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King County

Department of
Natural Resources and Parks

Science Seminar

November 2, 2017

Monitoring Water Quality in Central Puget Sound During the West Point Treatment Plant Restoration –

What Impacts Can We Assess?

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West Point Treatment Plant



West Point Outfall Locations

Layers

Bathymetric Surveys

- Multibeam Bathymetric Surveys
- Multibeam Bathymetry Mosaic (Shaded Relief Imagery)
- Single-Beam (Trackline) Bathymetric Surveys
- Trackline Bathymetry Density
- NOS Hydrographic Surveys:
 - All Surveys
 - Surveys with Bathymetric Attributed Grids (BAGs)
- BAG Footprints
- BAG Color Shaded Relief Imagery

Search Surveys

Reset

Digital Elevation Models (DEMs)

- DEM Footprints
- DEM Color Shaded Relief Imagery

Bathymetric Lidar

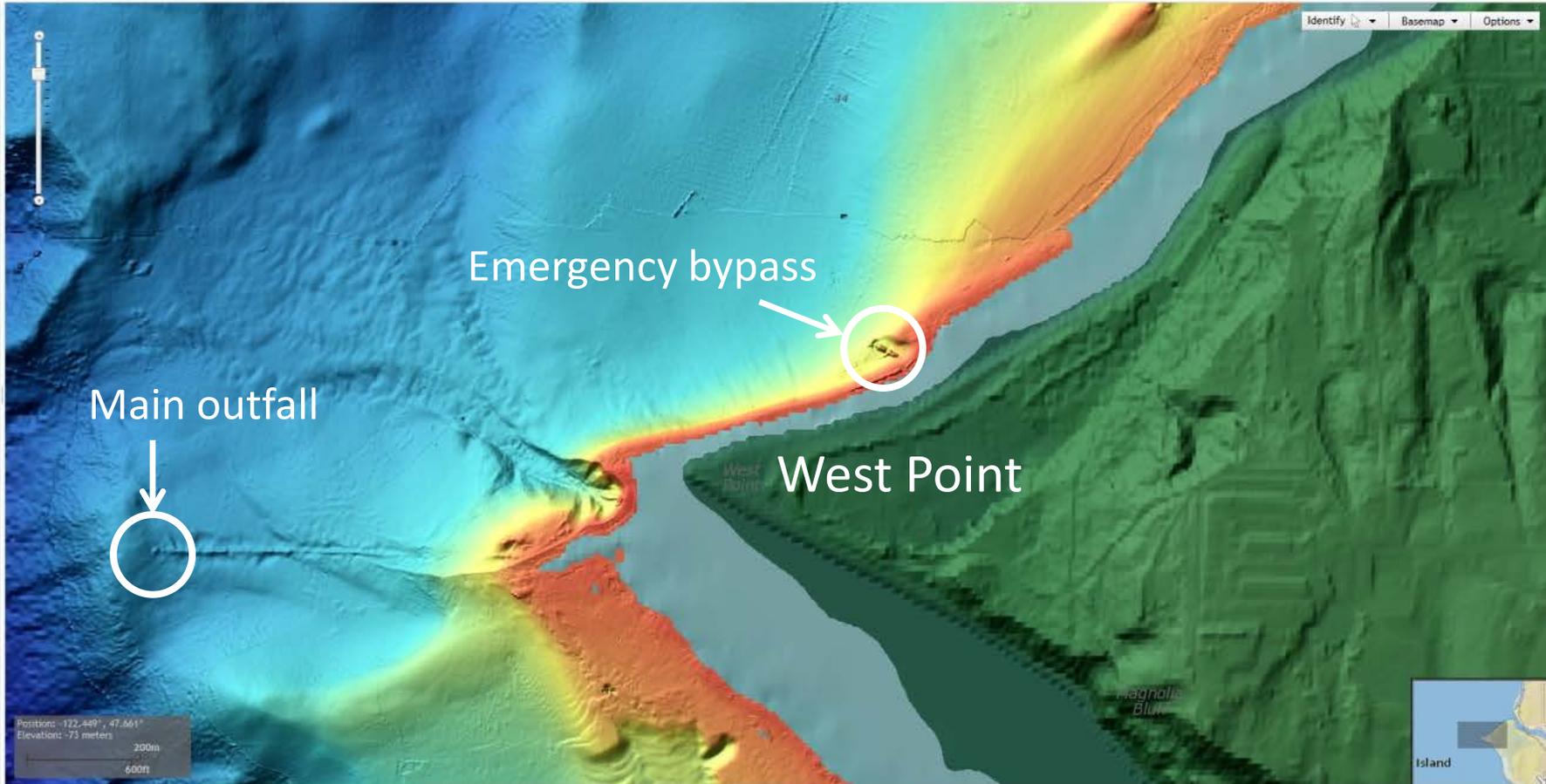
- Coastal Lidar Datasets available from NOAA's Office for Coastal Management

Legend

More Information

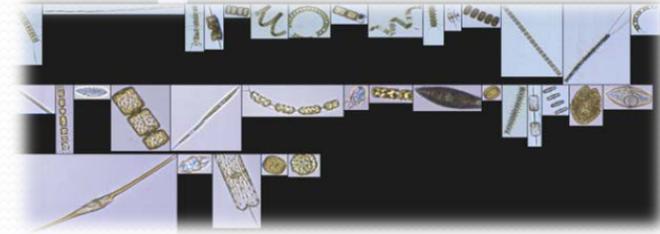
Help

Identify Basemap Options





How Do We Monitor Water Quality?



