	7.23	743	0.8	low er	SD

Temp=degrees C; Conductivity=umhos/cm; Turbidity= NTU

Table 2-3 Colbert Landfill Shut-down Test Criteria

	SHUT-DOWN TEST CRITERIA	
COC	ACTION LEVEL CRITERIA (ug/L)	CONSENT DECREE EVALUATION CRITERIA (ug/L)
TCA	130	200
DCA	2632	4050
DCE	4.55	7
MC	1.6	2.5
PCE	0.5	0.7
TCE	3.25	5

Table 2-4 Shut-down Test Compliance Well Analytical Results

StationID	Date	DCA	DCE	MC	PCE	TCA	TCE
CD-40C1	4-2017	3.15	1.93	<0.5	<0.5	4.66	<0.5
CD-41C1	4-2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CD-41C2	4-2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CD-41C3	4-2017	<0.5	<0.5	<0.5	<0.5	0.84	<0.5
CD-42C1	4-2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CD-42C2	4-2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CD-42C3	4-2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CD-43C1	4-2017	<0.5	<0.5	<0.5	<0.5	0.63	<0.5
CD-43C2	4-2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CD-43C3	4-2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CD-44C1	4-2017	<0.5	<0.5	<0.5	<0.5	2.05	<0.5
CD-44C2	4-2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CD-44C3	4-2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CD-45C1	4-2017	<0.5	<0.5	<0.5	<0.5	0.88	<0.5
CD-45C2	4-2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CD-45C3	4-2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CD-48C1	4-2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CD-48C2	4-2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CD-48C3	4-2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CD-49	7-2016	<0.5	<0.5	<0.5	<0.5	5.33	<0.5
CD-49	10-2016	<0.5	1.79	<0.5	<0.5	5.36	<0.5
CD-49	1-2017	0.51	<0.5	<0.5	<0.5	7.81	<0.5
CD-49	4-2017	0.51	2.07	<0.5	<0.5	6.98	<0.5

Table 2-5 Lower Aquifer Extraction Well Analytical Results

StationID	Date	DCA	DCE	MC	PCE	TCA	TCE
CP-E1	7-2016	8.23	12	<0.5	1.99	7.53	7.17
CP-E1	10-2016	8.31	11.4	<0.5	1.83	6.55	6.85
CP-E1	1-2017	8.52	14.80	<0.5	1.87	7.13	7.23
CP-E1	4-2017	10.3	16	<0.5	2	9.26	7.74
CP-E2	7-2016	30	95.8	<0.5	0.8	54.8	88.7
CP-E2	10-2016	28.6	107	<0.5	0.82	45.6	117
CP-E2	1-2017	32.80	123.00	<0.5	0.86	52.00	131.00
CP-E2	4-2017	29.9	103	<0.5	0.76	62.7	92.9
CP-E3	7-2016	3.3	16.9	<0.5	<0.5	14.6	2.26
CP-E3	10-2016	2.85	13.5	<0.5	<0.5	11.8	1.37
CP-E3	1-2017	2.95	16.80	<0.5	<0.5	11.70	1.97
CP-E3	4-2017	3.96	16.3	<0.5	<0.5	14.4	2.34
CP-W1	7-2016	<0.5	5.5	<0.5	<0.5	6.8	<0.5
CP-W1	10-2016	<0.5	4.45	<0.5	<0.5	5.67	<0.5
CP-W1	1-2017	<0.5	5.45	<0.5	<0.5	5.70	<0.5
CP-W1	4-2017	<0.5	5.06	<0.5	<0.5	6.26	<0.5
CP-W2	7-2016	<0.5	<0.5	<0.5	<0.5	1.47	<0.5
CP-W2	10-2016	<0.5	0.56	<0.5	<0.5	1.69	<0.5
CP-W2	1-2017	<0.5	0.85	<0.5	<0.5	2.22	<0.5
CP-W2	4-2017	<0.5	<0.5	<0.5	<0.5	2.06	<0.5
CP-W3	7-2016	34.9	70.1	<0.5	<0.5	94.4	33.5
CP-W3	10-2016	38.8	76.8	<0.5	<0.5	96.3	33.7
CP-W3	1-2017	42.70	90.00	<0.5	<0.5	105.00	36.60
CP-W3	4-2017	37.1	66.8	<0.5	<0.5	88.5	40.2

Figure 2-4 Lower Aquifer Monitoring Well COC Concentrations

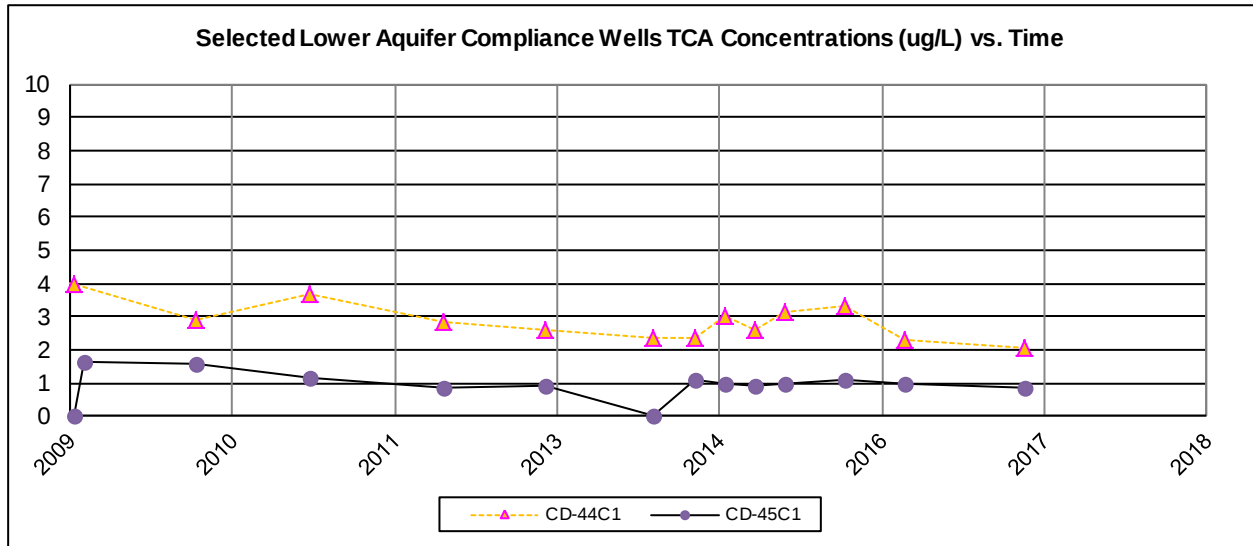
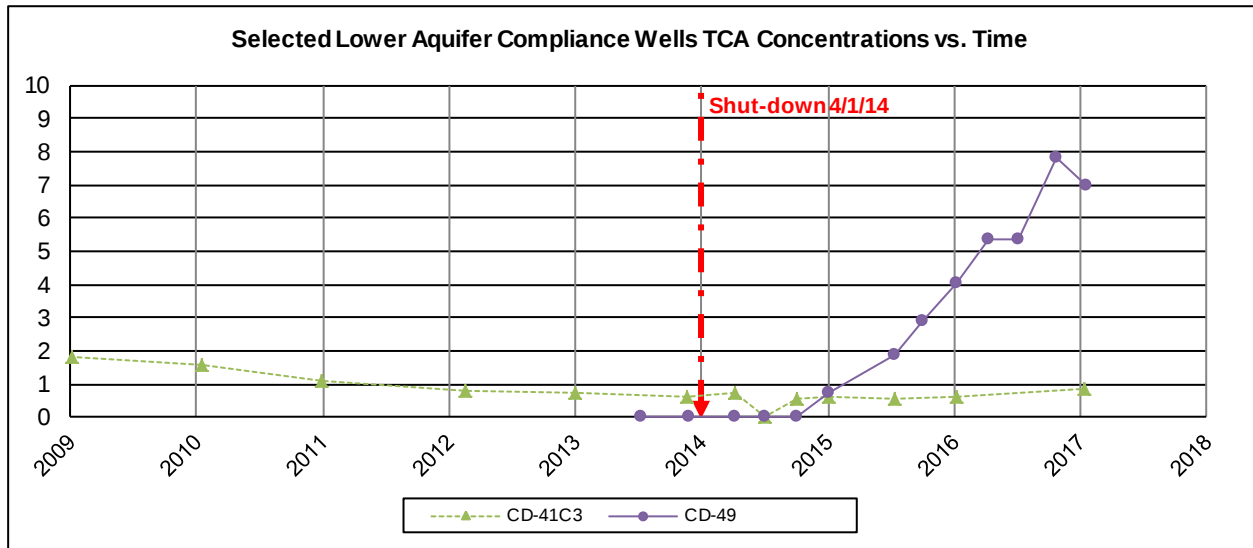


Figure 2-5 Lower Aquifer Extraction Well COC Concentrations

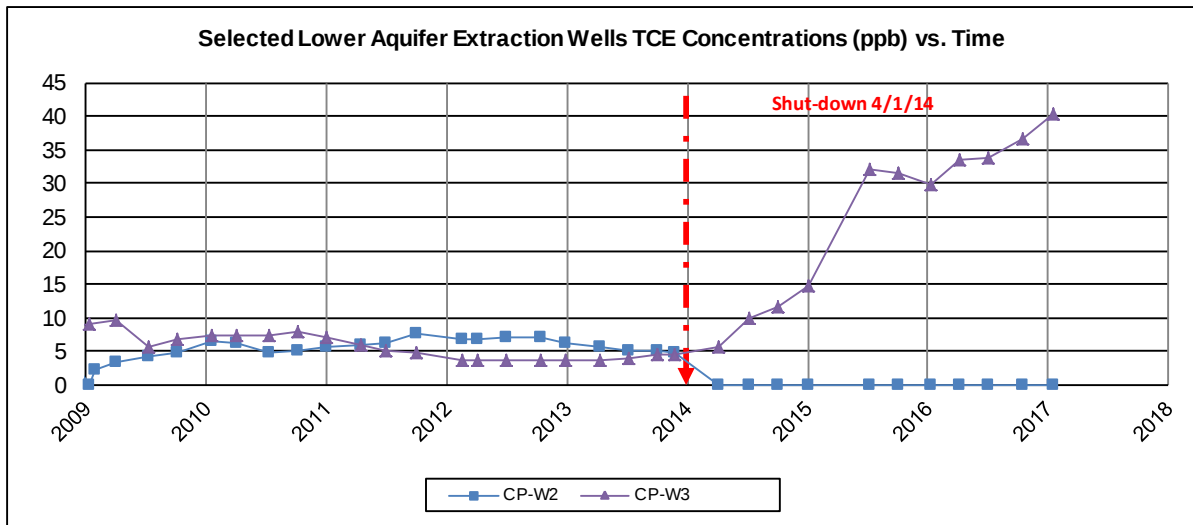
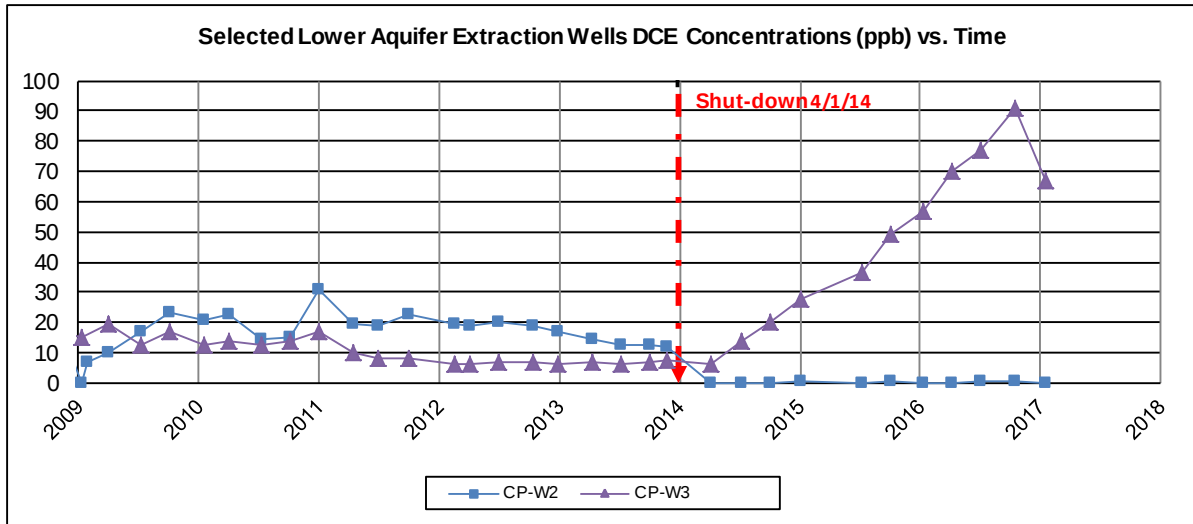
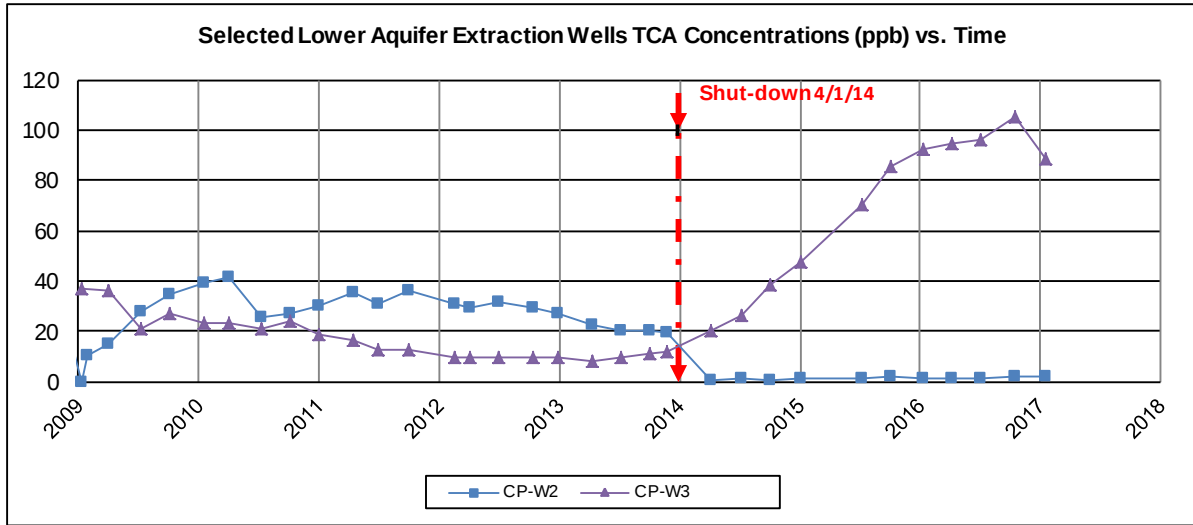


Figure 2-6 Lower Aquifer Extraction Well COC Concentrations

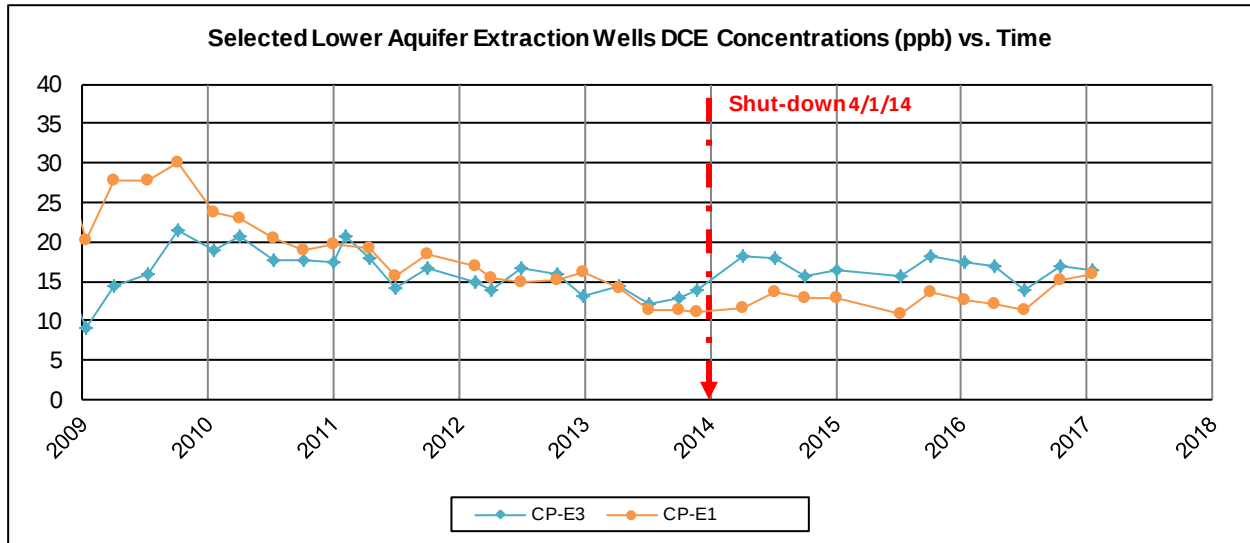
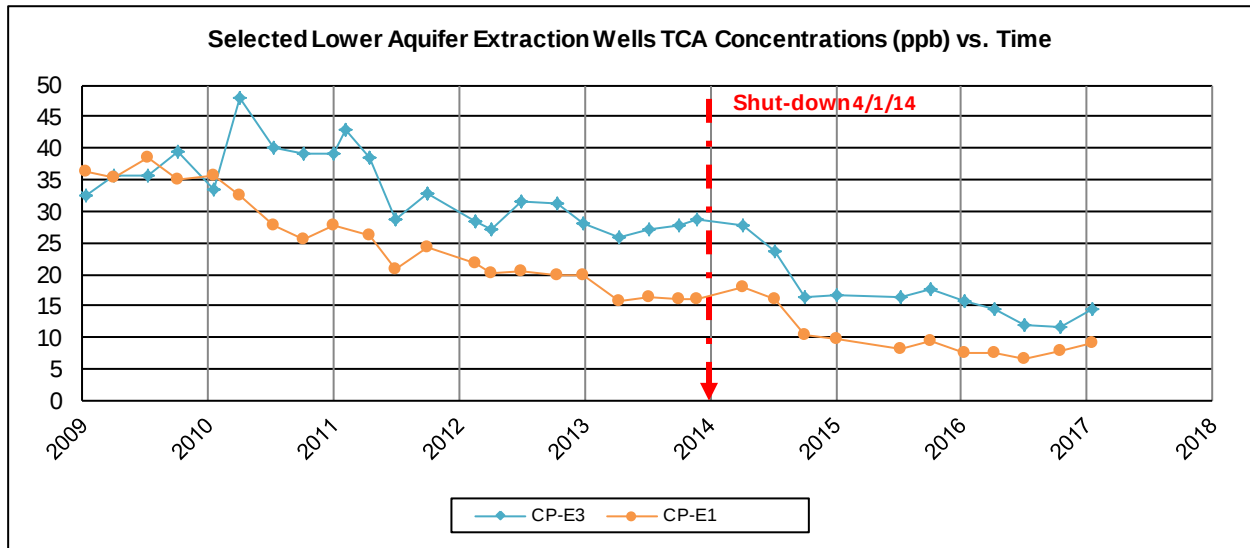


