DSN028/029/030/032-WWT-1 (KC) or MEBI-Cons Hanford-Lander-King-Kingdome-KC-WWTF (EBI Modifications)

Alternative DSN028/029/030/032-WWT-1 (KC) controls King County's King St, Kingdome, Lander St, and Hanford #2 CSOs by building an equalization basin and wet-weather treatment facility (WWTF) to store and treat CSOs prior to discharge into the East Waterway (Duwamish River). The WWTF would be located near the Hanford 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 Hanford St Regulator Station) - Diversion of flows from the EBI, upstream of the proposed WWTF location.
- EBI Gate and Bypass Structure (located near the Kingdome Regulator Station) - Backflowing of flows via the EBI, downstream of the proposed WWTF location from the Kingdome and Lander St CSO Basins.

Design Criteria

- Conveyance Improvements and Structures for Diversion of Flows to the WWTF[1]
    - CSO Peak Flow Rate for Kingdome: 87.0 MGD (for sizing conveyance from Kingdome Regulator Station to EBI)
    - CSO Peak Flow Rate for Lander St: 47.9 MGD (for sizing conveyance from Lander St Regulator Station to EBI)
    - CSO Peak Flow Rate for Sizing Influent Pipe from EBI Diversion Structure to WWTF: 164.5 MGD (backflowing of flows from Kingdome and Lander St CSO Basins and diversion of flows upstream of the EBI Diversion Structure from the West Seattle Pump Station and Duwamish Pump Station)
    - CSO Peak Flow Rate for Sizing Conveyance from Hanford St Regulator Station to Influent Pump Station, Equalization Basin, and WWTF: 94.9 MGD (Hanford #2 CSOs)
- Ballasted Sedimentation
    - WWTF and Influent Pump Station Peak Design Flow Rate: 151.0 MGD
    - Equalization Basin Volume: 1.71 MG
    - CSO Peak Flow Rate for Sizing Effluent Conveyance from WWTF to Hanford St Regulator Station: 151.0 MGD
    - CSO Peak Flow Rate for Sizing New Outfall[2]: 151.0 MGD

[1] Diversion of flows from the EBI, upstream of the proposed WWTF location and backflowing of flows from the Kingdome and Lander St CSO Basins, will provide downstream system capacity in the EBI to control the King St CSO Outfall (CSO Peak Flow Rate of approximately 29.0 MGD).

- Chemically Enhanced Primary Treatment with Lamella Plates
    - WWTF and Influent Pump Station Peak Design Flow Rate: 155.0 MGD
    - Equalization Basin Volume: 1.43 MG
    - CSO Peak Flow Rate for Sizing Effluent Conveyance from WWTF to Hanford St Regulator Station: 155.0 MGD
    - CSO Peak Flow Rate for Sizing New Outfall[2]: 155.0 MGD

Description

Alternative DSN028/029/030/032-WWT-1 (KC) consists of a WWTF to control King St, Kingdome, Lander St, and Hanford #2 CSOs, which discharge into the East Waterway. Flows from the West Seattle Pump Station and Duwamish 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 Kingdome Regulator Station) is closed during wet-weather events, flows from the Kingdome and Lander St CSO Basins would backflow via the EBI to the EBI Diversion Structure where they would be diverted to the WWTF for treatment. These diversions will provide capacity in the EBI to control the King St CSO Outfall. The WWTF includes an influent pump station, equalization basin, screening facility, CSO treatment process, and disinfection. A new EBI Gate and Bypass Structure (located near the Kingdome Regulator Station), a new EBI Diversion Structure (located near the Hanford St Regulator Station), and modifications to the Lander St and Hanford 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.3.8-2. 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 Lander St and Kingdome Regulator Stations.
    - EBI Gate and Bypass Structure near the Kingdome Regulator Station to house a gate that will allow flows from the Kingdome and Lander St CSO Basins to backflow to the WWTF via the EBI.
    - Approximately 300 ft of 60-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.

