Fall 2018 Summary Report

Residential Drinking Water Well Sampling

LRI Landfill

January 2019
Drinking Water Program
Residential Water Sampling Project

Tacoma-Pierce County Health Department
Healthy People in Healthy Communities

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Summary

BACKGROUND

This report is a summary of the water quality sampling event conducted in the Fall of 2018.

All drinking water wells within one-half (1/2) mile of the boundary of the LRI Landfill are eligible for free water quality sampling once each year. The Fall 2018 water sampling is a continuation of a *Residential Drinking Water Well Program (Program)* developed and implemented in 2006, by the Tacoma-Pierce County Health Department, in response to concerns raised during the LRI Landfill's solid waste permit re-issuance process. The Program is a requirement of the LRI Landfill Solid Waste Handling Permit, issued by the Health Department. Substances chosen for testing by the Health Department were selected in order to assess groundwater quality. These tests can provide information about possible groundwater impacts from the landfill.

The Program allows property owners to have their well water sampled in either the Spring ("Spring Participants") or Fall ("Fall Participants") of each year and may decline participation in the Program or drop out of the Program at any time.

The water samples are tested annually for twenty characteristics and substances, including conductivity, pH, ammonia, nitrate, chloride, iron, manganese, magnesium, and Coliform bacteria. In addition to the annual water quality test, participants will have their water tested once every five years for 'Volatile Organic Compounds' (VOCs). Approximately one fifth of the participating property owners will be selected to have their well water tested for VOCs each year, thereby ensuring all participants will have their water analyzed for VOCs once every five-year cycle. However, effective with the spring 2015 sampling event, members of the Woodbrook Homeowners Association are now eligible for annual VOC testing. This change is the result of a legal settlement between the Woodbrook Homeowners Association and LRI over the relocation of Woodbrook Road (317th Street East). The legal settlement facilitated the relocation of Woodbrook Road around the perimeter of the landfill during the summer of 2016. Major construction was completed in Summer of 2016 with follow up work done in summer of 2017. Woodbrook Road currently has been relocated to the south border of the southern portion of the landfill property and is the sole access point for residents of the Woodbrook community.

Although landfills are not regarded as a source of Coliform bacteria in groundwater, the Health Department elected to include Coliform bacteria testing as part of the sampling program. These tests are taken due to the known health effects of bacterial contamination, and because many homeowners in rural areas are unaware of possible bacterial contamination of their well water.

In addition to this Program, the Health Department requires the landfill operator to maintain an on-site groundwater monitoring program. This on-site monitoring program has been in effect since 1999. For the on-site groundwater monitoring program, nine wells around the perimeter of the landfill property are sampled and tested once every 3 months. All groundwater monitoring data from these wells is available from the Health Department.

FALL 2018 SAMPLING EVENT

The Fall 2018 water samples were collected at 43 properties between October 1-4, 2018. Samples collected by the Health Department were analyzed by independent Washington State certified analytical laboratories. Centric Analytical Labs performed bacteriological analyses, and OnSite Environmental Inc. performed organic and inorganic chemical analyses. 2018 Fall participants were sent detailed water quality test results in November 2018. No landfill-related impacts to groundwater quality were identified from the water quality test results.

A complete list of water quality test results may be found on **Table 1** of this summary report.

For the Fall 2018 sampling event, water samples from 22 residential wells were tested for VOCs.

The analytical results indicated that VOCs were detected in water samples from 2 of the 22 wells tested. Of the 68 different VOCs that the testing includes, chloroform and dichlorobromomethane were detected.

The two wells have chlorinated disinfectant systems installed or had added chlorine to their systems prior to the sampling event. Chloroform and dichlorobromomethane are known byproducts of using chlorine as a disinfectant in drinking water. Detections of likely byproducts from adding chlorine to the well did not show a need for re-sampling.

The remaining Fall 2018 water quality test results are consistent with water quality test results from previous sampling events and show groundwater near the landfill remains typical of groundwater chemistry in Pierce County. Iron and manganese levels were consistently above the secondary standards set by the Washington State Department of Health. Elevated iron and manganese levels are typical of groundwater conditions throughout much of Pierce County due to the underlying geology.

