February 8, 2016

Alex Liverman  
Oregon Department of Environmental Quality  
Northwest Region Cleanup Program  
700 NE Multnomah St., Suite #600  
Portland, OR  97232

Subject: City of Portland Outfalls Project  
Revised Sampling and Analysis Plan

Dear Alex:

This letter presents the revised project-specific Sampling and Analysis Plan (SAP) for conducting stormwater monitoring at City outfall basins in the Portland Harbor Study Area. The City developed this revised plan in collaboration with the Oregon Department of Environmental Quality (DEQ), under the 2003 Intergovernmental Agreement (IGA) with DEQ for the City of Portland Outfalls Project. The revised SAP is intended to satisfy DEQ’s request to the City1 to broaden the previous scope of the proposed monitoring to include data collection at additional outfalls in order to demonstrate the effectiveness of all source control measures (SCMs) that have been implemented in City outfall basins and to facilitate an evaluation of potential unacceptable inwater risks affiliated with stormwater discharges. To help demonstrate the rationale for the outfall basins selected for monitoring under the SAP, the City developed the Selection of Outfall Basins for Source Control Measure Effectiveness Monitoring technical memorandum (Basin Selection TM). Upon DEQ approval of the revised SAP, the revised SAP will supersede the SAP previously submitted as an appendix to the Source Control Measure Effectiveness Demonstration technical memorandum (Effectiveness Demonstration TM), delivered to DEQ in September 2015. The format of this SAP matches the format of previous SAPs submitted to DEQ under the IGA and refers to the amended programmatic Quality Assurance Project Plan (QAPP) and programmatic SAP documents that were developed for the City of Portland Outfalls Project.

Monitoring Objectives

The previous SAP was designed to evaluate the performance of Portland Harbor-specific SCMs that the City had implemented, but for which the City had not yet collected data to demonstrate that the SCM is effective. This revised SAP is designed to meet broader objectives identified by DEQ and agreed to by the City (Basin Selection TM), namely an assessment of the collective effectiveness of various stormwater source control programs (i.e., City and State water quality programs and State and Federal Cleanup programs) at the basin scale. The primary purpose of this SAP is to collect additional basin-scale stormwater data from representative basins that will be evaluated in conjunction with existing data. The objective of the data evaluation will be to

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1 Letter from A. Liverman (DEQ) to L. Scheffler (BES) dated December 28, 2015.
demonstrate that the collective effect of site and basin source controls, implemented under City and state stormwater quality programs and state and federal Cleanup programs, will meet Portland Harbor sediment and water quality objectives once identified sources are controlled.

In order to define the specific objectives that the proposed SAP would be designed to meet, the City completed a Data Quality Objectives (DQO) process for the SAP (DQO 1) and for each basin proposed for additional stormwater data collection (DQOs 2 – 9). These DQOs are included as Attachment A.

**Monitoring Locations**

There currently are 35 City outfalls that discharge separated stormwater to the Portland Harbor Study Area. Drainage areas for each outfall are shown on Figure 1 (see Attachment B). The Basin Selection TM identifies eight outfall basins for additional monitoring under this SAP. Table 1 below summarizes the proposed monitoring locations for each outfall basin and additional rationale for the suitability of each location in terms of the defined DQOs (see Attachment A). Proposed locations are displayed on Figures 2 through 9 (see Attachment B).

Stormwater samples intended to represent the whole basin typically will not be collected directly from the outfalls themselves, because outfalls are often at least partially submerged during the wet season and therefore are not conducive to collecting samples representative of the basin. Manhole locations are available within each affiliated stormwater conveyance system that will represent all of each basin drainage area.

Due to the constructed elevations of trunk storm lines leading to a few selected outfalls and the seasonal elevation of the river during the wet season, river water can back up in the system during high-stage conditions and can prevent collection of representative samples at some manholes during storm events. Because of the importance of collecting all data from a given basin at the same location to allow for comparability between storm events, the selected manholes in Table 1 represent the best locations where all or most of the drainage area will be represented and which are least likely to be inundated during high river stages. Table 1 also includes an alternative monitoring location for one basin in case the preferred monitoring location is not accessible.

In accordance with the basin-specific DQOs, the City also aims to collect stormwater samples from specific sites discharging to three basins, concurrently with the basin-scale sampling locations. These locations are also described in Table 1.