- **Offshore & beach waters**
 - *Physical, chemical, & biological indicators*
 - *Routine sampling for decades*
- **Event response – beach waters**
 - *Fecal indicator bacteria; incident-dependent*
- **Moorings: since 2008**
 - *Automated sensors sample every 15-min*
- **Phytoplankton**
 - *Semi-Quantitative and FlowCam since 2014*
- **Zooplankton**
- **Sediments (offshore and beach)**



Timeline of Events

Feb. 9th :
flood and
emergency
bypass;
Beaches
closed

Feb. 21st :
Beaches
reopened



Mar. 30th :
Partial
secondary
treatment
begins

Apr. 27th :
Restoration of
full secondary
treatment
processes

Feb. 15-16th :
Emergency
bypass



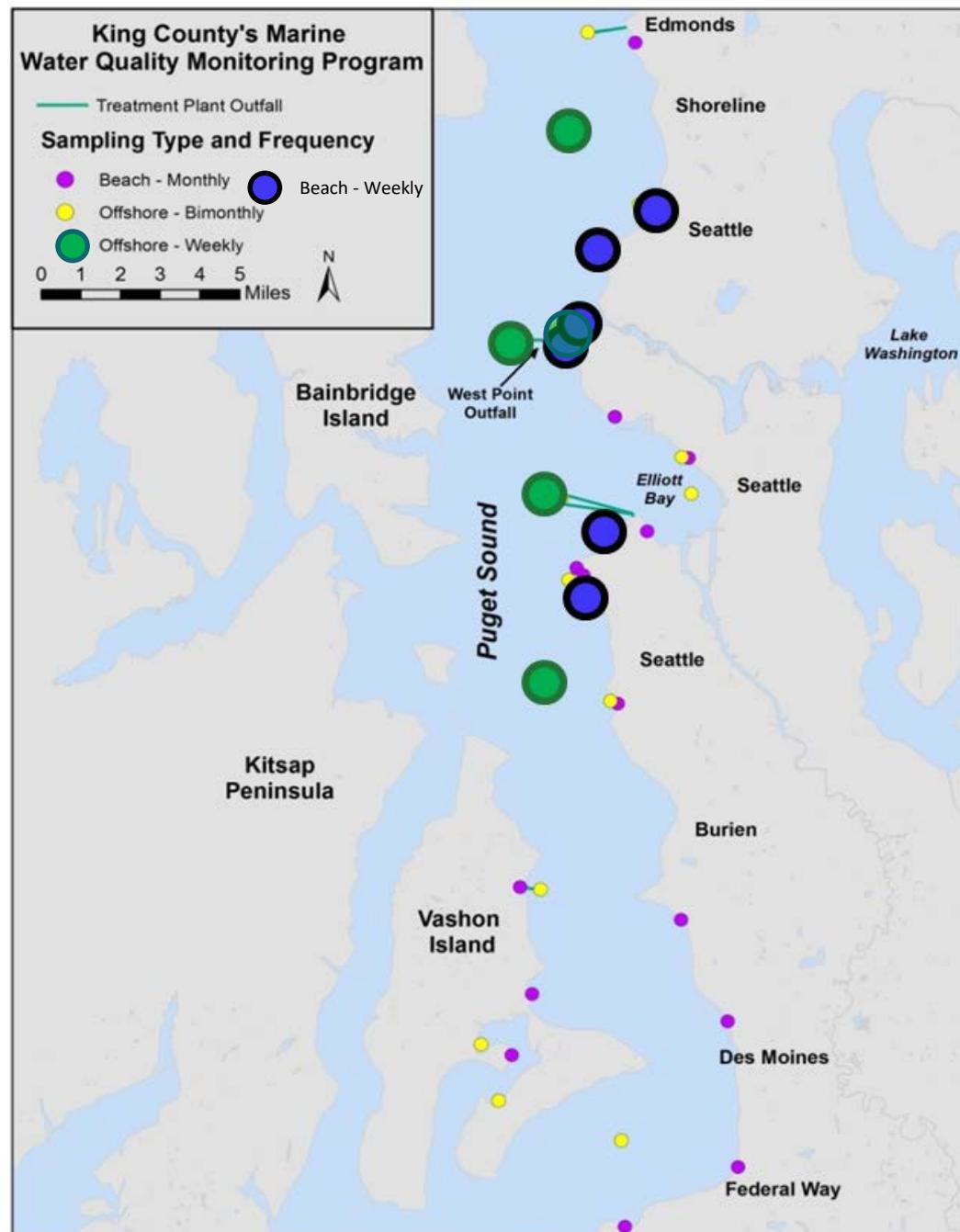
May 10th-present
All permit
discharge limits
are met

Limited Primary Treatment During Restoration;
Flows diverted to combined sewer overflow
(CSO) facilities

Full Secondary
Treatment

Puget Sound Monitoring During Restoration

- Increased sample frequency to weekly
- Bi-weekly reporting online
- Added nitrate sensor profiles (with help from Dept. of Ecology)
- Trace metals water column analysis
- Sediments sampled in summer
- Organism tissues sampled (fish, clams, crab, and zooplankton)



Were Impacts on Water Quality Observed?

- Initial increase in beach bacteria levels
- Near-bottom oxygen levels showed typical seasonal ranges
- Nutrient levels generally similar to typical conditions
- Water clarity due to suspended solids similar to prior years
- Timing of phytoplankton spring bloom typical; concentrated in the surface layer due to physical conditions
- Trace metals in the water column well below water quality standards



