2018 Loop Quality Data Summary

King County | Resource Recovery

This information is available
in accessible formats on request
at 206-477-5371 (voice) or
711 (for TTYTDD users only).

Table of Contents

1.0 Introduction

Biosolids are the nutrient-rich organic products of the wastewater treatment process. Biosolids contain water, organic matter, sand, nutrients, microorganisms, trace metals, and trace organic compounds. Because of their moisture content, carbon-rich characteristics, essential nutrients for plants, and very low levels of pollutants, biosolids are effective, safe, and sustainable to use as a fertilizer replacement and soil amendment for forest trees and agricultural crops, and as an ingredient in compost for landscaping.

The King County Wastewater Treatment Division began conducting research and recycling biosolids through land application in 1973. The program has grown to beneficially recycle 100% of the nearly 120,000 wet tons (or approximately 29,500 dry tons) produced annually in agriculture, forestry, soil reclamation, and compost.

King County's biosolids are called Loop®, a name and brand created in 2011, to reflect the nature of biosolids and the benefits of returning carbon and nutrients to the land.

Loop is certified as Class B biosolids. Biosolids are classified as Class A or Class B based on the level of pathogen reduction. Class A biosolids are treated to eliminate pathogens and can be used in landscaping and home gardens. Class B biosolids are treated to significantly reduce, but not eliminate, pathogens. Therefore, use of Class B biosolids requires application site permits which include public access and crop harvest restrictions to allow for die-off of pathogens to non-detectable levels after application. These regulatory requirements make the use of Class A and Class B biosolids equally safe.

To ensure the safety and efficacy of Loop, we routinely monitor its physical, chemical, and microbial characteristics. This monitoring is performed monthly in order to characterize the biosolids, evaluate changes over time, and provide data to determine appropriate application rates for Loop biosolids.

Summary data for all parameters is included in the appendix of this report and raw data is available on request from King County. All data included in tables have been rounded in accordance with the accuracy of the specific analytical procedure. Unless otherwise noted, all concentrations are reported on a dry weight basis. Concentrations of metals, nutrients, and organic compounds are reported in terms of either percent or parts per million (ppm or mg/kg) dry. Microbiological data are reported in terms of organisms per gram or organisms per 4 grams on a dry weight basis.

This report summarizes the 2018 monitoring of Loop biosolids from West Point Treatment Plant, South Treatment Plant, and Brightwater Treatment Plant. Both state and federal regulations (WAC 173-308 and 40 CFR Part 503) apply to biosolids. Loop meets the most stringent quality standards for metals, as well as the anaerobic digestion process requirements for Class B pathogen reduction and vector attraction reduction.

Regular quality testing not only fulfills our regulatory requirements, but also ensures that we are providing a safe and effective product to our partners and customers.

2.0 Metals

Every month, the King County Environmental Lab tests Loop samples from all three plants for the presence and concentrations of 18 metals. Nine of these metals are regulated under state and federal biosolids rules: arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc. We began collecting metals data as soon as we began biosolids production (since 1981 at West Point, 1988 at South Plant, and 2012 at Brightwater).

Throughout 2018 the concentrations of the nine regulated metals in Loop biosolids were well below the most stringent state and federal regulatory levels (Figure 1). Since 1990, there has been a statistically significant decrease in all regulated metals, with the exception of Selenium. Selenium has remained stable at low levels for the last 28 years.

The overall long-term reduction in concentration of many metals in Loop over time is attributed to King County's source control efforts, as well as the ongoing corrosion control programs implemented by the Cities of Renton and Seattle and the removal of lead from gasoline and leaded solder from plumbing.

