



## King County

### Water and Land Resources Division

Department of Natural Resources and Parks

King Street Center

201 South Jackson Street, Suite 600

Seattle, WA 98104-3855

206-477-4800 Fax 206-296-0192

TTY Relay: 711

### **Documenting Progress Report for Effectiveness Monitoring of the South 356th Street Retrofit and Expansion Project, Federal Way, WA (Deliverable D2.1)**

Submitted to Brandi Lubliner, Ecology – RSMP Coordinator

Submitted by Kate Macneale, King County

Submitted on August 4, 2015

#### Summary of Activities

In the first half of 2015, King County wrote a draft QAPP and began monitoring stormwater flows through the South 356th Street Retrofit and Expansion Project in Federal Way, WA. The establishment of sampling locations was finalized in January 2015, and the installation of flow meters was initiated in April 2015. Flow meters have been installed by King County Environmental Laboratory staff in the West Bioretention Facility Inlet (WBI) and in the outlet (WBO).

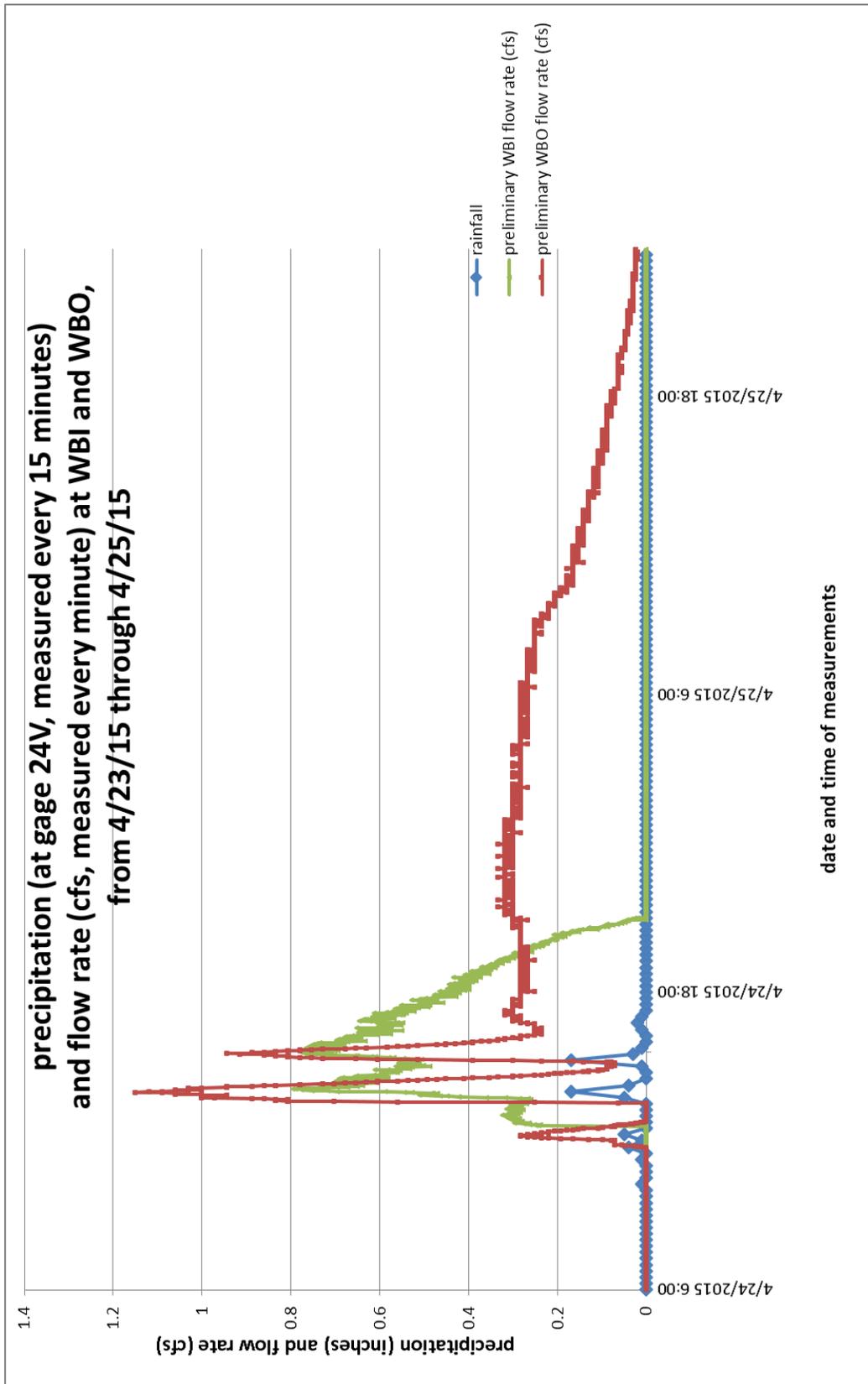
Additional flow meters will be installed at the other sampling locations. These include the inlet pipe to the wet pond complex (WPCI) and the outlet pipe of the catch basin that receives flows from the old wet pond, the new engineered pond and from the east bioretention facility (WPCEBO). The installation of the flow meters at WPCI and WPCEBO had been delayed because of some questions about how to safely access the confined spaces, but those concerns have been addressed and the flow meters are scheduled to be installed by the end of Q3. There is also some concern that grasses that were seeded on the slopes of the new engineered pond are not established yet. The new pond may be held offline until it is certain the vegetation is thriving.