Initial response

- Fecal indicator bacteria sampled daily from Feb 9-21, 2017

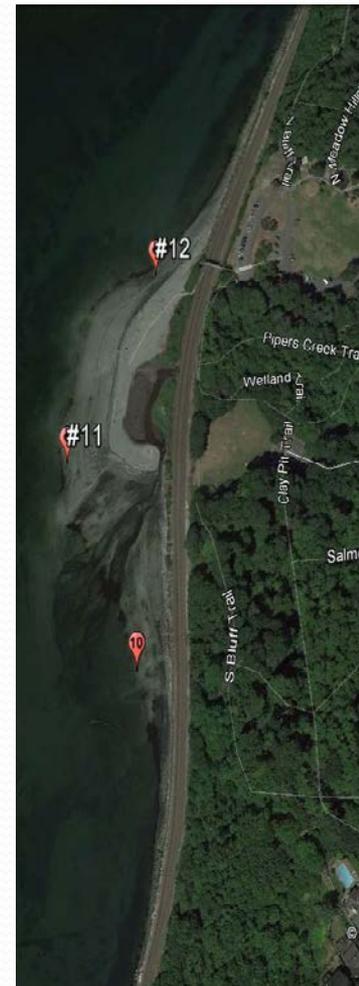
West Point



Golden Gardens



Carkeek



Initial response

- Fecal indicator bacteria sampled daily from Feb 9-21, 2017

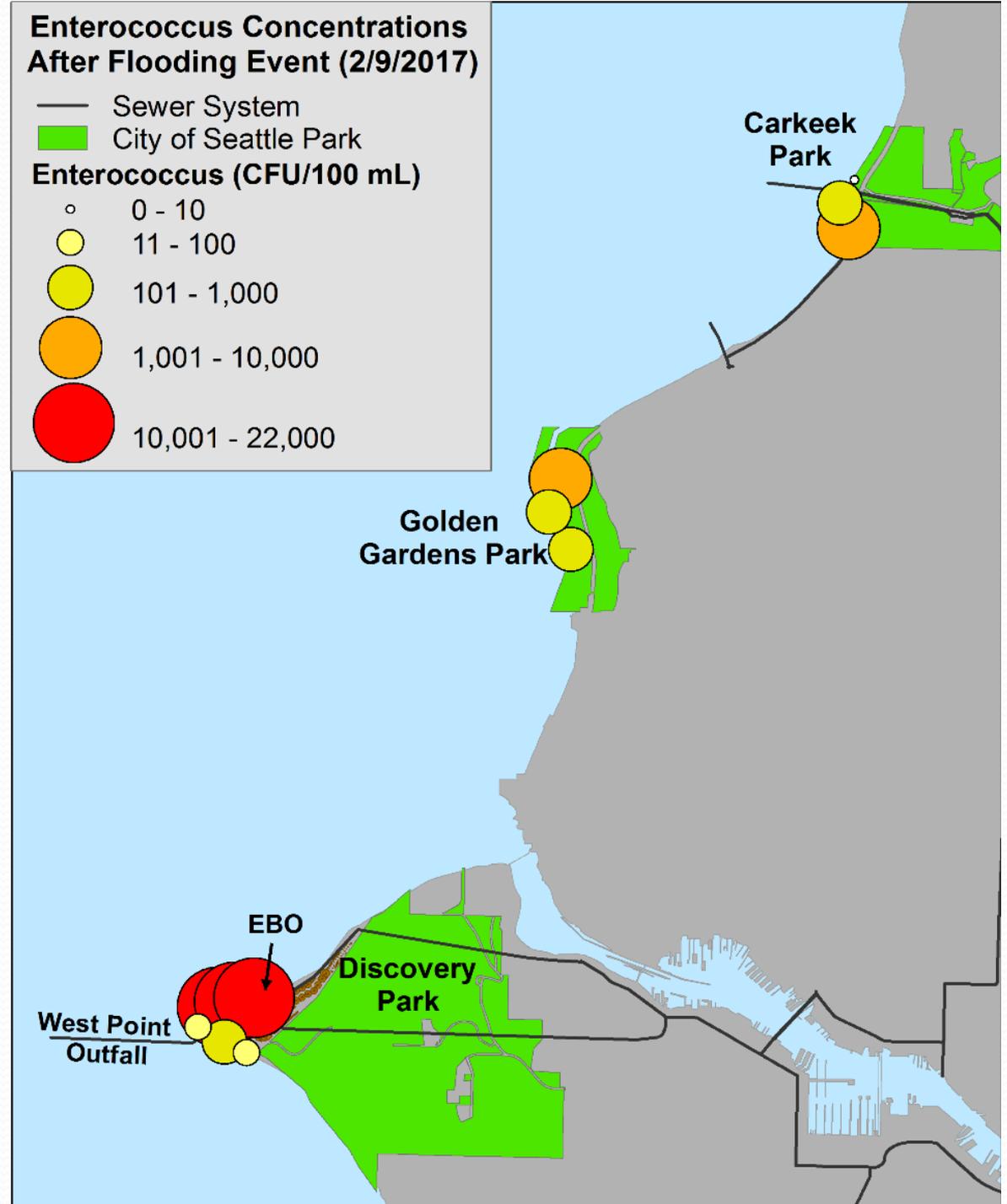
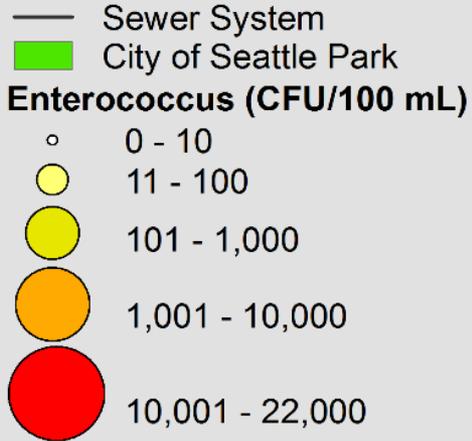