The Washington State Department of Health considers iron and manganese a “secondary contaminant.” Secondary contaminants pose aesthetic problems rather than health concerns. High levels of iron and manganese can give water a metallic taste, cause odors, and can cause brown or black staining of porcelain fixtures exposed to the water. They are not a health hazard and are not a result of the LRI Landfill.

The water quality sample results are shown on **Tables 1**,**2 and 2A** of this report. Results that exceed the state water quality standards are shown in bold. For quality control purposes duplicate samples were taken at four locations. Results of the quality control samples are shown on **Tables 3 and 4**.

BACTERIA

During this sampling event, 11 of the 43 wells tested had bacteria present in their well water (bacteria in the water is shown as an “unsatisfactory” test result and indicated as a “U” on Table 1).

CONTACTS

For questions regarding this report or the sample results please contact representatives of the Health Department's Drinking Water Program.

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TABLE 1: Fall 2018 Water Quality Results

Chemical or Analyte*--------------------------------------→

		Dissolved Metals											Total Metals		General Chemistry						Cond/Bact/pH		
Site	**Sample Date**	**Arsenic**	**Barium**	**Calcium**	**Copper**	**Iron**	**Magnesium**	**Manganese**	**Potassium**	**Sodium**	**Vanadium**	**Zinc**	**Iron**	**Manganese**	**Ammonia**	**Chloride**	**Nitrate**	**Nitrite**	**Sulfate**	**Total Dissolved Solids**	**Conductivity**	**Bacteriological**	**pH**
MCL**		**0.01**	**2.0**		**1.3**							**5.0**	**0.3**	**0.05**		**250**	**10.0**	**1.0**	**250**	**500**	**700**		
SR0117337	10/4/2018	0.004	ND	23	ND	ND	9.5	0.18	3.2	11	ND	ND	0.83	0.19	ND	2.1	ND	ND	ND	160	228	S	7.89
SR0117338	10/2/2018	ND	ND	13	ND	ND	9.1	0.041	1.8	8	ND	ND	0.45	0.071	ND	2.2	0.53	ND	ND	120	151	S	6.9
SR0117339	10/4/2018	ND	ND	24	ND	ND	7.2	0.11	3.2	16	ND	ND	0.78	0.16	ND	7.5	ND	ND	ND	150	244	S	7.92
SR0117362	10/4/2018	ND	ND	11	ND	ND	6.3	ND	1.7	7.8	ND	ND	ND	ND	ND	2.8	0.85	ND	ND	170	143.6	S	7.22
SR0117443	10/4/2018	ND	ND	15	ND	1.1	8.9	0.11	3.1	17	ND	ND	2.1	0.12	ND	2.7	ND	ND	ND	160	203.0	S	7.61
SR0117445	10/2/2018	ND	ND	15	ND	ND	7.1	ND	1.4	9	ND	ND	ND	ND	ND	ND	1	ND	ND	130	153	S	7.3
SR0117447	10/2/2018	ND	ND	12	0.036	ND	7.7	ND	2.1	8.2	ND	ND	ND	ND	ND	2.2	1.4	ND	ND	140	154	S	7.0
SR0117449	10/3/2018	ND	ND	18	ND	0.058	6.8	0.16	1.3	13	ND	ND	0.21	0.18	ND	ND	ND	ND	ND	140	188.6	S	7.86
SR0117459	10/1/2018	ND	ND	15	ND	0.18	6.8	0.17	1.7	12	ND	ND	0.5	0.17	0.062	ND	ND	ND	ND	77	175	S	7.8
SR0117478	10/4/2018	ND	ND	16	ND	0.07	7.1	0.2	1.6	13	ND	ND	0.76	0.21	ND	5.6	0.58	ND	ND	130	187.6	S	7.82
SR0117479	10/3/2018	ND	ND	14	ND	0.33	6.6	0.17	1.4	11	ND	ND	0.88	0.17	ND	ND	ND	ND	ND	130	165.9	S	8.01
SR0117480	10/2/2018	ND	ND	19	ND	0.63	9.2	0.72	1.5	20	ND	ND	0.71	0.73	ND	2.4	ND	ND	ND	150	233	U	7.6
SR0120517	10/1/2018	0.0045	ND	25	ND	ND	13	0.22	3.4	10	ND	ND	0.16	0.18	0.094	7	ND	ND	11	150	252	U	7.8