<table>
<thead>
<tr>
<th>Table 1. Proposed Sampling Locations</th>
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</thead>
<tbody>
<tr>
<td><strong>Basin</strong></td>
</tr>
</tbody>
</table>
| 16 | Manhole AAX408 Outgoing 48” Pipe | • Represents majority of Basin 16 drainage area.  
• Is downstream of connection from the 8” line cleaned by the City as an SCM under the IGA.  
• Low elevation of line presents inundation concern: this is the best location that still meets monitoring objectives.  
• Includes the drainage area represented in the 2007 stormwater data set. |
| | Manhole ANH937 Incoming 12” line from manhole | • Represents only stormwater discharges to OF-16 from Calbag Metals site (ECSI #5059).  
• Basin 16 source investigation identified this source; site SCM effectiveness not |
Baseline Sampling Location | Rationale
---|---
ANK329 | yet demonstrated.

<table>
<thead>
<tr>
<th>Basin</th>
<th>Sampling Location</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>At Outfall Alternative: Manhole AAT596 Outgoing 90” Pipe</td>
<td>• Both locations represent all of the Basin 17 drainage area. • Alternative location to be used if outfall submerged. This is the only other location that represents whole basin.</td>
</tr>
<tr>
<td>19</td>
<td>Manhole AAP918 Outgoing 42” Pipe</td>
<td>• Represents all of Basin 19 drainage area. • Location previously sampled by City and LWG.</td>
</tr>
<tr>
<td></td>
<td>Stormwater Sampling Manhole at 4927 NW Front</td>
<td>• Represents stormwater discharges to OF-19 from Calbag Metals (ECSI #2454). • Same location as that previously sampled as part of Basin 19 source investigations. • Basin 19 source investigation identified this source; site SCM effectiveness not yet demonstrated.</td>
</tr>
<tr>
<td>44</td>
<td>Manhole ABC352 Outgoing 12” Pipe</td>
<td>• Represents all of Basin 44 drainage area. • Location previously sampled by City.</td>
</tr>
<tr>
<td>45</td>
<td>Manhole ABC319 Outgoing 27” Pipe</td>
<td>• Represents all of Basin 45 drainage area. • Location previously sampled by City.</td>
</tr>
<tr>
<td>M-2</td>
<td>Manhole AAM169 Outgoing 60” Pipe</td>
<td>• Represents all of Basin M-2 drainage area. • Location previously sampled by City.</td>
</tr>
<tr>
<td>52D</td>
<td>Manhole APT249 At Manhole</td>
<td>• Represents all of Basin 52D drainage area. • Location previously sampled by private party (ECSI #2355)</td>
</tr>
<tr>
<td></td>
<td>Manhole APT252 Incoming Line from 9449 N. Burgard Way</td>
<td>• Location previously sampled by private party (ECSI #2355). • Basin 52D source investigation identified this source; site SCM effectiveness not yet demonstrated. • Note that due to recent site storm system changes, discharge may no longer be occurring.</td>
</tr>
<tr>
<td>53A</td>
<td>Manhole AAA170 At Manhole</td>
<td>• Represents all of Basin 53A drainage area. • Location previously sampled by City.</td>
</tr>
</tbody>
</table>

**Sampling Approach and Schedule**

The sampling approach is intended to collect stormwater data sets in general accordance with the *Portland Harbor Joint Source Control Strategy* ([JSCS]; DEQ/EPA, 2005, as amended 2007] and that where possible, can be compared to the existing representative data sets in order to evaluate the significance of concentration trends.

Previous stormwater data sets collected from City basins by the City, the Lower Willamette Group (LWG), and others include a mix of composite and grab samples. The JSCS (and subsequent DEQ guidance) supports collection of four stormwater grab samples to evaluate stormwater quality. With the exception of Basin 19, stormwater grab samples will be collected from the designated basin-scale monitoring locations during four storm events. At least two of the four events will target “first-flush” conditions. Due to the complexity and size of Basin 17, which also includes significant pervious acreage, first-flush will be defined as being within the first 3 hours of observed runoff to ensure that samples represent contributions from the entire basin rather than only the portions closest to the monitoring location. For the other basins, first-flush will be defined as being within the first 30 - 60 minutes of observed runoff. For Basin 19, much of the previous stormwater data was collected via flow-weighted composite samples that represented the majority of the hydrographs for each storm event (i.e., first-flush samples were not needed). Because this basin is slated for future monitoring by the BES MS4 program,
sample collection in Basin 19 will consist of collecting four flow-weighted composite samples in accordance with the target storm criteria identified below.

