CITY OF PORTLAND
ENVIRONMENTAL SERVICES
1120 SW Fifth Ave, Suite 613, Portland, Oregon 97204 ▪ Mingus Mapps, Commissioner ▪ Dawn Uchiyama, Director

Technical Memorandum

May 30, 2024

To: Sarah Miller, Oregon Department of Environmental Quality (DEQ) Northwest Region Cleanup Program
Heidi Nelson, PE, DEQ Northwest Region Cleanup Program

From: Andrew Davidson, PE, City of Portland/Bureau of Environmental Services (BES)/ Columbia Slough Sediment Program
Rod Struck, City of Portland BES Columbia Slough Sediment Program
Nanci Klinger, City of Portland Attorney's Office

Cc: Gary Vrooman, State of Oregon Department of Justice

Interim DEQ Approval: October 30, 2023

Workplan Amendment Date: May 30, 2024

Subject: **Columbia Slough 2026 Long-term Sediment Sampling and Analysis Plan Amendment**

This Sampling and Analyses Plan (SAP) Amendment was prepared by the City of Portland (City) in conformance with the Consent Judgment Statement of Work. This Interim SAP Amendment was approved by the Oregon Department of Environmental Quality (DEQ) on October 30, 2023, and becomes final upon entry of the Consent Judgment. The Interim Plan noted that if the Scope of Work for this task was modified pursuant to the Consent Judgment's public comment or judicial process, then the City will submit an amendment to this Workplan to DEQ for approval within 45 days of the entry of the Consent Judgment to incorporate the relevant changes. The Consent Judgment was entered on May 8th, 2024, and these changes to the Interim SAP Amendment are provided in this final document.

This SAP Amendment establishes the scope of work for a one-time Slough-wide sediment sampling event to be completed by the City in 2026. This work will be conducted in general conformance with the DEQ approved 2016 *Sampling and Analysis Plan for the Collection and Processing of Bulk Sediment Samples in the Columbia Slough* (BES, 2016[1]).

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[1] Sampling and Analysis Plan for the Collection and Processing of Bulk Sediment Samples in the Columbia Slough. Prepared by City of Portland Bureau of Environmental Services. Prepared for Oregon Department of Environmental Quality. December 1, 2016.

Sediment Sampling Objectives

The objectives of the 2026 sediment sampling event are to provide spatially balanced data to assess:

1) Whether contaminants of potential concern (COPCs) in sediment have remained consistent over time.
2) If results are consistent with widespread low-level contamination across the Slough, documented in the Record of Decision (i.e., sediment concentration patterns are consistent over time):
    a. Areas with identified elevated concentrations of COPCs are consistent with historical data.
    b. Areas with identified low concentrations of COPCs are consistent with historical data.
3) Sediment quality trends over time (i.e., compare to historical data from 1994, 2006 and 2017 collected by the City).

Schedule

The target dates for sediment sample collection are between January 2026 and December 2026.

Sediment Sample Locations

Proposed 2026 sample locations will generally duplicate those collected in 2017. Ninety-three (95) samples from two depth intervals are proposed: 78 samples from the 0-10 cm depth interval and 17 samples from the 0-2 cm depth interval. Table 1 (prepared and adapted from BES/GSI, 2018[2]) summarizes the number of samples collected by reach in 2006 (0-10 cm interval) and 2017 (0-2 cm and 0-10 cm intervals), and the number of samples proposed for 2026 in both sampling intervals. Proposed 2026 sediment sample locations are shown on Figures 1 to 2 (prepared and adapted from BES/GSI, 2018[2]).

Table 1. Number of Sediment Samples by Slough Reach

Slough Reach	2006 Samples	2017 Samples[1]		2026 Samples[1]	
		0-2 cm depth	0-10 cm depth	0-2 cm depth	0-10 cm depth
North Slough	3	0	3	0	3
Lower Slough	23	5	25 [2]	5	25
Wapato Slough	3	0	0 [3]	0	0
Peninsula Drainage Canal	3	0	2	0	2
Middle Slough	15	5	15	5	17[4]
Buffalo Slough	3	0	3	0	3
Whitaker Slough	14	3	11	3	11
Upper Slough	8	4	9	4	9
Big Four Corners Slough	6	0	8	0	8
Subtotal		17	76	17	78
Total	**78**	**93**		**95**	

Notes:

[1] Does not include duplicate samples.