Figure 2-7 Lower Aquifer Extraction Well Concentrations

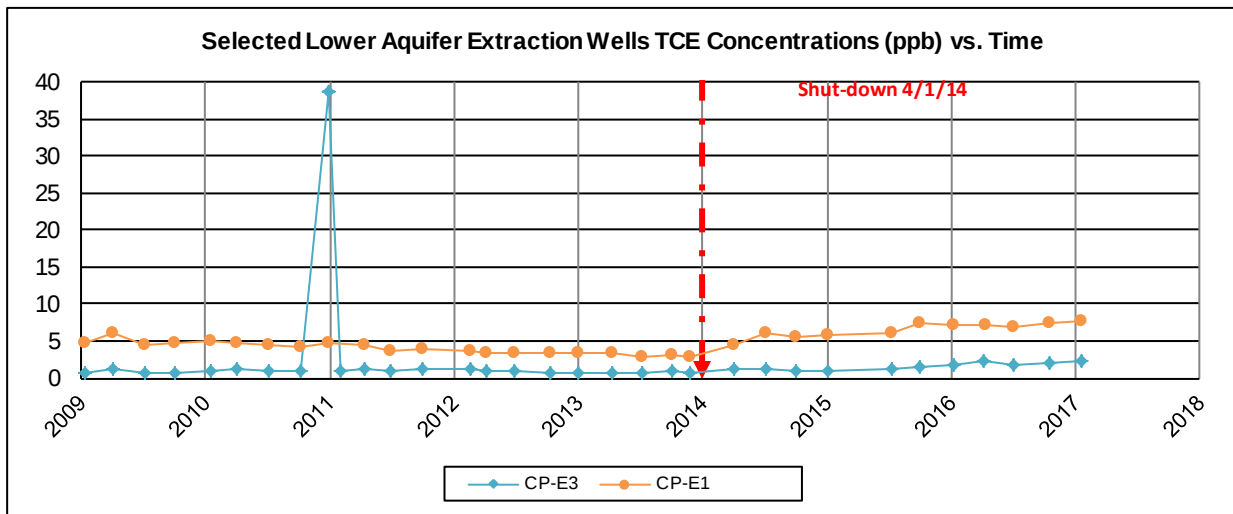
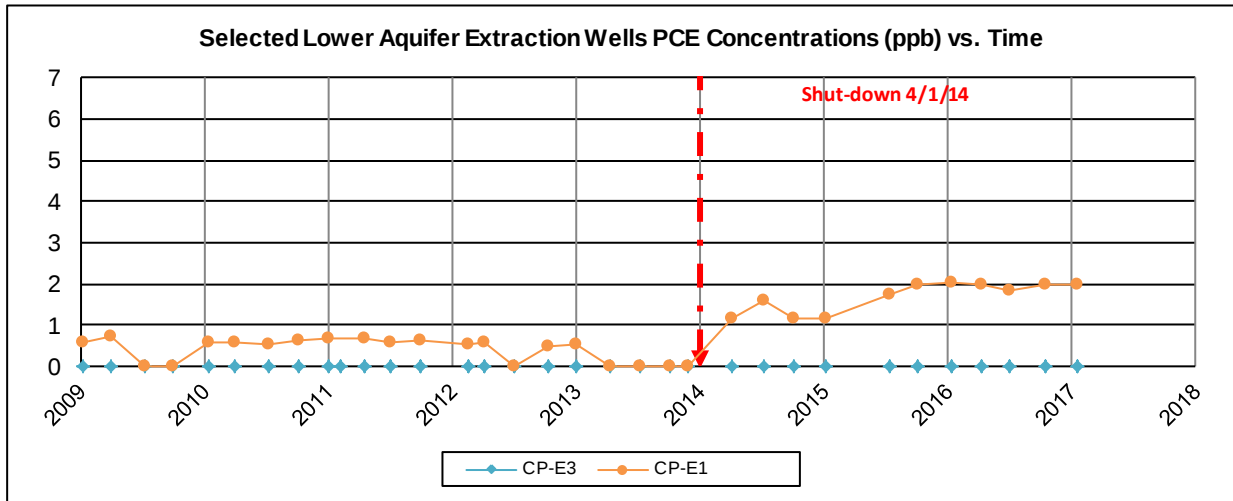
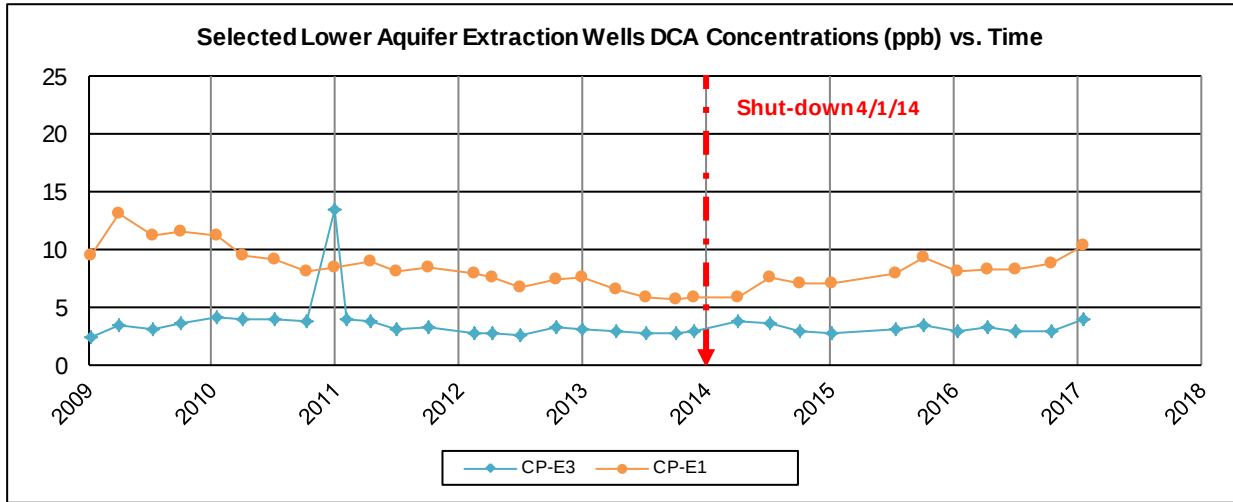
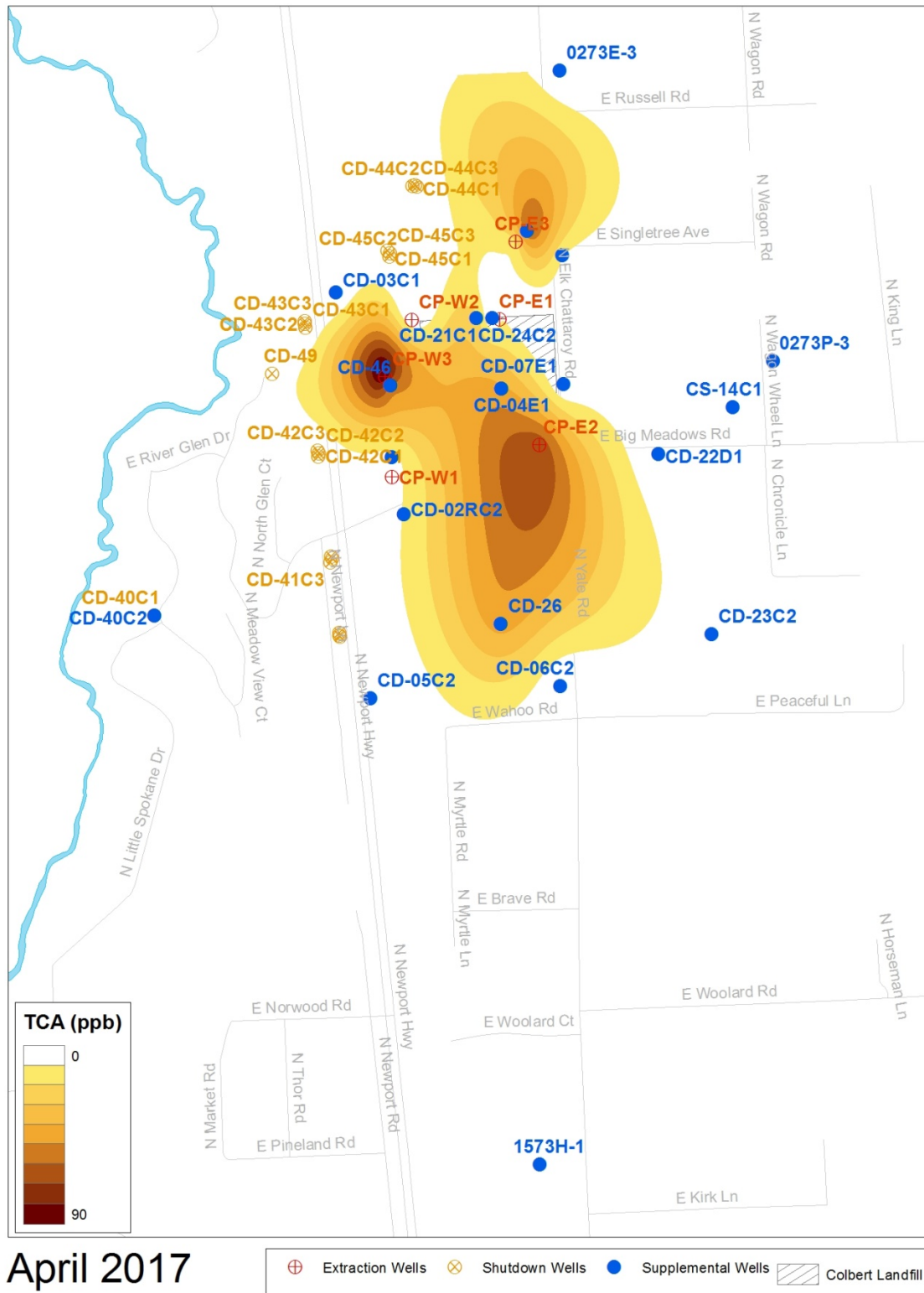


Figure 2-8 Lower Aquifer Estimated TCA Plume



3.0 Upper Aquifer Monitoring

The upper aquifer monitoring program includes the sampling of compliance indicator COC's (VOC's), 1,4-dioxane sample collection, and MFS sampling from selected monitoring wells. Table 3-1 presents all wells located in the upper aquifer monitoring program and the sample analyses assigned to each well. Upper aquifer monitoring locations are presented in Figure 3-1. All upper aquifer monitoring occurs on an annual basis with the exception of extraction wells, which are operated and sampled quarterly.

3.1 Field Data and Groundwater Elevations

All upper aquifer compliance monitoring field parameters and groundwater elevations for this reporting period are shown in Table 3-3. Conductivity values ranged from 327 to 799 umhos/cm. Field pH values ranged from 6.44 to 7.57. Upper aquifer groundwater elevation contours and flow paths are presented in Figure 3-3.

3.2 Compliance Monitoring (VOC's)

All wells in the upper aquifer have VOC samples collected from them and analyzed, even though the VOC analysis is not required in the MFS or 1,4-Dioxane work plan specifications.

3.2.1 Chemical Data

Constituent of concern concentrations at the south system extraction wells were consistent with previous quarters (see Table 3-4). Selected upper aquifer wells TCA concentrations versus time are presented in Figure 3-4. Upper aquifer TCA plume boundaries are shown in Figure 3-5.

3.2.2 Criteria

Criteria for the upper aquifer programs are presented in Table 3-2. There were no criteria exceeded in any of the upper aquifer compliance monitoring wells or extraction wells during this reporting period.

3.3 1,4-Dioxane Sampling

As outlined in the *1,4-Dioxane Workplan for the Colbert Landfill (December 2007)*, five locations were selected for one year of Quarterly 1,4-dioxane sampling to further evaluate the extent of this analyte as well as protect residential wells at the Colbert Landfill site (see Table 3-1). In April 2009, that sample event concluded the year of quarterly sampling at these locations. Since then, Spokane County has continued sampling these wells on an annual basis. The 2017 1,4-dioxane sampling was performed during the month of April. 1073D-1 was not sampled because the resident had shut off the well.

3.3.1 Chemical Data

The results for April 2017 1,4-dioxane sampling are shown in Table 3-5. Concentrations versus time are presented Figure 3-6.

3.4 Upper Aquifer MFS Monitoring

Upper aquifer locations designated in the MFS groundwater monitoring program were sampled in April 2017.

3.4.1 Chemical Data

Concentrations of analytes tested for under MFS monitoring were consistent with previous results (see Figure 3-7 and Figure 3-8). Zinc was not detected in the MFS wells during this reporting period.

3.4.2 Criteria

None of the MFS sampling locations exceeded any of the applicable criteria during this reporting period.

3.4.3 Statistical Analysis

The MFS Groundwater Monitoring Plan (Landau Assoc., 1996) requires three statistical methods be used when evaluating groundwater Quality in accordance with MFS requirements. Time series plots were performed and discussed previously. Box plots were required after one year of data was collected. Box plots are presented in Figure 3-9.

The third statistical method required is the Mann-Whitney nonparametric significance test. The summary results for this test are presented in Table 2-6 . Although lower aquifer locations are no longer scheduled for sampling, previous results are shown here as well. A statistically significant change (less than 0.05 level of significance) from this test indicates that a difference may exist between background and downgradient wells but does not differentiate between sets. While it is true that a difference in nitrate and chloride concentrations may exist between background and downgradient wells, when taking time series plots and box plots into consideration, it is not likely these differences were due to influence by the landfill.

Table 3-1 Upper Aquifer Monitoring Programs and Locations

Program	Schedule	Parameters	Wells
Compliance Monitoring	Annual Quarterly at extraction wells	VOC's	CD-31A1, CD-34A1, CD-36A1, CD-37A1, CD-38A1, CP-S1, CP-S3, CP-S4, CP-S5, CP-S6
1,4-Dioxane Sampling	Annual	1,4-Dioxane	CP-S1, 1073D-1*, 1473M-1*, 1573A-1*, CD-40C1**
MFS Monitoring	Annual	Cl/NH3/NO2/NH3/SO4/Fe/Mn/Zn/TOC/COD	CD-03A1, CD-60A1, CD-61A1, CS-04A1

* Residential use wells

**Well considered to be screened in fluvial aquifer and COC source is from upper aquifer west of Hwy 2 (see *Phase 1 Engineering Report. Landau Assoc, 1991.*)

Table 3-2 Upper Aquifer Criteria

PROGRAM	CRITERIA	TCA	DCE	DCA	TCE	PCE	MC	1,4-Dioxane	Units
CONSENT DECREE (Compliance)	Performance	200	7	4050	5	0.7	2.5		ug/L
	Evaluation	200	7	4050	5	0.7	2.5	7	
		Cl	Fe	Mn	Zn	TOC	COD	SO4 NO3	
MFS	(mg/L)	250	0.3	0.05	5	NA	NA	250 10	mg/L

Figure 3-1 Upper Aquifer Compliance Monitoring Locations

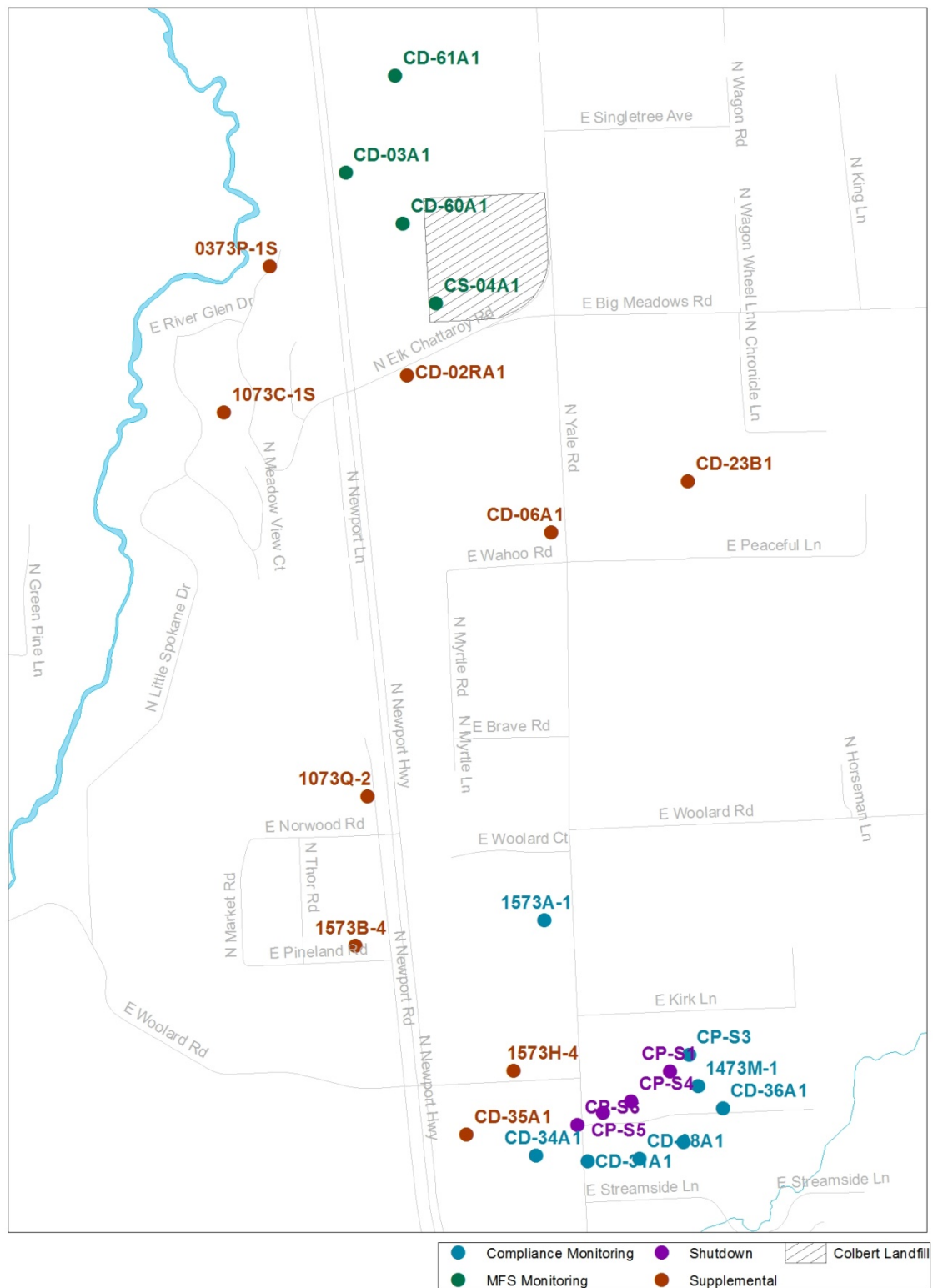


Table 3-3 Upper Aquifer Field Parameters

StationID	SampleDate	WtrElev	FieldTemp	FieldPH	FieldConductivity	FieldTurbidity	Aquifer
1473M-1	4/19/17	1759.15	10.4	7.38	476	0.53	upper
1573A-1	4/19/17	1764.49	9.6	7.34	537	0.57	upper
CD-31A1	4/18/17	1766.84	10.3	7.49	429	0.21	upper
CD-34A1	4/18/17	1767.21	10.3	7.5	458	0.41	upper
CD-36A1	4/18/17	1757.24	10.6	7.57	477	0.21	upper
CD-37A1	4/18/17	1759.41	10.9	7.38	335	0.19	upper
CD-38A1	4/18/17	1760.5	10.7	7.55	548	0.79	upper
CP-S3	4/19/17	1763.1	11.5	7.41	487	1.22	upper
CD-03A1	4/20/17	1775.91	9.4	7.49	327	0.21	upper
CD-60A1	4/20/17	1775.37	10	6.9	554	0.06	upper
CD-61A1	4/20/17	1776.87	10	7.44	378	0.47	upper
CS-04A1	4/20/17	1775.63	9.5	6.44	657	1.01	upper
CP-S1	7/12/16	1759.48	12	7.23	619	0.4	upper
CP-S1	1/18/17	1758.34	9.9	7.28	601	0.89	upper
CP-S1	4/19/17	1763.09	10.1	7.15	704	0.77	upper
CP-S4	7/12/16	1761.01	11.4	7.11	747	0.47	upper
CP-S4	10/5/16	1760.94	10.9	6.98	737	0.49	upper
CP-S4	1/18/17	1760.64	9.9	7.16	756	1.12	upper
CP-S4	4/19/17	1764.91	10.3	7.03	686	2.1	upper
CP-S5	7/12/16		10.9	7.09	717	0.37	upper
CP-S5	10/5/16		10.5	7.04	728	0.89	upper
CP-S5	1/18/17		9.6	7.14	728	1.21	upper
CP-S5	4/19/17	1767.48	10.1	7.12	589	1.55	upper
CP-S6	7/12/16	1761.06	11.7	7.15	790	4.84	upper
CP-S6	10/5/16	1760.68	10.9	7.22	799	1.12	upper
CP-S6	1/18/17	1760.28	9.5	7.17	747	1.01	upper
CP-S6	4/20/17	1766.53	9.8	7.25	535	1.42	upper

Figure 3-2 Upper Aquifer Groundwater Elevations vs. Time

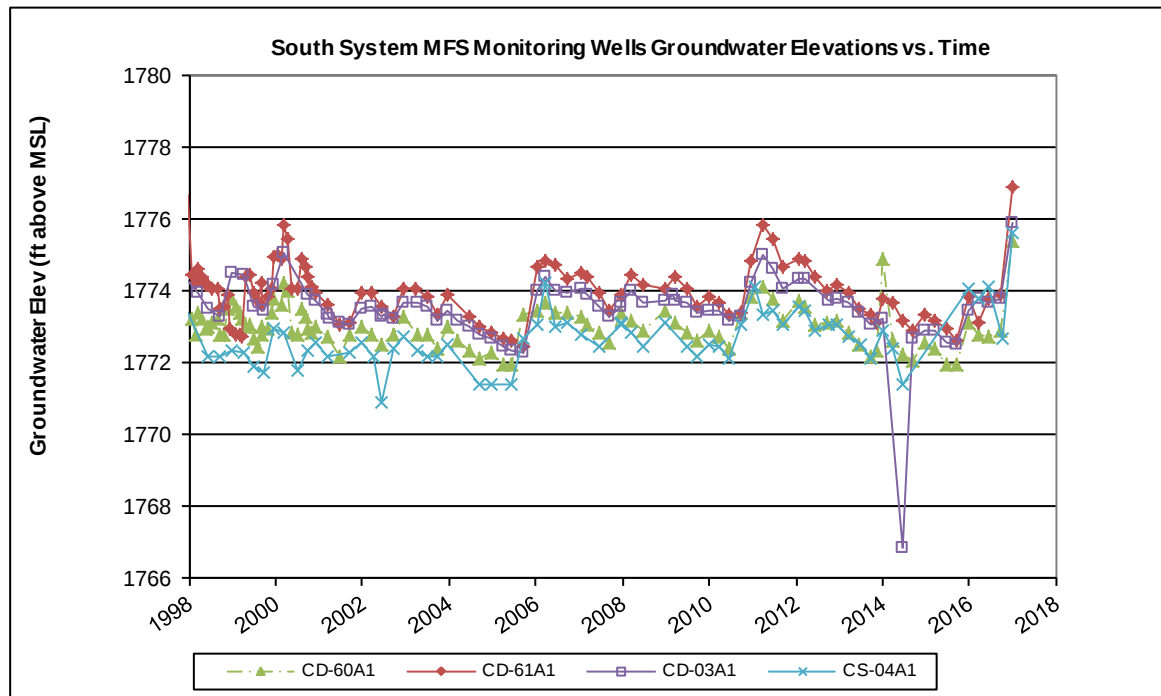
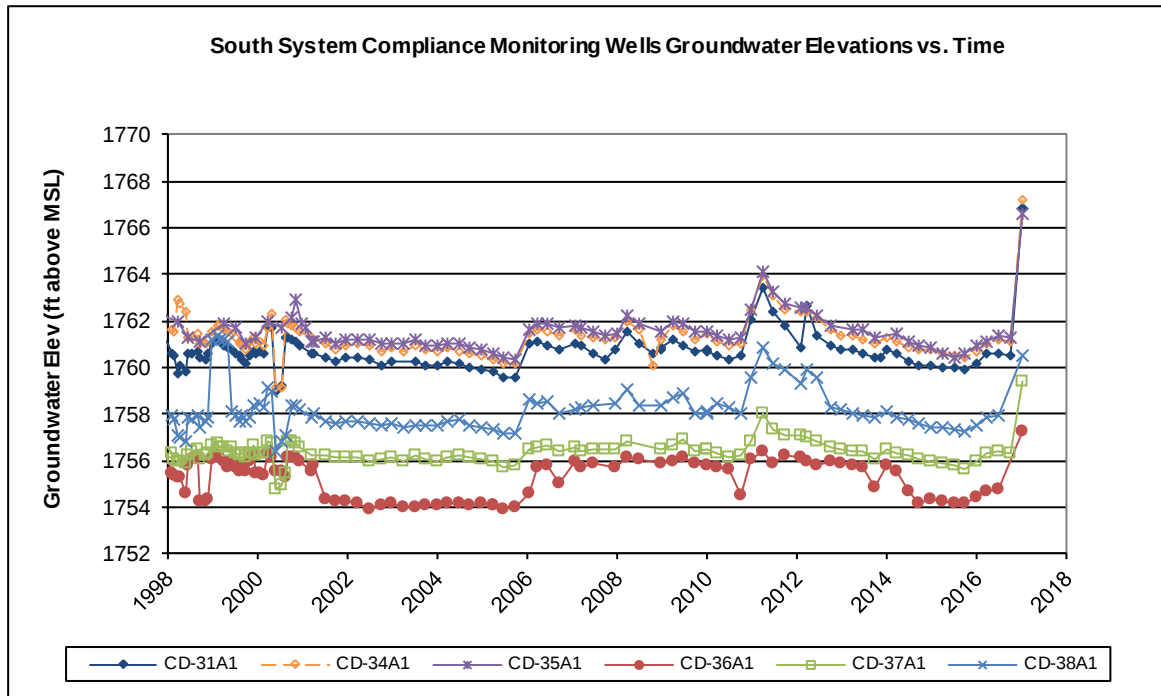


