DSN039/041-WWT-1 (KC) or SEBI-Cons Brandon-SMichigan-KC-WWTF (EBI Modifications)

Alternative DSN039/041-WWT-1 (KC) controls King County's S Michigan St and Brandon St CSOs by building an equalization basin and wet-weather treatment facility (WWTF) to store and treat CSOs prior to discharge into the Lower Duwamish Waterway. The WWTF would be located near the S Michigan St Regulator Station and designed to meet NPDES effluent water quality limits. This alternative is an independent alternative which would store or treat King County CSOs.

This alternative includes modifying the Elliott Bay Interceptor (EBI) with new structures to route flows from the EBI to the WWTF via the following:

- EBI Diversion Structure (located near the S Michigan St Regulator Station) - Diversion of flows from the EBI, upstream of the proposed WWTF location.
- EBI Gate and Bypass Structure (located near the Brandon St Regulator Station) - Backflowing of flows via the EBI, downstream of the proposed WWTF location from the Brandon St CSO Basin.

Design Criteria

- Conveyance Improvements and Structures for Diversion of Flows to the WWTF[1]
    - CSO Peak Flow Rate for Brandon St: 35.2 MGD (for sizing conveyance from Brandon St Regulator Station to EBI)
    - CSO Peak Flow Rate for Sizing Influent Pipe from EBI Diversion Structure to WWTF: 101.3 MGD (backflowing of flows from Brandon St CSO Basin and diversion of flows upstream of the EBI Diversion Structure from the East Marginal Pump Station)
    - CSO Peak Flow Rate for Sizing Conveyance from S Michigan St Regulator Station to Influent Pump Station, Equalization Basin, and WWTF: 66.1 MGD (S Michigan St CSOs)
- Ballasted Sedimentation
    - WWTF and Influent Pump Station Peak Design Flow Rate: 66.0 MGD
    - Equalization Basin Volume: 0.89 MG
    - CSO Peak Flow Rate for Sizing Effluent Conveyance from WWTF to S Michigan St Regulator Station: 66.0 MGD
    - CSO Peak Flow Rate for Sizing New Outfall[2]: 66.0 MGD
- Chemically Enhanced Primary Treatment with Lamella Plates

[1] Diversion of flows from the East Marginal Pump Station to the WWTF will provide downstream system capacity in the EBI to allow a portion of the flows from the Brandon St CSO Basin to continue downstream in the EBI. The remaining flows from the Brandon St CSO Basin will backflow in the EBI to the WWTF located at the S Michigan St CSO Basin.

[2] Untreated CSOs will discharge to existing CSO outfalls (Brandon St and S Michigan St CSO Outfalls).

- WWTF and Influent Pump Station Peak Design Flow Rate: 68.0 MGD
- Equalization Basin Volume: 0.72 MG
- CSO Peak Flow Rate for Sizing Effluent Conveyance from WWTF to CSO Outfall: 68.0 MGD
- CSO Peak Flow Rate for Sizing New Outfall[2]: 68.0 MGD

Description

Alternative DSN039/041-WWT-1 (KC) consists of a WWTF to control S Michigan St and Brandon St CSOs, which discharge into the Lower Duwamish Waterway. Flows from the East Marginal Pump Station, which enter the EBI upstream of the EBI Diversion Structure, would be diverted to the WWTF for treatment during wet-weather events. When the EBI gate at the EBI Gate and Bypass Structure (located near the Brandon St Regulator Station) is closed during wet-weather events, a portion of the flows from the Brandon St CSO Basin would backflow via the EBI to the EBI Diversion Structure where they would be diverted to the WWTF for treatment. The WWTF includes an influent pump station, equalization basin, screening facility, CSO treatment process, and disinfection. Modifications to both the Brandon St and S Michigan St Regulator Stations would be required for diversion of flows to the WWTF. Ancillary facilities include an odor control facility, electrical/controls building, and emergency generator. The CSO treatment process could be either a) Ballasted Sedimentation or b) Chemically Enhanced Primary Treatment (CEPT) with Lamella Plates. See Section 6.1 and Appendix F.3 for more details about the treatment facilities and CSO treatment processes.