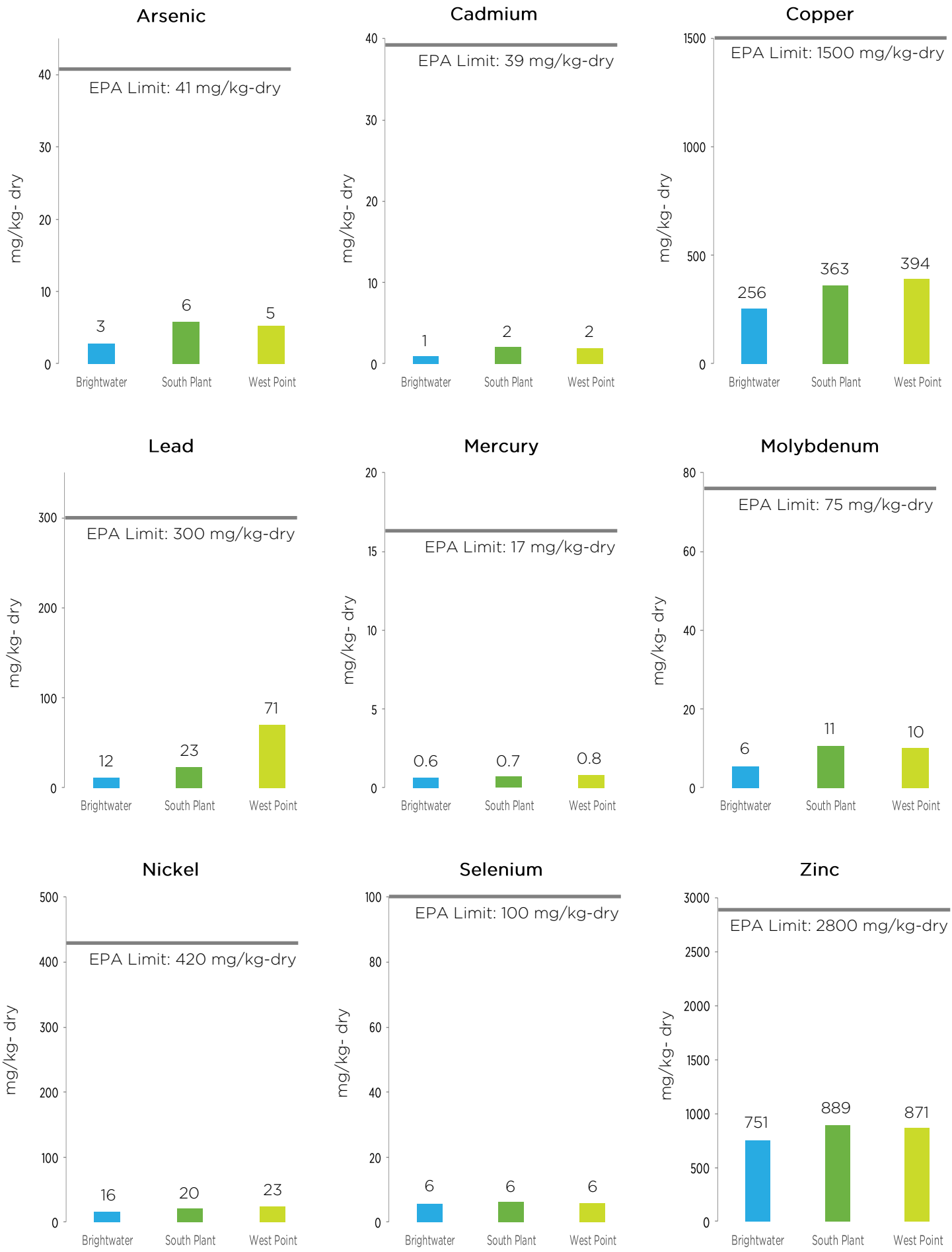


Figure 1. 2018 Metals Data for Loop compared to EPA safety limits

3.0 Conventional Constituents

3.1 Nutrients

In order to calculate application rates and the value of Loop as a fertilizer replacement, we test for total nitrogen, phosphorus, sulfur, and potassium on a monthly basis. Nitrogen is limiting factor on which we base all application rates. 2018 levels of nitrogen, phosphorus, sulfur, and potassium are comparable to previous years (Figure 2).