The JSCS establishes target storm criteria as follows:

- Antecedent dry period of at least 24 hours (as defined by <0.1” over the previous 24 hours);
- Minimum predicted rainfall volume of >0.2” per event; and
- Expected duration of storm event of at least 3 hours.

Based on the City’s experience with stormwater monitoring in this region, smaller storms or those of shorter duration are less likely to generate runoff that would be representative of entire stormwater basins. An effort will be made to select storm events that meet target criteria; however, from the City’s extensive stormwater sampling experience, it is likely that a targeted and sampled storm may not meet optimal criteria when the sampling event is completed, or that unpredicted events will occur that do meet the criteria. The criteria will be used as general guidance to determine when forecasted storms should be targeted for project sampling. Field crews will use best professional judgment to determine whether samples are representative of first-flush conditions and to determine potential storm events for which a shorter antecedent dry period may be acceptable in an effort to collect larger storms and a full data set this winter and spring. Per previous SAPs approved by DEQ, antecedent dry periods will not be shorter than six hours. Consultation with the field crew will be made prior to each sample event to ensure that a variety of types of storms (e.g., storm size, intensity) comprise the four storm events for each basin. Following sample collection, rain gage data, field observations and sample times will be evaluated to assess sample representativeness prior to submitting samples for laboratory analyses.

Based on an evaluation of seasonal river gage data and storm line elevations for stormwater SAPs completed previously for the Outfalls Project, the monitoring locations for all basins except Basins 19 and 44 have a significant potential to be impeded by river back-up during high river stages, because they are below elevations of 17 feet City of Portland Datum (COP Datum), where river impacts have been observed. Table 2 below summarizes the invert elevations for these basin-scale monitoring locations.

### Table 2. Monitoring Location Invert Elevations

<table>
<thead>
<tr>
<th>Basin</th>
<th>Location</th>
<th>Invert Elevation (COP Datum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Manhole AAX408</td>
<td>10.7’</td>
</tr>
<tr>
<td>17</td>
<td>Outfall/Manhole AAT596</td>
<td>3’/5’</td>
</tr>
<tr>
<td>45</td>
<td>Manhole ABC319</td>
<td>12.4’</td>
</tr>
<tr>
<td>M-2</td>
<td>Manhole AAM169</td>
<td>11.5’</td>
</tr>
<tr>
<td>52D</td>
<td>Manhole APT249</td>
<td>11.3’</td>
</tr>
<tr>
<td>53A</td>
<td>Manhole AAA170</td>
<td>15.4’</td>
</tr>
</tbody>
</table>
In advance of implementing stormwater sampling SAPs in City basins in 2007 and 2008, the City evaluated river stage data to assess the viability of lower-elevation sampling locations. As a point of reference, Table 3 provides an indication of the likelihood for the Basin 45 location to be inundated.

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>12.4</td>
<td>0%</td>
<td>0%</td>
<td>3%</td>
<td>11%</td>
<td>26%</td>
<td>20%</td>
<td>20%</td>
<td>18%</td>
<td>30%</td>
<td>35%</td>
</tr>
</tbody>
</table>

Table 3. % of Days River Above Invert Elevation

1Based on USGS Morrison Bridge Gage Height Daily Means from January 1, 1996 to January 1, 2006, adjusted to COP datum, excluding all values from July through August.

In order to ensure that samples from Basins 16, 17, 45, M-2, 52D, and 53A represent only basin stormwater, field crews will check the river stage and make visual observations prior to sampling (such as noting positive flow direction into the outfall) to ascertain whether observed water at the monitoring locations likely represents stormwater flow from the basin or river water. If confirmation cannot be made of storm flow conditions, samples will not be collected at that time.

Due to the number of basins being sampled, the geographic distance between sampling locations, and the variability of rainfall within different parts of the Study Area, it is unlikely that all eight basins will be sampled during each event. Due to the proximity of discharge locations, an effort will be made to collect grab samples for the following basin pairs on the same events: Basin 16/17 and Basin 44/45. For ease of data evaluation and reporting, field crews also will try to minimize the total number of storm events needed to complete the target four storms for each basin.

