



Post Point Wastewater Resource Recovery

Fall 2021

EMERGING CONTAMINANTS OF CONCERN TEST RESULTS

Overview

At the request of City Council and local non-profit organization RE Sources, the Post Point Resource Recovery project team conducted testing in the fall of 2021 to better understand levels of emerging contaminants of concern in the city's wastewater (listed in summary and table below).

Staff researched cost and availability of testing options for these compounds and contracted with ALS Environmental to conduct the tests.

Important note: When discussing these compounds and test results, it is important to note Post Point Treatment Plant is not producing emerging contaminants of concern. A treatment plant is a recipient, not a generator of these compounds. The treatment process works to remove contaminants to the degree possible with current affordable technology. The City is committed to keeping informed of innovations in technology, testing, and regulations for all emerging contaminants of concern, as well as new uses for biosolids.

Summary of Results

When possible, both an incinerator feed solids sample (currently incinerated solids that will become biosolids) and an effluent sample (treated liquid that returns to Bellingham Bay) were sent for testing.

Using available methods for testing, comparisons with data in current scientific literature, and relevant state-level regulations, the tests showed the following:

- **Per-and Polyfluoroalkyl Substances (PFAS):** Post Point showed the lowest level of PFAS in effluent out of 14 sampled plants in Washington State. When compared to Maine regulations, the only state currently regulating PFAS, the incinerator solids were below acceptable screening levels. PFOA and PFOS, the most concerning and researched PFAS, have been mostly phased out of products, eliminating new sources.
- **Polybrominated diphenyl ethers (PBDE):** Results from the incinerator solids are delayed due to supply chain and staffing challenges at ALS. Bellingham has an established record of no PBDE being detected in effluent.
- **Polychlorinated biphenyls (PCB), dioxins, and furans:** Results from the incinerator solids are delayed due to supply chain and staffing challenges at ALS. Bellingham has an established record of no PCBs being detected in effluent.
- **Polycyclic Aromatic Hydrocarbons (PAHs):** Post Point showed a cumulative level of 0.888 mg/Kg of PAHs in incinerator solids.¹ This amount is below standards established in Europe as safe for children playing in soil and established in the U.S. for invertebrates in soil (e.g., earthworms).
- **Microplastics:** An effluent sample contained 1,980 microplastic particles per liter, which is 67% fewer particles than was measured in a washing machine load from a cited study. Western Washington University researchers are attempting to quantify microplastics found in the incinerator solids. It has proven difficult as there are limitations in current methods to quantify microplastics. There are not currently any standards for microplastics in effluent or solids.
- **SARS-CoV-2:** None detected in treated effluent or incinerator solids.

¹ mg/Kg is equivalent to parts per million. A part per million is like one inch in 16 miles.

Discussion of Results

Per-and Polyfluoroalkyl Substances (PFAS)

As of July 2021, there were no EPA approved methods for analyzing PFAS in biosolids and there are no federal regulations for PFAS in biosolids. Bellingham's effluent and incinerator solids were analyzed for a suite of PFAS. Neither sample indicates major sources of PFAS in the service area. Additionally, sources of Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA) are declining due to source point regulations, controls, and their elimination from consumer goods. Bellingham's drinking water, which could contribute PFAS to the wastewater stream, is non-detect for PFAS. Bellingham has no known industrial dischargers in high-risk PFAS use categories. Post Point's incinerator solids sample was shown to be the lowest for PFAS of 14 sampled plants in Washington State. The State of Maine does regulate three PFAS compounds and the sample tested was below Maine's acceptable limits for those compounds.

Polybrominated diphenyl ethers (PBDE)

Post Point's treated effluent has been analyzed for the PBDE 4-bromophenyl phenyl ether since 1991 with no detections. Enhanced monitoring was conducted (46 PBDE compounds) twice in 2009 with no detections. Results on the incinerator solids have been delayed due to supply chain/staffing challenges at ALS Laboratory.

Polychlorinated biphenyls (PCB), dioxins, and furans

Bellingham treated effluent has been analyzed for PCBs since 1991 with no detections. Enhanced monitoring was conducted twice in 2009 with no detections. Results on the incinerator solids have been delayed due to supply chain/staffing challenges at ALS Laboratory.

Polycyclic aromatic hydrocarbons (PAHs)

Bellingham's incinerator solids were analyzed for the 18 most common PAH compounds using low-level detection methodology. There are no PAH regulations for sewage solids or biosolids, so results were compared against two safety standards. First, the Environmental Protection Agency has established soil screening levels to protect wildlife. Lower molecular weight PAHs degrade faster in soil, so there are two acceptable levels based on the species present. The most stringent levels apply to terrestrial invertebrates (e.g., earthworms). Another standard established in Europe is based on research designating safe levels of PAHs for areas where children are in contact with soils. Bellingham's 18-PAH cumulative level of 0.888 mg/Kg is well below both standards.