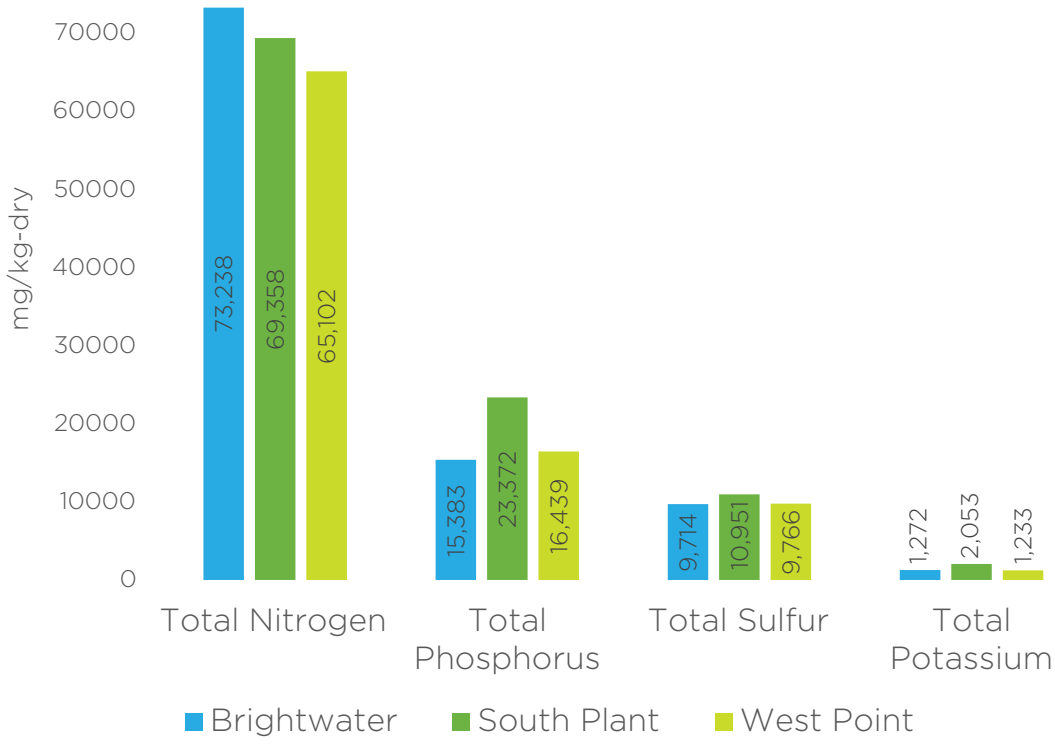


Figure 2. Average 2018 nitrogen, phosphorus, sulfur, and potassium levels of Loop.

3.2 pH

Average pH values of biosolids in 2018 at West Point, South Plant, and Brightwater were 8.8, 8.58, and 8.83 respectively. The pH of biosolids at all the treatment plants has changed little over time.

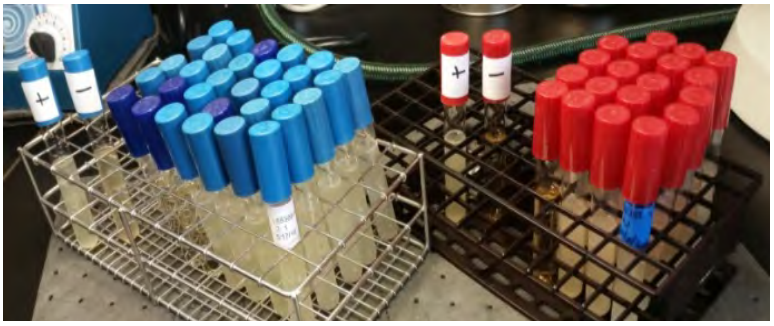
3.3 Volatile Solids Reduction

Volatile solids represent the organic matter fraction of the biosolids that can be degraded by microorganisms over time. Volatile solids reduction ensures that vectors, such as insects and rodents, are not attracted to the biosolids, thereby reducing the spread of pathogens and diseases. West Point, South Plant, and Brightwater reduced their volatile solids by 65.0%, 60.9%, and 62.2% respectively, well above the 38% required by the EPA.

4.0 Microbial Constituents

Loop biosolids are digested for the required time and at specific temperatures to meet the Class B regulatory requirement to significantly reduce pathogens. Since the anaerobic digestion used at our treatment plants is known to be effective, we are not required to test for microbial properties of Loop. However, we monitor pathogens regardless of regulatory requirements.