Quality control samples will include a field decontamination blank for each sampled event, field duplicate grab samples at a target minimum frequency of one per ten samples over the course of the project, and one duplicate composite sample from Basin 19. All grab duplicates will be collected at basin-scale monitoring locations. With the exception of Basin 44, grab samples will be collected in accordance with Standard Operating Procedure (SOP) 2.02b “Grab Sample Collection with Stainless Steel Beaker” in addition to general SOPs that will be utilized by field crews during sample collection for equipment preparation, measurement of field parameters, chain-of-custody, and quality control sampling. Due to obstructions in the monitoring location for Basin 44, grab samples may need to be collected via SOP 2.02c “Grab Sample Collection with Peristaltic Pump.” Composite samples will be collected in accordance with SOP 2.01b “Flow-Paced Composite Sampling of Stormwater.” All relevant SOPs are included in the programmatic SAP.

Field crews will begin implementation of the SAP following DEQ review and approval.

**Analytical Approach**

All stormwater samples will be analyzed for the following analytical suite: polychlorinated biphenyl (PCB) congeners, polycyclic aromatic hydrocarbons (PAHs), phthalates, total metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc) and total
suspended solids (TSS). In two basins (Basins 17 and 44), samples will also be analyzed for organochlorine pesticides (see DQO 3 and DQO 5 in Attachment A). Measurements of pH, temperature, and conductivity will be made in the field.

Proposed methods and laboratory assignments are listed below in priority order, to address the unlikely event that sample volume is limited. Target method reporting limits (MRLs) for each analysis are summarized in Table 4 below to allow comparison with existing data and DEQ screening levels. Laboratories have been selected to achieve MRLs that will allow for a comparison, to the extent feasible, to the 2007 data set and screening level values listed in the updated Table 3-1 of the JCS.

Table 4. Analytical Approach

<table>
<thead>
<tr>
<th>Analyte Group</th>
<th>Target MRLs</th>
<th>Method</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCB Congeners</td>
<td>5.0 to 30.0 pg/L for individual congeners</td>
<td>EPA 1668A</td>
<td>ALS/Pace</td>
</tr>
<tr>
<td>PAHs and phthalates</td>
<td>0.01 - 1.0 μg/L</td>
<td>EPA 8270-SIM</td>
<td>WPCL</td>
</tr>
<tr>
<td>Total Metals</td>
<td>0.1 to 0.5 μg/L</td>
<td>EPA 200.8</td>
<td>WPCL</td>
</tr>
<tr>
<td>TSS</td>
<td>1 mg/L</td>
<td>SM 2540D</td>
<td>WPCL</td>
</tr>
<tr>
<td>Organochlorine Pesticides</td>
<td>1 ng/L</td>
<td>EPA 8081</td>
<td>ALS</td>
</tr>
</tbody>
</table>

ALS = ALS Environmental Laboratory
Pace = Pace Analytical Laboratory
WPCL = BES Water Pollution Control Laboratory

**Reporting**

During and following the data collection and analysis period, the City will collaborate with DEQ on developing the outline and intended content of a final report that will be submitted to DEQ. The report will summarize data collection activities and analytical results and will evaluate and present the data in accordance with the established DQOs for the SAP.

If you have any comments or questions, please call me at 503-823-2296.

Sincerely,

[Signature]

Linda Scheffler
Water Resources Program Manager
Superfund Program
Attachment A: Data Quality Objectives

Attachment B: Figures

- Figure 1 – City Outfall Basins
- Figure 2 – Outfall Basin 16
- Figure 3 – Outfall Basin 17
- Figure 4 – Outfall Basin 19
- Figure 5 – Outfall Basin 44
- Figure 6 – Outfall Basin 45
- Figure 7 – Outfall Basin M-2
- Figure 8 – Outfall Basin 52D
- Figure 9 – Outfall Basin 53A
### DQO 1: Representative Basin Sampling for City Outfall Effectiveness Monitoring