SR0120518	10/2/2018	0.0032	ND	11	ND	0.14	9.2	0.39	2.1	20	ND	ND	0.23	0.42	ND	ND	ND	ND	ND	140	191	U	7.8
SR0120529	10/4/2018	ND	ND	14	ND	0.47	6.9	0.18	1.3	9.8	ND	0.031	0.9	0.18	ND	ND	ND	ND	ND	120	171.6	S	7.73
SR0120540	10/3/2018	0.0036	ND	26	ND	ND	9.2	0.084	3.4	16	ND	ND	0.48	0.13	ND	17	ND	ND	ND	200	234	S	7.6
SR0120627	10/1/2018	ND	ND	13	ND	ND	6.4	ND	1.8	8.8	ND	ND	ND	ND	ND	ND	0.41	ND	ND	110	137	U	7.3
SR0120631	10/1/2018	ND	ND	19	ND	0.057	7.7	0.15	2	21	ND	ND	1	0.13	ND	ND	0.056	ND	ND	110	220	S	7.8
SR0120639	10/2/2018	0.0058	ND	24	ND	ND	13	0.41	3	10	ND	ND	0.45	0.4	0.27	4.1	0.27	ND	5.7	170	259	S	8.0
SR0120645	10/1/2018	ND	ND	21	ND	ND	7.2	0.26	1.6	16	ND	ND	0.11	0.21	0.06	ND	ND	ND	ND	110	186	S	8.2
SR0120742	10/2/2018	ND	ND	ND	ND	ND	ND	ND	ND	38	ND	ND	ND	ND	ND	ND	0.17	ND	ND	130	157	S	7.9
SR0120928	10/2/2018	ND	ND	ND	ND	ND	ND	ND	ND	65	ND	ND	0.1	ND	ND	ND	ND	ND	ND	170	239	S	7.8
SR0120938	10/4/2018	ND	ND	12	0.033	ND	5.9	ND	1.7	9.1	ND	ND	ND	ND	ND	5.5	2.5	ND	ND	140	150.1	U	6.76
SR0126801	10/2/2018	0.0045	ND	28	ND	ND	19	0.02	3.9	9.4	ND	ND	ND	0.032	ND	8.2	ND	ND	13	210	330	U	7.8
SR0126807	10/2/2018	ND	ND	14	ND	ND	7.7	ND	1.8	8.4	ND	ND	ND	ND	ND	3.5	0.84	ND	7.6	120	162	S	7.2
SR0126808	10/2/2018	ND	ND	13	ND	ND	16	ND	2	9.4	ND	ND	ND	ND	ND	5.8	4	ND	ND	190	228	U	7.7
SR0126809	10/4/2018	0.0039	ND	17	ND	0.14	6.1	0.12	1.3	9.7	ND	ND	0.17	0.12	ND	2.1	ND	ND	ND	110	162.7	S	8.01
SR0133428	10/1/2018	ND	ND	16	ND	0.098	5.9	0.15	1.1	12	ND	ND	1.2	0.15	ND	ND	ND	ND	ND	91	169	U	7.9
SR0133429	10/3/2018	ND	ND	14	ND	0.13	6.3	0.13	1.3	11	ND	ND	0.76	0.15	ND	ND	ND	ND	ND	110	160.2	U	7.93
SR0133430	10/4/2018	ND	ND	15	ND	ND	6.5	0.12	1.2	12	ND	ND	0.28	0.12	ND	ND	ND	ND	ND	110	173.8	S	8.17
SR0145751	10/3/2018	ND	ND	15	ND	0.15	6.1	0.14	1.1	12	ND	0.03	3	0.14	ND	3.3	ND	ND	ND	130	175.9	S	7.87
SR0154486	10/4/2018	ND	ND	12	ND	ND	5.7	0.25	ND	8.2	ND	0.031	0.13	0.27	ND	ND	ND	ND	ND	100	130.8	S	7.99
SR0169553	10/3/2018	0.0031	ND	18	ND	ND	6.8	0.13	1.9	14	ND	ND	0.52	0.13	ND	2.4	ND	ND	ND	100	190.9	S	7.82
SR0169703	10/3/2018	0.0073	ND	21	ND	0.27	7.9	0.77	2.3	16	ND	ND	2.2	0.81	0.92	3.5	ND	ND	ND	180	265	U	7.58
SR0169704	10/3/2018	ND	ND	18	ND	0.13	6.9	0.11	1.3	13	ND	ND	0.38	0.11	ND	ND	ND	ND	ND	150	175.5	S	7.91
SR0185993	10/1/2018	ND	ND	16	ND	0.12	6.6	0.14	1.3	11	ND	ND	0.41	0.13	ND	2	0.061	ND	ND	100	165	S	8.0
SR0192658	10/1/2018	0.0035	ND	ND	ND	ND	ND	ND	ND	54	ND	ND	ND	ND	ND	2.6	0.05	ND	ND	140	267	S	9.6
SR0198408	10/2/2018	ND	ND	22	ND	0.074	9.8	0.75	1.4	16	ND	ND	0.23	0.73	ND	ND	ND	ND	ND	140	224	S	7.6
SR0217737	10/3/2018	ND	ND	ND	ND	ND	ND	ND	ND	42	ND	ND	0.077	ND	ND	ND	ND	ND	ND	140	164.8	S	8.24
SR0217738	10/1/2018	ND	ND	20	ND	0.58	9.6	0.56	1.1	21	ND	ND	1.2	0.6	0.13	ND	ND	ND	ND	150	222	S	7.4
SR0219859	10/4/2018	0.0035	ND	22	ND	ND	12	0.17	3.5	9	ND	ND	0.25	0.18	ND	5.6	0.27	ND	8.9	180	239	S	7.94
SR0230734	10/3/2018	ND	ND	14	ND	ND	6.7	0.21	1.6	14	ND	ND	1.3	0.23	ND	ND	ND	ND	ND	130	177.8	S	7.73
SR0230735	10/3/2018	ND	ND	13	ND	ND	6.4	ND	1.6	8.4	ND	ND	ND	ND	ND	2.9	1.1	ND	ND	150	150.1	U	7.06