Fecal coliform and *Salmonella* are analyzed on a monthly basis. The levels of fecal coliform at West Point, South Plant, and Brightwater were well below the acceptable two million most probable number/gram for Class B biosolids. *Salmonella* levels were also reflective of Class B biosolids quality.



Blue tubes show the two tests for fecal coliform. Positive results are indicated by turbidity (cloudiness) and small gas bubbles.

Loop is tested quarterly for the presence of viruses and several parasites with public health significance. These parasites include *Ascaris species, Giardia lamblia*, hookworm, *Hymenolepis species, Taenia species, Trichuris trichiura* and *Toxocara species*. Of these, hookworm was detected in most quarterly samples and *Hymenolepis* was detected in one sample from West Point. It is not uncommon in Class B biosolids (and regular soil) to occasionally have some parasites present. In 2018, we found no viruses in any of the samples.

5.0 Trace Organic Constituents

Loop was analyzed for 140 trace organic compounds, many of which are identified by EPA as priority. Eighteen of these 140 organic compounds were detected at very small concentrations in Loop. This degree of testing for trace organics, though not required by federal or state regulations for biosolids use, provides additional information and assurance as to the high quality of the Loop product.

The following types of organic compounds were detected in very low concentrations during 2018:

- Phthalates, which are plasticizers used in many products (including food wrap, cosmetics, and PVC), are prevalent in the environment. Phthalates do not persist in soils and are rapidly removed by volatilization and microbial decomposition.

- Solvents, such as phenol, acetone, toluene, and carbon disulfide are widely used in both residences and industry, and are commonly found in high concentrations in commercial products such as paint and resins. Concentrations in biosolids are very low. Solvents degrade or volatilize rapidly in soil, and land application of biosolids is not considered a significant pathway of human exposure.

- Polycyclic Aromatic Hydrocarbons (PAHs) are a product of incomplete combustion and are ubiquitous environmental pollutants due to their transport in the atmosphere. Natural sources include forest fires and volcanic eruptions, while

anthropogenic sources include creosote, asphalt, and burning of fossil fuels and biomass, including residential wood burning. Transfer of PAHs from soil has been shown to be minimal for root crops, and essentially zero for above-ground crops. Total PAH concentrations in Loop are small and similar to urban soil background concentrations.

- Although EPA banned manufacture and commercial use of polychlorinated biphenyls, also called PCBs or aroclors, in 1979, these compounds are persistent in the environment. PCBs enter wastewater from atmospheric deposition and stormwater runoff and may be found in very low concentrations in biosolids. In 2018, the total aroclors detected in Loop at all three treatment plants had concentrations ranging from 0.04 to 0.44 mg/kg.

After extensive review of biosolids data, EPA chose not to establish criteria or monitoring requirements for organic compounds due to the low concentrations found in biosolids and the minimal risk to public health and the environment. In general, research on the bioavailability of trace organic compounds to plants indicates that the risk to humans consuming food crops grown on soils amended with biosolids is negligible.

6.0 Conclusions

Loop continues to be an excellent product, with respect to all relevant criteria. Concentrations of regulated metals were consistently well below the most stringent state and federal standards for land application of biosolids. Loop from all three treatment plants may be used to safely and effectively improve soils, sequester carbon, provide nutrients for agricultural crops and forest plantations, and make high-quality compost.

7.0 Appendix

Table 1: 2018 Summary of Metals, Conventional, Microbial, and Organics Data for West Point Loop

Table 2: 2018 Summary of Metals, Conventional, Microbial, and Organics Data for South Plant Loop

Table 3: 2018 Summary of Metals, Conventional, Microbial, and Organics Data for Brightwater Loop

Table 4: List of Organic Compounds Analyzed in Loop

Table 1. 2018 Summary of Metals, Conventional, Microbiological, and Organics Data for West Point Loop Biosolids