<table>
<thead>
<tr>
<th><strong>DQO Steps</strong></th>
<th></th>
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<tbody>
<tr>
<td><strong>Step 1: State the Problem</strong></td>
<td></td>
</tr>
<tr>
<td>In December 2013, the City submitted the Municipal Report which describes by outfall, the various source controls being implemented through state and city programs and concluded that recontamination from City outfalls was unlikely once these activities were completed. DEQ has requested that the City further demonstrate that the existing programs will be effective in reducing contaminant concentrations through further evaluation of existing and new basin-scale stormwater data for outfalls representative of a variety of conditions.</td>
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<tr>
<td>In order to demonstrate that the existing programs are effective, basins that are controlled or nearly controlled will be evaluated as described in the following categories:</td>
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<tr>
<td>1) Basins for which only state and/or municipal stormwater programs are in place.</td>
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<tr>
<td>2) Basins for which all ECSI sites have been controlled and state and/or municipal stormwater programs are in place.</td>
<td></td>
</tr>
<tr>
<td>3) Basins for which almost all ECSI sites have been controlled and state and/or municipal stormwater programs are in place.</td>
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<tr>
<td>The Municipal Report concluded that controlled basins (i.e., Category 1and 2) have lower contaminant concentrations in stormwater than basins where site source control implementation was still underway. Four additional basins in Category 1 and 2 will be monitored to help to confirm the City's conclusions about these controlled basins.</td>
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<tr>
<td>The Municipal Report also concluded that stormwater in uncontrolled basins would fall below the DEQ knee-of-the-curves once ECSI controls were implemented. Four additional basins from Category 3, where most of the ECSI site source controls have been implemented, will be monitored to support the Municipal Report conclusion.</td>
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<tr>
<td>Because all ECSI sites have not been controlled in the Category 3 basins, the evaluation will need to consider the anticipated improvement. For example, stormwater contaminant concentrations may not be as low as Categories 1 and 2 but should be evaluated in light of the sources that have not been controlled. Site-specific DQOs are also needed for all monitored basins to guide evaluation.</td>
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</tr>
<tr>
<td><strong>Step 2: Identify the Decision to be Made</strong></td>
<td></td>
</tr>
<tr>
<td>1. Does stormwater quality from controlled basins (Categories 1 and 2) demonstrate that existing programs are effective?</td>
<td></td>
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<tr>
<td>2. Does stormwater quality from nearly controlled basins (Category 3) demonstrate a downward trend (or already below relevant screening levels) indicating that once controls are in place that the existing programs will be effective?</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3: Identify the Inputs to the Decision</strong></td>
<td></td>
</tr>
<tr>
<td>Existing and new stormwater data from Categories 1-3 will be used to evaluate effectiveness. New stormwater data will be collected in general accordance with DEQ/EPA Joint Source Control Strategy (JSCS). Because the JSCS criteria are designed to apply to discrete sites, some adjustments to the criteria are warranted to adapt the monitoring approach to shared stormwater conveyance system serving large drainage areas. Adjustments to the target criteria will align with the adjustments approved by DEQ during City collection of basin-scale stormwater data in 2007-2008. Unless noted on the specific outfall DQO, each outfall will be monitored with the following components:</td>
<td></td>
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<tr>
<td>• Four grab samples at each monitored basin-scale location.</td>
<td></td>
</tr>
<tr>
<td>• Stormwater samples will be analyzed for TSS, total metals, PAHs, phthalates and PCB congeners.</td>
<td></td>
</tr>
<tr>
<td>• Target storm criteria include a 24-hour antecedent dry period, predicted rainfall volume ≥0.2”, and storm duration of at least 3 hours. In some cases, shorter antecedent dry periods (minimum of 6 hours) may be warranted in order to include storms of larger size.</td>
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<tr>
<td><strong>Step 4: Define the Boundaries</strong></td>
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<tr>
<td>• A variety of storm conditions, including two first-flush sample events (i.e., within the first 30 – 60 minutes of full-basin discharge at the monitoring location), should be targeted to better represent the full range of conditions in the basin. This does not apply if composite sampling is proposed for an outfall.</td>
<td></td>
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<tr>
<td>• Detection limit targets should be equal to or lower than those achieved in data previously collected (primarily in 2007/2008).</td>
<td></td>
</tr>
<tr>
<td>• Sampling should be conducted below all connections to the system, if feasible. In some basins, river water can potentially back up into the storm system and affect sample representativeness. The potential for this to occur for each basin monitoring location should be evaluated to ensure that the location will represent only basin flow. If locations are at risk of river inundation, field crews will need to use river gage data, rain gage data, and visual observations to confirm that samples will be representative of basin flow, before samples are collected for each event.</td>
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<tr>
<td><strong>Step 5: Develop a Decision Rule</strong></td>
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</tbody>
</table>
## DQO Steps

1. If the geomeans of the existing and new Category 1 and 2 data sets are lower than the DEQ knee-of-the-curves, then the City can conclude that basin source control measures have been effective. Individual data points above the knee-of-the-curves will be evaluated to determine if additional site controls or program improvements may be needed.

2. If the geomeans of the existing and new Category 3 data sets are lower than the DEQ knee-of-the-curves or showing a downward trend, then the City can conclude that basin source control measures will likely be effective once source control implementation is complete. Individual data points above the knee-of-the-curves will be evaluated to determine if additional site controls or program improvements may be needed.