[2] Two Lower Slough samples were added to replace two eliminated Wapato Slough samples.

[3] Wapato Slough locations were on private property and eliminated in 2017.

[4] Two sample locations near airport collected in 2006 were not collected during 2017 sample event. Locations added back to 2026 event.

[2] Columbia Slough Sediment Data Analysis Report - 2017 Sampling. Prepared for Oregon Department of Environmental Quality. Prepared by City of Portland Bureau of Environmental Services and GSI Water Solutions, Inc. June 2018.

The 2017/2026 sample design was based around the City's "Portland Area Watershed Monitoring and Assessment Program" (PAWMAP) city-wide monitoring program. PAWMAP is a probabilistically-selected, spatially balanced sampling design which generally provides good comparability with previous sampling efforts. The 1994 and 2006 studies used a relatively systematic sample design with samples collected approximately every half mile.

As indicated in the DEQ-approved 2016 SAP, surficial sediment samples were collected from the top 0-10 cm of sediment to represent the biologically active zone and to compare with 1994 and 2006 samples (DEQ, 2016[3]). However, a review of sample depths used in the 1994 *Screening Level Risk Assessment* (SLRA) (BES, 1995[4]) and the *Columbia Slough Sediment Analysis, 2006 Sampling Report* (BES, 2009[5]) found that sample depths have not been consistent. A 0-2 cm sampling interval was used in the 1994 SLRA, and a 0-10 cm depth was used in the 2006 slough-wide sampling event. Therefore, in 2017 seventeen (17) 0–2 cm samples were randomly collected slough-wide adjacent to the 0-10 cm samples, these sample depths will be recollected in 2026. Washington Department of Ecology guidance[6] states that this narrower sample depth can be used to represent more recently deposited particulate matter and facilitate detection of temporal changes. Comparison of the 1994 sample data (0–2 cm) to the 2017 and 2026 shallow (0-2 cm) sediment samples may more accurately reflect changes in concentrations in the upper sediment.

Sample Collection Procedures

Sampling locations will be accessed by jet or electrofishing boats, row boats, wading and/or from bridges depending upon site conditions. Sediment samples will be collected using an Ekman dredge sampler, van Veen grab sampler, or a modified Ponar grab sampler, depending upon sediment substrate at the site of sample collection.

Once a successful sample had been obtained it will then be spooned either directly from the grab sampler or a decontaminated stainless-steel bowl into sample containers. Before filling labeled sample jars, the sample depth range, number of sub-samples required, collection method, sediment description, percent volume and description of any debris removed from sample, etc., will be recorded on field data sheets. Samples will be placed in a chilled cooler for transport to the Water Pollution Control Laboratory (WPCL).

Sediment Analyses

Sediment samples will be analyzed for total metals (antimony, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc), polychlorinated biphenyl (PCB) congeners, PCB Aroclors, organochlorine pesticides (approximately 25 samples will also be analyzed for EPA 1699 high resolution pesticides for comparison), polycyclic aromatic hydrocarbons (PAHs), phthalates, Per- and polyfluoroalkyl substances (PFAS), total solids (TS), total organic carbon (TOC) and grainsize. PCB congeners will be analyzed in all samples. Analytical methods will be consistent with those identified in the 2016 SAP and the following table (Table 2).

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3 Sampling and Analysis Plan for the Collection and Processing of Bulk Sediment Samples in the Columbia Slough. Prepared by the City of Portland Bureau of Environmental Services. December 1, 2016.

4 Columbia Slough Sediment Project, Screening Level Risk Assessment Report. Prepared by the City of Portland, Bureau of Environmental Services. February 1995.

5 Columbia Slough Sediment Analysis, 2006 Sampling Report. Prepared by the City of Portland Bureau of Environmental Services for Oregon Department of Environmental Quality. January 2009.

6 (https://fortress.wa.gov/ecy/publications/publications/0309043.pdf).