arkeek

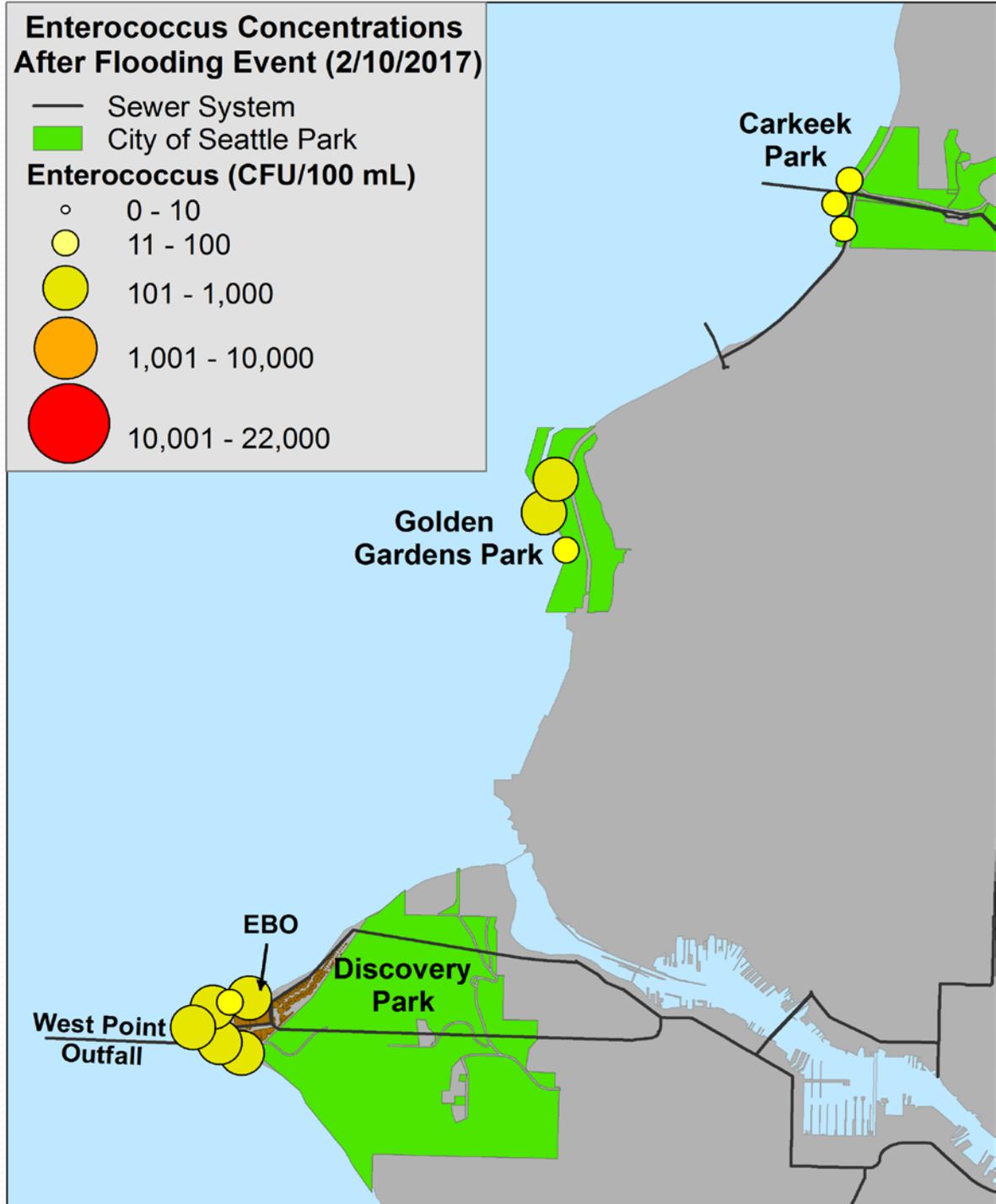


Feb. 9th Bacteria Levels

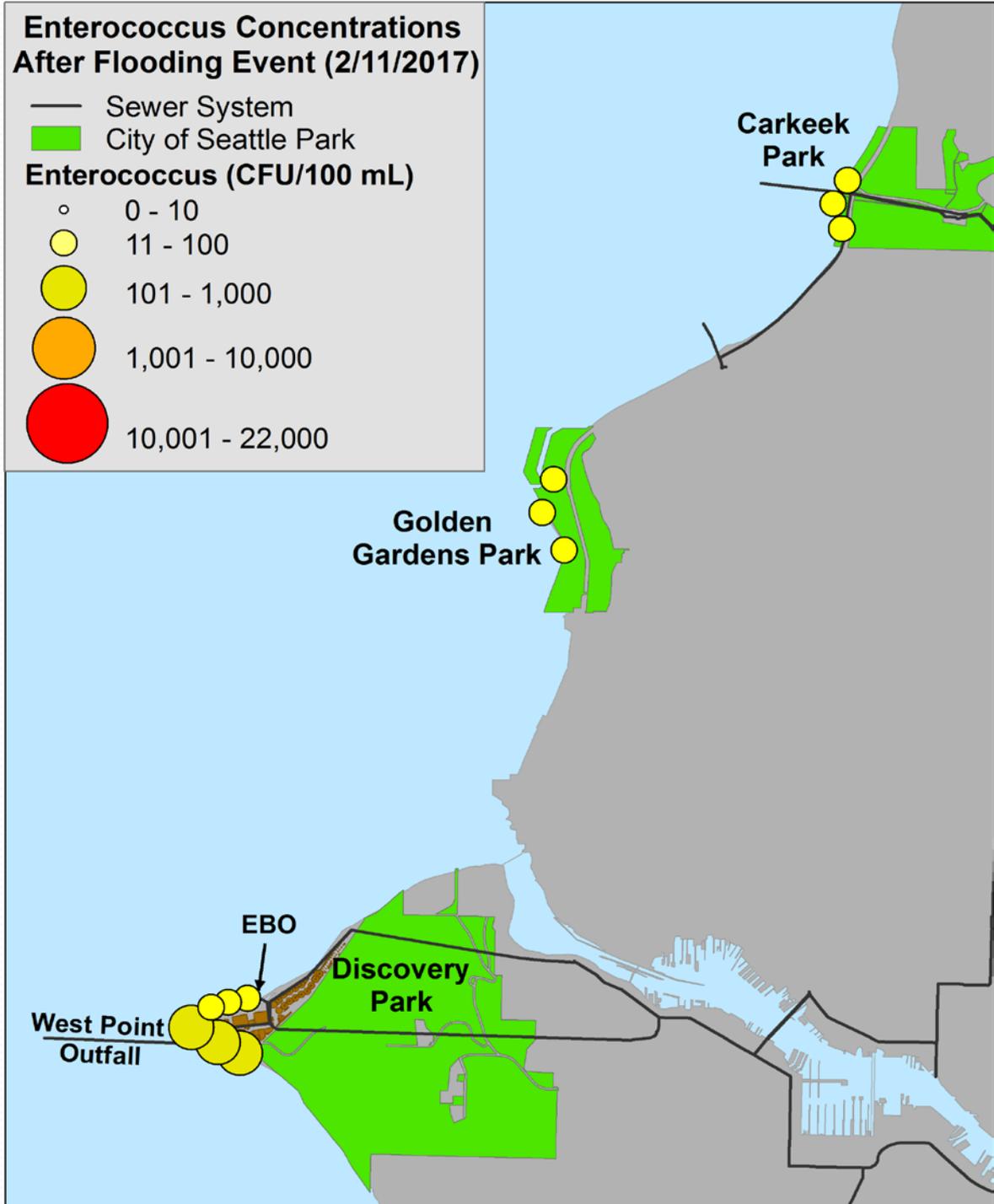
Enterococcus Concentrations After Flooding Event (2/9/2017)