Metals	Number of Detections	Minimum	Median	Maximum	Standard Deviation	Mean	Regulatory Limits
Arsenic (mg/kg)	16	4.57	5.33	5.79	0.44	**5.24**	41
Barium (mg/kg)	16	157	170	204	13	**173**	
Beryllium (mg/kg)	13	0.10	0.15	0.18	0.03	**0.14**	
Boron (mg/kg)	12	10.36	12.15	13.60	1.01	**12.17**	
Cadmium (mg/kg)	16	1.6	1.8	2.5	0.2	**1.9**	39
Calcium (mg/kg)	12	17647	19625	21734	1259	**19681**	
Chromium (mg/kg)	16	24.7	30.9	40.5	4.6	**31.3**	
Copper (mg/kg) Iron	16	310	391	448	31	**388**	1500
(mg/kg)	12	12077	14623	18720	2239	**15327**	
Lead (mg/kg)	17	57.8	70.6	93.9	10.7	**72.3**	300
Magnesium (mg/kg)	12	6000	6938	8352	742	**6937**	
Manganese (mg/kg)	12	270	475	1040	294	**580**	
Mercury (mg/kg)	15	0.52	0.69	1.33	0.20	**0.77**	17
Molybdenum (mg/kg)	12	6.3	9.6	16.1	3.3	**10.1**	
Nickel (mg/kg)	16	18.1	24.0	28.9	3.4	**23.6**	420
Selenium (mg/kg)	16	4.03	5.60	6.41	0.66	**5.52**	100
Silver (mg/kg)	16	2.26	3.19	7.82	1.21	**3.50**	
Zinc (mg/kg)	16	754	836	1008	85	**872**	2800

Conventional	Number of Detections	Minimum	Median	Maximum	Standard Deviation	Mean
Total Solids (%)	12	24.5	26.8	35.2	0.0	**27.2**
Total Volatile Solids Reduction (%)	12	58.68	64.03	72.43	4.76	**64.99**
pH	12	8.58	8.85	8.92	0.11	**8.80**
Total Kjeldahl Nitrogen (mg/kg)	12	59058	65841	70522	4168	**65102**
Ammonia Nitrogen (mg/kg)	12	6642	8248	10153	962	**8395**
Organic Nitrogen (mg/kg)	12	50865	56755	63806	4323	**56687**
Total Phosphorus (mg/kg)	12	14739	16973	18238	1186	**16439**
Total Potassium (mg/kg)	12	981	1180	1502	164	**1233**
Total Sulfur (mg/kg)	12	8581	10110	10605	710	**9766**

Microbiological	Number of Detections	Minimum	Median	Maximum	Geometric Mean
Fecal Coliform (org/g dry)	12	49057	184777	842912	**188846**
Salmonella (org/4g dry)	12	10.81	66.35	1446.54	**70.51**
Total Viruses (PFU/4g dry)*	ND				
Parasites (no units)	4**	CC	CC	CC	**CC**

Organics	Compound Name	Number of Detections	Minimum	Median	Maximum	Standard Deviation	Mean
Volatiles (mg/kg)							
	2-Butanone (MEK)	4	0.15	0.59	1.58	0.62	**0.73**
	Acetone	4	0.52	3.13	7.10	2.78	**3.47**
	Carbon Disulfide	3	0.02	0.03	0.05	0.01	**0.03**
	Toluene	4	0.03	0.04	0.11	0.04	**0.06**
Polycyclic Aromatic Hydrocarbons (mg/kg)	Phenanthrene	3	0.68	0.83	0.85	0.09	**0.79**
	n-Decane	4	13.15	26.85	53.24	18.67	**30.02**
	Anthracene	2	0.39	0.45	0.52	0.09	**0.45**
Semivolatiles (mg/kg)	Benzoic Acid	2	10.07	11.33	12.59	1.78	**11.33**
	Bis(2-Ethylhexyl) Phthalate	4	26.14	33.62	41.03	7.38	**33.60**
	Phenol	4	4.10	8.08	11.97	3.27	**8.06**
Polychlorinated Biphenyls (mg/kg)	Total Aroclors	4	0.17	0.28	0.45	0.14	**0.30**

*PFU = Plaque Forming Unit ND = Not Detected CC= Cannot Calculate

**Hookworm was present in 3 samples. *Hymenolepis species* was present in one sample.

Table 2. 2018 Summary of Metals, Conventional, Microbiological, and Organics Data for South Plant Loop Biosolids