Table 2. Proposed Analytes, Methods, and Laboratories

Analyte	Method	Analytical Laboratory
Total metals	EPA 6020A	WPCL [a]
PCB congeners	EPA Method 1668C	Contract [b]
PCB Aroclors	EPA Method 8082	WPCL
Organochlorine pesticides	EPA 8081A Modified	Contract
	EPA 1699 High Resolution	Contract
PAHs and phthalates	EPA 8270-SIM	Contract
PFAS	EPA 1633 [c]	Contract
Total solids	SM2540B	WPCL
TOC	EPA 9060	WPCL
Grain Size	ASTM D422	WPCL

Notes:

[a] WPCL indicates the City Water Pollution Control Laboratory in Portland, Oregon.

[b] Contract indicates an analytical laboratory contracted to WPCL for specialized analyzes.

[c] Method may change due before sampling is conducted. EPA /DEQ recommended methods will be used. DEQ will be notified if method is changed.

Reporting

BES will prepare a project report summarizing findings of the sediment analytical data and comparisons with historical data and submit to DEQ. The report will be similar to the 2017 Sediment Sampling Report (BES and GSI, 2018[7]) and include a presentation of relevant field and analytical data in textual, tabular, and/or graphic form as appropriate.

Sediment concentrations will be compared to DEQ reach-specific screening level values (SLVs) on a sample-by-sample and average slough-reach concentration basis. 2026 sediment results will be used to verify key findings of the 2017 sediment sampling report including:

- COPCs, defined based on the protection of human health (i.e., fish consumption) and the environment (e.g., toxicity), have remained consistent over time.
- Sediment concentration patterns are consistent across 1994, 2006, and 2017 data and confirm widespread contamination across the Slough.
- Contaminant concentrations are generally decreasing (i.e., lower in 2026 than in 2017, 2006, and 1994.)
- Areas with identified elevated concentrations of COPCs are consistent with historical data.

  In general, areas with higher sediment concentrations detected in 2017 were located in the Lower Slough (3 sample locations); Middle Slough (5 sample locations); Whitaker Slough (3 sample locations); Upper Slough (1 sample location); and Big Four Corners (2 sample locations). PCBs and pesticides were identified as the primary sediment risk drivers.

- Areas with identified lower concentrations of COPCs are consistent with historical data.

  In general, North Slough, Peninsula Drainage Canal, and Buffalo Slough have shown consistently

[7] Columbia Slough Sediment Data Analysis Report - 2017 Sampling. Prepared for Oregon Department of Environmental Quality. Prepared by City of Portland Bureau of Environmental Services and GSI Water Solutions, Inc. June 2018.

lower sediment COPC concentrations than other reaches. In addition, samples in the western portion of the Lower Slough (at the mouth of the Columbia Slough) generally have uniformly lower concentrations of COPCs.

The City will also provide an updated electronic database to DEQ, as described in the *Columbia Slough Outfall Investigation and Basin Closure Work Plan* (BES, 2024[8]), that includes the 2026 analytical sediment data in accordance with the Consent Judgment.

[8] Columbia Slough Outfall Investigation and Basin Closure Work Plan. Prepared by the City of Portland, by and through its Bureau of Environmental Services. Prepared in conformance with the Consent Judgment. Submitted to DEQ for Interim Approval in October 2023. Finalized in June 2024.