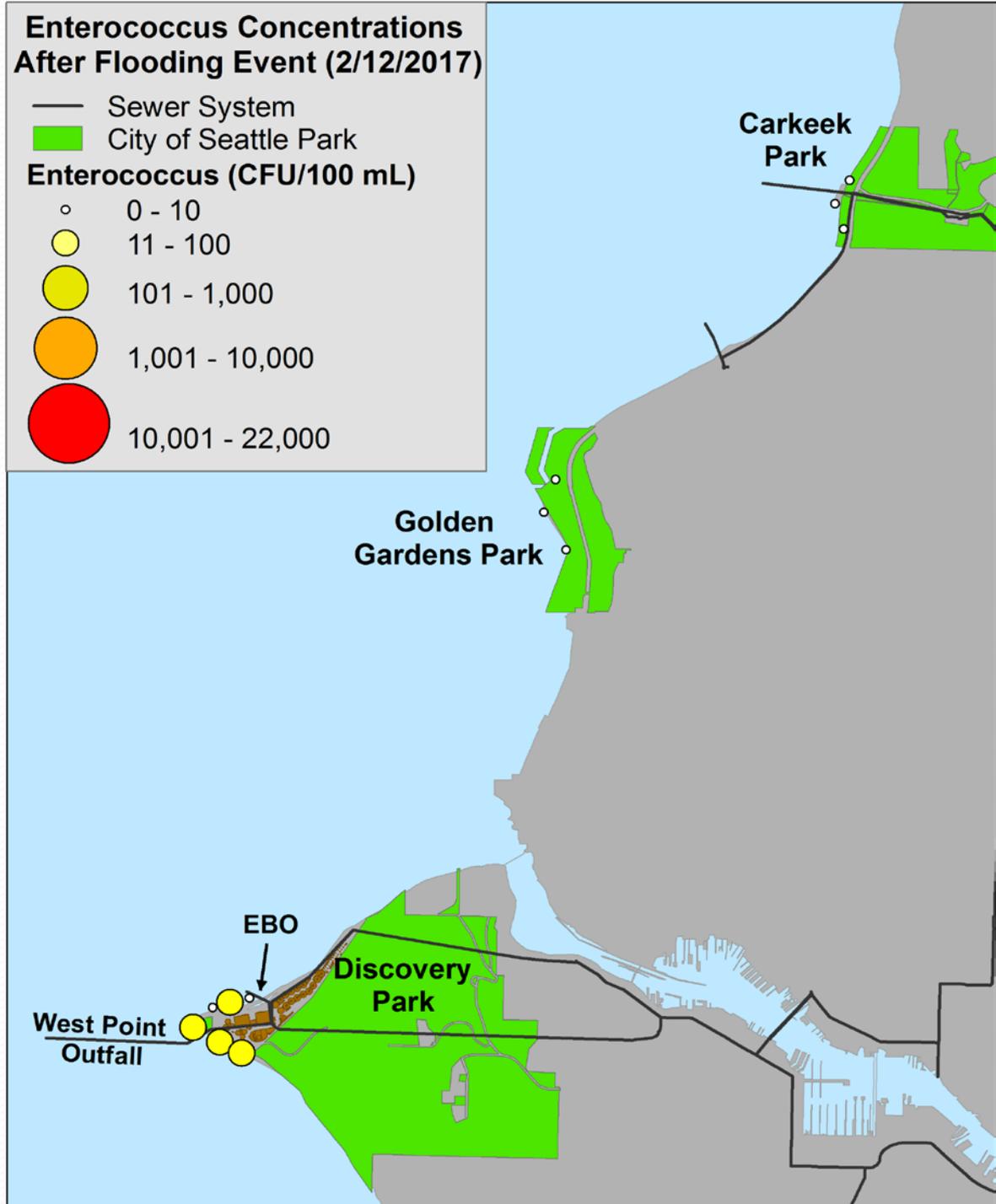
Feb. 10th Bacteria Levels



Feb. 11th Bacteria Levels



Feb. 12th Bacteria Levels

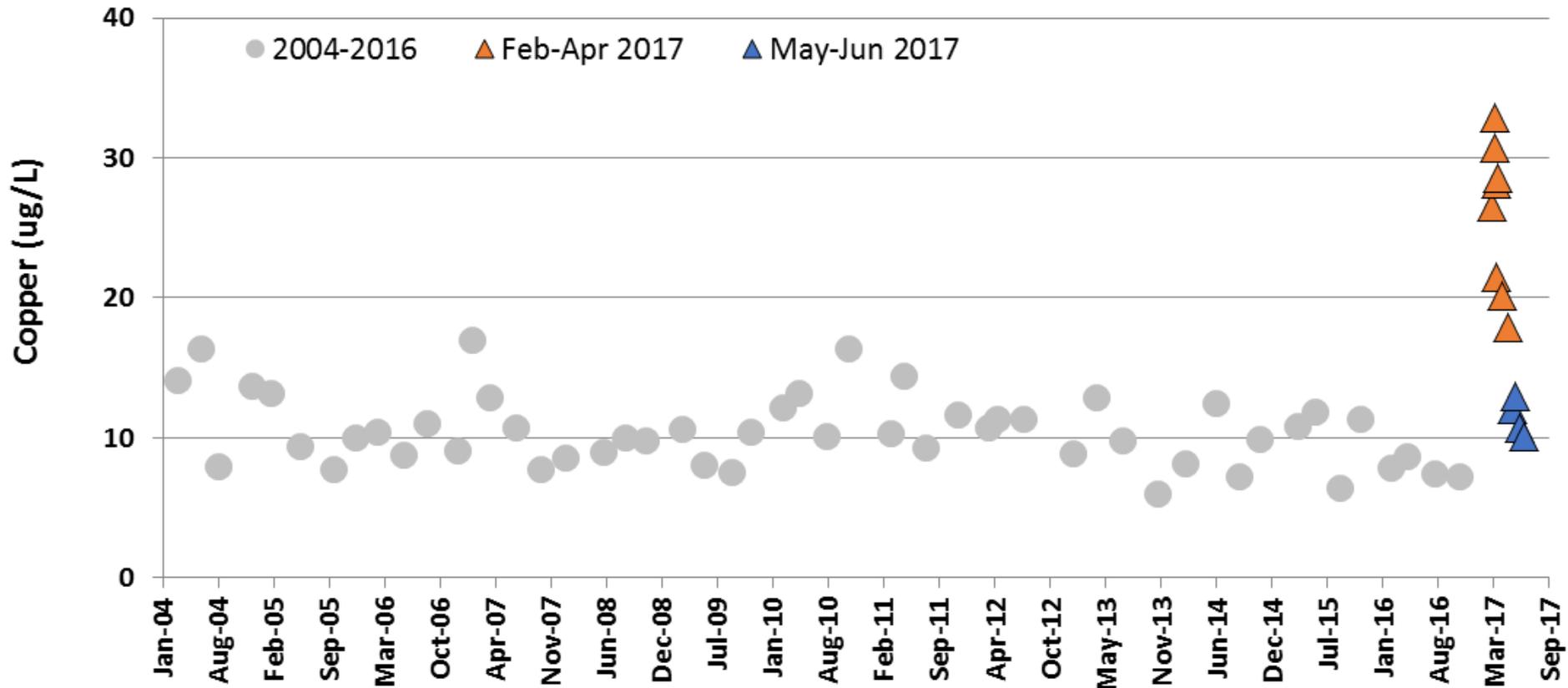


What was observed in the West Point effluent?