Metals	Number of Detections	Minimum	Median	Maximum	Standard Deviation	Mean	Regulatory limits
Arsenic (mg/kg)	19	3.89	6.08	7.69	0.74	5.94	41
Barium (mg/kg)	19	160	188	207	14	187	
Beryllium (mg/kg)	4	0.11	0.12	0.13	0.01	0.12	
Boron (mg/kg)	11	18.33	23.21	27.07	2.62	22.75	
Cadmium (mg/kg)	19	1.71	2.12	2.61	0.28	2.16	39
Calcium (mg/kg)	11	24664	26167	28876	1358	26432	
Chromium (mg/kg)	19	26.4	29.7	36.6	2.1	30.4	
Copper (mg/kg)	19	325	361	428	36	370	1500
Iron (mg/kg)	11	12881	18729	23500	3085	17953	
Lead (mg/kg)	19	18.9	23.5	29.0	3.0	23.5	300
Magnesium (mg/kg)	11	5556	7360	9516	1323	7648	
Manganese (mg/kg)	11	399	508	824	144	563	
Mercury (mg/kg)	20	0.51	0.69	1.01	0.12	0.69	17
Molybdenum (mg/kg)	11	7.5	10.1	13.6	2.2	10.2	
Nickel (mg/kg)	19	16.5	20.8	24.1	2.5	20.3	420
Selenium (mg/kg)	19	5.28	6.19	6.87	0.46	6.11	100
Silver (mg/kg)	19	2.09	2.85	5.48	0.80	2.99	
Zinc (mg/kg)	19	777	880	1063	86	914	2800

Conventional	Number of Detections	Minimum	Median	Maximum	Standard Deviation	Mean
Total Solids (%)	12	17.50	21.90	25.50	0.03	21.07
Total Volatile Solids Reduction (%)	12	56.00	62.50	64.00	2.84	60.92
pH	12	6.80	8.70	9.10	0.58	8.58
Total Kjeldahl Nitrogen (mg/kg)	12	64384	69706	76344	3072	69358
Ammonia Nitrogen (mg/kg)	12	9588	12035	14807	1822	12338
Organic Nitrogen (mg/kg)	12	51546	56290	62366	3332	56946
Total Phosphorus (mg/kg)	12	17078	23935	27258	3027	23372
Total Potassium (mg/kg)	11	1107	2129	2737	497	2053
Total Sulfur (mg/kg)	11	8660	11183	12374	1180	10951

Microbial	Number of Detections	Minimum	Median	Maximum	Geometric Mean
Fecal Coliform (org/g dry)	12	30120	80383	231569	87591
Salmonella (org/4g dry)	12	2.46	39.38	251.91	32.27
Total Viruses (PFU/4g dry)*	ND				
Parasites (no units)	3**	CC	CC	CC	CC

Organics	Compound Name	Number of Detections	Minimum	Median	Maximum	Standard Deviation	Mean
Volatiles (mg/kg)	2-Butanone (MEK)	8	0.08	0.20	1.03	0.35	0.36
	Acetone	8	0.31	0.81	3.90	1.24	1.38
	Carbon Disulfide	7	0.02	0.04	0.07	0.02	0.04
	Toluene	8	0.01	0.03	0.07	0.02	0.03
Polycyclic Aromatic Hydrocarbons (mg/kg)	Fluoranthene	1	0.46	0.46	0.46	CC	0.46
	n-Decane	1	2.47	2.47	2.47	CC	2.47
	n-Octadecane	8	13.33	16.80	42.30	9.65	20.73
	Phenanthrene	1	0.81	0.81	0.81	CC	0.81
	Total Xylenes	1	0.04	0.04	0.04	CC	0.04
Semivolatiles (mg/kg)	Benzoic Acid	5	6.90	12.63	17.64	4.00	12.15
	Bis(2-Ethylhexyl) Phthalate	8	32.87	42.61	52.50	7.48	42.06
	Phenol	8	5.05	7.68	12.04	2.69	8.29
Polychlorinated Biphenyls (mg/kg)	Total Aroclors	8	0.05	0.07	0.24	0.07	0.09