## Step 6: Identify Acceptance Criteria or Decision Errors

Data meet field and lab QC criteria, sample event selection was based on target storm criteria, and data are considered representative of Basin stormwater discharge.

## Step 7: Optimize the Design

Stormwater samples will be targeted for collection in Winter/Spring 2016
**DQO Steps**

### Step 1: State the Problem
This represents a Category 3 basin. The Municipal Report describes the existing programs in place. One facility in the basin has not completed DEQ Cleanup performance monitoring after source control implementation: Calbag Metals - Nicolai (ECSI #5059).

The previous trunk line stormwater samples were collected by the LWG in 2007 at manhole AMZ120, which only represented about 75% of the basin. Sampling in the main trunk line downgradient of the connection with the 8-inch Front Avenue storm line would represent most of the basin but a comparison to previous LWG stormwater samples will not be a direct comparison.

For the 2007 stormwater data, the only individual sample results that exceeded both the DEQ knee-of-the-curves and SLVs were cadmium, copper, and lead. Given that these metals were also elevated at the Calbag facility, grab samples that represent only discharges from the facility should be collected at the same time as the basin-scale samples to help interpret the basin results.

Sampling in this basin would also meet performance monitoring objectives as detailed in the Source Control Measures Effectiveness Demonstration, Appendix C (September 2015).

### Step 2: Identify the Decision to be Made
See DQO 1

### Step 3: Identify the Inputs to the Decision
- See DQO 1
- A minimum of two stormwater samples representative of Calbag facility discharges, that are collected concurrently with basin-scale stormwater samples.
- Verification of presence of stormwater flow at the monitoring location; during high Willamette River elevations, river water could potentially back up into the Basin 16 system at the proposed monitoring location.

### Step 4: Define the Boundaries
- See DQO 1
- A monitoring location downgradient of the connection of the NW Front Ave storm lines
- Sampling should not be conducted if the monitoring location has been inundated with river water and is not representative of basin stormwater.

### Step 5: Develop a Decision Rule
See DQO 1

### Step 6: Identify Acceptance Criteria or Decision Errors
See DQO 1

### Step 7: Optimize the Design
See DQO 1
DQO 3: OF-17 Effectiveness Monitoring

### DQO Steps

**Step 1: State the Problem**

This represents a Category 1 basin. The Municipal Report describes the existing programs in place. Due to the significant changes in the basin configuration scheduled for 2011, this outfall was not sampled during the City’s harbor-wide stormwater sampling in 2007/2008. The outfall is also difficult to sample because it is at a low elevation and it is frequently inundated by the river. The first upstream manhole point can also be subject to river back-up and additionally has safety concerns during sampling. Because the river was unusually low during the fall of 2015, the City was able to collect three grab samples from the outfall, using the same protocol as described in DQO 1. Therefore, one additional sample will be collected at the outfall or at the first upstream manhole if conditions allow.

In addition to the DEQ knee-of-the-curve analyte list, pesticides were analyzed in the three samples collected in 2015 since this outfall had not been sampled before and DDx was elevated in Balch Creek Cove sediment. A full suite of analytes, including pesticides, will be collected to confirm the City’s conclusion that the basin is controlled.

**Step 2: Identify the Decision to be Made**

See DQO 1

**Step 3: Identify the Inputs to the Decision**

- See DQO 1
- Verification of presence of stormwater flow at the monitoring location; during high Willamette River elevations, river water could potentially back up into the Basin 17 system at the outfall.
- The three 2015 samples should be evaluated to determine if any of them represent first-flush conditions. If less than two samples are considered as first-flush, then the additional sample should target first-flush conditions.
- Pesticides will also be analyzed in the additional sample.

**Step 4: Define the Boundaries**

- See DQO 1
- Sampling should not be conducted if the monitoring location has been inundated with river water and is not representative of basin stormwater.

**Step 5: Develop a Decision Rule**

See DQO 1

**Step 6: Identify Acceptance Criteria or Decision Errors**

See DQO 1

**Step 7: Optimize the Design**

See DQO 1
### DQO Steps

#### Step 1: State the Problem
This represents a Category 3 basin. The Municipal Report describes the existing programs in place. Although there are still a number of Cleanup sites that have not received Source Control Decisions from DEQ, most sites in the basin have made significant progress on source control implementation.