Figure 3-3 Upper Aquifer Estimated Groundwater Elevation Contours

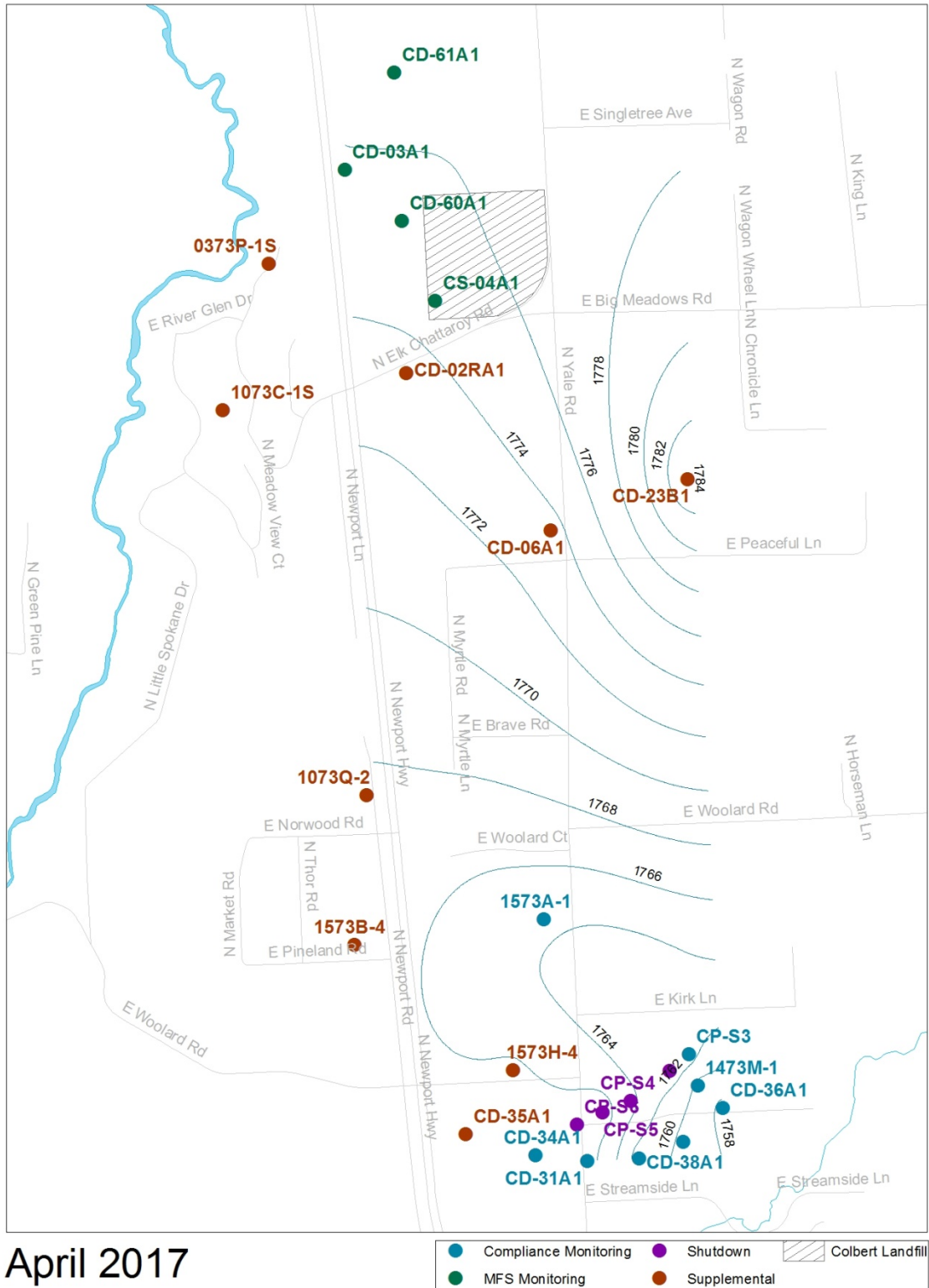


Table 3-4 Upper Aquifer Groundwater Monitoring Results

StationID	SampleDate	DCA	DCE	MC	PCE	TCA	TCE	Cl	COD	Fe	Mn	N-NH3	N-NO3	SO4	TOC	Zn
1573A-1	4/19/2017	1.87	0.78	<0.5	<0.5	1.77	0.95									
CD-03A1	4/20/2017	<0.5	<0.5	<0.5	<0.5	0.58	<0.5	0.68	<5	<0.1	<0.008	<0.03	0.143	5.3	<1	<0.01
CD-31A1	4/18/2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5									
CD-34A1	4/18/2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5									
CD-36A1	4/18/2017	1.76	<0.5	<0.5	<0.5	0.7	1.07									
CD-37A1	4/18/2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5									
CD-38A1	4/18/2017	<0.5	<0.5	<0.5	<0.5	0.84	<0.5									
CD-60A1	4/20/2017	<0.5	<0.5	<0.5	1.12	<0.5	<0.5	2.85	<5	<0.1	<0.008	<0.03	1.37	6.45	<1	<0.01
CD-61A1	4/20/2017	<0.5	<0.5	<0.5	<0.5	2.41	<0.5	0.66	<5	<0.1	<0.008	<0.03	0.093	10.6	<1	<0.01
CP-S1	7/12/2016	2.11	0.7	<0.5	<0.5	1.26	1.53									
CP-S1	1/18/2017	1.74	0.64	<0.5	<0.5	0.98	1.38									
CP-S1	4/19/2017	3.3	0.73	<0.5	<0.5	1.13	2.04									
CP-S3	4/19/2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5									
CP-S4	7/12/2016	1.15	<0.5	<0.5	0.75	0.78	2.33									
CP-S4	10/5/2016	1.08	<0.5	<0.5	0.56	0.7	1.85									
CP-S4	1/18/2017	1.5	0.56	<0.5	0.58	0.84	2.25									
CP-S4	4/19/2017	<0.5	0.53	<0.5	0.65	0.53	1.81									
CP-S5	7/12/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5									
CP-S5	10/5/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5									
CP-S5	1/18/2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5									
CP-S5	4/19/2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5									
CP-S6	7/12/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5									
CP-S6	10/5/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5									
CP-S6	1/18/2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5									
CP-S6	4/20/2017	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5									
CS-04A1	4/20/2017	0.61	<0.5	<0.5	<0.5	<0.5	0.53	<0.2	<5	<0.1	0.0133	<0.03	0.067	2.52	1.16	<0.01

Table 3-5 1,4-Dioxane Monitoring Results

Aquifer	StationID	SampleDate	Analyte	Result	Qualifier	Units
upper	CP-S1	4/19/2017	1,4-Dioxane	11.9		ug/L
lower	CD-40C1	4/20/2017	1,4-Dioxane	7		ug/L
upper	1473M-1	4/21/2017	1,4-Dioxane	2	U	ug/L

Figure 3-4 Upper Aquifer COC Concentrations vs Time

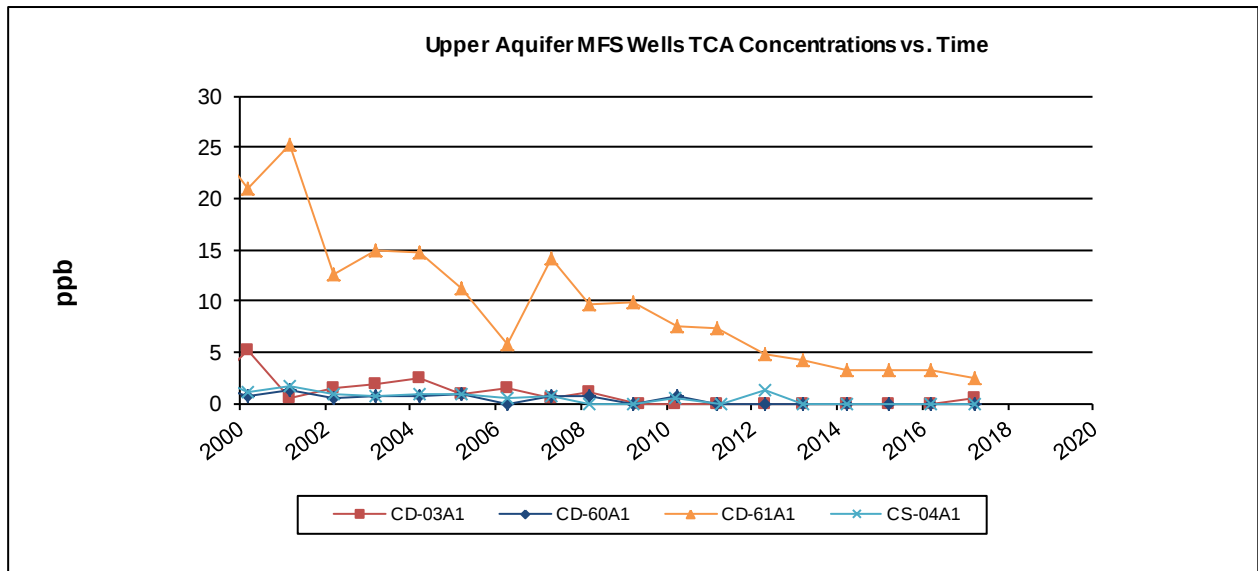
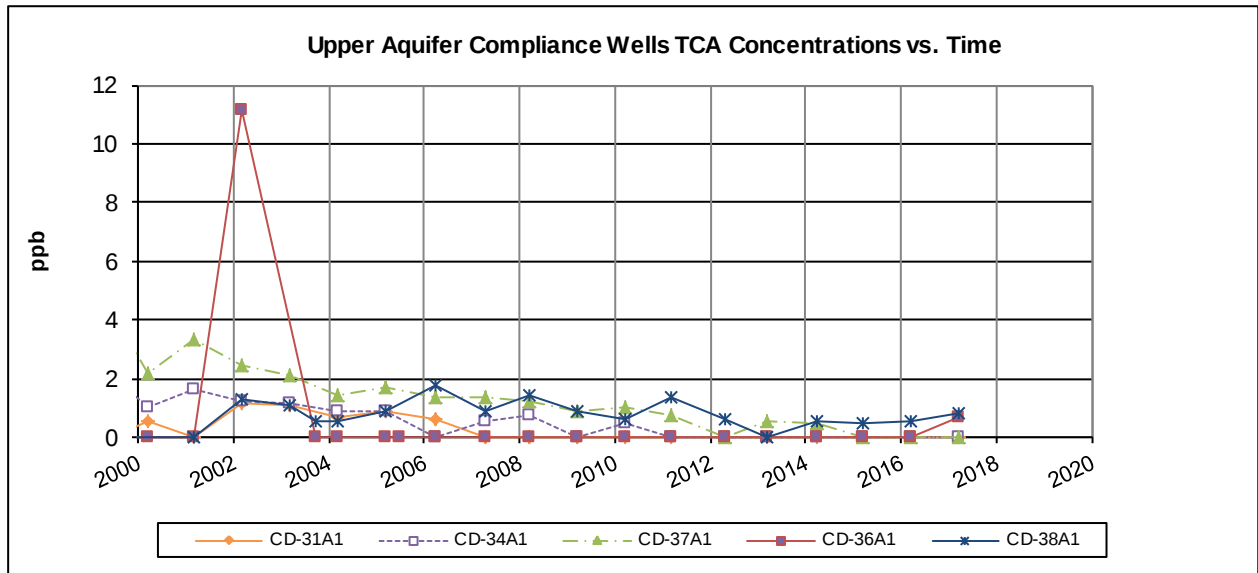


Figure 3-5 Upper Aquifer Estimated TCA Plume Boundaries

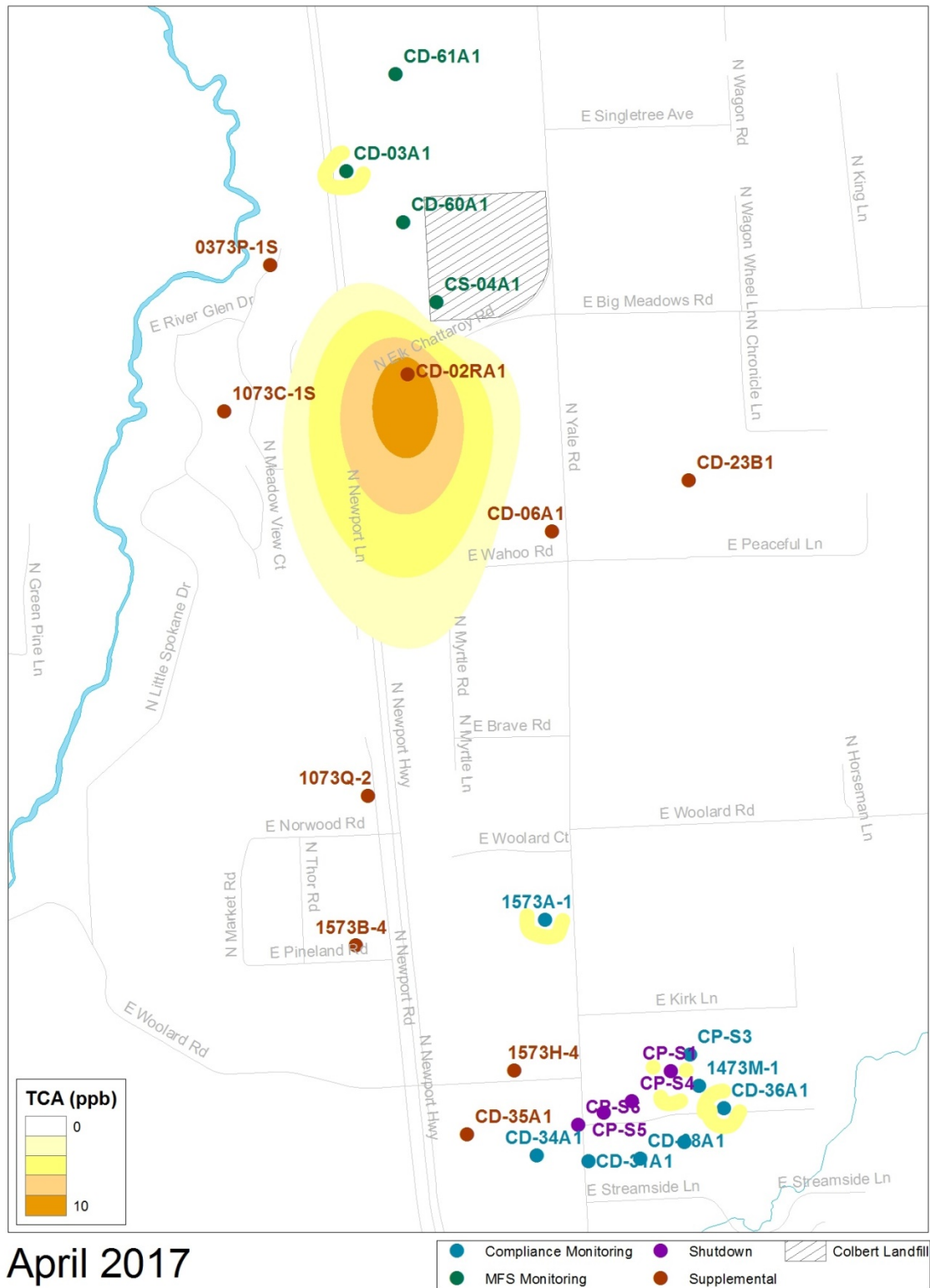


Figure 3-6 1,4-Dioxane Concentrations vs Time

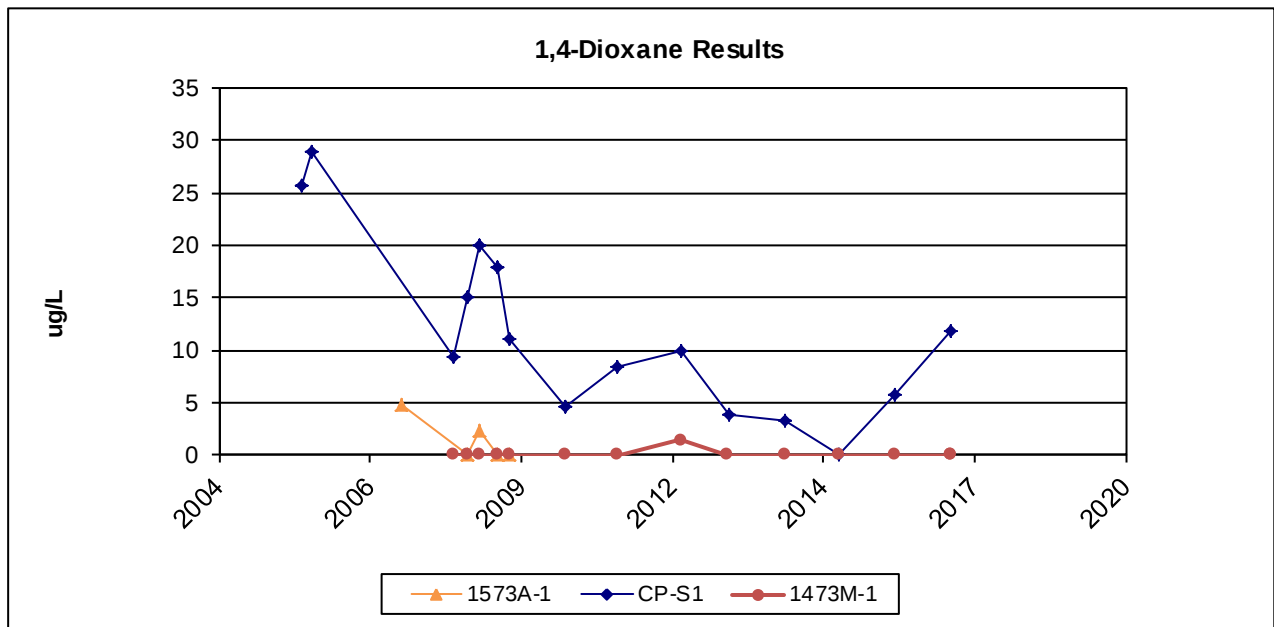
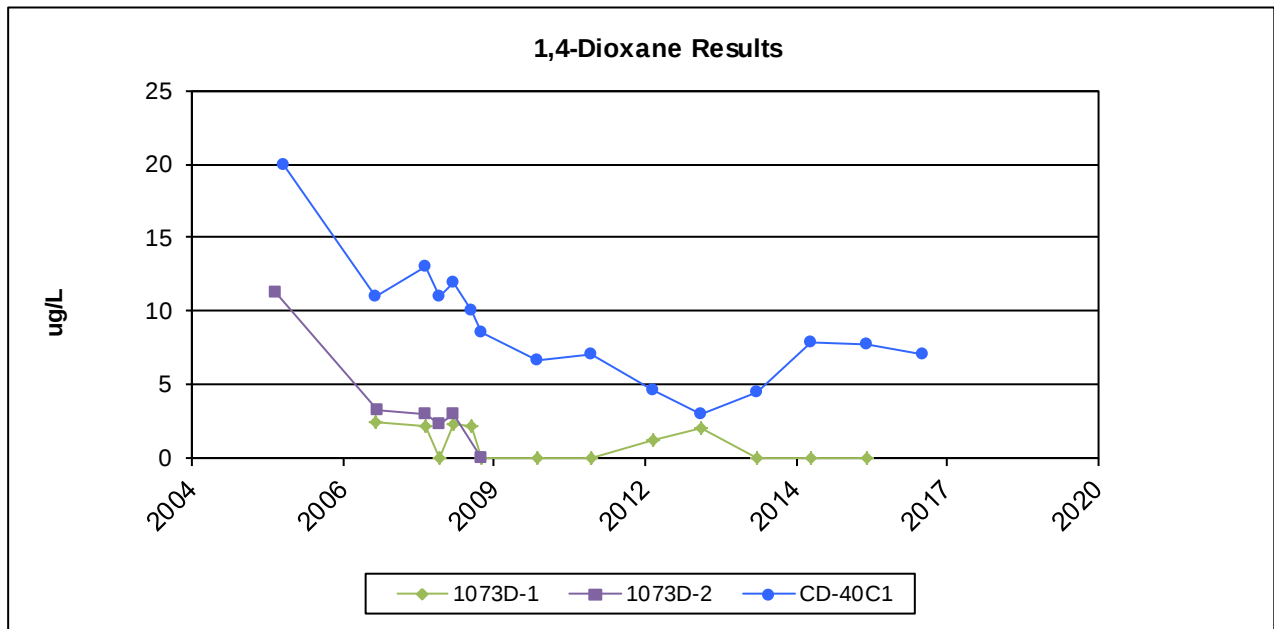


