Context

The City of Portland’s MS4 system includes 36 outfalls that discharge stormwater to the Portland Harbor Superfund study area, a 10-mile reach of the Willamette River. These outfalls drain an upland area totaling more than 5,000 acres of mixed land uses, including heavy and light industrial, commercial, major transportation (i.e., highways and freeways), residential, and open space. The harbor has been an active industrial area for over 100 years, and legacy contaminants remain in some upland areas.

Approach

The project took the following approach to source investigation and control:

- Use sediment data to prioritize basin investigations. Outfalls with high contaminant concentrations in adjacent inriver sediment data were given highest priority for additional source investigation. Data used to identify source tracing contaminants.
- Use land use (current and historical) to identify potential source areas. Industrial land uses typically have the highest pollutant concentrations and broadest range of pollutant types.
- Identify potential pathways from sources to the City stormwater conveyance system. Pathways to the MS4 include piped connections, overland runoff to offsite catch basins, infiltration of contaminated groundwater into storm lines, and vehicle tracking of contaminated soil offsite to adjacent roadways.
- Trace contaminant sources. Historical research and data collection/evaluation were conducted to find specific contaminant sources to the MS4.
- Refer contaminant sources to the appropriate city, state, or federal programs for source control. The idea is that contaminants will be controlled at the source by the site owner/operator. Source controls more effective and less costly when implemented at the source.

Source Tracing

Data Collection and Evaluation

Tracing upland contaminant sources was a key objective of the City of Portland Outfalls Project. Types of analytical data collected from the City conveyance system included samples of stormwater, inline solids, and dry-weather flow. Sample locations generally progressed “up-the-pipe” from the outfall to specific source areas; where data from the outfall indicated current sources of contaminants, source investigations were conducted at upgradient locations in the conveyance system.

Sample methodologies were modified as needed to address technical challenges that arose during the investigations. For example, existing models of in-line sediment traps often failed to capture enough sediment for the required chemical analysis – or would not fit into smaller diameter pipes – and required considerable time and effort to install and process. To deal with these issues, the City’s field operations staff invented a new design of sediment trap – the Screened Inline Flow-through (SIFT™) sediment trap.

Source Identification

Use system data and research to identify potential sources. Review subsequent site data to confirm more source tracing not needed.

Basin Case Studies

Case studies from individual outfall basins provide examples of how these steps were tailored to suit the specific circumstances of each basin.

Basin 18

- Developed part of the basin has long history of heavy industrial use. Sediment near the outfall has elevated contaminant concentrations, but other pathways present (e.g., other outfalls, overwater activities, eroding bank soils). Inline stormwater and solids data pointed to current sources in the basin. Several iterative investigations were conducted, and major sources were identified.
- Lessons learned:
  - Current sources of legacy contaminants may be present. High PCB concentrations were detected in solids from the Basin 18 conveyance system, even after the lines were cleaned out.
  - Identifying possible sources to a branch of the system can be tricky. For example, one site contractor caused upstream transport of site contaminants within the adjacent City storm line during line hydrocleaning activities, confounding interpretation of “upgradient” and “downgradient” samples from the City line.
  - High variability in stormwater and inline solids data, so may need to collect more data to confirm presence and absence of sources.

These case studies illustrate important lessons learned during the course of the project and show how this multifaceted, iterative, up-the-pipe approach proved successful and efficient for identifying sources where additional controls were needed.

A summary of the recent City of Portland Outfalls Project investigation, the Municipal Stormwater Source Control Report for Portland Harbor is available on the BES web site at: http://www.portlandoregon.gov/bes/64448