This basin was sampled by the City’s MS4 and Portland Harbor programs between 1995 and 2011. Data from Dec. 1999 to Feb. 2010 were collected as flow-weighted composites and were evaluated for stormwater trends (*Basin 19 Stormwater Quality Trend Analyses Effectiveness of City Stormwater Source Control Efforts*, Feb. 2011). Since that time, the City collected two more flow-weighted composite samples and additional source control measures have been implemented in the basin through the DEQ Cleanup program and the DEQ 1200Z stormwater permit.

For comparative purposes, the City will collect flow-weighted composites samples at the same location as previously monitored, which represents the entire basin. Previous targeted investigations indicated one significant source in the basin, Calbag Metals - Front (ECSI #2454); grab samples from the facility connection to the municipal system will be collected concurrently to assist in data evaluation.

#### Step 2: Identify the Decision to be Made
See DQO 1

#### Step 3: Identify the Inputs to the Decision
- See DQO 1 except: four flow-weighted composites will be collected instead of grab samples
- A minimum of two stormwater grab samples representative of Calbag facility discharges, that are collected concurrently with basin-scale composite stormwater samples.

#### Step 4: Define the Boundaries
See DQO 1 except: First-flush sampling will not be conducted because the entire storm event will be represented by the composite samples.

#### Step 5: Develop a Decision Rule
See DQO 1

#### Step 6: Identify Acceptance Criteria or Decision Errors
See DQO 1

#### Step 7: Optimize the Design
See DQO 1
## DQO Steps

<table>
<thead>
<tr>
<th>Step 1: State the Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>This represents a Category 2 basin. The Municipal Report describes the existing programs in place. All Cleanup sites have been controlled; one facility in the basin implemented significant source control measures and performance monitoring and another disconnected from the City’s conveyance system. Basin stormwater data were collected in 2008/2009. In addition to other analytes, low levels of pesticides were detected and the City conducted source tracing and system cleaning. After Cleanup site source control measures were implemented, the City conducted one round of stormwater sampling in 2012 and analyzed samples for PCBs to augment the performance monitoring. A full suite of analytes, including pesticides, will be collected to confirm the City’s conclusion that the basin is controlled.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 2: Identify the Decision to be Made</th>
</tr>
</thead>
<tbody>
<tr>
<td>See DQO 1</td>
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<table>
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<tr>
<th>Step 3: Identify the Inputs to the Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>See DQO 1 except: Pesticides will also be analyzed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 4: Define the Boundaries</th>
</tr>
</thead>
<tbody>
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<td>See DQO 1</td>
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<td>See DQO 1</td>
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<tr>
<td>DQO Steps</td>
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</tr>
<tr>
<td><strong>Step 7: Optimize the Design</strong></td>
</tr>
</tbody>
</table>
## DQO Steps

### Step 1: State the Problem
This represents a Category 1 basin. The Municipal Report describes the existing programs in place, which include facilities with 1200Z stormwater permits and No Exposure Certifications. Basin stormwater data were collected in 2007. An additional data set will be utilized to confirm that the basin has been controlled.

### Step 2: Identify the Decision to be Made
See DQO 1

### Step 3: Identify the Inputs to the Decision
See DQO 1
- Verification of presence of stormwater flow at the monitoring location; during high Willamette River elevations, river water could potentially back up into the Basin M-2 system at the proposed monitoring location.

### Step 4: Define the Boundaries
See DQO 1 except:
- Sampling should not be conducted if the monitoring location has been inundated with river water and is not representative of basin stormwater.

### Step 5: Develop a Decision Rule
See DQO 1

### Step 6: Identify Acceptance Criteria or Decision Errors
See DQO 1

### Step 7: Optimize the Design
See DQO 1
### DQO Steps

**Step 1: State the Problem**
This represents a Category 3 basin. The Municipal Report describes the existing programs in place. Basin stormwater data were collected in 2012-2014. Metals (chromium, copper, lead), bis(2-ethylhexyl)phthalate, and total PAHs exceeded both the DEQ knee-of-the-curves and SLVs. The basin is composed of three DEQ Cleanup sites in the basin: the Portland Container facility (ECSI #2375) identified these contaminants in site stormwater and has recently completed significant source control measures, but no performance monitoring has been conducted. Sampling at the basin-scale and at the connection from this facility will assist in evaluating the basin data.

**Step 2: Identify the Decision to be Made**
See DQO 1

**Step 3: Identify the Inputs to the Decision**
See DQO 1
- Verification of presence of stormwater flow at the monitoring location; during high Willamette River elevations, river water could potentially back up into the Basin 52D system at the proposed monitoring location.
- A minimum of two stormwater grab samples representative of Portland Container facility discharges, that are collected concurrently with basin-scale stormwater grab samples.