Microplastics

Wastewater treatment plants can be very effective at reducing microplastic loads – one study showing reductions of 88% by conventional treatment alone.² Post Point Resource Recovery Plant treated effluent was analyzed for microplastics by the standardized method for liquids. The Post Point Effluent sample contained 1,980 microplastic particles per liter. A liter equals 0.26 liquid gallons. For context, a typical washing machine load is 30 gallons and studies have shown 700,000 microplastic particles from an average wash load of acrylic fabric.³ Post Point's sample showed 67% less particles than what was measured in the wash load from the cited study. Removed particles would be expected to be present in sewage solids. Western Washington University researchers are attempting to quantify the microplastics found in Post Point's incinerator solids. It has proven to be difficult. There are limitations in the current methods to quantify microplastics in sludge, with one recent study citing an inability to account for 96% of the expected microplastics in sewage sludge.

SARS-CoV-2

SARS-CoV-2 was not detected in plant effluent or incinerator solids. Current federal requirements for biosolids production help ensure that biosolids are processed, handled, and land-applied in a manner that minimizes the risk of exposure to pathogens, including viruses with level of treatment based on end use. Thermal destruction (including digestion), air drying and/or pH elevation methods are used to meet specific bacteria, viral and helminth ova reduction requirements. SARS-CoV-2 is susceptible to destruction by these means.

² Iyare, Paul U., Ouki, Sabeha K., Bond, Tom (2020). Microplastics removal in wastewater treatment plants: a critical review. Water Research and Technology, 2020 Issue 10.

³ Napper, Imogen E., Thompson, Richard C. (2016). Release of synthetic microplastic fibres from domestic washing machines: Effects of fabric type and washing conditions. Marine Pollution Bulletin, 2016 Nov. 15; 112(1-2):39-45.



Post Point Wastewater Resource Recovery

Key Findings Summary Table

Emerging contaminant of concern tested	Common Sources	Incinerator Feed Solids Sample (solids that will become biosolids rather than incinerated)	Treated Effluent Sample (treated water released through an outfall to Bellingham Bay)
Per-and Polyfluoroalkyl Substances (PFAS) <i>A family of compounds – 23 were analyzed in the tests</i>	<ul style="list-style-type: none">Nonstick cookwareStain and water-resistant coatingsPlumbing tapeFast-food wrappersIndustrial usesFirefighting foam	Post Point's settled solids sample is the lowest for PFAS out of 14 sampled plants in Washington State. Maine does regulate 3 PFAS compounds and the sample tested met or was below Maine's Biosolids Soil Beneficial Use Screening levels for these compounds.	Bellingham's effluent sample does not indicate major sources of PFAS in the service area and sources of Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA) are declining, due to source point regulations and controls. Bellingham's drinking water, which could contribute PFAS to the wastewater stream, is non-detect for PFAS.
Polybrominated diphenyl ethers (PBDE)	<ul style="list-style-type: none">Flame retardants in furniture foamPlasticsConsumer electronicsUpholstery	<i>Results pending</i>	No detections in the PBDE 4-bromophenyl phenyl ether in monitoring conducted since 1991.
Polychlorinated biphenyls (PCB), dioxins, and furans	<ul style="list-style-type: none">Transformers and capacitorsFluorescent light ballastsCable insulation	<i>Results pending</i>	No detections in monitoring conducted since 1991.

Emerging contaminant of concern tested	Common Sources	Incinerator Feed Solids Sample (solids that will become biosolids rather than incinerated)	Treated Effluent Sample (treated water released through an outfall to Bellingham Bay)
Polycyclic Aromatic Hydrocarbons (PAHs) <i>Over 100 hazardous substances from incomplete combustion of carbon-containing materials (e.g., wood, coal, oil, gas) – 18 of the most common were analyzed</i>	<ul style="list-style-type: none"> • Natural sources: <ul style="list-style-type: none"> ○ Volcanoes ○ Forest fires • Human-made products: <ul style="list-style-type: none"> ○ Household products (e.g., mothballs, some shampoos) ○ Cigarette smoke ○ Oil-based heating ○ Indoor and outdoor grilling ○ Jet exhaust ○ Road paving 	A cumulative level of 0.888 mg/Kg was detected in incinerator feed solids. This is below standards established in Europe as safe for children playing in soil, and in the U.S. for invertebrates (e.g., earthworms) in soil.	No detections in annual priority pollutant monitoring.
Microplastics - polymerics (polyethylene, polypropylene, nylon, etc.) less than 5 millimeters in diameter.	<ul style="list-style-type: none"> • Clothes • Paints • Tire dust • Plastic litter (e.g., bags, bottles, straws) • Personal care products (e.g., microbeads in body wash) 	Method for quantifying microplastics in incinerator solids is not available. The project team is working with Western Washington University researchers to quantify the microplastics found in the test sample, which has proven to be difficult.	The effluent sample contained 1,980 microplastic particles per liter. A liter equals 0.26 liquid gallons. For context, a typical washing machine load is 30 gallons and studies have shown 700,000 microplastic particles from an average wash load of acrylic fabric. Post Point's sample showed 67% less particles than what was measured in the wash load from the cited study.
SARS-CoV-2		SARS-CoV-2 was not detected in incinerator solids. SARS-CoV-2 does not appear to survive the treatment process, based on current science.	Effluent testing showed no detectable SARS-CoV-2 present.