Units of measurement = Parts Per Million (mg/L), except for bacteria, conductivity, and pH
ND = Not detected at the specified laboratory detection limit
U = Unsatisfactory (bacteria are present in the sample)
S = Satisfactory
****MCL = Maximum Contamination Level**
1 = Sites with a "T" indicate a water treatment system was present.
***Please refer to the "Water Quality and Abbreviation and Notes" page for information about the terms used on this table.**

TABLE 2: Fall 2018 Water Quality VOC Results

	MCL	SR0117337	SR0117339	SR0117362	SR0117443	SR0117449	SR0117478	SR0117479	SR0120529	SR0120540	SR0120938	SR0126809	SR0133429	SR0133430	SR0145751	SR0154486	SR0169553	SR0169703	SR0169704	SR0217737	SR0219859	SR0230734	SR0230735
1,1,1,2-Tetrachloroethane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinylether	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromobenzene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CFC-11	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CFC-12	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	7	ND	**10**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.88**	ND	ND
Chloromethane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,2-Dichloroethene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,3-Dichloropropene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorobromomethane	---	ND	**1.1**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.22**	ND	ND
Ethylbenzene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylene dibromide	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m, p-Xylene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Iodide	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Isobutyl Ketone	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl t-Butyl Ether	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Isopropyltoluene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,2-Dichloroethene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-Dichloropropene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Acetate	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Units of measurement = Parts per Billion (ug/L)
ND = Not detected at the specified laboratory detection limit
MCL = Maximum Contamination Level

TABLE 3: Fall 2018 Water Quality Duplicate Results

Chemical or Analyte*--------------------------------------→

		Dissolved Metals											Total Metals		General Chemistry					
RECORD_ID	Collection Date	Arsenic	Barium	Calcium	Copper	Iron	Magnesium	Manganese	Potassium	Sodium	Vanadium	Zinc	Iron	Manganese	Ammonia	Chloride	Nitrate	Nitrite	Sulfate	Total Dissolved Solids
SR0120938	10/4/2018	ND	ND	12	0.054	ND	5.9	ND	1.6	9.1	ND	ND	ND	ND	ND	5.4	2.4	ND	ND	120
SR0126807	10/2/2018	ND	ND	13	ND	ND	7.6	ND	1.8	8.2	ND	ND	ND	ND	ND	3.5	0.81	ND	7.5	120
SR0185993	10/1/2018	ND	ND	17	ND	0.15	6.9	0.15	1.2	11	ND	ND	0.56	0.14	ND	ND	0.055	ND	ND	100
SR0230735	10/3/2018	ND	ND	13	ND	ND	6.5	ND	1.6	8.6	ND	ND	ND	ND	ND	2.8	1.1	ND	ND	140

Units of measurement = Parts Per Million (mg/L)

ND = Not detected at the specified laboratory detection limit
****MCL = Maximum Contamination Level**

MCL exceedances for Iron and Manganese do not pose a health risk.