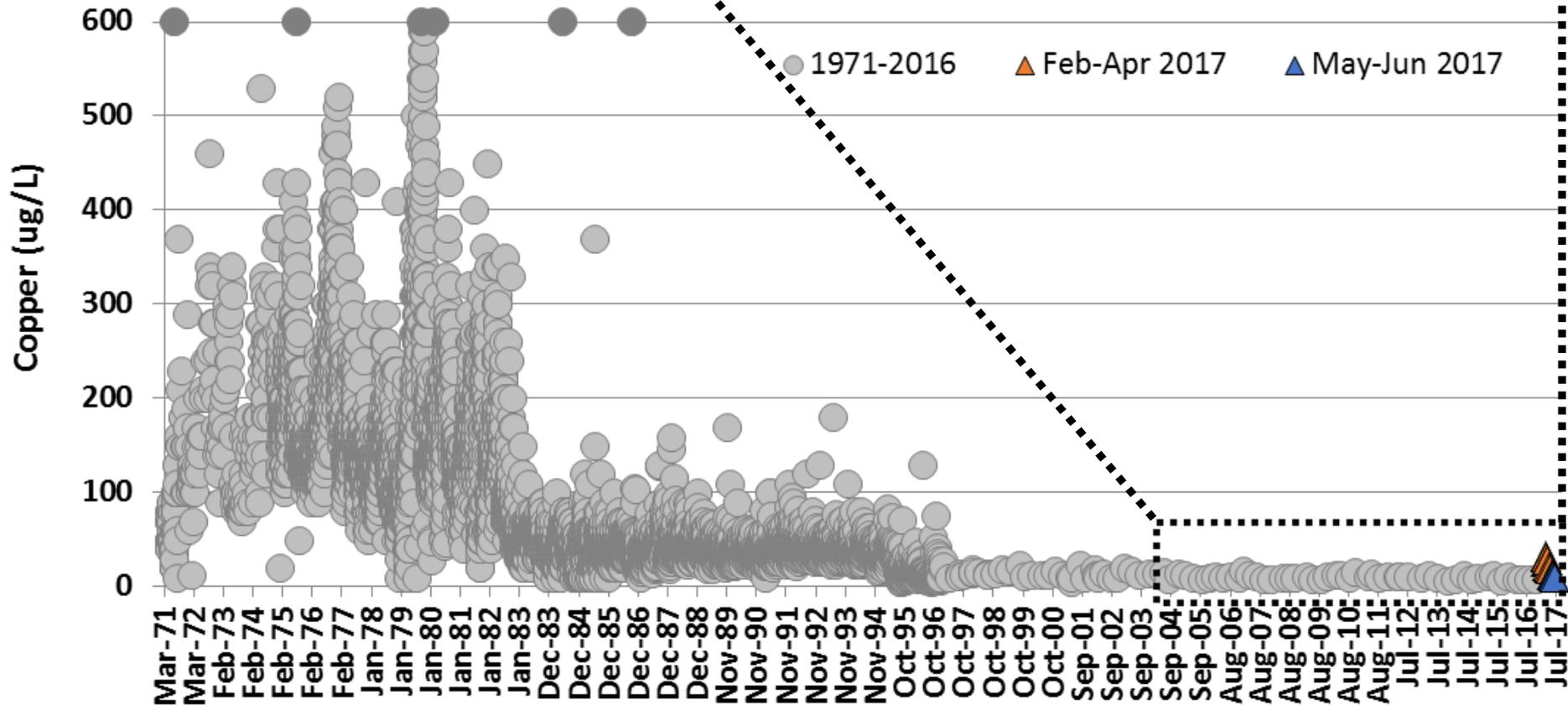
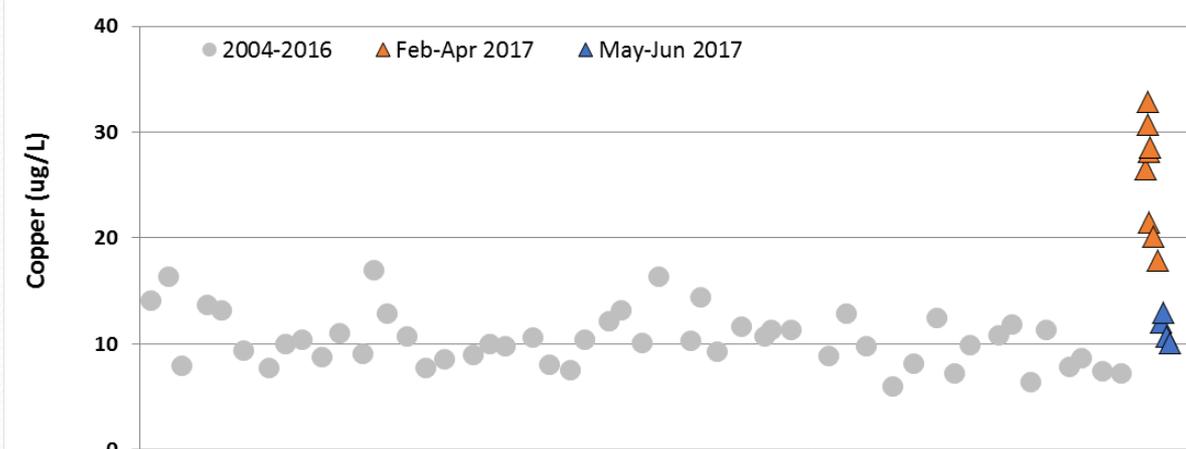
- Daily fecal coliform levels variable; met permit limits throughout restoration
- Total suspended solids (TSS) and carbonaceous biological oxygen demand (CBOD) did not meet permit limits until May 10th
- Nutrient levels generally similar to typical conditions
- Trace metals elevated from recent ranges; below historic levels and met mixing zone standards
- Acute & chronic toxicity tests showed no impacts on aquatic organisms in the lab