Figure 3-7 Upper Aquifer MFS Parameters vs Time

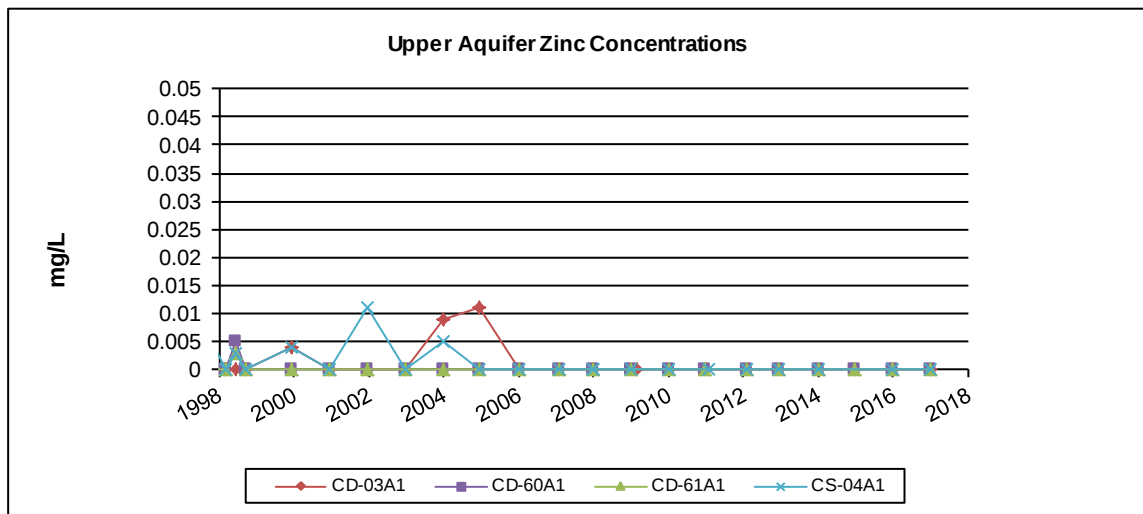
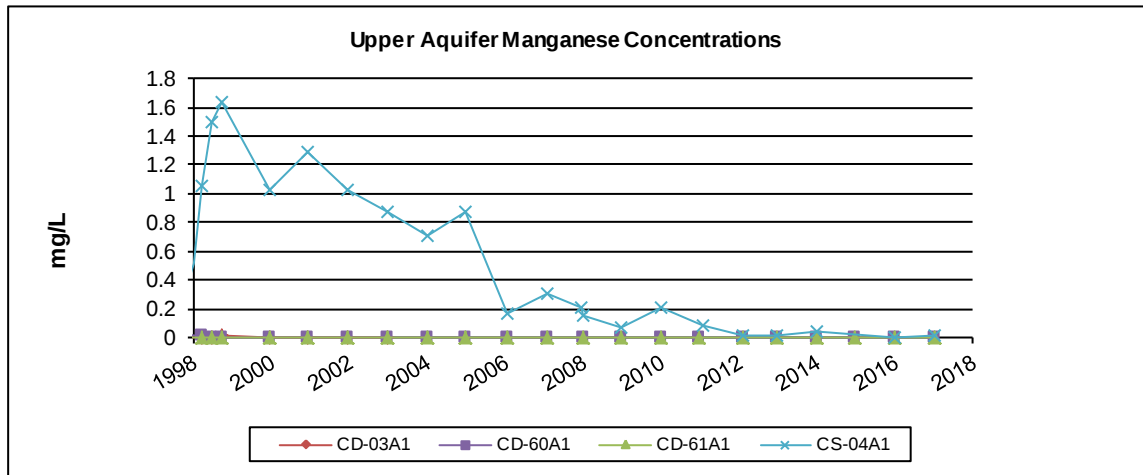
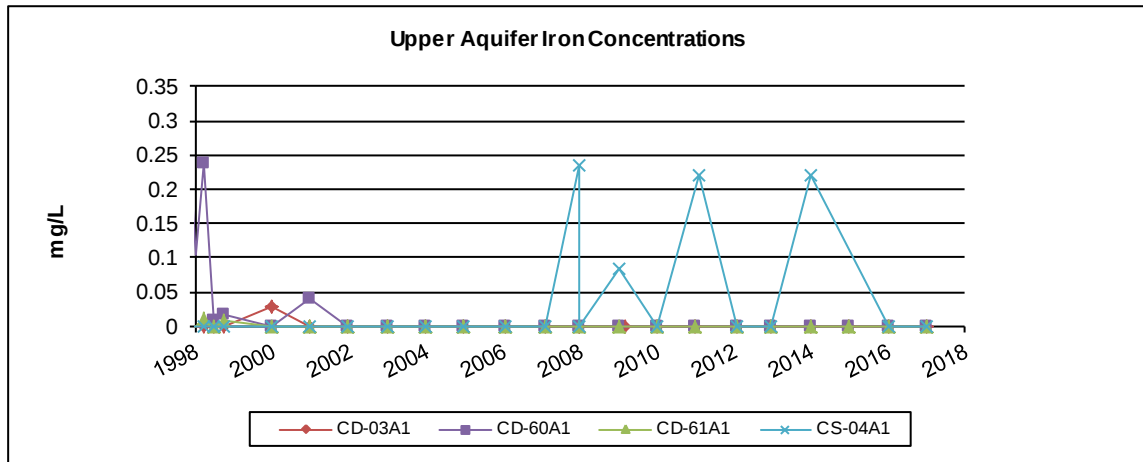


Figure 3-8 Upper Aquifer MFS Parameters vs Time

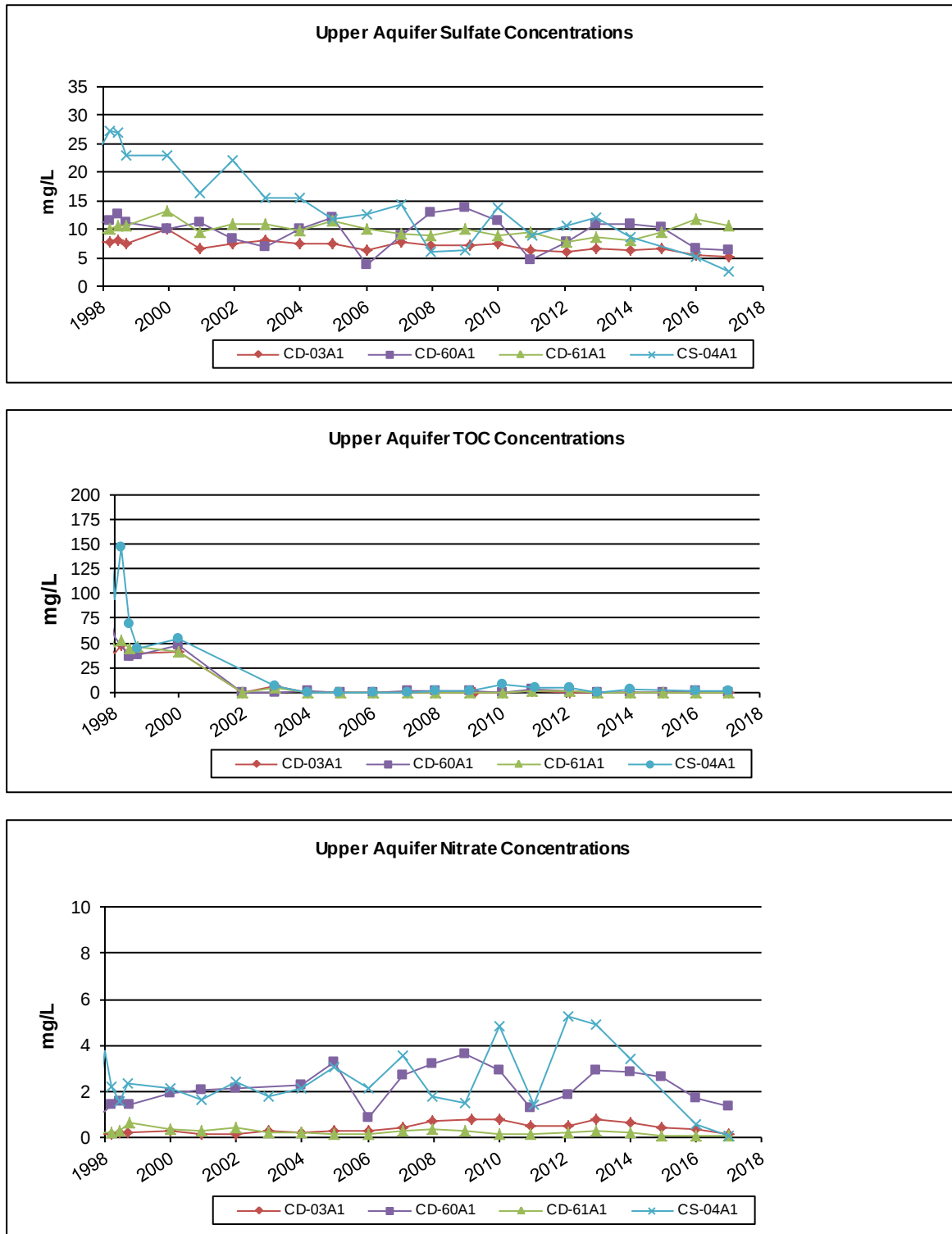


Table 3-6 Summary Results for the Mann-Whitney Nonparametric Significance Test (2017)

Constituent	Level of Significance (p)	
	Upper Aquifer	*Lower Aquifer (1999)
Chloride	0.0001	0.006
Chemical Oxygen Demand	0.461	0.48
Iron	0.143	0.17
Manganese	0.058	0.86
Ammonia	0.467	0.42
Nitrite	0.431	1.13
Nitrate	0.00002	0.08
Sulfate	0.753	0.0006
Total Organic Carbon	0.741	0.32
Zinc	0.062	0.06

*Lower aquifer results from January 1999 using CP-E2 and CD-48C2 analytical results for calculations.

Bold number indicates a level of significance under 0.05, test run as two-tailed method

Figure 3-9 Box Plots for Background and Downgradient MFS Wells (2017)

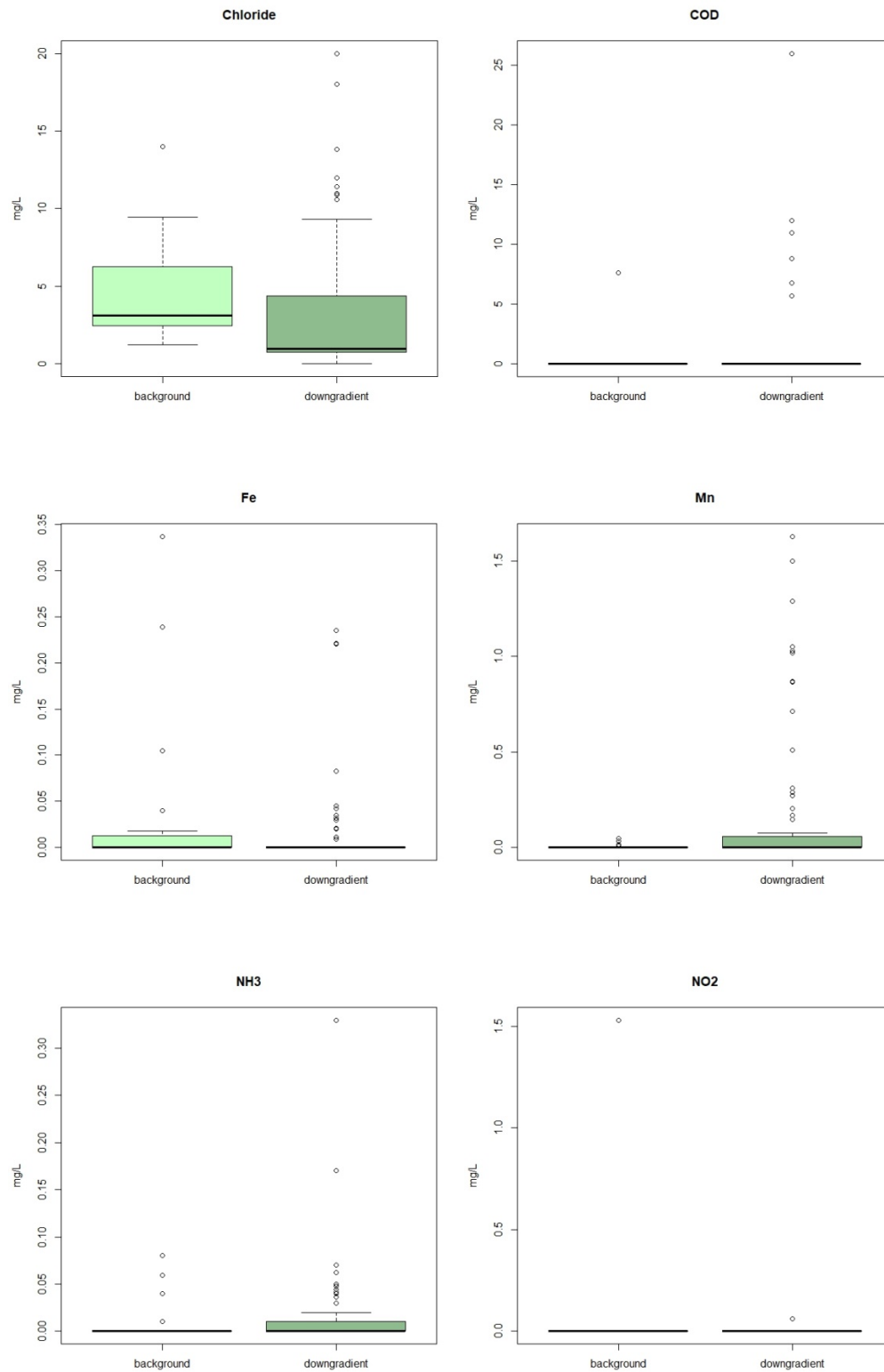
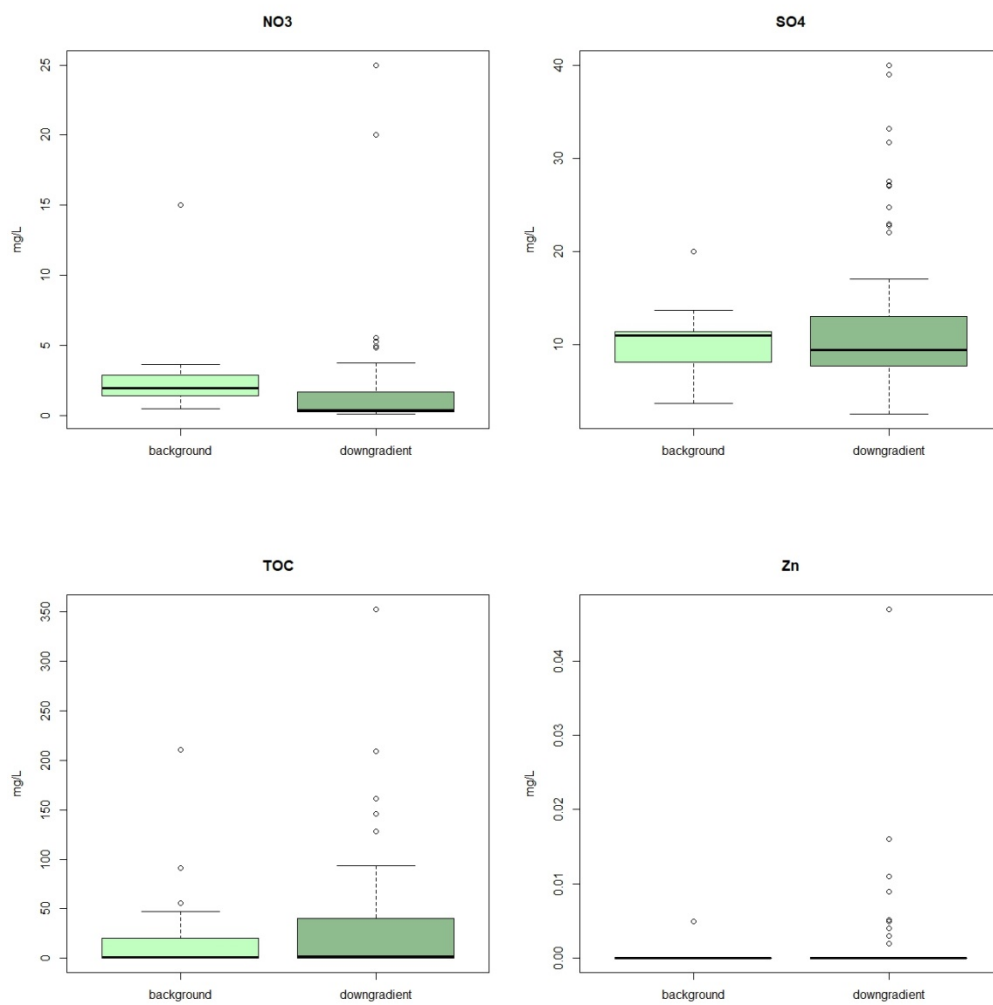


Figure 4-9 continued



4.0 Residential Program

4.1 Locations and Schedule

Current residential well sampling locations can be found in Figure 4-1. The residential sampling schedule is included in Table 4-1.

4.2 Monitoring Results and Criteria

Criteria for residential use wells were established in the Consent Decree. The Consent Decree states that if any residential well with a concentration over the evaluation criteria OR any residential well that has an average concentration over 65% of the evaluation criteria over a 12 month period, the county shall supply that residence with an alternative water source.

All residential well results were well below established criteria. Results from sampling are presented in Table 4-2. Time series plots for wells with COC detections are shown in Figure 4-2.

4.3 Data Evaluation

Only two of the residential wells measured concentrations above the method detection limits for the 2016-2017 sampling year (June 2016). These detections were only slightly above the detection limit and far below any criteria.

4.4 Program Modifications

On a regular basis, the program schedule is re-evaluated to determine if any changes are needed. With the initiation of the Shut-down test, a re-evaluation was performed comparing plume maps and well locations as well as a list of residences connected to a public water supply. Some modifications to increase sampling in specific areas were made to the schedule to ensure a conservative approach with regard to public health.

No modifications have been made to the schedule for the upcoming 2017-2018 sampling year. However, minor adjustments can be made to the schedule to temporarily increase monitoring in the area just west of the landfill near the Little Spokane River if needed to monitor very low concentration changes in DCA and TCE if measured. Changes are not required by any documentation or work plan.

The 2017 residential well sampling schedule is presented in Table 4-3.

Figure 4-1 Residential Well Sampling Locations

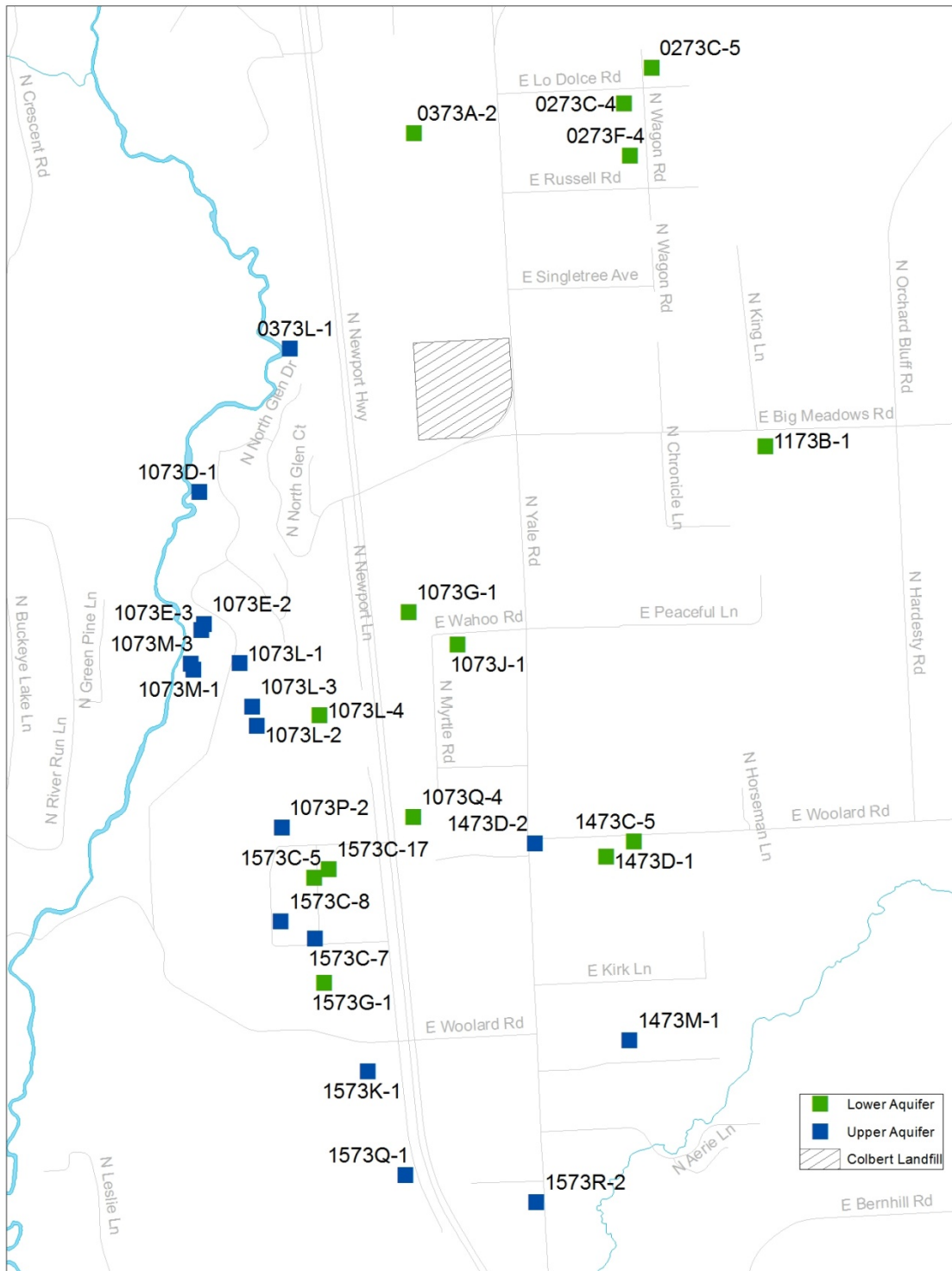


Table 4-1 Residential Well Sampling Schedule for Reporting Period

Colbert Residential Sampling Plan 2016

Station#	Last Name	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Notes/Comments
0273C-2	Vannatter	☐	☐	☒	☐	☐	☐	☐	☐	☐	☒	☐	☐	
0273C-3	Kramer	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	BiAnnual 10'
0273C-4	McQuesten	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	
0273C-5	Hogan	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	many years no detects, wells btwn this and plume
0273D-6	Thornton	☐	☒	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	
0273F-4	Gander	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☒	☐	
0373A-2	Resseman	☐	☐	☒	☐	☐	☒	☐	☒	☐	☐	☒	☐	
0373A-4	Vansickel	☐	☒	☐	☐	☒	☐	☒	☐	☐	☒	☐	☐	
0373J-3	Golding	☐	☐	☐	☐	☒	☒	☐	☐	☐	☐	☐	☐	
0373L-1	Sterling	☐	☐	☐	☐	☒	☐	☐	☐	☐	☒	☐	☐	
1073D-1	Coats	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	
1073E-2	Pullen	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	Alt w/1073E-3
1073E-3	Clark	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	Alt w/1073E-2
1073E-4	Carpenter	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
1073G-1	Rux	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	
1073J-1	Moreno	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	
1073L-1	Halpin	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	
1073L-2	Countryman	☐	☐	☐	☒	☐	☐	☐	☐	☐	☒	☐	☐	Alt w/1073L-3
1073L-3	Anderson	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	Alt w/1073L-2
1073L-4	Crabb	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	
1073M-1	Bertholf	☒	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	Alt w/1073M-3
1073M-3	Lane	☐	☐	☐	☐	☐	☒	☐	☐	☒	☐	☐	☐	Alt w/1073M-1
1073M-5	Swenson	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
1073P-1	Greenen	☐	☐	☐	☒	☐	☐	☐	☐	☐	☒	☐	☐	
1073P-2	Petrelli	☐	☒	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	