<u>*Please refer to the “Water Quality and Abbreviation and Notes” page for information about the terms used on this table</u>

TABLE 4: Fall 2018 Water Quality VOC Duplicate Results

	MCL	SR0120938	SR0230735
1,1,1,2-Tetrachloroethane	---	ND	ND
1,1,1-Trichloroethane	0.2	ND	ND
1,1,2,2-Tetrachloroethane	---	ND	ND
1,1,2-Trichloroethane	---	ND	ND
1,1-Dichloroethane	1	ND	ND
1,1-Dichloroethene	---	ND	ND
1,1-Dichloropropene	---	ND	ND
1,2,3-Trichlorobenzene	---	ND	ND
1,2,3-Trichloropropane	---	ND	ND
1,2,4-Trichlorobenzene	---	ND	ND
1,2,4-Trimethylbenzene	---	ND	ND
1,2-Dibromo-3-chloropropane	---	ND	ND
1,2-Dichlorobenzene	---	ND	ND
1,2-Dichloroethane	0.5	ND	ND
1,2-Dichloropropane	0.6	ND	ND
1,3,5-Trimethylbenzene	---	ND	ND
1,3-Dichlorobenzene	---	ND	ND
1,3-Dichloropropane	---	ND	ND
1,4-Dichlorobenzene	4	ND	ND
2,2-Dichloropropane	---	ND	ND
2-Butanone	---	ND	ND
2-Chloroethylvinylether	---	ND	ND
2-Chlorotoluene	---	ND	ND
2-Hexanone	---	ND	ND
4-Chlorotoluene	---	ND	ND
Acetone	---	ND	ND
Benzene	1	ND	ND
Bromobenzene	---	ND	ND
Bromochloromethane	0.3	ND	ND
Bromoform	5	ND	ND
Bromomethane	---	ND	ND
Carbon Disulfide	---	ND	ND
Carbon Tetrachloride	0.3	ND	ND
CFC-11	---	ND	ND
CFC-12	---	ND	ND
Chlorobenzene	---	ND	ND
Chloroethane	---	ND	ND
Chloroform	7	ND	ND
Chloromethane	---	ND	ND
Cis-1,2-Dichloroethene	---	ND	ND
Cis-1,3-Dichloropropene	---	ND	ND
Dibromochloromethane	---	ND	ND
Dibromomethane	---	ND	ND
Dichlorobromomethane	---	ND	ND
Ethylbenzene	---	ND	ND
Ethylene dibromide	---	ND	ND
Hexachlorobutadiene	---	ND	ND
Isopropylbenzene	---	ND	ND
m, p-Xylene	---	ND	ND
Methyl Iodide	---	ND	ND
Methyl Isobutyl Ketone	---	ND	ND
Methyl t-Butyl Ether	---	ND	ND
Methylene Chloride	5	ND	ND
Naphthalene	---	ND	ND
n-Butylbenzene	---	ND	ND
n-Propylbenzene	---	ND	ND
o-Xylene	---	ND	ND
p-Isopropyltoluene	---	ND	ND
sec-Butylbenzene	---	ND	ND
Styrene	---	ND	ND
tert-Butylbenzene	---	ND	ND
Tetrachloroethene	---	ND	ND
Toluene	---	ND	ND
Trans-1,2-Dichloroethene	---	ND	ND
Trans-1,3-Dichloropropene	---	ND	ND
Trichloroethene	---	ND	ND
Vinyl Acetate	---	ND	ND
Vinyl Chloride	0.02	ND	ND

Units of measurement = Parts per Billion (ug/L)
ND = Not detected at the specified laboratory detection limit
MCL = Maximum Contamination Level

Water Quality Abbreviations and Notes:

Analyte: The chemical or metal tested for in the water sample.