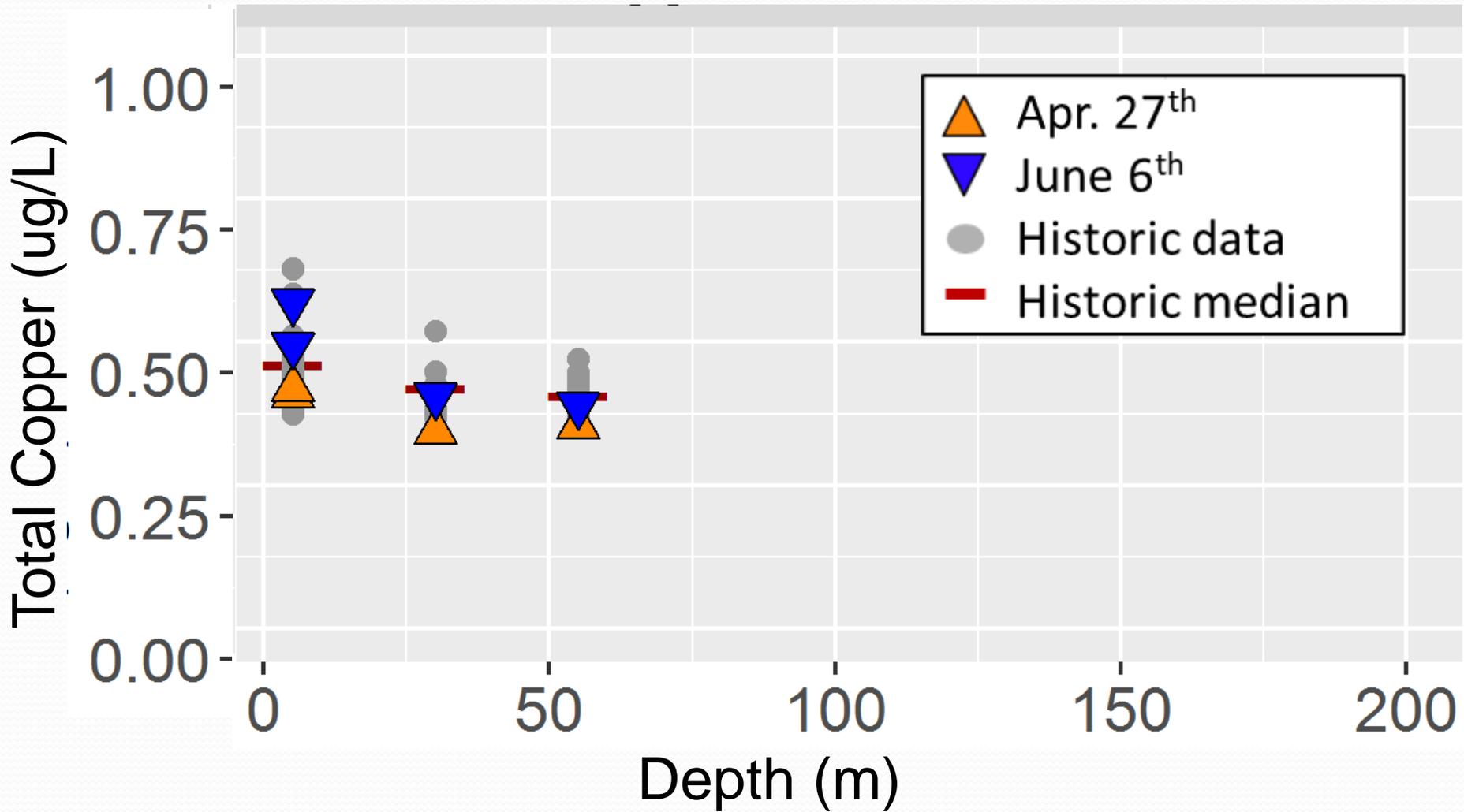
Example – Total Copper in Effluent



High historical data – City of Seattle implemented corrosion control for leaching pipes in 1982-83, so levels due to influent. Secondary treatment began at West Pt in late 1995.