Station#	Last Name	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Sched Comments
1073Q-4	NORTH MEADOWS W	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	
1173B-1	Blise	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	
1473C-5	Overmyer	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	BiAnnual (11) Alt w/1473D-1
1473D-1	Farris	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Alt w/1473C-5
1473D-2	Wardian	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	Alt w/1473C
1473M-1	Ennis	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	
1573C-10	Lake	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	
1573C-17	RESIDENT	☐	☐	☐	☒	☐	☐	☐	☐	☐	☒	☐	☐	
1573C-5	Nelson	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	
1573C-7	Brown	☐	☐	☐	☒	☐	☐	☐	☐	☐	☒	☐	☐	
1573C-8	Williams	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	BiAnnual (10)
1573G-1	Gano	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	BiAnnual (11)
1573H-1	Hunter	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	
1573K-1	Eschenbacher	☐	☐	☐	☒	☐	☐	☐	☐	☐	☒	☐	☐	
1573Q-1	Saunders	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	
1573R-2	Hunter	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☒	☐	
3483M-1	Campbell	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	

Table 4-2 Residential Groundwater Monitoring Program Results
(May 2016 through April 2017)

StationID	Aquifer	SampleDate	LastName	TCA	DCA	DCE	MC	PCE	TCE
0273C-2	lower	10/25/2016	Vannatter	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
0273C-2	lower	3/14/2017	Vannatter	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
0273C-3	lower	6/22/2016	Kramer	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
0273C-4	lower	11/15/2016	McQuesten	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
0273C-5	lower	3/14/2017	Hogan	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
0273D-6	lower	8/4/2016	Thornton	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
0273D-6	lower	2/13/2017	Thornton	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
0273F-4	lower	6/22/2016	Gander	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
0273F-4	lower	1/25/2017	Gander	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
0373A-2	lower	6/22/2016	Resseman	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
0373A-2	lower	9/12/2016	Resseman	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
0373A-2	lower	1/25/2017	Resseman	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
0373A-2	lower	3/14/2017	Resseman	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073G-1	lower	6/22/2016	Rux	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073G-1	lower	9/12/2016	Rux	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073G-1	lower	1/25/2017	Rux	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073G-1	lower	3/15/2017	Rux	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073J-1	lower	7/19/2016	Moreno	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073J-1	lower	7/19/2016	Moreno	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073J-1	lower	10/26/2016	Moreno	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073J-1	lower	10/26/2016	Moreno	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073J-1	lower	4/18/2017	Moreno	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073J-1	lower	4/18/2017	Moreno	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073L-4	lower	9/13/2016	Crabb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073Q-4	lower	6/23/2016	NORTH MEADOWS WATER	<0.5	0.53	<0.5	<0.5	<0.5	<0.5
1073Q-4	lower	6/23/2016	NORTH MEADOWS WATER	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073Q-4	lower	9/12/2016	NORTH MEADOWS WATER	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073Q-4	lower	3/15/2017	NORTH MEADOWS WATER	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1173B-1	lower	2/13/2017	Bise	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1473C-5	lower	8/3/2016	Overmyer	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1473D-1	lower	2/13/2017	Farris	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1573C-10	lower	6/22/2016	Lake	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1573C-17	lower	10/25/2016	RESIDENT	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1573C-17	lower	4/18/2017	RESIDENT	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1573C-5	lower	8/3/2016	Nelson	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1573G-1	lower	5/10/2016	Gano	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1573H-1	lower	5/10/2016	Hunter	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073E-3	upper	5/10/2016	Clark	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073E-3	upper	8/4/2016	Clark	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073E-3	upper	11/15/2016	Clark	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073E-3	upper	2/13/2017	Clark	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073E-2	upper	7/19/2016	Pullen	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073E-2	upper	10/25/2016	Pullen	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073E-2	upper	1/25/2017	Pullen	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073E-2	upper	4/18/2017	Pullen	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Table 3-2 Continued

StationID	Aquifer	SampleDate	LastName	TCA	DCA	DCE	MC	PCE	TCE
0373L-1	upper	5/10/2016	Sterling	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
0373L-1	upper	11/15/2016	Sterling	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073D-1	upper	5/11/2016	Coats	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073D-1	upper	8/4/2016	Coats	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073D-1	upper	8/4/2016	Coats	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073L-1	upper	6/23/2016	Halpin	<0.5	0.52	<0.5	<0.5	<0.5	<0.5
1073L-1	upper	9/13/2016	Halpin	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073L-1	upper	9/13/2016	Halpin	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073L-1	upper	1/25/2017	Halpin	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073L-1	upper	3/15/2017	Halpin	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073L-1	upper	3/15/2017	Halpin	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073L-2	upper	10/25/2016	Countryman	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073L-2	upper	4/18/2017	Countryman	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073L-3	upper	5/10/2016	Anderson	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073L-3	upper	8/4/2016	Anderson	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073L-3	upper	11/15/2016	Anderson	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073L-3	upper	2/13/2017	Anderson	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073M-1	upper	7/19/2016	Bertholf	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073M-1	upper	1/25/2017	Bertholf	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073M-3	upper	6/23/2016	Lane	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073M-3	upper	9/13/2016	Lane	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073M-5	upper	6/22/2016	Swenson	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073P-1	upper	10/25/2016	Greenen	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073P-2	upper	8/4/2016	Petrelli	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1073P-2	upper	2/14/2017	Petrelli	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1473D-2	upper	5/11/2016	Wardian	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1473D-2	upper	8/3/2016	Wardian	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1473D-2	upper	11/16/2016	Wardian	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1473D-2	upper	2/13/2017	Wardian	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1473M-1	upper	7/19/2016	Ennis	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1473M-1	upper	10/25/2016	Ennis	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1473M-1	upper	1/25/2017	Ennis	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1573C-7	upper	10/26/2016	Brown	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1573C-7	upper	4/18/2017	Brown	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1573C-8	upper	2/14/2017	Williams	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1573C-8	upper	2/14/2017	Williams	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1573K-1	upper	10/26/2016	Eschenbach	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1573K-1	upper	4/18/2017	Eschenbach	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1573Q-1	upper	7/19/2016	Saunders	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1573R-2	upper	5/11/2016	Hunter	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1573R-2	upper	11/16/2016	Hunter	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Figure 4-2 Upper Aquifer Residential Wells Concentrations vs Time

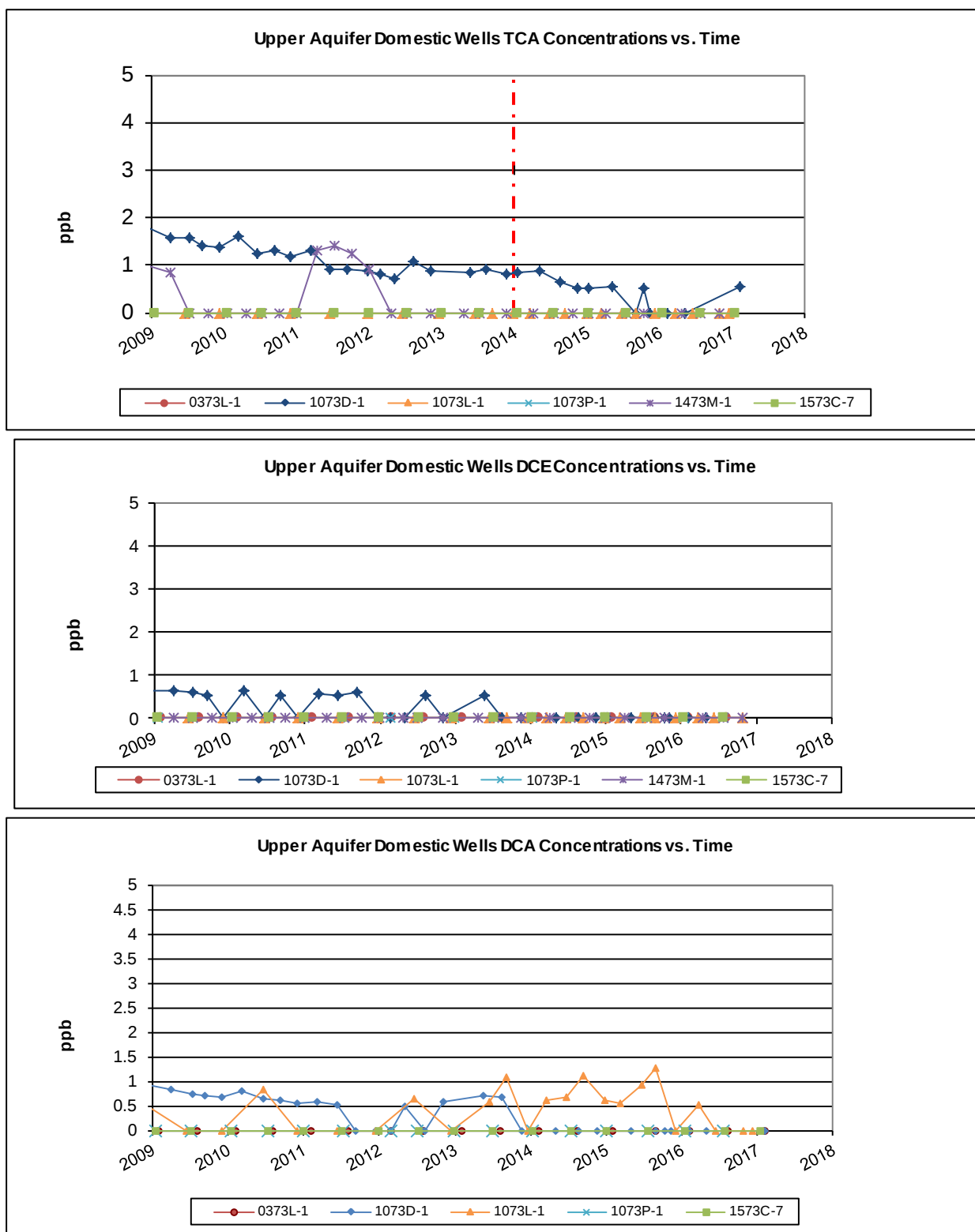
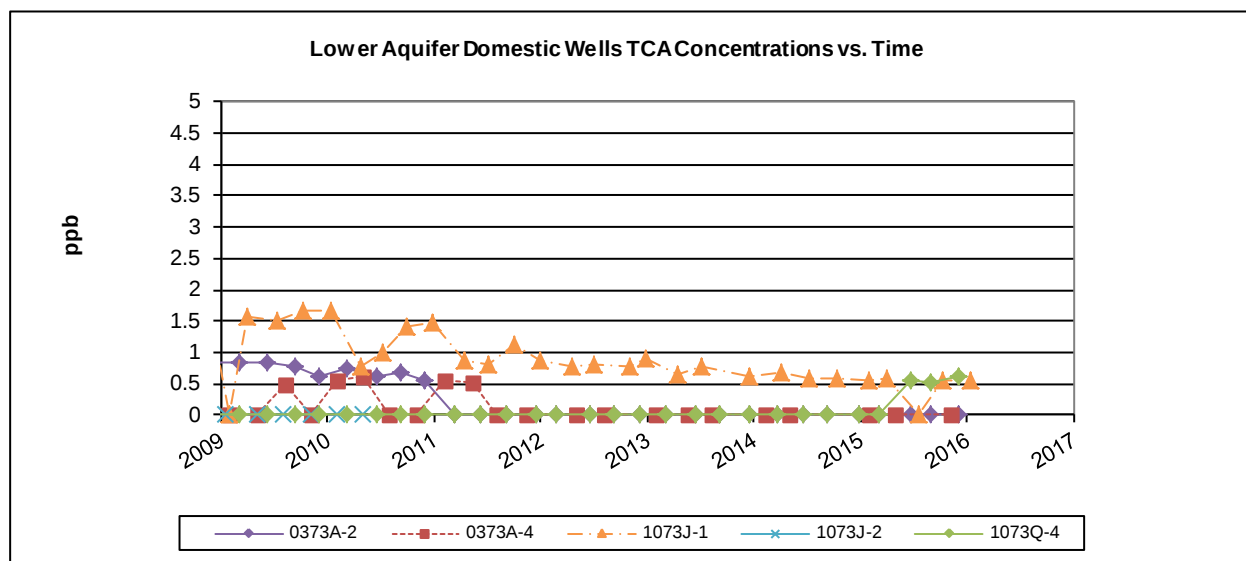


Figure 4-3 Lower Aquifer Residential Wells Concentrations vs Time



5.0 Supplemental Sampling

Every five years, supplemental wells are sampled during the annual sampling round to gather additional information and data on groundwater movement and contaminant transport around the Colbert Landfill. During the April sampling round, 33 supplemental wells were sampled.

5.1 Locations and Schedule

Sampling locations for the 2017 supplemental sampling round can be found in Figure 5-1. The supplemental sampling matrix is included in Table 5-1.

5.2 Monitoring Results

Because supplemental sampling is a voluntary program, there are no criteria for monitoring or reporting. The data is primarily used to get a more accurate snapshot of the groundwater flow and contaminant movement within and around the Colbert Landfill site.

5.2.1 Field Data and Groundwater Elevations

All supplemental field parameters and groundwater elevations for this reporting period are shown in Table 5-2. Conductivity values ranged from 265 to 1169 umhos/cm. Field pH values ranged from 6.78 to 8.11. Groundwater elevations from supplemental wells were included in the creation of both the lower and upper aquifer contour and flow path maps presented in Figures 2-3 and 3-3. Some water levels could not be accurately measure because they were running.

5.2.2 Chemical Data

Constituent of Concern concentrations time-series plots are shown in Figures 5-2. Supplemental data was used in the creation and analysis of this year's groundwater elevation contours and TCA plume maps for both lower and upper aquifers.

Figure 5-1 Supplemental Well Sampling Locations

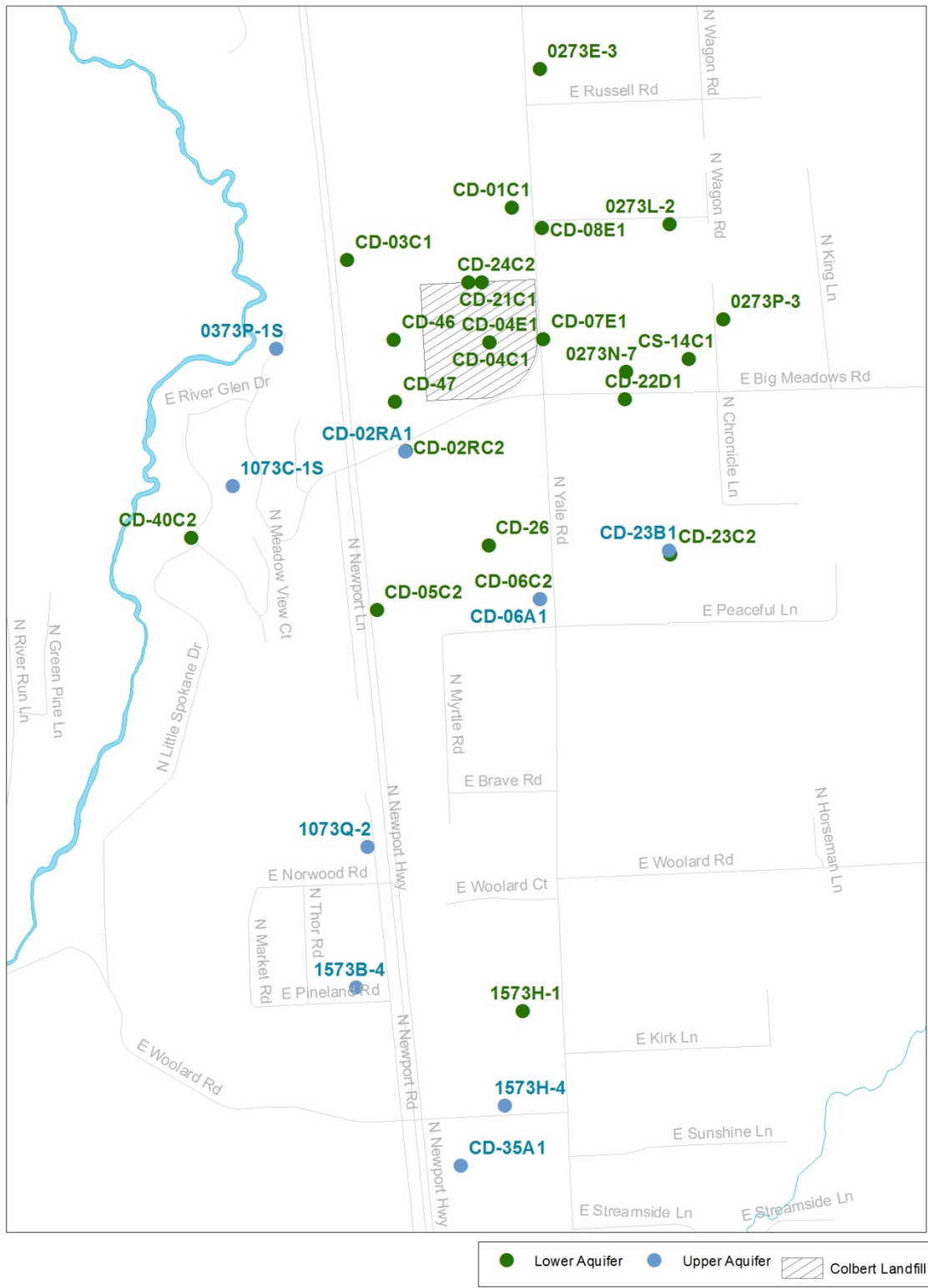


Table 5-2 Supplemental Wells Field Parameters

StationID	SampleDate	WtrElev	FieldTemp	FieldPH	FieldConductivity	FieldTurbidity	Aquifer	Program
0273E-3	4/26/17	1739.09	10	7.33	447	2.35	low er	SUP
0273D-2	4/27/17		11.8	7.2	309	0.79	low er	SUP
0273L-2	5/3/17		14.6	7.03	399	6.19	low er	SUP
0273N-7	5/3/17		12.9	7.08	729	0.39	low er	SUP
0273P-3	4/26/17	1784.9	11.4	7.6	388	0.47	low er	SUP
0373P-1S	4/25/17		9.5	7.53	394	0.28	upper	SUP
1073C-1S	4/25/17		8.6	8.11	458	0.42	upper	SUP
1073Q-2	5/4/17		9.8	7.21	598	1.44	upper	SUP
1573B-4	4/26/17		8.6	7.47	592	0.97	upper	SUP
1573H-1	4/26/17	1688.34	10.8	7.61	371		low er	SUP
1573H-4	5/1/17	1766.46	1	7.24	611	3.56	upper	SUP
CD-01C1	5/3/17	1674.96	13.5	6.89	767	30.7	low er	SUP
CD-02RA1	5/1/17	1772.68	10.6	6.78	832	2.15	upper	SUP
CD-02RC2	5/2/17	1674.31	11.3	7.74	502	0.79	low er	SUP
CD-03C1	4/27/17	1671.6	9.3	7.8	315	0.71	low er	SUP
CD-04C1	5/4/17	1724.12	12.9	7.67	578	8.79	low er	SUP
CD-04E1	5/4/17	1673.71	13.1	7.15	1104	26.1	low er	SUP
CD-05C2	4/26/17	1694.24	11.2	7.77	486	1.41	low er	SUP
CD-06A1	5/3/17	1773.13	12.3	7.45	522	0.44	upper	SUP
CD-06C2	5/2/17	1690.28	12.7	7.8	495	0.31	low er	SUP
CD-07E1	4/27/17	1714.93	15.4	6.8	316	1.18	low er	SUP
CD-08E1	5/2/17	1679.86	14.5	7.08	810	5.96	low er	SUP
CD-21C1	5/1/17	1673.13	11.6	7.28	812	0.12	low er	SUP
CD-22D1	4/27/17	1776	12.5	7.02	330	0.15	low er	SUP
CD-23B1	5/2/17	1784.6	11.6	7.6	425	0.32	upper	SUP
CD-23C2	5/3/17	1697.08	11.6	7.36	506	0.21	low er	SUP
CD-24C2	5/2/17	1673.29	12.5	6.95	1169	0.26	low er	SUP
CD-26	5/2/17	1683.65	12.6	7.03	874	1.97	low er	SUP
CD-35A1	4/26/17	1766.6	10.6	7.32	643	0.42	upper	SUP
CD-40C2	5/1/17	1671.84	11.7	7.99	265	0.98	low er	SUP
CD-46	5/2/17	1672.81	13	7.55	681	2.76	low er	SUP
CD-47	5/1/17	1672.68	12.3	7.64	494	0.29	low er	SUP
CS-14C1	4/25/17	1787.71	11.2	7.46	496	11.1	LOWer	SUP

Table 5-3 Supplemental Well Analytical Results

StationID	SampleDate	DCA	DCE	MC	PCE	TCA	TCE	Aquifer
0273D-2	4/27/17	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	low er
0273E-3	4/26/17	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	low er
0273L-2	5/3/17	2.74	10.5	<0.5	<0.5	2.21	<0.5	low er
0273N-7	5/3/17	1.37	4.37	<0.5	<0.5	2.53	2.24	low er
0273P-3	4/26/17	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	low er
0373P-1S	4/25/17	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	upper
1073C-1S	4/25/17	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	upper
1073Q-2	5/4/17	<0.5	<0.5	<0.5	<0.5	0.91	<0.5	upper
1573B-4	4/26/17	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	upper
1573H-1	4/26/17	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	low er
1573H-4	5/1/17	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	upper
CD-01C1	5/3/17	6.32	53	<0.5	<0.5	56.9	<0.5	low er
CD-02RA1	5/1/17	0.59	<0.5	<0.5	0.58	<0.5	0.68	upper
CD-02RC2	5/2/17	0.53	3.88	<0.5	<0.5	9.86	1.39	low er
CD-03C1	4/27/17	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	low er
CD-04C1	5/4/17	276	372	<0.5	2.26	44.4	13.7	low er
CD-04E1	5/4/17	241	326	<0.5	2.26	36.4	13.4	low er
CD-05C2	4/26/17	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	low er
CD-06A1	5/3/17	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	upper
CD-06C2	5/2/17	<0.5	<0.5	<0.5	<0.5	0.71	<0.5	low er
CD-07E1	4/27/17	<0.5	1.87	<0.5	<0.5	<0.5	<0.5	low er
CD-08E1	5/2/17	3.76	32.6	<0.5	<0.5	10.2	6.49	low er
CD-21C1	5/1/17	2.34	5.72	<0.5	<0.5	23	<0.5	low er
CD-22D1	4/27/17	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	low er
CD-23B1	5/2/17	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	upper
CD-23C2	5/3/17	<0.5	4.95	<0.5	<0.5	5.49	<0.5	low er
CD-24C2	5/2/17	4.35	6.88	<0.5	<0.5	8.24	1.27	low er
CD-26	5/2/17	8.65	18.9	<0.5	<0.5	41.3	67.6	low er
CD-35A1	4/26/17	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	upper
CD-40C2	5/1/17	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	low er
CD-46	5/2/17	14.6	30.2	<0.5	<0.5	50.7	31.9	low er
CD-47	5/1/17	<0.5	4.16	<0.5	<0.5	5.46	<0.5	low er
CS-14C1	4/25/17	<0.5	2.62	<0.5	<0.5	2.55	<0.5	low er

