

**Brief description of stormwater
monitoring studies not part of
Tacoma's Annual Stormwater
Monitoring Report**

Attachment B6

Attachment B6. 2009 Tacoma Stormwater Monitoring Studies

Thea Foss Stormwater Monitoring and Source Control Program

Under a Unilateral Administrative Order and a Consent Decree with EPA (AOC), the City of Tacoma implements the Thea Foss Post-Remediation Source Control Strategy, a stormwater monitoring and source control program for the municipal storm drains entering the Thea Foss and Wheeler-Osgood Waterways.

The monitoring program component evaluates the quality of stormwater discharges to the Thea Foss Waterway and the effect of those discharges on sediment quality. The monitoring results are being used in an ongoing evaluation of source loadings to the waterway to help identify and manage new or existing sources and to protect sediment quality in the years following the sediment remedial action. Chemicals predicted with the greatest potential to affect sediment quality in the years following cleanup action include polycyclic aromatic hydrocarbons (PAHs) and phthalates.

Over eight years (October 2001-2009), stormwater, baseflow and stormwater suspended particulate matter (SPM) were sampled at seven outfalls that discharge into Thea Foss Waterway. A total of 501 stormwater samples were collected with between 54 and 78 stormwater samples collected at each outfall. A total of 240 baseflow samples were collected with at least 34 baseflow samples collected at each outfall. 205 stormwater SPM samples were collected in pipeline sediment traps deployed throughout the watershed.

The whole-water samples were analyzed for target analytes selected from the list of problem chemicals identified in the AOC, including selected semi-volatiles (PAHs and phthalates), total metals (lead, mercury and zinc), hardness, pH and TSS. The stormwater SPM samples from the sediment traps and the sump were analyzed for the target analytes including PAHs and phthalates, total solids, grain size, TOC, selected total metals (lead, zinc and mercury), Pesticides/PCBs and NWTPh-Dx.

Media Filtration Stormwater Treatment Device Monitoring – WSDOT Lake Union Ship Canal Research Facility

The City has entered into an Interagency Memorandum of Agreement (IMOA) with the Washington State Department of Transportation (WSDOT) and the City of Seattle, Seattle Public Utility for participation in a study of structural stormwater controls located at the Ship Canal Test Facility. For the City of Tacoma, the overall intent of this IMOA is to work collaboratively to verify the performance of temporary and permanent stormwater treatment technologies, and to evaluate the applicability of these technologies to the conditions in the Thea Foss Watershed. The City is using a \$500,000 grant from the Federal Highway Administration, 2003 Transportation Community and System Preservation Pilot (TCSP) Program to continue and expand the study and evaluation of the effectiveness of various treatment methodologies for stormwater.

Testing has been completed at the Ship Canal Test Facility on the StormFilter and AquaShield, AquaFilter. The StormFilter BMP final report summary was presented in the 2007 Stormwater Source Control Report (City of Tacoma 2008e). Testing of the

AquaFilter was completed in December 2008. A final report will be prepared in 2010 to evaluate the treatment performance of this treatment system.

In 2010, the City will evaluate each technology's effectiveness and applicability and reasonableness for use of this technology within the Thea Foss Watershed using a watershed sediment quality model. The evaluation shall take into consideration effectiveness, capacity, maintenance requirements, flood control, and cost of the treatment technology in comparison to the effectiveness achieved or expected to be achieved in reducing contaminant loads to Thea Foss Waterway as predicted by the watershed model.

Tacoma Landfill Pervious Pavement Demonstration Project

The Surface Water and Solid Waste Utilities created a demonstration project at the Tacoma Landfill to study various types of pervious pavements and how each affect flow control, water quality, maintenance and durability. The 36,100 square-foot paved area, which is used to provide employee parking, was constructed with equal sections of pervious interlocking pavers, pervious concrete, pervious asphalt and standard asphalt. Additionally, a grassy area adjacent to the site will be used as a control and tested for water quality and flow control. The project's prime location in a closed section of the Tacoma Landfill allows for complete collection of water infiltrating the pervious pavement sections due to the existing impermeable landfill liner beneath the pavement. The pervious pavements allow rainwater to infiltrate through the pavement and into the landfill cover layer, prior to entering the landfill cap primary drainage system. Infiltration through the pervious pavement and cover material provides basic water quality treatment and reduces flow control requirements.

Test results for both impervious and pervious pavement areas will be compared and results will be used for future stormwater modeling of the landfill cap and to evaluate the effectiveness of pervious pavements for flow control and water quality treatment.

Construction of the project was completed in April 2006. Sampling of the project was started in late 2006 and is anticipated to be completed by summer 2010.

City of Tacoma Wet/Dry Atmospheric Sampling Study

Tacoma completed a total of 20 rounds of atmospheric deposition from May 2006 through September 2009 at five sampling locations in the Thea Foss Watershed, in Tacoma, Washington (nine rounds from May 2006 through April 2007 and eleven rounds from January 2008 through September 2009). The sites represent predominately commercial, industrial, and residential areas.