Result: The level of the chemical or mineral detected by the laboratory in this water sample.

ND: Non-Detect, the chemical or metal was not detected in this water sample.

Unit: The unit of measure reported by the laboratory.

mg/l: milligrams per liter, or 1 part per million.

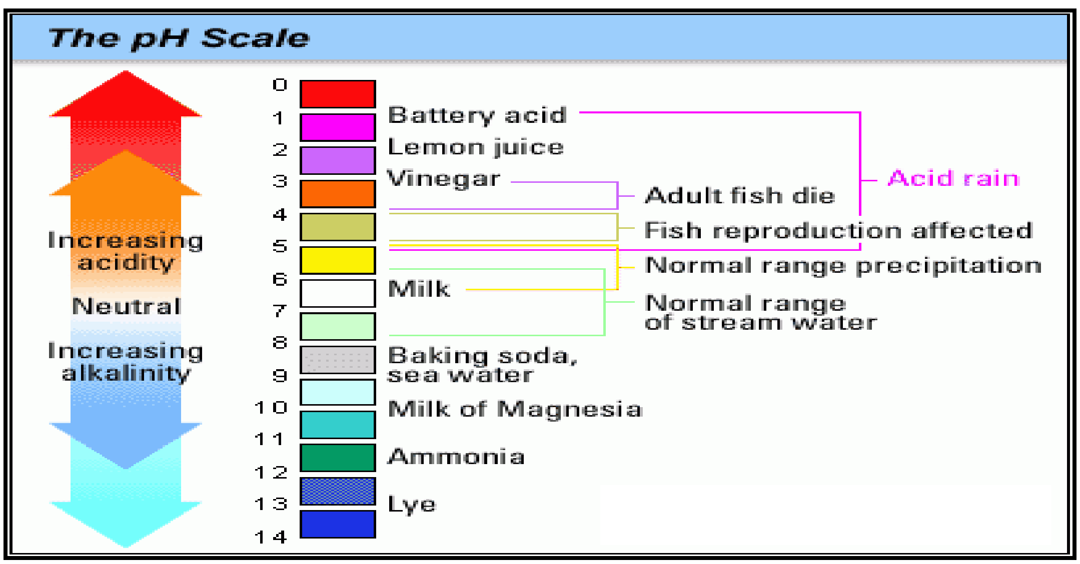
MCL: "Maximum Contaminant Level". The water quality standard established by state or federal regulation.

#/100ml: The number of bacteria colonies detected in 100 milliliters of water.

Note: An MCL of "0.00" means that there should be no bacteria detected in the water sample.

uS/cm: microSiemens per centimeter, a measurement of the ability of the water to conduct an electrical charge (sometimes reported as microMhos). Used to help determine the presence of some chemical ions.

pH: A numerical measure of the level of acidity or alkalinity of the water. See the table below.



ppb: Parts per billion often expressed as micrograms per liter (ug/L)

Unit: The unit of measure reported by the laboratory.

#/100ml: Unit of measure for *Bacteria* test, the number of bacteria colonies detected in 100 milliliters of water. Note: An MCL of "0/100" means that there should be zero bacteria detected in the 100 milliliter water sample.

(---): The Environmental Protection Agency and/or the Centers for Disease Control and Prevention have not established a health-risk based maximum contaminant level (MCL) for this chemical, metal, or property.

APPENDIX A

Sampling for Volatile Organic Compounds

In 2007, several program participants and members of the Graham Land Use Advisory Commission asked why 'volatile organic compounds' (VOC) had not been included in the original LRI Landfill residential drinking water sampling program. They asked to have the sampling program modified to include testing for these volatile organic compounds. Because of the request and inquiries, the sampling program was modified to include a limited suite of approximately 68 VOCs for analysis.

The program modification included a provision to test each participating well once every five-year period for VOCs. This modification began during the Fall 2007 sampling event with the testing of nine residential wells for VOCs.

Where do VOCs come from?

Common artificial sources of VOCs are many and varied, but can include paint thinners, dry cleaning solvents, and some constituents of petroleum-based fuels (e.g., gasoline and natural gas). Landfills, through the anaerobic digestion of waste generate methane gas, which is also considered a VOC