Figure 5-2 Supplemental Well COC Concentrations

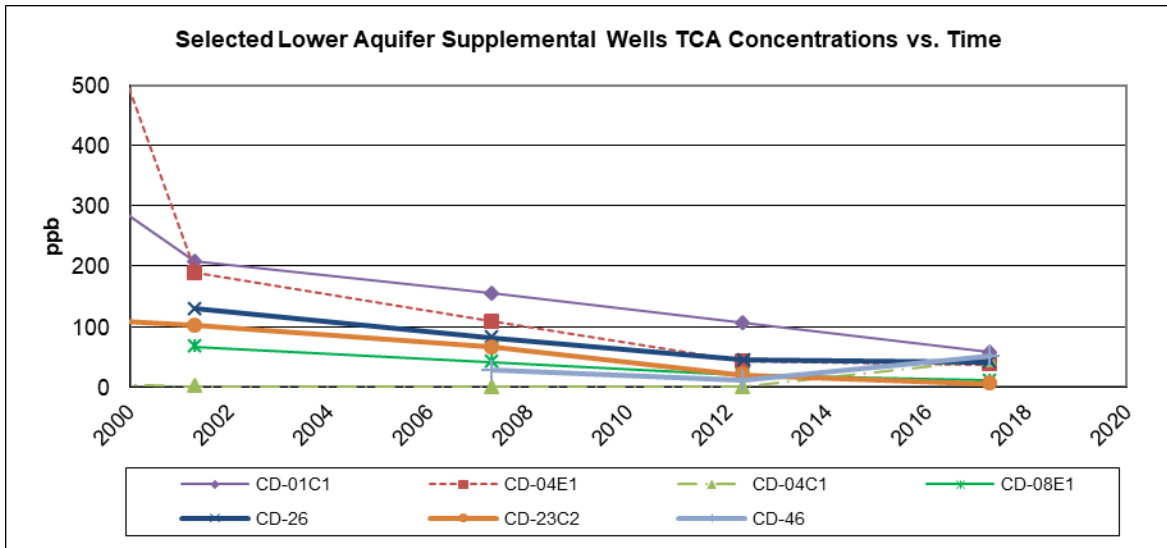
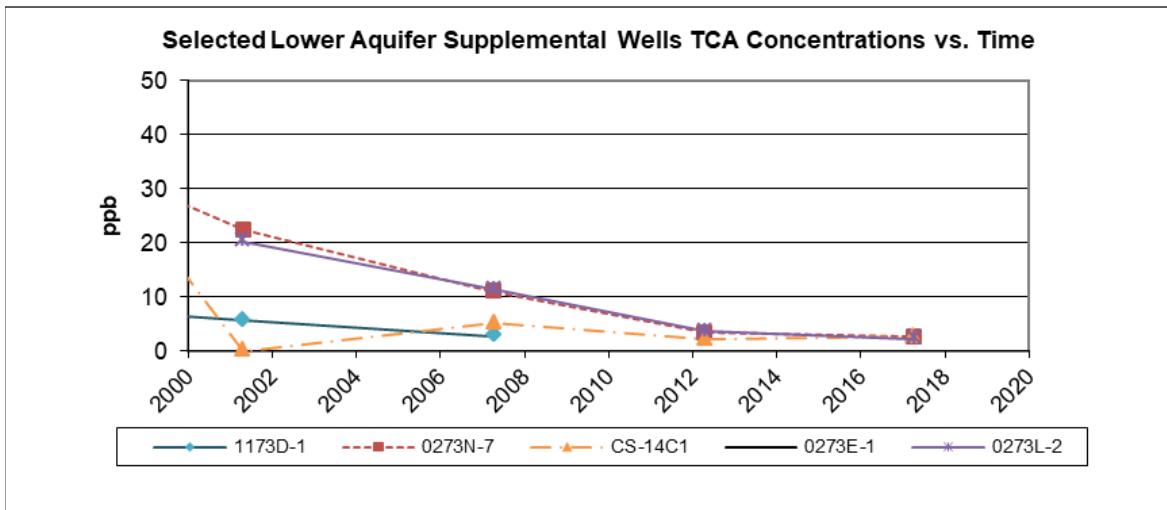


Figure 5-3 Supplemental Well COC Concentrations

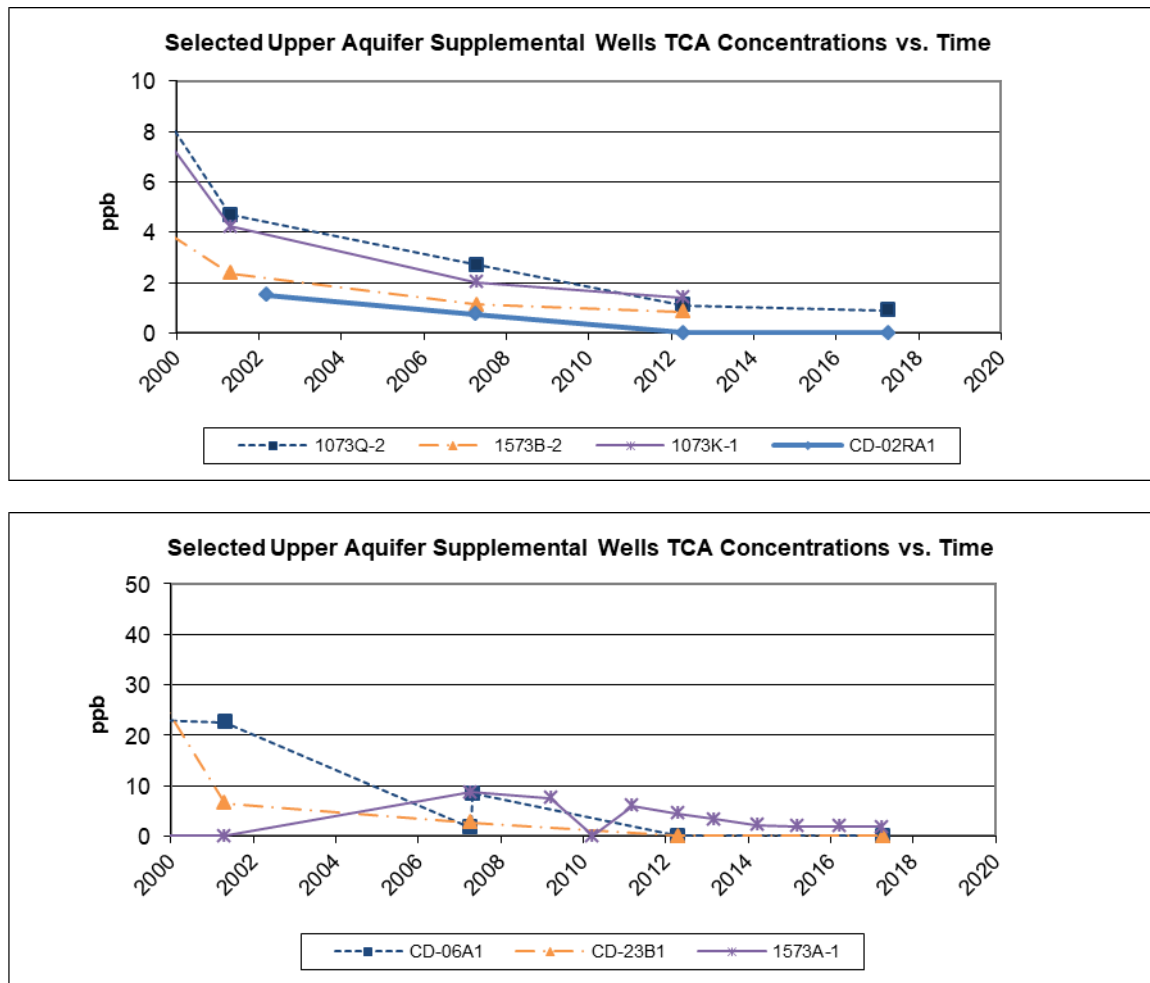
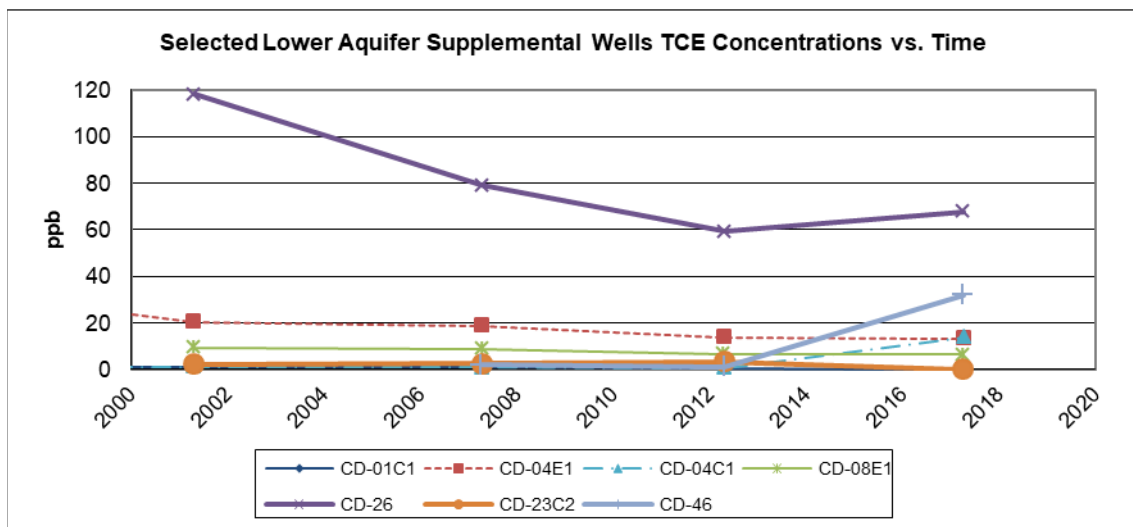
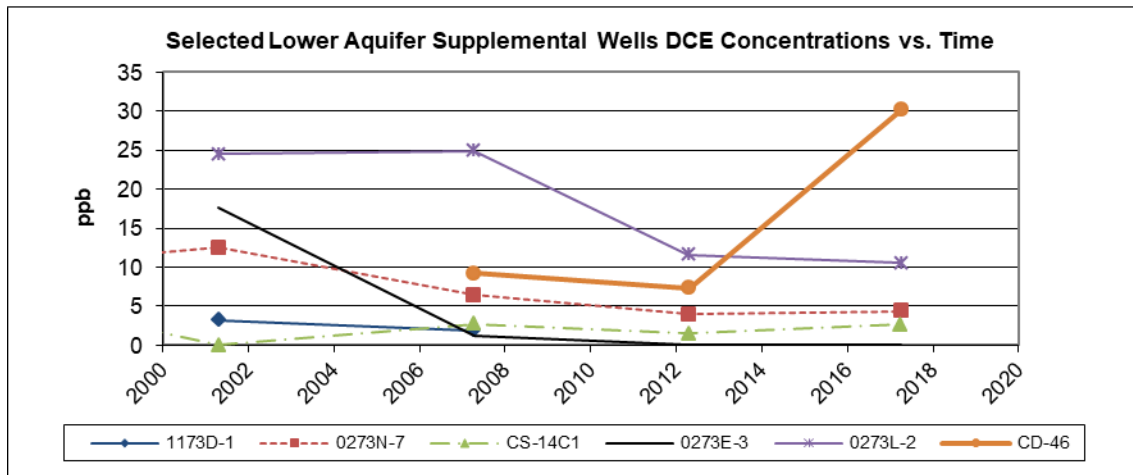


Figure 5-4 Supplemental Well COC Concentrations



6.0 Landfill Operations and Maintenance

From May 1, 2014 through April, 2017 the following routine landfill cover and gas system monitoring and maintenance was accomplished at the Colbert Landfill. Data collected is included in this section.

- Monthly monitoring at gas probes and exhaust system
- Monthly condensate tank levels
- Monthly gas fan maintenance (greasing, belt tension adjustments, etc.)
- Landfill gas sampling and analysis (Method TO-15) was performed in April 2017.
- Quarterly monitoring of trench risers (June, October, February and April).

Other notable items include:

- Cover and ditch weed control was ongoing throughout the growing season.
- Carbon tub change outs were performed in November 2016 and April 2017.

Landfill Operations and Maintenance Field Data

COLBERT PERIMETER GAS MONITORING REPORT

Barometer: 27.8

Tech: MT

Calibration: Zeroed CH4 to AB air-> calgas CH4 reading 14.8%, calibrated 15.0%; CO2 reading 15.1%, calibrated to 15.0%; zeroed O2 to calgas. O2 reading 20.6% to AB air.

FanFlow: 57

Weather: Partly Cloudy mid-upper 60's

Equipment: Gem 500 #410

Location	Date	Time	CH4	CO2	O2	Balance	Static Press	Diff. Press.	Comments
CGP0001L	5/5/2016		0	2.1	17.9	80	0	0	
CGP0001L	10/28/2016		0	2.8	17.1	81	0	-0.01	
CGP0001L	1/12/2017		0	3.5	16.3	80.2	0	0	
CGP0001L	4/7/2017		0	2.1	17.1	80.8	0	-0.01	
CGP0001L	3/23/2017		0	2.3	17.4	80.3	0	0	
CGP0001L	11/21/2016		0	3.1	16.8	80.1	0	0	
CGP0001L	8/10/2016		0	3.4	16.5	80.1	0	0	
CGP0001L	2/3/2017		0	4.1	15.7	80.2	0	0	
CGP0001L	12/19/2016		0	3.1	17	79.9	0	0	
CGP0001L	7/22/2016		0	3.1	16.5	80.4	0	-0.01	
CGP0001L	6/20/2016		0	2.4	16.2	81.4	0	0	
CGP0001L	9/20/2016		0	3.5	16.2	80.3	0	0	
CGP0001U	7/22/2016		0	6.6	7	86.4	0	-0.02	
CGP0001U	6/20/2016		0	5.9	6.1	88	0	0	
CGP0001U	1/12/2017		0	2.8	16.8	80.4	0	0	
CGP0001U	12/19/2016		0	7.1	7.5	85.4	0	0	
CGP0001U	2/3/2017		0	2.8	16.8	80.4	0	0	
CGP0001U	5/5/2016		0	4.9	13.6	81.5	0	0	
CGP0001U	9/20/2016		0	3.9	15.1	81	0	0	
CGP0001U	11/21/2016		0	2.5	16.3	81.2	0	0	
CGP0001U	3/23/2017		0	5	15.7	79.3	0	0	
CGP0001U	4/7/2017		0	4.7	15.6	79.7	0	0	
CGP0001U	10/28/2016		0	6.9	7.2	85.9	0	-0.02	
CGP0001U	8/10/2016		0	6.3	6.9	86.8	0	-0.01	
CGP0002L	1/12/2017		0	1.5	19.7	78.8	0	0	
CGP0002L	8/10/2016		0	6.9	14.7	78.4	0	-0.01	
CGP0002L	12/19/2016		0	7	12.9	80.1	0	-0.01	
CGP0002L	11/21/2016		0	1.1	19.8	79.1	0	-0.02	
CGP0002L	2/3/2017		0	1.8	19.4	78.8	0	0	
CGP0002L	5/5/2016		0	7.4	7.1	85.5	0	0	
CGP0002L	7/22/2016		0	6.5	14.7	78.8	0	-0.01	

COLBERT PERIMETER GAS MONITORING REPORT

Barometer: 30.06

Tech: MT

Calibration: Zeroed CH4 to AB air-> calgas CH4 reading 14.9%,
calibrated to 15.0%; CO2 reads 15.0% (no calibration);
zeroed O2 to calgas. calibrated to 20.9% at AB air

FanFlow: 54

Weather Mostly clear Mid-60's

Equipment: Gem 500 #410

Location	Date	Time	CH4	CO2	O2	Balance	Static Press	Diff. Press.	Comments
CGP0002L	9/20/2016		0	6.8	6.6	86.6	0	-0.03	
CGP0002L	10/28/2016		0	7	7.2	85.8	0	-0.01	
CGP0002L	4/7/2017		0	4.5	8.3	87.2	0	-0.01	
CGP0002L	6/20/2016		0	6.5	6.8	86.7	0	0	
CGP0002L	3/23/2017		0	7.4	5.8	86.8	0	-0.01	
CGP0002U	5/5/2016		0	1.6	19.1	79.3	0	-0.02	
CGP0002U	7/22/2016		0	1.6	17.1	81.3	0	0	
CGP0002U	9/20/2016		0	1.3	19.2	79.5	0	-0.02	
CGP0002U	6/20/2016		0	1.7	19.4	78.9	0	0	
CGP0002U	10/28/2016		0	1.6	19.3	79.1	0	0	
CGP0002U	12/19/2016		0	2.2	18.9	78.9	0	0	
CGP0002U	2/3/2017		0	2.7	18.9	78.4	0	0	
CGP0002U	11/21/2016		0	2	18.4	79.6	0	-0.01	
CGP0002U	3/23/2017		0	1.5	18.5	80	0	0	
CGP0002U	4/7/2017		0	1.7	18.4	79.9	0	0	
CGP0002U	1/12/2017		0	2.2	19.4	78.4	0	-0.01	
CGP0002U	8/10/2016		0	1.8	17	81.2	0	-0.02	
CGP0003L	8/10/2016		0	9.3	8.4	82.3	0	-0.01	
CGP0003L	4/7/2017		0	8.8	5.1	86.1	0	-0.02	
CGP0003L	3/23/2017		0	9	4.9	86.1	0	-0.02	
CGP0003L	9/20/2016		0	8.3	5.6	86.1	0	0	
CGP0003L	7/22/2016		0	9.1	6.5	84.4	0	0	
CGP0003L	5/5/2016		0	9.4	5.1	84.5	0	0	
CGP0003L	2/3/2017		0	9.4	5.6	85	0	0	
CGP0003L	6/20/2016		0	9.2	5	85.8	0	-0.02	
CGP0003L	12/19/2016		0	9.5	5.1	85.4	0	0	
CGP0003L	1/12/2017		0	9.5	5.5	85	0	0	
CGP0003L	10/28/2016		0	9.4	5.6	85	0	0	
CGP0003L	11/21/2016		0	9.3	5	85.7	0	-0.04	
CGP0003U	11/21/2016		0	1.7	18.4	79.9	0	-0.02	
CGP0003U	7/22/2016		0	1.9	18.7	79.4	0	0	

COLBERT PERIMETER GAS MONITORING REPORT

Barometer: 30.36

Tech: MT

Calibration: Zeroed CH4 to AB air; calgas CH4 reading 14.8% calibrated to 15.0%; CO2 reading 15.2% calibrated to 15.0%; Zeroed O2 to calgas. calibrated to AB air 20.9%

FanFlow: 45

Weather Cloudy Mid 20's

Equipment: Gem 500 #410

Location	Date	Time	CH4	CO2	O2	Balance	Static Press	Diff. Press.	Comments
CGP0003U	1/12/2017		0	2.1	18.9	79	0	-0.02	
CGP0003U	2/3/2017		0	2.1	18.9	79	0	-0.01	
CGP0003U	12/19/2016		0	1.6	19.1	79.3	0	0	
CGP0003U	8/10/2016		0	2.1	18.8	79.1	0	0	
CGP0003U	6/20/2016		0	1.3	19.4	79.3	0	0	
CGP0003U	9/20/2016		0	1.2	19	79.8	0	0	
CGP0003U	3/23/2017		0	1	19.5	79.5	0	-0.01	
CGP0003U	4/7/2017		0	1.7	18.9	79.4	0	-0.01	
CGP0003U	10/28/2016		0	1.4	19.9	79.2	0	-0.02	
CGP0003U	5/5/2016		0	1.1	19.5	79.4	0	-0.02	
CGP0004L	4/7/2017		0	5.5	6.1	88.4	0	-0.01	
CGP0004L	5/5/2016		0	2.7	17.5	79.8	0	-0.01	
CGP0004L	8/10/2016		0	6	13.7	80.3	0	0	
CGP0004L	12/19/2016		0	4.5	16	79.5	0	0	
CGP0004L	11/21/2016		0	3.7	16.7	79.6	0	-0.02	
CGP0004L	2/3/2017		0	3.5	17.1	79.4	0	-0.01	
CGP0004L	6/20/2016		0	6.3	6.2	87.5	0	-0.02	
CGP0004L	7/22/2016		0	6.1	13.8	80.1	0	-0.02	
CGP0004L	3/23/2017		0	6.5	6.2	87.3	0	0	
CGP0004L	1/12/2017		0	3.5	17.1	79.4	0	0	
CGP0004L	10/28/2016		0	4.1	16.4	79.5	0	-0.01	
CGP0004L	9/20/2016		0	4.9	15.1	80	0	-0.01	
CGP0004U	2/3/2017		0	3.3	16.2	80.5	0	-0.01	
CGP0004U	10/28/2016		0	3.5	16.3	80.2	0	-0.01	
CGP0004U	8/10/2016		0	5	15	80	0	-0.01	
CGP0004U	12/19/2016		0	3.1	16.6	80.3	0	-0.01	
CGP0004U	11/21/2016		0	2.8	17	80.2	0	-0.01	
CGP0004U	7/22/2016		0	5.2	15.1	79.7	0	-0.01	
CGP0004U	9/20/2016		0	3.3	16.2	80.5	0	0	
CGP0004U	3/23/2017		0	2.9	16.9	80.2	0	0	
CGP0004U	1/12/2017		0	3	16.5	80.5	0	-0.01	

COLBERT PERIMETER GAS MONITORING REPORT

Barometer: 30.1

Tech: MT

Calibration: Zeroed CH4 AB air ->CALGAS CH4 reading 14.8%
Calibrated to 15.0%; CO2 reading 15.1% Calibrated to
15.0%; zeroed O2 to CALGAS disconnect CALGAS O2

