

Lower Duwamish Waterway Source Control
**Brandon Combined Sewer
Basin Study**



King County

Protecting Our Waters

Doing our part on rainy days

Pilot Study on Pathways of Pollution to Combined Sewer Sewer Basins

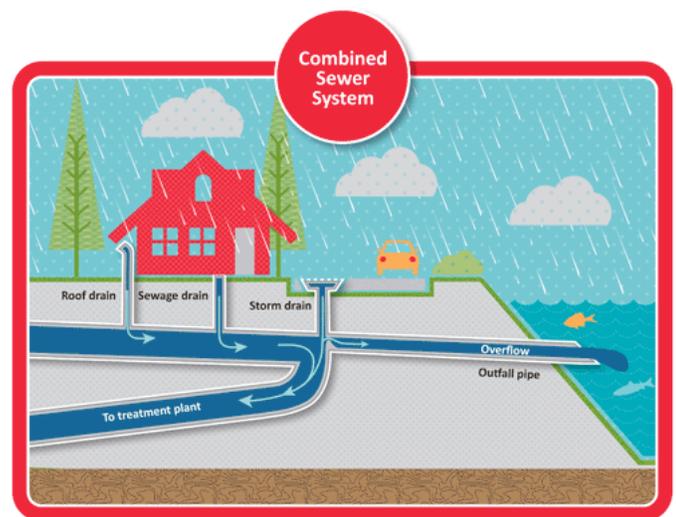
King County is committed to doing its part to clean up the Duwamish River and keep it clean. Understanding how pollution gets into the river is key to keeping it out of the river.

Background

King County has been conducting a series of studies to improve our understanding of how contamination is entering the Lower Duwamish Waterway.

Like many cities around the country, the older parts of King County's wastewater system rely on a single set of pipes to carry untreated sewage (domestic and industrial wastewater) and stormwater to a treatment plant. Wastewater from many areas along the Lower Duwamish Waterway normally flows to the West Point treatment plant. During very large storms, the system includes safety valves called "combined sewer overflows" that can route excess sewage and stormwater flow directly into the Waterway to prevent sewer backups into homes and streets. King County is required to control all of its CSOs by 2030. The study described here was a pilot effort to identify the primary pathway of chemical pollution into combined systems.

Pollution can enter combined systems through three **pathways** (sewage, stormwater, and groundwater infiltration). This pilot study attempts to determine the amount of chemicals contributed by each pathway, or the "chemical load", to the Brandon Combined Sewer Basin. A greater understanding of the chemical loads to a combined sewer basin can help King County and other government agencies focus their efforts to best decrease the amount of pollution entering the system and local waters before CSO control goals are met in 2030.



Pathway is defined as the route or mechanism by which contaminated media are transported.



Study Objective

How much pollution is entering the Brandon Combined Sewer Basin pipes during a rainstorm, and does it primarily come from sewage, stormwater, or groundwater?

To answer this question, researchers collected wastewater samples from the combined system during different weather conditions to help estimate the chemical load entering the pipes for each pathway:

- Sewage (domestic and industrial wastewater present in pipes year-round)
- Stormwater (runoff entering into pipes during storms only)
- Groundwater (groundwater seeping into pipes during the rainy season)

Pathway Analysis

Researchers analyzed the chemical concentrations from the samples in combination with flow data (the amount of wastewater flowing through the pipe at the time the sample was taken) to estimate the chemical load for each pathway. They then compared these chemical loads to determine whether groundwater, sewage, or stormwater was the pathway contributing the greatest amount of chemicals flowing to the treatment plant during storms.

- **Groundwater** seeping into pipes did not seem to add to the chemical load, but more research is needed to fully understand the chemical contribution from groundwater.
- **Sewage alone** in the pipes had a smaller chemical load than when mixed with stormwater.
- **Stormwater** was the major contributor to the chemical load for most chemicals found in the system, including some metals (like copper and zinc), PCBs, dioxin/furans, and PAHs.
- For some other metals and phthalates, the chemical load did not vary greatly between sewage and stormwater.

Conclusions

A clear finding of this study is that stormwater contributes the largest chemical input into the Brandon Combined Sewer Basin during periods of rainfall compared to sewage alone for most of the chemicals studied. While efforts are underway to control CSOs in King County, large storms can currently cause untreated CSO discharges to the Lower Duwamish Waterway. The study results suggest efforts to reduce or control chemical pollution in stormwater before it enters a CSO basin would be the most effective way to reduce the amount of chemical pollution released into the Lower Duwamish Waterway during an untreated CSO event.

How will this study be used?

This study will be used to guide pollution control needs within combined sewer basins prior to the completion of King County's CSO control plan. For example, these results would shape decisions about whether stormwater or sewer inputs should be targeted as the main source of a particular chemical in the basin. Results from this pilot study will be compared to results from a similar study in another combined sewer basin to assess if primary pathways of chemicals to a combined sewer system during storm events are consistent across different basins.

Chemicals studied

The following chemicals were targeted in this study because they are chemicals of concern for the Lower Duwamish Waterway:

- *Polychlorinated biphenyls (PCBs)*
- *Metals and mercury*
- *Polycyclic aromatic hydrocarbons (PAHs)*
- *Phthalates*
- *Dioxin/furans*

Alternative formats available

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