*PFU = Plaque Forming Unit ND= Not Detected CC=Cannot Calculate

**Hookworm was present in 3 samples

Table 3. 2018 Summary of Metals, Conventional, Microbiological, and Organics Data for Brightwater Loop Biosolids

Metals	Number of Detections	Minimum	Median	Maximum	Standard Deviation	Mean	Regulatory Limits
Arsenic (mg/kg)	15	2.36	2.66	3.07	0.24	**2.69**	41
Barium (mg/kg)	15	123	132	344	55	**157**	
Beryllium (mg/kg)	1	0.14	0.14	0.14	CC	**0.14**	
Boron (mg/kg)	12	48.44	52.21	97.52	13.22	**56.74**	
Cadmium (mg/kg)	15	0.85	0.95	1.29	0.12	**0.94**	39
Calcium (mg/kg)	12	22212	23226	26020	1186	**23589**	
Chromium (mg/kg)	15	13.6	15.6	19.9	1.9	**16.1**	
Copper (mg/kg)	15	240	254	282	13	**257**	1500
Iron (mg/kg)	12	5436	6675	8551	1031	**6832**	
Lead (mg/kg)	15	8.6	9.9	21.6	3.9	**11.3**	300
Magnesium (mg/kg)	12	2819	3486	3986	319	**3477**	
Manganese (mg/kg)	12	365	593	1025	205	**607**	
Mercury (mg/kg)	16	0.47	0.55	1.38	0.22	**0.63**	17
Molybdenum (mg/kg)	12	4.6	5.4	6.2	0.5	**5.5**	
Nickel (mg/kg)	15	13.2	15.0	24.6	2.9	**15.8**	420
Selenium (mg/kg)	15	4.76	5.45	6.37	0.54	**5.56**	100
Silver (mg/kg)	15	2.18	2.74	3.72	0.48	**2.73**	
Zinc (mg/kg)	15	690	754	804	30	**755**	2800

Conventional	Number of Detections	Minimum	Median	Maximum	Standard Deviation	Mean
Total Solids (%)	16	19.20	20.10	21.10	0.01	**20.23**
Total Volatile Solids Reduction (%)	12	59.43	62.06	65.69	1.85	**62.19**
pH	12	8.49	8.85	9.04	0.16	**8.83**
Total Kjeldahl Nitrogen (mg/kg)	12	65829	72467	85938	5506	**73238**
Ammonia Nitrogen (mg/kg)	12	7546	8798	10256	859	**8899**
Organic Nitrogen (mg/kg)	12	56784	64405	76563	5436	**64274**
Total Phosphorus (mg/kg)	12	14010	15596	16979	998	**15383**
Total Potassium (mg/kg)	12	977	1244	1573	150	**1272**
Total Sulfur (mg/kg)	12	9146	9617	10376	462	**9714**

Microbial	Number of Detections	Minimum	Median	Maximum	Geometric Mean
Fecal Coliform (org/g dry)	12	25167	59493	388971	**64097**
Salmonella (org/4g dry)	15	2.15	484.85	19256.93	**365.66**
Total Viruses (PFU/4g dry)*	ND				
Parasites (no units)	3**	CC	CC	CC	**CC**

Organics	Compound Name	Number of Detections	Minimum	Median	Maximum	Standard Deviation	Mean
Volatiles (mg/kg)	2-Butanone (MEK)	4	0.19	0.60	0.88	0.29	**0.57**
	Acetone	4	0.91	3.12	4.32	1.45	**2.87**
	Carbon Disulfide	1	0.03	0.03	0.03	CC	**0.03**
	Toluene	4	0.03	0.08	0.09	0.03	**0.07**
Polycyclic Aromatic Hydrocarbons (mg/kg)	n-Decane	1	1.65	1.65	1.65	CC	**1.65**
	n-Octadecane	4	16.30	28.57	33.15	7.75	**26.65**
	Total Xylenes	1	0.04	0.04	0.04	CC	**0.04**
Semivolatiles (mg/kg)	Benzoic Acid	3	19.49	25.79	32.19	6.35	**25.82**
	Bis(2-Ethylhexyl) Phthalate	4	13.80	18.67	21.11	3.21	**18.06**
	Phenol	1	4.17	4.17	4.17	CC	**4.17**
Polychlorinated Biphenyls (mg/kg)	Total Aroclors	4	0.04	0.05	0.05	0.01	**0.05**