FanFlow: 52

Weather PC Upper 60's

Equipment: Gem 500 #410

Location	Date	Time	CH4	CO2	O2	Balance	Static Press	Diff. Press.	Comments
CGP0004U	6/20/2016		0	2.6	17	80.4	0	-0.01	
CGP0004U	5/5/2016		0	3.6	16.1	80.3	0	-0.02	
CGP0004U	4/7/2017		0	2.1	15.9	82	0	0	
CGP0005L	8/10/2016		0	6.1	13.1	80.8	0	0	
CGP0005L	4/7/2017		0	6.3	2	91.7	0	0	
CGP0005L	3/23/2017		0	6.3	2.1	91.6	0	0	
CGP0005L	9/20/2016		0	6.5	5.9	87.6	0	-0.02	
CGP0005L	7/22/2016		0	5.9	12.9	81.2	0	0	
CGP0005L	6/20/2016		0	5.9	6.4	87.7	0	0	
CGP0005L	2/3/2017		0	6.5	14.5	89	0	0	
CGP0005L	12/19/2016		0	6.5	6.1	87.4	0	0	
CGP0005L	10/28/2016		0	6.9	6.6	86.6	0	0	
CGP0005L	1/12/2017		0	6.1	4.9	89	0	0	
CGP0005L	5/5/2016		0	4.7	6.9	88.4	0	0	
CGP0005L	11/21/2016		0	6.4	5.1	88.5	0	-0.04	
CGP0005U	1/12/2017		0	1.3	17.5	81.1	0	0	
CGP0005U	11/21/2016		0	1.2	17.9	80.9	0	-0.03	
CGP0005U	4/7/2017		0	1.5	15.1	83.4	0	0	
CGP0005U	7/22/2016		0	1.1	16.9	82	0	-0.03	
CGP0005U	3/23/2017		0	1.6	16	82.4	0	0	
CGP0005U	2/3/2017		0	1.1	17.7	81.1	0	0	
CGP0005U	9/20/2016		0	1.1	18.9	80	0	0	
CGP0005U	12/19/2016		0	1.3	18.1	80.6	0	-0.02	
CGP0005U	8/10/2016		0	1.3	16.7	82	0	0	
CGP0005U	5/5/2016		0	1.1	19.1	79.8	0	-0.01	
CGP0005U	10/28/2016		0	1.6	19.3	79.1	0	-0.01	
CGP0005U	6/20/2016		0	1.2	19.4	79.4	0	-0.02	
CGP0007L	12/19/2016		0	1.4	19.7	78.9	0	0	
CGP0007L	8/10/2016		0	1.3	18	80.7	0	0	
CGP0007L	11/21/2016		0	1.2	19.5	79.3	0	-0.03	
CGP0007L	2/3/2017		0	1.1	19.3	79.6	0	-0.01	

COLBERT PERIMETER GAS MONITORING REPORT

Barometer: 30.1

Tech: MT

Calibration: Zeroed CH4 AB air ->CALGAS CH4 reading 14.8%
Calibrated to 15.0%; CO2 reading 15.1% Calibrated to
15.0%; zeroed O2 to CALGAS disconnect CALGAS O2

FanFlow: 52

Weather PC Upper 60's

Equipment: Gem 500 #410

Location	Date	Time	CH4	CO2	O2	Balance	Static Press	Diff. Press.	Comments
CGP0007L	6/20/2016		0	0.9	20.8	78.3	0	-0.01	
CGP0007L	7/22/2016		0	1.1	17.9	81	0	0	
CGP0007L	9/20/2016		0	0.8	20.3	78.9	0	0	
CGP0007L	1/12/2017		0	1	19.4	79.6	0	-0.01	
CGP0007L	4/7/2017		0	1.1	20.7	78.2	0	-0.01	
CGP0007L	5/5/2016		0	1.1	20.1	79.8	0	0	
CGP0007L	10/28/2016		0	1.1	20	78.9	0	0	
CGP0007L	3/23/2017		0	0.4	21.1	78.5	0	-0.01	
CGP0007U	2/3/2017		0	2.5	17.7	79.8	0	0	
CGP0007U	1/12/2017		0	2.1	18.1	79.8	0	0	
CGP0007U	4/7/2017		0	2.2	19.7	78.1	0	0	
CGP0007U	3/23/2017		0	1.1	20	78.9	0	0	
CGP0007U	9/20/2016		0	1.2	19.3	79.5	0	0	
CGP0007U	6/20/2016		0	3	18.2	78.8	0	0	
CGP0007U	11/21/2016		0	2	18.3	79.7	0	-0.02	
CGP0007U	12/19/2016		0	2.9	17.1	80	0	-0.01	
CGP0007U	5/5/2016		0	5.1	14.1	81.8	0	0	
CGP0007U	7/22/2016		0	3.7	16.5	79.8	0	-0.01	
CGP0007U	10/28/2016		0	3.5	15.3	81.2	0	-0.01	
CGP0010L	1/12/2017		0	5.7	7.8	86.5	0	0	
CGP0010L	8/10/2016		0	6	12.6	81.4	0	-0.01	
CGP0010L	12/19/2016		0	5.9	6.9	87.2	0	0	
CGP0010L	11/21/2016		0	5.5	6.4	88.1	0	0	
CGP0010L	2/3/2017		0	6.5	7	86.5	0	0	
CGP0010L	7/22/2016		0	6.1	12.7	81.2	0	-0.01	
CGP0010L	5/5/2016		0	5.1	13.9	80	0	-0.02	
CGP0010L	4/7/2017		0	3.4	16.8	79.8	0	0	
CGP0010L	6/20/2016		0	5.2	6.6	88.2	0	-0.03	
CGP0010L	3/23/2017		0	3.6	16.1	80.3	0	0	
CGP0010L	10/28/2016		0	6.3	7	86.7	0	0	
CGP0010L	9/20/2016		0	5.1	6.8	88.1	0	0	

COLBERT PERIMETER GAS MONITORING REPORT

Barometer: 30.18

Tech: MT

Calibration: Zeroed CH4 to AB ait -> CALGAS CH4 reads 14.6% calibrated to 15.0% CH4; CO2 reads 15.1% calibrated to 15.0%; zeroed O2 to CALGAS. calibrated to 20.9% AB air

FanFlow: 47

Weather: Cloudy and cold mid 20's

Equipment: GEM 500 #410

Location	Date	Time	CH4	CO2	O2	Balance	Static Press	Diff. Press.	Comments
CGP0010U	12/19/2016		0	2.3	17.4	80.3	0	-0.01	
CGP0010U	4/7/2017		0	1.4	18.8	79.8	0	0	
CGP0010U	8/10/2016		0	3.1	17.4	79.5	0	-0.01	
CGP0010U	11/21/2016		0	2.4	17.3	80.3	0	-0.01	
CGP0010U	2/3/2017		0	2.4	16.9	80.7	0	-0.01	
CGP0010U	6/20/2016		0	1.1	20.2	78.7	0	-0.02	
CGP0010U	7/22/2016		0	2.9	17.5	79.6	0	0	
CGP0010U	9/20/2016		0	1.3	19.2	79.5	0	-0.01	
CGP0010U	3/23/2017		0	1	19.4	79.6	0	0	
CGP0010U	10/28/2016		0	2	17.3	80.5	0	0	
CGP0010U	1/12/2017		0	2.5	16.8	80.7	0	-0.01	
CGP0010U	5/5/2016		0	1.4	18.2	80.4	0	0	
CGP0011L	7/22/2016		0	1.1	19.1	79.8	0	0	
CGP0011L	5/5/2016		0	0.9	20.6	78.5	0	0	
CGP0011L	8/10/2016		0	1.2	19	79.8	0	0	
CGP0011L	12/19/2016		0	0.5	19.7	79.8	0	-0.01	
CGP0011L	1/12/2017		0	0.4	19.7	79.9	0	0	
CGP0011L	11/21/2016		0	0.2	20.5	79.3	0	0	
CGP0011L	9/20/2016		0	0.2	20.2	79.6	0	0	
CGP0011L	10/28/2016		0	0.9	19.8	79.3	0	-0.01	
CGP0011L	3/23/2017		0	0.3	20	79.7	0	0	
CGP0011L	4/7/2017		0	1.1	19.9	79	0	0	
CGP0011L	6/20/2016		0	0.5	20.3	79.2	0	-0.03	
CGP0011L	2/3/2017		0	0.6	19.5	79.9	0	0	
CGP0011U	3/23/2017		0	2.6	17.6	79.8	0	0	
CGP0011U	8/10/2016		0	5.1	14	80.9	0	0	
CGP0011U	12/19/2016		0	4.5	14.1	81.4	0	0	
CGP0011U	11/21/2016		0	3.8	7.2	89	0	-0.01	
CGP0011U	2/3/2017		0	4.6	7	88.4	0	-0.01	
CGP0011U	6/20/2016		0	3	16.7	80.3	0	-0.03	
CGP0011U	7/22/2016		0	5.2	14.1	80.7	0	0	

COLBERT PERIMETER GAS MONITORING REPORT

Barometer: 29.97

Tech: MT

Calibration: Zeroed CH4 AB air -> CALGAS ch4 reads 14.8%
calibrated to 15.0%; CO2 reads 14.9%, calibrated to
15.0% CO2: zeroed O2 to CALGAS-> O2 reading 20.7%

FanFlow: 49

Weather: Cloudy Lt Showers
low 50's

Equipment: Gem 500 #410.

Location	Date	Time	CH4	CO2	O2	Balance	Static Press	Diff. Press.	Comments
CGP0011U	10/28/2016		0	5.1	14.5	80.4	0	0	
CGP0011U	4/7/2017		0	2.6	17.8	79.6	0	-0.01	
CGP0011U	1/12/2017		0	4.1	7.5	88.4	0	-0.01	
CGP0011U	5/5/2016		0	3.4	17.4	79.2	0	0	
CGP0011U	9/20/2016		0	3.2	15.7	81.1	0	-0.01	

COLBERT GP's

5/5/2016 (THURS)

TECH: MT

FILE NAME CP160505

WEATHER P. CLOUDY

MID-UPPER 60S

B.P. 27.80

GAS FLOW 57 CFM

GAS TEMP 20.1°C

FAN HZ 8262

GAS CALIB.: ZEROED CH₄ TO AB AIR → GAS CALIBRATION
 CH₄ READING 14.8% CALIB TO 15.0%
 CO₂ READING 15.1% CALIB TO 15.0%
 ZEROED O₂ TO CAL GAS; O₂ READING 20.6% CALIB TO AB AIR 20.9%

MT SAMPLED AT THE FOLLOW GAS LOCATION
 e COLBERT LF.

LOCATIONS	%CH ₄	%CO ₂	%O ₂	PRESSURE
21 GP's	X	X	X	X
4 EXTRACTOR	X	X	X	X

- ALL READING ARE IN NORMAL RANGE,
 NO ADJUSTMENTS WERE MADE TO GAS
 SYSTEM. MT OBSERVED NOTHING OUT OF
 THE ORDINARY.

MONTHLY GAS MAINT.

- KNOCKOUT VESSEL e Ø
- ✓ BELT TENSION e 51bs OK
- ✓ GREASED BOTH BEARINGS
- PULLED SAPLINGS ON COVER
- ✓ VD COND TANK IN REAR OF LF.
- CONDSTATE CONDENSATE TANK 1.5" → 15 e 9.5"

5/13/2016 (FRI)

GAS FLOW 57 SCFM e 20.1°C e #1215

5/19/2016 - GAS FLOW (WEEKLY)
49 CFM @ 18.1°C ALITTLE CHILLY @ 1145

5/27/16 - GAS FLOW (WEEKLY)
(WAS GONE ALL WEEK CAME IN FOR 1 HR
TO DO WEEKLY THING)
54 CFM @ 19.2°C 1000

6/2/16 - GAS FLOW (WEEKLY)
51 CFM @ 20.2°C 1430

6/9/16 - GAS FLOW (WEEKLY)
54 CFM @ 22.1°C OVER CAST 1300

6/16/2016 - Gas flow (weekly) (km)
(Thursday) 50 CFM @ 20.2°C 1045 Mostly cloudy 58°F

6/30/2016 - Gas flow *Weekly (km)
(Thursday) 55 CFM @ 22.1°C 1050 Clear sky's 78°F

COLBERT GP

6/2016

DATE: 6/20/16 (MON)

TECH: M. TERRIS

FILE NAME: CP160620.XLS

GAS FLOW 52 CFM

TEMP GAS: 21.7°C

FAN HR ~~942~~
9421

WEATHER: P.C. UPPER 60S LT SW WND

B.P. 30.1

GAS CALIBRATION! ZEROED CH₄ TO AB AIR → CAL GAS
CH₄ READING 14.8% CALIB TO
15.0%; CO₂ READING 15.1% CALIB
TO 15.0%; ZEROED O₂ TO CAL GAS
DISCON CAL GAS O₂ READING 20.6
CALIB TO AB AIR 20.9%

MT SAMPLED AT EACH LOCATION ON COLBERT
LF.

LOCATION	%CH ₄	%CO ₂	%O ₂	PRESSURE
21 GPS	X	X	X	X
4 EXTRACTION	X	X	X	X

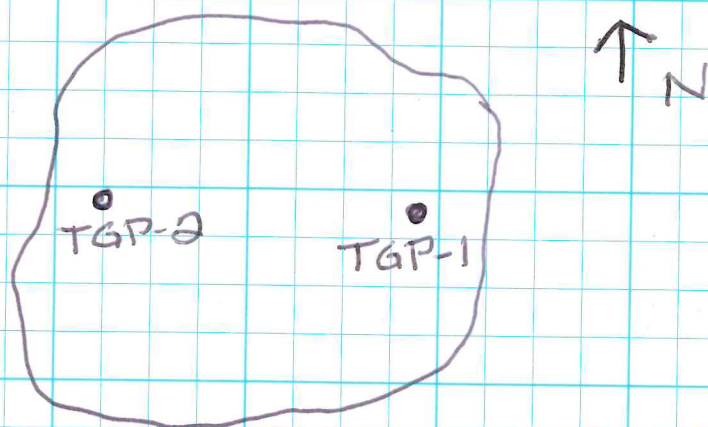
- ALL READING ARE IN NORMAL RANGE FOR
THIS TIME OF YEAR. NO ADJUSTMENT WERE
MADE NOTHING OUT OF THE ORDINARY OBSERVED.
DG/MT ~~ADDED~~ NOTICED ALOT OF NOX. WEED
NEED TO BE SPRAYED

- KNOCK OUT VESSEL c Ø
- V BELT TENSION ON BELT 4.5-5 lbs OIL
NO WEAR ON BELT.
- GREASED BOTH BEARINGS 4 STROKES EACH
- COND NE CORNER TANIL c 1.5" IS c 9.5"

6/22/16

- BU PULLED ALL SAPPINGS (PINE) OFF OF LANDFILL
- BU SPRAYED 30 GALLONS OF WEED CONTROL SKELITON NOX WEEDS 2-4 D AMINE 4 ALONG WEST ROAD & NORTH RD TO E-1 + ON COVER.

7/13/2016



GF TEMP PLACED 2 MANUAL GP ON THE AREA WE REPLACED LINER DUE TO A DEPRESSION IN AREA SOUTH SIDE OF THE LANDFILL. WE HAVE HAD ISSUES NOT BEING ABLE TO GROW GRASS OR VEGETATION IN AREA. AFRAID THERE IS A GAS LEAK.

THE TWO TEMP GP WERE PLACED ON EAST AND WEST SIDE OF AREA

TGP-1 IS 18" DEEP 16" PEATGRAVEL & 2" TOP SOIL 3/4" PVC PIPE WITH A BARB HOSE BIB ON END TO SAMPLE WITH. AND A OPEN/CLOSE VALVE.

TGP-2 IS 24" DEEP WITH 8" TOPSOIL AND PETGRAVE (16") A BARB HOSE BIB AND OPEN/CLOSE VALVE 5" OF SLOTTED 3/4" PIPE. TO ALLOW GAS flow (IF GAS (LANDFILL) IS PRESENT

7/13/16

GF SHOWED A LITTLE CONCERN W/ PEAGRAVE
ON COVER SOMETIMES SHARP ENDING
(MIGHT CAUSE HOLES IN LINER) WILL
KEEP A CLOSE EYE ON IT.

7/14/16

- GAS FLOW READING 51 CFM @ 20.9°C
CLEAR TOS MT

7/20/16

✓ PORTABLE GP ON PIMPLE

TGP-1	Ø CH ₄	Ø CO ₂	20.1% O ₂
TGP-2	Ø CH ₄	0.1 CO ₂	20.3% O ₂

* LITTLE VEGETATION GROWING DG/MT
TALKED MAYBE SINCE WE HAVE A
SEDIMENT MARKER ON TOP OF PIMPLE
MAYBE PROpane SPRAYED AREA WHEN
WE HAD THEM OUT TO STERILIZE
AREAS

- GAS FLOW READING 53 CFM @ 22.4°C
P. CLOUDY 80S

KM ADDED SHIMS ON GAS FAN TO STOP
VIBRATION ON SCREEN

COLBERT GP

"7/2016"

DATE: 7/22/2016 (FRI)

WEATHER P. CLOUDY MID-70S B.P. 30.01

TECH: M. TERRIS GAS TEMP: ~~20~~ 21.9°C

FAN HOURS: 10139

GAS CALIBRATION:

ZEROED CH₄ TO AB AIR → CALGAS CH₄ READING 14.7% CALIB. TO 15.0%; CO₂ READING 14.8% CALIB TO 15.0%; ZEROED O₂ TO CALGAS, CALIB TO AB AIR 20.9%.

MT SAMPLE AT EACH LANDFILL GAS PROBE & EXTRACTION LOCATION:

LOCATION	%CH ₄	%CO ₂	%O ₂	Pressure
21 GP'S	X	X	X	X
4 EXTRACTION	X	X	X	X
* TGP-1 & TGP-2	X	X	X	

* TGP-1 & TGP-2

TGP-1 ∅ CH₄ ∅ CO₂ 20.4% O₂
TGP-2 ∅ CH₄ 0.2 CO₂ 20.2% O₂

(CTEMP READING FROM PIMPLE)

MONTHLY GAS MAINT:

- KNOCKOUT VESSEL C ∅
- ✓ BELT AGAIN TENSION BETWEEN 5-6 LBS LOOKS GREAT
- DG FELT SHE HEARD BAD NOISES ON GAS FAN, KEEPING A CLOSE EYE ON IT SCREEN VIBRATES A LOT
- GREASED BOTH BEARINGS 4 ~~SHOTS~~ SHOTS
- ✓ TANIC PEAK OF LAND FILL CNE COND. 1.25" IS 9.5"

7/29/16 (Fri)

- GAS FLOW 52 CFM @ 24.7°C HOT/CLEAR

8/5/16

- GAS FLOW 51 CFM @ 22.7°C

COLBERT MONTHLY GAS

8/10/16 (Wed)

WEATHER: P. CLOUDY LOW TO MID 70'S B.P. 29.99

PELH: MT GAS FLOW 49 CFM @ 24.4°C PM

FAN HRS: 10591

GAS CALIB. ZEROED CH₄ TO AB AIR → GAS CALIBRATION
READING 14.7% CH₄ CALIB. TO 15.0%
CO₂ READING 14.9% CALIB. TO 15.0%
ZEROED O₂ → CALIB. TO AB AIR 20.9%

- MT SAMPLED EACH LOCATION ON COLBERT
LF

LOCATION	%CH ₄	%CO ₂	%O ₂	PRESSURE
21 GP'S	X	X	X	X
4 EXTRACTION	X	X	X	X

* ALL READING ARE IN NORMAL RANGE FOR
THIS TIME OF YEAR NO ADJUSTMENTS
WERE MADE. NOTHING OUT OF THE
ORDINARY OBSERVED.

MONTHLY MAINT:

- KNOCKOUT VESSEL ✓
- V BELT TENSION @ 51BS ✓
- GREASED BOTH BEARINGS
- ✓ SCREEN VIBRATION (STILL AITTLE NOISY)
- COND TANK @ 1.5" IS 9.5"
- ✓ PIMPLE IN MANMADE GP'S (NO CH₄)

GAS PROBES

DATE: 9/20/16 (TUES)

WEATHER: P. CLOUDY MID-60's B.P. 30.06↓

TECH: M. TERRIS GAS FLOW 54 CFM @ 18.6°C

FAN HR: 11573

GAS CALIBRATION:

ZEROED CH₄ TO AB AIR → GAS CALIBRATION

CH₄ READING 14.9% CALIB. TO 15.0% CH₄;

CO₂ READING 15.0% (NO CALIB); ZEROED O₂

THEN CALIBRATED TO AB @ 20.9%

MT SAMPLE AT THE FOLLOWING COLBERT LANDFILL PORTS:

LOCATION	%CH ₄	%CO ₂	%O ₂	Press.
21 GPS	X	X	X	X
4 EXTRACTION	X	X	X	X
2 PIMPLE GPS	X	X	X	

ALL READING ARE WITHIN NORMAL SAMPLING RANGE FOR THIS TIME OF THE YEAR

NO ADJUSTMENTS WERE MADE TO SYSTEM.

NOTHING OUT OF THE ORDINARY OBSERVED.

MONTHLY MAINT. PERFORMED

- KNOCK OUT COUNTER @ 1 RESET TO 0
- 1 GAL OF WATER IN GAS EFF LINE.
- V 2 PIMPLE GP (NO GAS DETECTED)
~~CTGP-1 & TGP-2~~ (CTGP-1 & TGP-2)
- GAS MAINT FAN CLEANED & GREASED BEARINGS
✓ BELT TENSION 4.5
- TANK LEVELS 1.5" IS 9.5

9-28-16

~~SPOKANE ENVIRONMENTAL SERVICES (PUE)~~

9-30-16

Flow is 56 CFM @ 17.9°C

10-7-16

Flow is 54 CFM @ 18.1°C MID-60'S
2 GAL COND.

10-13-16

Flow is 58 CFM @ 17.1°C MID-50'S
1 GAL CON.