The flow meter for the North Fork of West Hylebos Creek will also be installed by the end of Q3. That installation has been delayed because the first shed at the site was vandalized and then stolen. There was not any equipment in the shed, so the loss was relatively small, but we decided it would be prudent to install another shed and wait a while to see if it too would be stolen before any equipment was installed. The new shed was bolted from the inside to the concrete slab at the site (see photos below), and it has not been vandalized.

The installation of flow meters at the inlet and outlet of the east bioretention facility has been delayed because that facility is not yet functioning. The facility was not draining as designed, and after trouble shooting, Federal Way staff decided to replace half of the facility's proprietary underdrain (SmartDrain<sup>TM</sup>) with a conventional underdrain. Federal Way staff expect the facility will be operational by the next wet-season (starting October 2015), but we will not know if this is a realistic timeline until the reconstructed facility has been tested.

Flow data have been recorded continuously at the WBI and WBO sites since April 8, 2015, with the exception of a week during May. Flows measured at WBI largely correspond with rain events, with peak inflows occurring within hours of peaks in precipitation. Observational data and preliminary flow data from the outlet (WBO) indicate there is typically a small but constant discharge from the pipe, although flow rates are generally below measurable levels. After rain events, flow rates from the outlet increase substantially yet peak several hours later than flow rates in the inlet. The largest storm occurred on April 24, 2015 (0.71 inches in 24 hours), and the flow data at the two sampling sites and precipitation data during and after this storm are shown in the figure below.

In addition to the low but constant discharge from the WBO, we have also noticed in the preliminary flow data that the flow of water out of the facility can be greater than the inflow over two days spanning a storm event. This can be seen at certain times during a storm (instantaneous flow in WBO > WBI during several short intervals in the beginning of the storm on 4/24/15), but it can also be seen with the cumulative flow over two days. We are not yet sure how to explain this but we will address this by 1) checking all of the parameters used to calculate flow, 2) collecting additional measurements of flow in the field to verify the estimates derived using the flow meters, and 3) possibly exploring other tools, such as tracer additions, to better understand the flushing rate and residence time in the facility. We also recognize that there were few rain events in the spring and therefore there were few opportunities to evaluate flow through the WBI and WBO. Additional flow data from these sampling locations and the others are needed to verify our flow measurements are correct and help assess whether the storm sampling criteria outlined in the draft QAPP are appropriate.



## Activity Log and photos of site and equipment installation

The following activities and site visits were logged by Jeff Droker.

Date	KC staff	Activities
1/15/2015	JD, KM, MP	Site visit and finalizing sample location sites
4/2/15	JD, DR, HF	Installed sheds for equipment protection; Installed expansion bands in WBI and WBO
4/5/15	JD, DH	Downloaded flow data from WBI and WBO; installed shed at NWH creek site
4/15/15	JD, HF	Downloaded flow data from WBI and WBO; discovered shed at NWH had been stolen; strategized how to deal with vandalism at the site
4/20/15	HF, AF	Installed new shed at NWH with internal bolts and tamperproof lock; checked flows and adjusted program for WBO
4/23/15	JD, HF	Downloaded flow data from WBI and WBO
5/4/15	JD, HF	Downloaded flow data from WBI and WBO
5/7/15	JD, HF	Reinstalled WBI flow meter because it needed to be adjusted
5/18/15	JD, HF	Checked battery status of both loggers but didn't have tool to swap batteries
5/21/15	JD, HF	Installed Haze Gel cells at both sites
6/3/15	JD, HF	Downloaded flow data from WBI and WBO
6/9/15	JD, HF	Installed modems at the WBI and WBO
6/11/15	JD, HF	Checked on flow meters; worked on shed at NWH creek site
6/15/15	JD	Checked on flow meters, downloaded data
6/19/15	JD, JM	Received instruction on how best to install other meters in the confined spaces they are in
6/23/15	JD	Checked on flow meters but site access partially blocked by construction equipment
6/30/15	JD	Batteries changed



Jeff Droker (left) of King County is standing in the west end of the West Bioretention Facility, and Dan Smith (Federal Way), Fei Tang (Federal Way) and Marc Patton (King County) are standing on the path between the West Bioretention Facility and the new pond. January 15, 2015.



Jeff Droker standing near sampling location on North Fork West Hylebos Creek (NWH). January 15, 2015



Installing flow meter in WBI on April 2, 2015.



Flow meter cable at WBI site, April 2, 2015.



Installing the flow meter at WBO on April 2, 2015.



Installing the flow meter at WBO, April 2, 2015.



Setting up Isco sampler at WBO, April 20, 2015.



Installing tamper-resistant shed at creek site.



Metal shed that will house equipment at NWH creek site.