Figures

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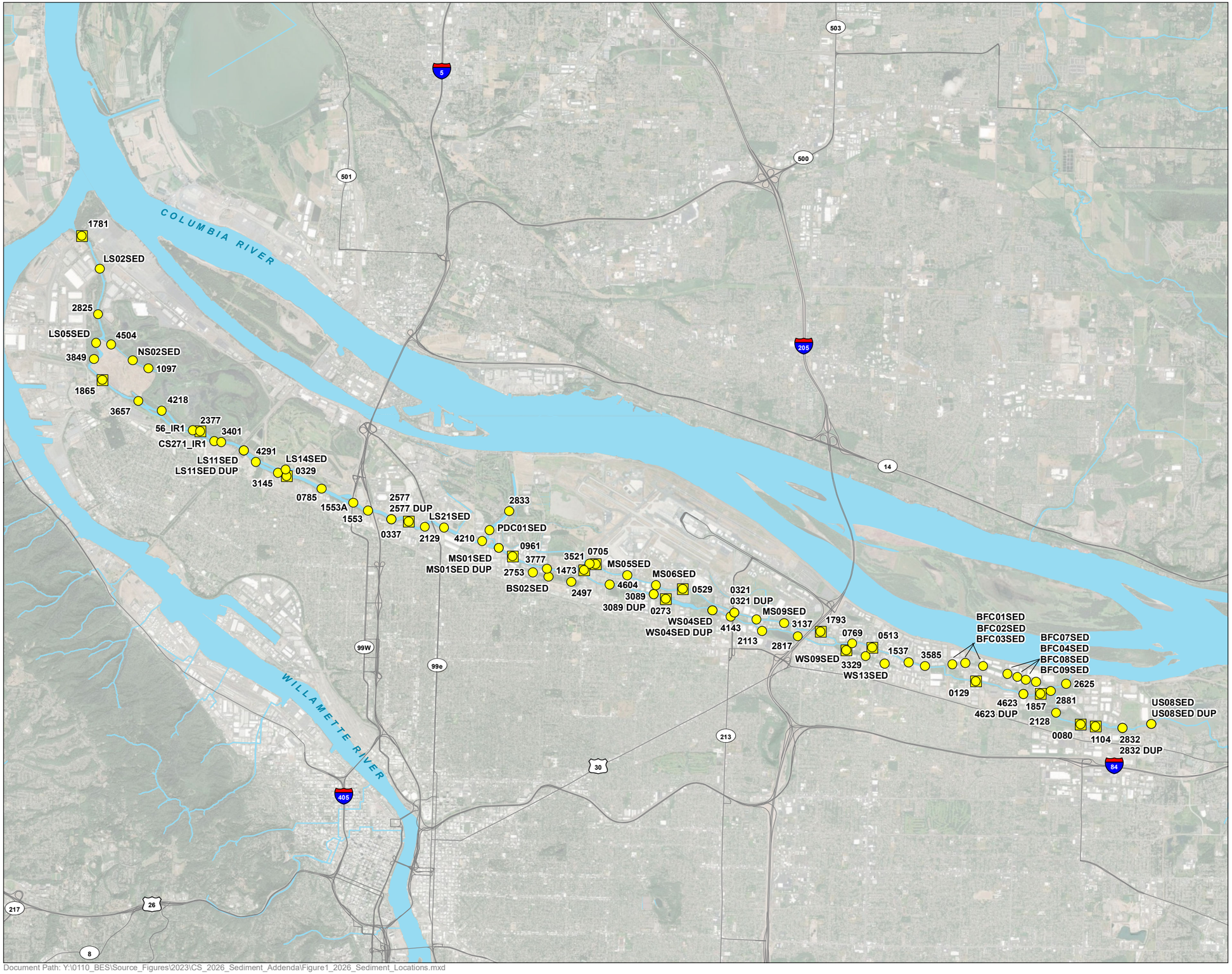
FIGURE 1

2026 Sediment Samples

Columbia Slough 2026
Long-term Sediment Sampling
and Analysis Plan Amendment



LEGEND

2026 Sample

- Sediment, 0-2cm
- Sediment, 0-10cm

NOTE

Sample IDs reflect previous events and may change during 2026 event.