10-21-16

Flow 57 CFM @ 15.8°C MID-50'S CLOUDY
A LOT OF RAIN THIS WEEK
5- GAL CONDENSATION

COLBERT GP

10/28/2016 (FRIDAY)

WEATHER: CLOUDY LT SHOWERS LOW 50's

B.P 29.97 GAS FLOW 49 CFM GASTEMP 13.1°

FAN HR: 12484

GAS CALIBRATION: ZEROED CH₄ TO AB AIR

GAS CAL → 14.8% CH₄ CALIB TO 15.0% CH₄

CO₂ READING 14.9% CALIB TO 15.0% CO₂

ZEROED O₂ TO CALGAS → 20.7% AB AIR

CALIB. TO 20.9%

MT SAMPLED GAS FROM THE FOL LOCATIONS

LOCATION	%CH ₄	%CO ₂	%O ₂	PRESSURE
21 GP'S	X	X	X	X
4 GAS EXTRACT	X	X	X	X
2 PIMPLE GP	X	X	X	

ALL READINGS ARE IN NORMAL RANGE

FOR THIS TIME OF YEAR NO ADJUSTMENTS

WERE MADE TO THE SYSTEM, NOTHING OUT

OF THE ORDINARY WAS OBSERVED. EVERYTHING

LOOKS GOOD.

MONTHLY GAS MAINT

- KNOCK OUT COUNTER WAS c ∅
- ✓ PIMPLE GP BOTH ND
- 2.5 GAL EFF GAS LINE WAS DRAINED
- GAS MAINT OF FAN TENSION c 4.5-5 lbs.
- GREASED BOTH BEARINGS
- TANK LEVELS 1.5" IS 9.5"

11/4/2016 (FRI)

1100 FLOW 53 CFM e 11.1° 2.5 GAL P. CLOUDY
40's

11/8/2016 (TUES)

- FLAGGED ALL SURFACE AREAS ~~W~~ SO WHEN WE HAVE SNOW COVER, WE WILL BE ABLE TO SEE LOCATION!
- SAPCINGS PULLED FROM LANDFILL.

11/10/16 (THURS)

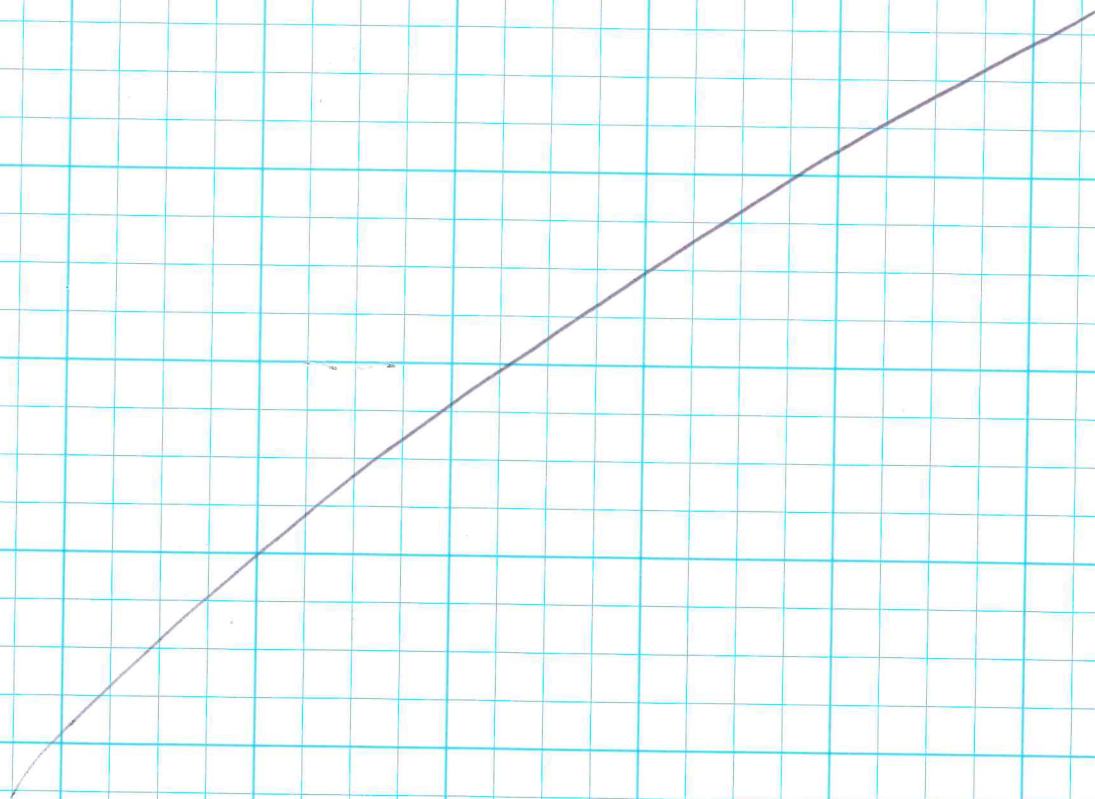
PLANT GAS FLOW 52 CFM @ 12.1°C 1 GAL COND

11/15/16 (TUES)

GAS HEAT TRACE TURNED ON FOR WINTER

11/18/16 (FRI)

- GAS FLOW 51 CFM @ 13.7°C 1/2 GAL COND



COLBERT GAS RD

11/2016

11/21/2016 (MON)

GAS FLOW 53 CFM @ 13.9°

WEATHER: CLOUDY / P. CLOUDY 40S B.P. 29.99↓

TECH: M. TERRIS

GEM 500 #410

FAN HR 13060

GAS CALIBRATION: ZEROED CH₄ TO AB AIR → CALGAS

CH₄ READS 14.7% CALIB TO 15.0%;

CO₂ READS 14.8% CALIB TO 15.0%

O₂ READS 0.7% w/CALGAS, ZEROED

O₂ → CAUB CO TO AB AIR 20.9%

MT SAMPLED @ FOLLOW GAS LOCATIONS ON SITE:

LOCATION	%CH ₄	%CO ₂	%O ₂	TEMP	FLOW	PRESSURE
13 TRENCH RISER	X	X	X	X	X	X
21 GAS PROBES	X	X	X			X
4 EXTRACTION	X	X	X			X
8 PIMPLE GP	X	X	X			

ALL READINGS ARE IN NORMAL RANGE. FOR
THIS TIME OF YEAR AND UNDER THIS
B.P. NO ADJUSTMENTS WERE MADE. NOTHING
OUT OF THE ORDINARY OBSERVED.

MONTHLY GAS MAINT:

- KNOCKOUT COUNTER @ 1 RESET TO 0
- GP PIMPLE ND @ BOTH LOCATIONS
- 5 GAL OF COND IN EFF GAS LINE
- TUNED GAS HEAT TRACE ON.
- WINTERIZED TR VAULTS TURNING VALVE
SIDEWAYS.
- MARKED EACH LOCATION ON SITE THAT HAS
A SURFACE MON w/ FLAGGING.
- GAS FAN MAINT 4 SHOTS IN EACH BEARING
BELT TENSION @ 5 LBS LOOKS GOOD
- TANIL LEVELS 2" IS 9.5"
- ✓ TO MAKE SURE SUMP PUMPS KICK ON.
"OK"
- PULLED 50-75 SABLING OFF SITE

11/29/2016 (TUES)

- GAS FLOW 49 CFM @ 11.2°C 1/4 GAL OF COND

MT/KM CHANGED OUT CARBON UNITS
#2 & #4 TAKEN OFF LINE, REPLACED
WITH UNITS #1 & #3 WITH #3 VALVES
CLOSED & #1 VALVE OPEN.

ORDERED 2 SUMMA CANISTERS TO-15
TO ARRIVE 12/14/16

12/9/16 (FRI)

- FLOW RATE 43 CFM @ 12.1°C 0 COND

~~12/14/16 (WED)~~

~~TO-15~~

~~SAMPLED~~

~~TODA~~

12/14/2016 (WED)

GEM 500 #410

Flow

FAN AIR 13606

41 CFM @ 3.2°C

WEATHER: CLEAR

COLD AM -11°C OVERNIGHT

CLEAR → CLOUDY PM LOW 20'S PM

- FOUND Flow Port TO Flow Reading
FROZEN. HAD TO THAW OUT FOUND Flow
LOW & TEMP @ 3.2°C. LOOK C SYSTEM
FOUND HEAT TRACE WAS OFF. BLOWN
CIRCUIT. RESET SEEMS TO BE OK
KEEP ✓ DAILY.

TO-15 SAMPLED TODAY, RUNNING A
TEST OR STUDY ON OUR GAS SYSTEM.
SAMPLING EVERY 3 MONTHS CHANGED OUT
UNITS LATE LAST MONTH WILL SAMPLE
TO-15 IN MARCH & IN JUNE.

SAMPLE PORTS & SAMPLE ID

PORT	ID	TIME	TO-15
CGE-001	CGE-001-161214	1230	X
CGE-003	CGE-003-161214	1245	X

eurofins

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Page 1 of 1

Project/Manager DEB GEIGER

Collected by: (Print and Sign) MIKE TERRIS

Company SPOKANE COUNTY

Address N. ELK CHATTAQUOTY COLBERT State WA Zip 99005

Phone 509-238-6601 Fax 509-238-6812

Project Info:

P.O. # MT404C

Project # COLBERT

Project Name

Turn Around Time:

☒ Normal

☐ Rush

Lab-Use Only

Pressurized by:

Date:

Pressurization Gas:

specify

N₂

He

Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested	Canister Pressure/Vacuum			
						Initial	Final	Receipt	Final (psi)
	CGE-001-161214	N0891	12/14/16	1230	TO-15				
	CGE-003-161214	N0105	12/14/16	1245	TO-15				
Relinquished by: (signature) Date/Time Received by: (signature) Date/Time Notes:									
Relinquished by: (signature) Date/Time Received by: (signature) Date/Time									
Relinquished by: (signature) Date/Time Received by: (signature) Date/Time									
Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals Intact?	Work Order #			
					Yes No None				

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FIELD SAMPLE I.D. # CGE-003-1612

CLIENT NAME: SPOKANE COUNTY ENV

PROJECT: COLBERT

SAMPLERS NAME: M. TERRIS

DATE: 12/14/2016 TIME: 1245

CANISTER #: N0105 (6121216)

COMMENTS: TO-15

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FIELD SAMPLE I.D. # CGE-001-161214

CLIENT NAME: SPOKANE ENVIRO SERV

PROJECT: COLBERT

SAMPLERS NAME: M. TERRIS

DATE: 12/14/2016 TIME: 1230

CANISTER #: N0891 (611451)

COMMENTS: TO-15

12/15/2016 (THURS)

✓ Flow & Temp ON GAS EXTRACTION

44 CFM Temp 9.1°C
(HEAT TRACE IS ON)

12/19/2016 (MON)

FAN HR 13726

GEM 500#410

GAS FLOW 47 CFM Temp 9.9°C

WEATHER: CLOUDY COOL E MID 20'S B.P. 30.185

GAS CALIBRATION: ZEROED CH₄ TO AB AIR → CAL GAS
CH₄ READING 14.6% CALIB TO
15.0%; CO₂ READS 15.1% CALIB
TO 15.0%; ZEROED O₂ TO CAL GAS;
O₂ READING 20.7% CAL TO
20.9% AB AIR.

MT SAMPLED ALL 21 GAS PROBE LOCATION
AND 4 GAS EXTRACTION LOCATIONS FOR
%CH₄, %CO₂, %O₂ & PRESSURE. ALL
READING ARE IN NORMAL RANGE, NO
ADJUSTMENTS WERE MADE. NOTHING OUT OF
THE ORDINARY OBSERVED.

MONTHLY GAS MAINT:

- FAN MAINT; ✓ BELT TENSION @ 45-5 lbs
WITHIN NORMAL RANGE, ✓ VISUAL LOOK @
BELT, LOOKS GOOD (AVE)
* GREASED BEARINGS FRONT & REAR
- HAD TROUBLE LAST WEEK WITH HEAT TRACE
GOOD SHAPE NOW, BUT ~~too~~ COLLECTED 6
GAL OF COND IN EFF-LINE.
- ✓ GP PIMPLE Ø CH₄
- KNOCKOUT @ Ø
- TANK LEVELS 2" IS 9.25"
- SITE GOOD SHAPE.
- 1 DEAD TREE ON WEST SIDE OF FENCE
NW CORNER OF SITE. NEED ATT. IN IN
SPRING *Rite in the Rain*

12/29/2016 (THURS)

- GAS FLOW 48 CFM @ 11.1°C 1/2 GAL COND.
CHILLT OUTSIDE LOW 30'S UNDER CLOUDY

1/6/2017 FRIDAY

- GAS FLOW 47 CFM @ 11.1°C 1 GAL COND.

COUBERT GAS ROUND

1/12/17 (THURS)

GEM 500 #410

TECH: M. TERRIS

WEATHER: CLOUDY COLD 20'S B.P 30.36

GAS FLOW 45 CFM @ 10.1°C

GAS CALIB. : ZEROED CH₄ TO AB AIR; CALGAS
CH₄ READS 14.8%, CALIB. TO 15.0%;
CO₂ READING 15.2% CALIB TO 15.0%;
O₂ ZEROED CALIB TO AB AIR 20.9%

- MT SAMPLED ALL 21 GAS PROBE LOCATION
ON LANDFILL USING MICA SIDE BY SIDE
WITH TRACS SINCE SNOW COVERED LANDFILL
2' + 4 GAS EXTRACTION LOCATIONS ALL
LOCATION SAMPLED FOR %CH₄, %CO₂, %O₂
+ PRESSURE ALL READINGS ARE IN NORMAL
RANGE NO ADJUSTMENTS WERE MADE

- FAN MAINT GREASED BEARINGS ✓ BELT

- KNOCKOUT #1 RESET TO 0

- 2 GAL OF COND.

- TANK LEVELS 2" IS 9.25"

1/20/17 44 CFM @ 11.9°C 7 GAL OF COND.
BEEN SUB-ZERO FOR 6 DAYS VALVE
WAS FROZEN

1/27/17 (FRI)

* HEAT TRACE ON TEMP MID-30'S
- GAS FLOW 48 CFM @ 11.4°C
Ø CONDENSATION

2/3/2017 (FRI)

WEATHER: CLOUDY COLD MID 20'S SNOW STARTED
TECH: M. TERRIS B.P. 29.85
GEM 500 #410 GAS FLOW 48 CFM @ 11.7°C

GAS CALIB: ZEROED CH₄ TO AB AIR → CAL GAS
CH₄ READING 14.8% CALIB TO 15.0%; CO₂ READING
15.1% CALIB TO 15.0%; ZEROED O₂ TO CAL GAS
CALIB 20.9% AB AIR.

- MT SAMPLED ALL 21 GAS PROBE LOCATIONS
ON LANDFILL & 4 GAS EXTRACTION LOCATION
FOR %CH₄, %CO₂, %O₂ + PRESSURE.
STILL LOTS OF ~~OF~~ SNOW MT USED SIDE BY
SIDE WITH TRACKS. STARTED SNOWING
HEAVY AFTER COMPLETION, ALL SEEMS
NORMAL NO ADJUSTMENTS WERE MADE
- FAN MAINT ✓ BELT OK 5 lb TENSION
GREASED BEARINGS
- KNOCK OUT @ Ø
- 1/2 GAC COND IN EFF GASLINE
- TANIC LEVELS 2" @ 9.5 IS SPACE

2-9-17 (Tues)

- GAS Flow 42 CFM @ 10.9°C 3.5 GAL COND

2-14-17 (Tues)

GAS Flow 47 CFM @ 11.9°C 2 GAL @ 1430

2/20/17

* Flow WAS MISSED MT VACATION.

2/28/17 (~~THU~~ TUES)

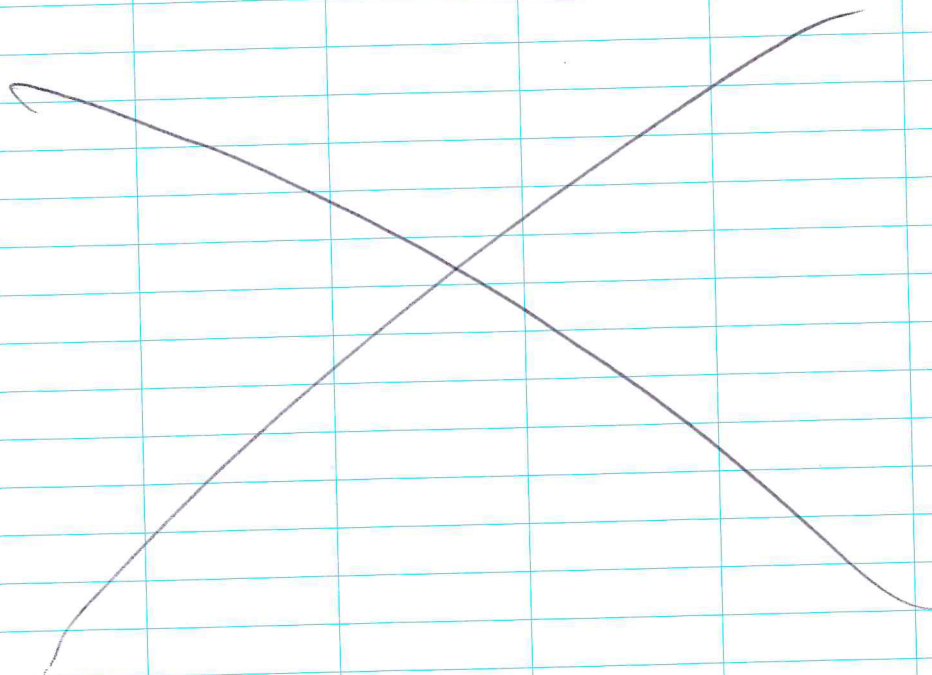
GAS Flow 44 CFM @ 13.3°C w/ 6 GAL OF COND
@ 1300

3/10/17 (FRI)

GAS Flow 49 CFM @ 15.7°C w/ 1.5 GAL ON Cond
@ 0930

3/17/17 (FRI)

- GAS Flow 50 CFM @ 16.1°C $\emptyset$ COND
@ 1330



3/23/2017 (THURS)

WEATHER: P. CLOUDY LT SW WIND 5-10 40'S

TECH: M. TERRIS GEM 500 #410

B.P 29.79 GAS Flow 51 CFM @ 15.6°C

GAS CALIB. ZEROED CH₄ TO AB AIR → CALGAS
CH₄ READING 14.7% CALIB TO 15.0%; CO₂
READING 14.9% CALIB TO 15.0%; ZEROED O₂
WITH CALGAS; O₂ READING 20.6% @
AB AIR CALIB. 20.9%.

- MT SAMPLED ALL 21 GP LOCATIONS &
4 GAS EXTRACTION LOCATIONS USING THE
GEM 500. HAD TO USE MCLA & WHEELER
W/ TRACS DUE TO HEAVY RAIN & SNOW
MELT VERY SOFT ON SOIL. ALL READING
IN NORMAL RANGE, NO ADJUSTMENTS
WERE MADE. ALL IS NORMAL.
- KNOCKOUT WAS @ 2 RESET TO 0
- 0 CONDENSATE IN EFF GAS LINE
- MAINT ON FAN GREASED BOTH BEARINGS
W/ 4 SHOTS ✓ BELT AITTLE WEAR BUT
NOT BAD 5 LB_s TENSION.
- ✓ TANK LEVELS 2.5" @ 9.5 IS SPACE.

3/28/17

- GAS Flow @ 52 CFM @ 16.1°C NO COND.
@ 1530 LT RAIN CHILL

COLBERT GAS RD

4/7/2017 (FRI)

B.P. 29.44

TECH: M. TERRIS

GEM 500 #410

WEATHER: P. CLOUDY MID 50S

FAN HR: 16340

FAN FLOW: 49 CFM

GAS TEMP: 13.6°C

GAS CALIBRATION! ZEROED CH₄ TO AB AIR →
CALGAS CH₄ READING 14.8% CALIB TO 15.0%;
CO₂ READING 14.8% CALIBRATED TO 15.0%;
ZEROED O₂ TO CALGAS, CALIB TO AB AIR 20.9% O₂.

* MT SAMPLED ALL 21 GP LOCATION ON SITE ALONG W/ 4 EXTRACTION LOCATIONS USING THE GEM 500 #410, ALL READINGS ARE IN NORMAL RANGE, WITH NOTHING OUT OF THE ORDINARY OTHER THAN A FEW SPOTS OF COVER WITH PONDS ~~OF~~ OF WATER.

- KNOCKOUT COUNTER e ∅ MT FOUND IT TO BE OFF RESET TURN ON.

- HEAT TRACE IS OFF

- ∅ CONDENSATION IN EFF GAS LINE

- FAN MAINT

* V BELT FOR WARE (NOTHING OBSERVED)

* V TENSION e 5 lbs

* CLEANED BOTH BEARING EXCESSIVE GREASE, PUT FRESH NEW GREASE IN BEARING.

- V TANK LEVELS NE CORNER OF LANDFILL
2.5" COND IS 9.5"

4/14/17 (Fri)

GAS Flow 51cfm @ 16.1°C Ø COND
@1430

4/21/17 (Fri)

GAS Flow 50cfm @ 16.7°C Ø COND
@1600

4/28/17 (Fri)

GAS Flow 52cfm @ 16.9°C Ø COND
@1410

5/5/17 (Fri)

GAS Flow 54cfm @ 17.9°C Ø COND
@1200 CLOUDY MID-60S

5/11/17 (THURS)

GAS Flow 52cfm @ 17.1°C Ø COND
@1600 CLOUDY MID-60S

7.0 References

Landau Associates. 1992. Phase II Remedial Design Remedial Action Colbert Landfill Spokane, Washington *Final Groundwater Monitoring Plan*. August 7.

Landau Associates. 1992. *Quality Assurance Project Plan - Phase II Remedial Design/Remedial Action - Colbert Landfill - Spokane, WA*. February 28.

Landau Associates. 1991. Colbert Landfill Remedial Design Remedial Action Spokane County, Washington *Final Phase I Engineering Report*. December 30.

EPA. 2011. Colbert Landfill Superfund Site Spokane County, Washington. *Remediation System Evaluation*. U.S. Environmental Protection Agency. October 14.

Landau Associates. 1998. *Colbert Landfill Operations and Maintenance Manual*.

Landau Associates. 1996. *MFS Groundwater Monitoring Plan*

Spokane County Utilities/ Landau Assoc. 2013. *Final Work Plan, Groundwater Pump and Treat System Shut-down Test, Colbert Landfill CERCLA Site*.

Spokane County Utilities. 2007. *1,4-Dioxane Work Plan for the Colbert Landfill*

Spokane County Utilities. 1991. *Quality Assurance and Field Sampling Plan-Colbert Residential Well Sampling*

CH2MHill. May 1997. *Operations and Maintenance Manual for Colbert Landfill Closure*

U.S. District Court, Eastern District of Washington. 1988. Consent Decree No. C-89-033-RJM. The Washington State Department of Ecology and The United States of America on behalf of the U.S. Environmental Protection Agency (plaintiffs) v. County of Spokane and Key Tronic Corporation (defendants). February 28.