*PFU = Plaque Forming Unit ND= Not Detected CC=Cannot Calculate

**Hookworm was present in 3 samples

Table 4. List of Organic Compounds Analyzed in King County Biosolids

Pesticides and PCBS	Volatiles	Semivolatiles	
4,4-DDE	1,1-Dichloroethane	1,2-Dichlorobenzene	Bis(2-chloroethoxy) methane
4,4-DDD	1,1-Dichloroethylene	1,2-Diphenylhydrazine	Bis(2-chloroethyl)ether
4,4-DDT	1,2-Dichloroethane	1,3-Dichlorobenzene	Bis(2-chloroisopropyl)-ether
Aldrin	1,2-Dichloropropane	1,4-Dichlorobenzene	Bis(2-ethylhexyl)phthalate
Alpha-BHC	1,2-Trans-Dichloroethylene	1,2,4-Trichlorobenzene	Benzyl Butyl Phthalate
Alpha Chlordane	1,1,1-Trichloroethane	2-Chloronaphthalene	Carbazole
Total Aroclors**	1,1,2-Trichloroethane	2-Chlorophenol	Chrysene*
Beta-BHC	1,1,2-Trichloroethylene	2-Methylnaphthalene	Di-n-Butyl Phthalate
Delta-BHC	1,1,2,2-Tetrachloroethane	2-Methylphenol	Di-n-Octyl Phthalate
Dieldrin	1,3-Trans-Dichloropropene	2-Nitroaniline	Dibenzo(a,h)anthracene*
Endosulfan 1	2-Butanone (MEK)	2-Nitrophenol	Dibenzofuran
Endosulfan Sulfate	2-Chloroethylvinyl Ether	2,4-Dichlorophenol	Diethyl Phthalate
Endosulfan11	2-Hexanone	2,4-Dimethylphenol	Dimethyl Phthalate
Endrin	4-Methyl-2-Pentanone (MIBK)	2,4-Dinitrophenol	Fluoranthene*
Endrin Aldehyde	Acetone	2,4-Dinitrotoluene	Fluorene*
Gamma-BHC	Acrolein	2,6-Dinitrotoluene	Hexachlorobenzene
Heptachlor	Acrylonitrile	2,4,5-Trichlorophenol	Hexachlorobutadiene
Heptachlor Epoxide	Benzene	2,4,6-Trichlorophenol	Hexachlorocyclopentadiene
Methoxychlor	Bromodichloromethane	3-Nitroaniline	Hexachloroethane
Toxaphene	Bromoform	3-,4-Methylphenol	Indeno(1,2,3-c,d)pyrene*
Trans Chlordane	Bromomethane	4-Bromophenyl Phenyl Ether	Isophorone
	Carbon Disulfide	4-chloro-3-methylphenol	N-Nitroso-di-n-propylamine
	Carbon Tetrachloride	4-Chloroaniline	N-Nitrosodimethylamine
	Chlorobenzene	4-Chlorophenyl Phenyl Ester	N-Nitrosodiphenylamine
	Chlorodibromoethane	4-Nitroaniline	Naphthalene*
	Chloroethane	4-Nitrophenol	Nitrobenzene
	Chloroform	4,6-Dinitro-O-Cresol	Pentachlorophenol
	Chloromethane	Acenaphthene*	Phenanthrene*
	Cis-1,3-Dichloropropane	Acenaphthylene*	Phenol
	Ethyl Benzene	Aniline	Pyrene*
	Methylene Chloride	Anthracene*	
	Styrene	Benzoic Acid	
	Tetrachloroethylene	Benzo(a)anthracene*	
	Toluene	Benzo(a)pyrene*	
	Total Xylenes	Benzo(b,j,k)fluoranthene*	
	Trichlorofluoromethane	Benzo(g,h,i)perylene*	
	Vinyl Acetate	Benzyl Alcohol	
	Vinyl Chloride		

* Polynuclear Aromatic Hydrocarbons (PAHs)

** Polychlorinated Biphenyls (PCBs)