This alternative assumes that the WWTF would be located within or adjacent to the approximate boundary shown in Figure G.5.3-2. See Section 6.1 Planning-Level Sizing Assumptions for criteria and assumptions used in establishing the approximate boundary. The main components of this alternative would include:

- Conveyance Improvements and Structures for Diversion of Flows to the WWTF (Common to Both CSO Treatment Processes)
  - Modifications to the Brandon St and S Michigan St Regulator Stations.
  - EBI Gate and Bypass Structure near the Brandon St Regulator Station to house a gate that will allow flows from the Brandon St CSO Basin to backflow to the WWTF via the EBI.
  - Approximately 200 ft of 48-inch-diameter bypass pipe to allow flows to bypass the EBI gate (located in the EBI Gate and Bypass Structure) during construction, allow flow splitting upstream or downstream of the EBI gate, and serve as a relief point in the event of failure of the EBI gate.
  - EBI Diversion Structure (located near the S Michigan St Regulator Station) to divert flows from the Brandon St CSO Basin (backflow from closing of EBI gate) and upstream flows from the East Marginal Pump Station to the WWTF.
  - Approximately 2,320 ft of 48-inch-diameter influent gravity sewer to convey flows from the EBI Diversion Structure (located near the S Michigan St Regulator Station) to the WWTF. The length depends on the location selected

for the WWTF within or adjacent to the approximate boundary shown in Figure G.5.3-2.

- Up to approximately 2,320 ft of 54-inch-diameter influent gravity sewer from the S Michigan St Regulator Station to the WWTF. The length depends on the location selected for the WWTF within or adjacent to the approximate boundary shown in Figure G.5.3-2.

- CSO Treatment Process (One of the Following)
  - Ballasted Sedimentation
    - 66.0-MGD WWTF.
    - 0.89-MG equalization basin.
    - 66.0-MGD influent pump station.
    - Up to approximately 2,320 ft of 54-inch-diameter effluent gravity sewer from the WWTF to the S Michigan St Regulator Station. The length depends on the location selected for the WWTF within or adjacent to the approximate boundary shown in Figure G.5.3-2.
    - Approximately 1,150 ft of 54-inch-diameter pipe for the CSO outfall. The alternative assumes a new CSO outfall would convey treated CSOs from the S Michigan St Regulator Station to the center of the Lower Duwamish Waterway[3].
  - Chemically Enhanced Primary Treatment with Lamella Plates
    - 68.0-MGD WWTF.
    - 0.72-MG equalization basin.
    - 68.0-MGD influent pump station.
    - Up to approximately 2,320 ft of 54-inch-diameter effluent gravity sewer from the WWTF to the S Michigan St Regulator Station. The length depends on the location selected for the WWTF within or adjacent to the approximate boundary shown in Figure G.5.3-2.
    - Approximately 1,150 ft of 54-inch-diameter pipe for the CSO outfall. The alternative assumes a new CSO outfall would convey treated CSOs from the S Michigan St Regulator Station to the center of the Lower Duwamish Waterway[3].

Wet-Weather Treatment Facility

Two treatment technologies have been developed for use in the CSO treatment processes for this alternative based on the findings of the *Technical Memorandum 700, Treatment Technology Selection.* Table 1 summarizes the unit processes of the WWTF that are included for each CSO

[3] Preliminary outfall assumptions (see Appendix F.3 for WWTF design criteria) were used during the alternatives development and evaluation process. Refined outfall design concepts and cost estimates were prepared separately from this technical memorandum and are included in *Technical Memorandum 954.03, Preliminary CSO Outfall Concepts Analysis*.

treatment process evaluated. See Section 6.1 and Appendix F.3 for more details about the treatment facilities and CSO treatment processes.