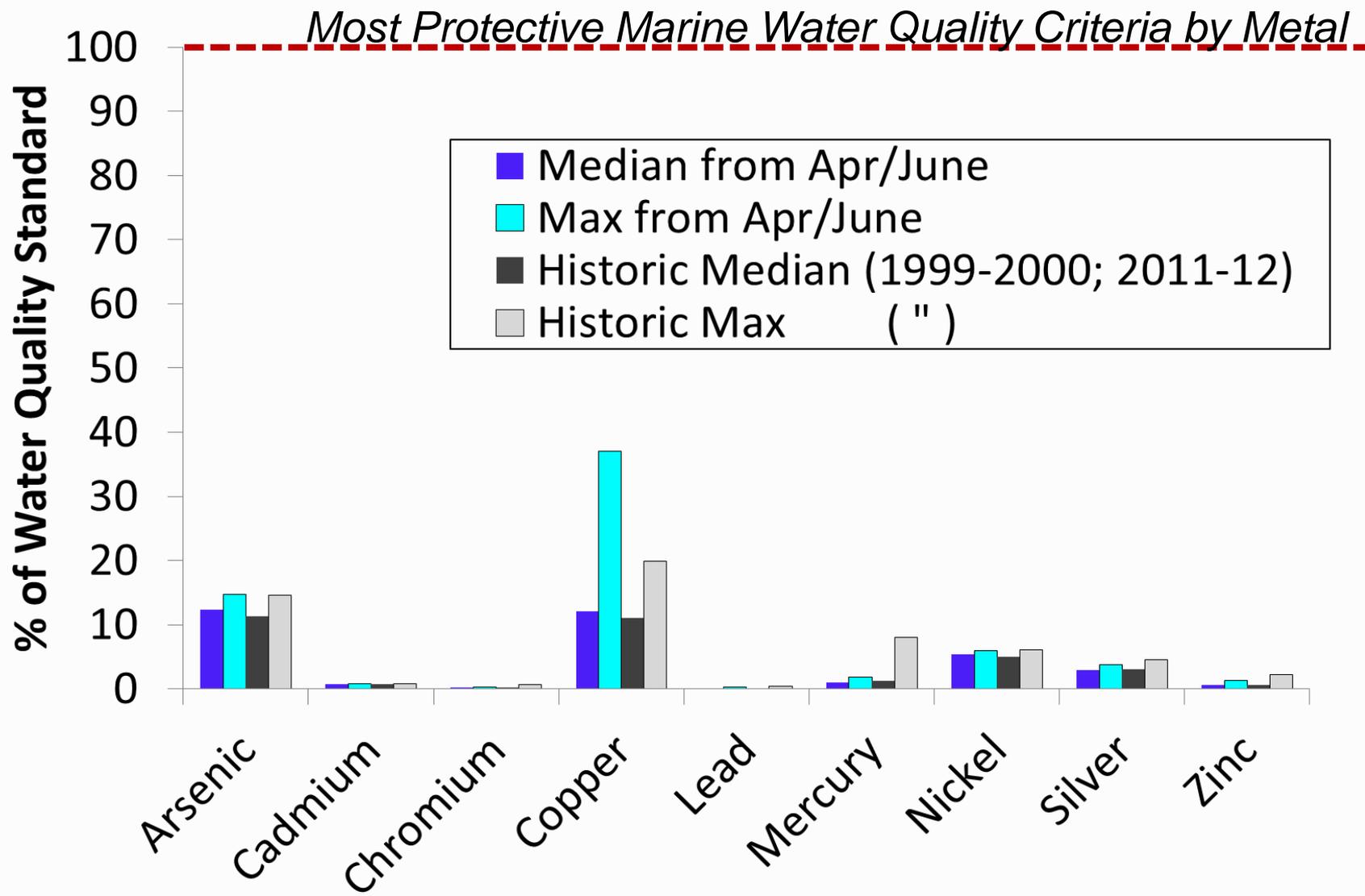


Total Copper at the West Point outfall site in Puget Sound

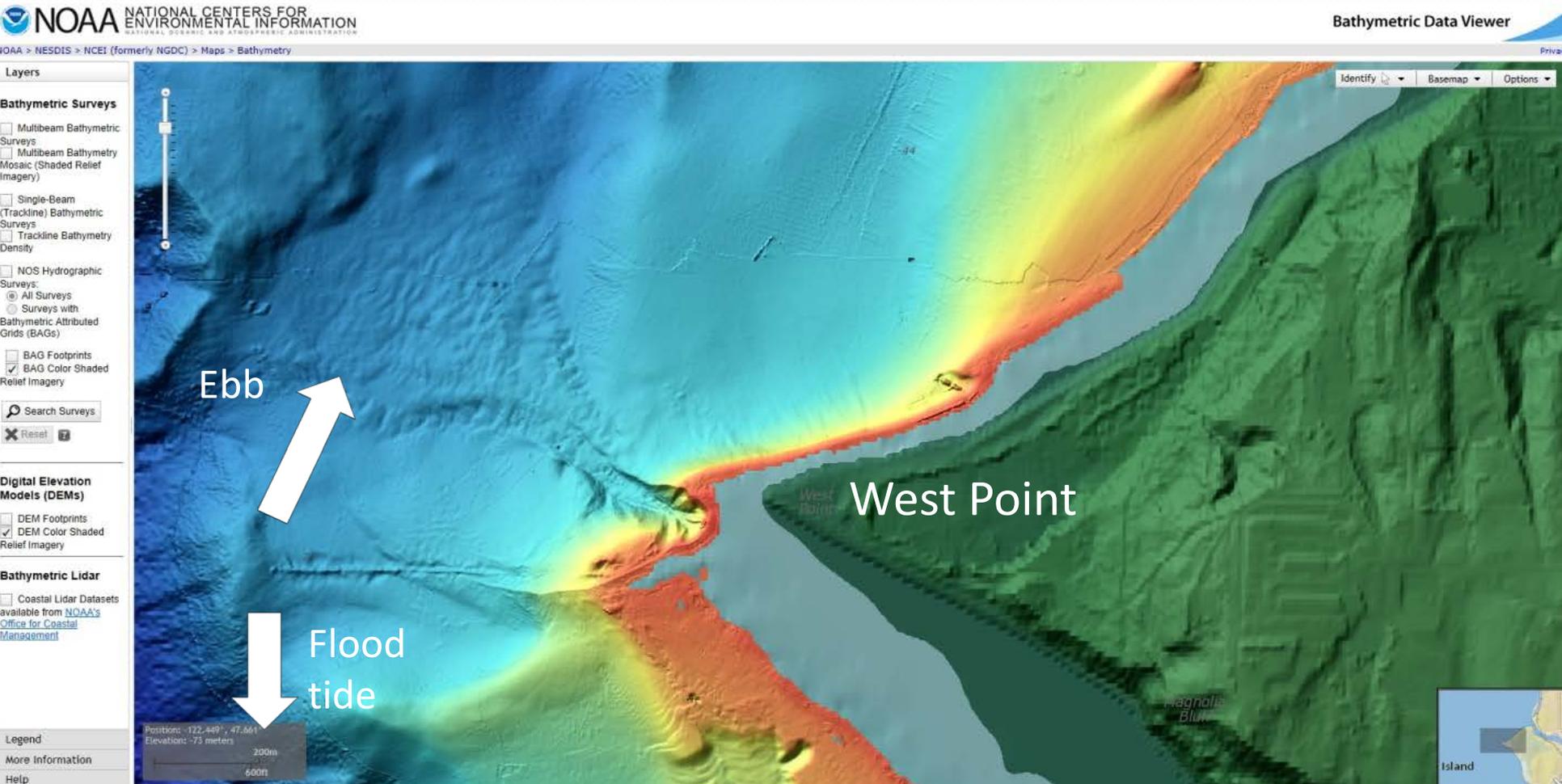


- Chronic marine water quality standard (dissolved) = 3.1 ug/L

Comparison of dissolved metals to state standards



Mixing, tidal currents, and outfall depth contribute to the fate and dispersal of West Point effluent



Summary Points

- Increase in fecal indicator bacteria with Feb. discharges
- West Point effluent: some elevated levels of materials and did not meet all permit discharge limits during restoration
 - Chronic and acute toxicity tests on aquatic organisms were negative
- Other water quality indicators showed typical seasonal patterns and ranges in Central Puget Sound
 - State marine water quality standards were met
- Mixing and tidal currents contributed to fate and dispersal
- Sediment and organism tissue analyses next in order to understand any other potential impacts

Thank you!

Contributors:

- King County Environmental Lab staff for intensive field sampling and lab analysis
- West Point Treatment Plant staff for intensive work during restoration process and photo credits
- Bruce Nairn: WTD Modeling



Reports and Next Steps

- Bi-weekly water quality summary reports during the restoration are available at <http://kingcounty.gov/depts/dnrrp/wtd/system/west/west-point-restoration/marine-monitoring.aspx>
- Effluent and water quality summary report for receiving waters expected by late 2017/early 2018
- Sediment and tissue sampling reports are expected in 2018
- West Point TP restoration near-field effluent mixing water quality analysis report is available at http://kingcounty.gov/~media/depts/dnrrp/wtd/system/WP/restoration/enviro-mon/170623_WP-priority-pollutant-data-update.ashx?la=en