N

0 3,500 7,000 10,500
Feet

Date: May 31, 2024
Data Sources: ESRI, USGS, Maxar

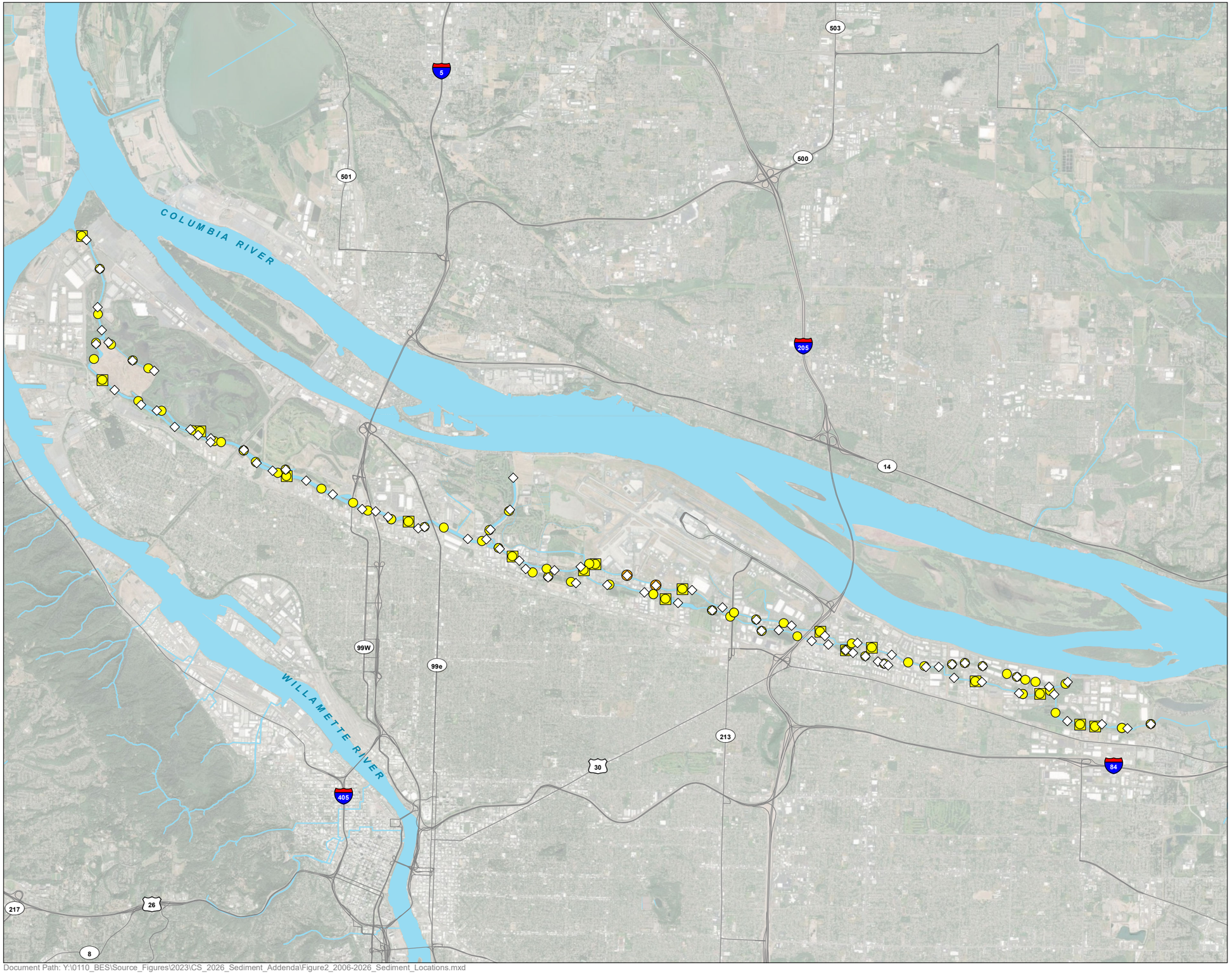
GSI Water Solutions, Inc.

Document Path: Y:\0110_BES\Source_Figures\2023\CS_2026_Sediment_Addenda\Figure1_2026_Sediment_Locations.mxd

FIGURE 2

2006, 2017, and 2026 Locations

Columbia Slough 2026
Long-term Sediment Sampling
and Analysis Plan Amendment



LEGEND

- 2006 Sediment Sample

2017/2026 Sample

- Sediment, 0-2cm
- Sediment, 0-10cm

2026 Sample

- Sediment, 0-10cm

N

0 3,500 7,000 10,500
Feet

Date: May 31, 2024
Data Sources: ESRI, USGS, Maxar

GSI Water Solutions, Inc.

Document Path: Y:\0110_BES\Source_Figures\2023\CS_2026_Sediment_Addenda\Figure2_2006-2026_Sediment_Locations.mxd