Table 1. Unit Process for CSO Treatment Processes

Ballasted Sedimentation	CEPT with Lamella Plates
• Influent Pump Station, • Fine Screening, • Grit Removal, • Ballasted Sedimentation System (including Chemical Feed System), • Solids Handling Facility, • Disinfection System, and • Facilities Building (odor control, electrical controls, standby generator).	• Influent Pump Station, • Coarse Screening, • CEPT System (including Chemical Feed System and Additional Depth for Solids Handling), • Solids Handling Facility, • Disinfection System, and • Facilities Building (odor control, electrical controls, standby generator).

Equalization Basin

The equalization basin allows for shaving peak flows to the WWTF. The shaving of peak flows results in a reduced design capacity requirement for the WWTF. In this alternative, CSOs would be pumped to the WWTF, and flows in excess of the hydraulic capacity of the WWTF would be diverted to the equalization basin prior to the WWTF. This operational mode ensures that CSOs are being treated, and the equalization basin is used only during peak wet-weather events that exceed the WWTF design capacity.

An alternate operational mode includes routing all flows to the equalization basin prior to sending flows to the WWTF to minimize operational costs associated with the WWTF. However, the capacity of the WWTF would need to increase to handle higher peak wet-weather events.

Flow Diversion and Discharge

Modifications to the S Michigan St Regulator Station will be required to divert King County flows (S Michigan St CSOs) to the WWTF and equalization basin. For this planning phase, it is assumed that the diversion would occur at the S Michigan St Regulator Station. Evaluation of whether flows can be diverted upstream of the regulator will be completed during preferred alternative development. Diverted King County flow would discharge to the location of the WWTF and equalization basin via a 54-inch-diameter influent gravity sewer. The length of the gravity sewer will vary depending on the selected location of the WWTF, which will be evaluated during preferred alternative development. The gravity sewer can be up to 2,320 feet long based on the criteria and assumptions listed in Section 6.1.

Additional flows to the WWTF would be routed via the EBI either from backflowing the EBI associated with closing the EBI gate or diverting upstream flows in the EBI directly to the WWTF. These flow diversions would provide available downstream system capacity in the EBI to control the Brandon St CSO Outfall. The following summarizes the flow scheme for routing flows from the EBI to the WWTF:

- Upstream Diversion of Flows. The East Marginal Pump Station flows (approximately 25 MGD[4]), would be routed to the EBI Diversion Structure (located near the S Michigan St Regulator Station) along the EBI and routed to the WWTF via approximately 2,320 ft of 48-inch-diameter influent gravity sewer[5].
- Backflowing of the EBI. Motorized gates will be installed in the EBI Gate and Bypass Structure (near the Brandon St Regulator Station) to control flows. Flows routed upstream of the gate from the Brandon St CSO Basin (only a portion of flows will be routed upstream) will backflow to the EBI Diversion Structure and then be routed to the WWTF via approximately 2,320 ft of 48-inch-diameter influent gravity sewer[5].

Treated CSOs would be conveyed to the S Michigan St Regulator via a 54-inch-diameter effluent gravity sewer[6], up to approximately 2,320 feet in length. The length of the gravity sewer will vary depending on the selected location of the WWTF, which will be evaluated during preferred alternative development. The treated CSOs would then be conveyed by the new CSO outfall (approximately 1,150 feet of 54-inch-diameter pipe) from the S Michigan St Regulator Station to the center of the Lower Duwamish Waterway[7]. The length of the CSO outfall will be modified depending on the selected location of the discharge, which will be evaluated during preferred alternative development.

[4] East Marginal Pump Station: maximum allowable pumped flow rate based on June 2010 modeling run.
[5] The total length of the influent gravity sewer will vary depending on the selected location of the WWTF, which will be evaluated during preferred alternative development.
[6] The 54-inch-diameter effluent pipe would operate as a gravity sewer for the Ballasted Sedimentation alternative, but it would operate as a pressure sewer for the CEPT with Lamella Plates alternative at peak flow rates.
[7] Preliminary outfall assumptions (see Appendix F.3 for WWTF design criteria) were used during the alternatives development and evaluation process. Refined outfall design concepts and cost estimates were prepared separately from this technical memorandum and are included in *Technical Memorandum 954.03, Preliminary CSO Outfall Concepts Analysis*.