**Step 4: Define the Boundaries**
See DQO 1
- Sampling should not be conducted if the monitoring location has been inundated with river water and is not representative of basin stormwater.

**Step 5: Develop a Decision Rule**
See DQO 1

**Step 6: Identify Acceptance Criteria or Decision Errors**
See DQO 1

**Step 7: Optimize the Design**
See DQO 1
**DQO Steps**

<table>
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<tr>
<td>This represents a Category 2 basin. The Municipal Report describes the existing programs in place. All Cleanup sites have implemented source control measures but Source Control Decisions for stormwater have not been issued. Basin stormwater data were collected in 2008. The City conducted an additional single round of stormwater sampling in 2010 after facility source control measures had been implemented. An additional data set will be used to confirm the City's conclusion that the basin is controlled</td>
</tr>
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<td>See DQO 1</td>
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<tr>
<td>• Verification of presence of stormwater flow at the monitoring location; during high Willamette River elevations, river water could potentially back up into the Basin 53A system at the proposed monitoring location.</td>
</tr>
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<td>• Sampling should not be conducted if the monitoring location has been inundated with river water and is not representative of basin stormwater.</td>
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ATTACHMENT B

Figures
FIGURE 2
Outfall Basin 16

LEGEND
- Proposed Sampling Location
- Previous LWG Sampling Location
- All Other Features
  - Basin 16
  - DEQ ECSI Site
  - NPDES Stormwater Permit
  - City Outfall
  - Non-City Outfall
  - Storm Line
  - 8-inch Line Cleaned by City, October 2006
  - Tax Lot

MAP NOTES:
Date: January 26, 2016
Data Sources: BES, METRO, Air Photo taken Summer 2014

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Figure 4
Outfall Basin 19

Legend:
- Proposed Sampling Location
- Basin 19
- DEQ ECSI Site
- NPDES Stormwater Permit
- City Outfall
- Non-City Outfall
- Storm Main
- Surface Water
- Tax Lot

Map Notes:
- Date: January 27, 2016
- Data Sources: BES, METRO

Document Path: P:\Portland\110 - BES\GIS\Project_MXDs\005_SC\SWMM_Meeting\Figure4_OF19.mxd
WILLAMETTE RIVER
LARRABEE AVE
RUSSELL ST
TILLAMOOK ST
RIVER ST
ALBINA AVE
CLARK AVE
LEWIS AVE
RANDOLPH AVE
HARDING AVE
VERMICULITE NORTHWEST, INC. (FORMER)
VALVOLINE
PACIFICORP
TUCKER BUILDING
ROSS ISLAND SAND & GRAVEL - N RIVER ST.
K F JACOBSEN & CO INC - PLANT
GLACIER NORTHWEST
RIVER MILE 11E STUDY AREA - PORTLAND HARBOR

Proposed Sampling Location (ABC352 Outgoing Line)

PACIFICORP ALBINA RIVERLOTS

FIGURE 5
Outfall Basin 44

LEGEND

- Proposed Sampling Location
- Basin 44
- DEQ ECSI Site
- NPDES Stormwater Permit
- City Outfall
- Non-City Outfall
- Storm Line
- Tax Lot

MAP NOTES:
Date: January 27, 2016
Data Sources: BES, METRO

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FIGURE 6
Outfall Basin 45

LEGEND
Proposed Sampling Location
Basin 45
DEQ ECSI Site
NPDES Stormwater Permit
City Outfall
Non-City Outfall
Storm Line
Tax Lot

MAP NOTES:
Date: January 27, 2016
Data Source: BES, METRO

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FIGURE 7
Outfall Basin M-2

LEGEND
- Proposed Sampling Location
- Basin M-2
- DEQ ECSI Site
- NPDES Stormwater Permit
- City Outfall
- Non-City Outfall
- Storm Line
- Tax Lot

MAP NOTES:
Scale: January 27, 2016
Data Sources: BES, METRO

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FIGURE 8
Outfall Basin 52D

LEGEND
- Proposed Sampling Location
- Basin 52D
- DEQ ECSI Site
- NPDES Stormwater Permit
- City Outfall
- Non-City Outfall
- Storm Line
- Tax Lot

MAP NOTES:
Date: January 27, 2016
Data Sources: BES, METRO

Document Path: P:\Portland\110 - BES\GIS\Project_MXDs\005_SC\SWMM_Meeting\Figure8_OF52D.mxd