In 2010, Tacoma will prepare a report and compare the Tacoma data to King County's data that was summarized in the Lower Duwamish Waterway Passive Atmospheric Deposition Sampling (King County 2008). Between October 2005 and April 2007, King County conducted 16 rounds of passive atmospheric deposition sampling at five stations in the Lower Duwamish Waterway drainage basin. PAH and phthalate data were collected for 16 rounds which measured a combination of dry and wet deposition in urban/industrial neighborhoods with the results being comparable to studies conducted in other urban/industrial areas.

Tattle-Tails Pilot Study Completed

As part of the IDDE Program, Tacoma is conducting a pilot study using an innovative sampling device called a "Tattle Tail". The "Tattle Tail" is a small strip of sponge-like material about ½-inch wide and three inches long (size is dependent on capture rate desired). The strip is tied to a long piece of fishing line and placed in the main flow of a stormwater pipe. During a rain event, stormwater runoff flows in the pipe and makes contact with the tattle tail device. These sampling devices act as a sponge, continuously collecting small amounts of organic chemicals from the water they are in contact with. The device can be placed in constant or intermittent flows (baseflow or stormwater). After a specific time frame, these samplers are retrieved from the environment and analyzed for chemical of concern. Another beneficial use of "Tattle Tail" samplers is in the laboratory analysis prep time. The extraction process takes less than one-half hour and many (30-100) samplers can be extracted at once.

In March 2008, these "tattle tails" were strategically placed in the Nalley Valley drainage of Basin 237A at 12 locations (and one duplicate) and repeated in April at the same deployed locations. The locations were selected to isolate "branches" of the storm drain system in this commercial/Industrial area. After one month, the devices were collected and analyzed for PAHs and phthalates. The analytical results from all 13 sites was compared during that singular deployment. The sites with relatively higher reported concentrations of chemicals as compared to other sites may indicate there is a possible source, or a greater magnitude of sources, in the drainage area of that site. This information lead the storm line cleaning crews and directed which areas to concentrate their efforts. As it turns out, all tested areas were cleaned by the storm cleaning crews.

Further use of these "tattle tails" devices was stopped due to offsite test confirmation of unequal loading or partitioning of the different chemicals of concern (Thea Foss organics) by the manufacture. Another solid phase device has been developed and is in the testing phase. Currently we use these tests to lead the storm line cleaning process.

Source Control and IDDE Sampling Activities

The Stormwater Collection System field support staff complete a variety of sampling and monitoring special projects throughout the City. These activities in 2009 included Wapato Lake groundwater sampling; quarterly sampling of "Pom-Pom" oil snare devices in 13 different locations within the collection system connected to Outfalls 245 and 254 and in areas of construction near the Thea Foss Waterway; Phosphorus grab sampling project to characterize "hotspots" within the stormwater system draining to Wapato Lake; Bi-monthly lake water quality monitoring at China Lake; and bacterial sampling in the Leach Creek Holding Basin.

Wapato Lake Stormwater Sampling

Monthly and storm event sampling was initiated April 2008 and continued through 2009, to determine nutrient and water budgets for the north pond and south lake. The City formalized and expanded this investigation with passage of resolution 37864 September 1, 2009. This is an intensive study involving 80 sample events and 605 laboratory samples (Cost/value \$351k). Water quantity and quality will be measured through 2010. Results will be used to develop the following:

1. Water and nutrient budgets: A measure of the inputs, transformations and outputs of an ecosystem. The water and nutrient budgets will determine the physical-chemical relationship between the north pond and south lake, as well as precipitation, evaporation, runoff (stormwater and sheet flow), and sediment and groundwater influences.
2. Trophic Assessment: An analysis of the linkages between lake chemistry, plant growth (algae and rooted) and aquatic life. Monitoring is used to determine ecosystem response to physical-chemical inputs, transformations and outputs.
3. Management assessment: Given the specific water/nutrient budgets and trophic (or ecosystem response) assessment, the management assessment provides:
 - Accounting of sources - scale of nutrient sources to storm and receiving water systems.
 - Efficacy – rating of management actions likely to be successful in controlling contaminant sources or limiting negative effects to receiving waters.
 - Cost-Efficiency - rating actions according to estimated cost.

The management assessment will seek to reduce the greatest sources of nutrients, in a manner that is likely to be successful and promotes cost efficiency.

The City is partnering with the University of Washington-Tacoma for this effort. The City monitors groundwater, stormwater and provide laboratory work (except biological analyses, by UWT). UWT collects lake and sediment samples and any other samples from the park area. All laboratory data will go to UWT for analysis and reporting. UWT will also manage the volunteers and develop reports.

Additionally, Public Works responded to, cleaned, investigated and assessed a sanitary sewer overflow (SSO) which entered Wapato Lake January 7-9, 2009.

Volunteer Stream Team Water Quality Monitoring

The Pierce Stream Team coordinates collection of water quality data by volunteers for the following list of streams in Tacoma: Buckley Gulch Creek, Crystal Creek, Flett Creek, Mason Creek, Puget Creek, Titlow Park Creek, Swan Creek and T&E Gulch (added in 2009). Monitoring parameters include pH, dissolved oxygen, nitrate, temperature, and turbidity. Qualitative observations of water appearance, visible discharges, stream bed coating, odor, weather, debris, or wildlife are also documented. Monitoring frequency varies from monthly to quarterly.