[2] Untreated CSOs will discharge to existing CSO outfalls (King St, Kingdome, Lander St, and Hanford #2 CSO Outfalls).

- Approximately 50 ft of 42-inch-diameter gravity sewer to upgrade the existing connection from the Lander St Regulator Station to the EBI.
- EBI Diversion Structure (located near the Hanford St Regulator Station) to divert flows from the Kingdome and Lander St CSO Basins (backflow from closing of EBI gate) and upstream flows from the Duwamish Pump Station and West Seattle Pump Station to the WWTF.
- Approximately 1,000 ft of 78-inch-diameter influent gravity sewer to convey flows from the EBI Diversion Structure (located near the Hanford 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.3.8-2.
- Modifications to the Hanford St Regulator Station.
- Up to approximately 1,890 ft of 60-inch-diameter influent gravity sewer to convey Hanford #2 CSOs from the Hanford 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.3.8-2.

- CSO Treatment Process (One of the Following)
  - Ballasted Sedimentation
    - 151.0-MGD WWTF.
    - 1.71-MG equalization basin.
    - 151.0-MGD influent pump station.
    - Up to approximately 1,890 ft of 72-inch-diameter effluent gravity sewer from the WWTF to the Hanford St Regulator Station. The length depends on the location selected for the WWTF within or adjacent to the approximate boundary shown in Figure G.3.8-2.
    - Approximately 1,500 ft of 72-inch-diameter pipe for the CSO outfall. The alternative assumes a new CSO outfall would convey treated CSOs from the Hanford St Regulator Station to the center of the East Waterway[3].
  - Chemically Enhanced Primary Treatment with Lamella Plates
    - 155.0-MGD WWTF.
    - 1.43-MG equalization basin.
    - 155.0-MGD influent pump station.
    - Up to approximately 1,890 ft of 72-inch-diameter effluent gravity sewer from the WWTF to the Hanford St Regulator Station. The length depends on the location selected for the WWTF within or adjacent to the approximate boundary shown in Figure G.3.8-2.

[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*.

- Approximately 1,500 ft of 72-inch-diameter pipe for the CSO outfall. The alternative assumes a new CSO outfall would convey treated CSOs from the Hanford St Regulator Station to the center of the East Waterway[4].

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 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 Hanford St Regulator Station will be required to divert King County flows (Hanford #2 CSOs) to the WWTF and equalization basin. For this planning phase, it is assumed

[4] 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*.

that the diversion would occur at the Hanford 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 60-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 1,890 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 King St CSO Outfall. The following summarizes the flow scheme for routing flows from the EBI to the WWTF:

- Upstream Diversion of Flows. The Duwamish Pump Station flows (approximately 88 MGD[5]), West Seattle Pump Station flows (approximately 19 MGD[5]), and local inflows (approximately 9 MGD[5]) would be routed to the EBI Diversion Structure (located near the Hanford St Regulator Station) along the EBI and routed to the WWTF via approximately 1,000 ft of 78-inch-diameter influent gravity sewer[6].
- Backflowing of the EBI. Motorized gates will be installed in the EBI Gate and Bypass Structure (near the Kingdome Regulator Station) to control flows. Flows routed upstream of the gate (from the Kingdome and Lander St CSO Basins) will backflow to the EBI Diversion Structure and then be routed to the WWTF via approximately 1,000 ft of 78-inch-diameter influent gravity sewer[6].

Modifications to the Lander St Regulator Station will be required to divert King County flows from the Lander St Regulator Station to the EBI to backflow to the WWTF.

Treated CSOs would be conveyed to the Hanford St Regulator Station via a 72-inch-diameter effluent gravity sewer[7], up to approximately 1,890 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 1,500 feet of 72-inch-diameter pipe) from the Hanford St Regulator Station to the center of the East Waterway[8]. 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.

[5] Duwamish Pump Station: 1-year pumped flow rate, West Seattle Pump Station: maximum allowable pumped flow rate, Local Inflows: 1-year peak flow rate from June 2010 modeling run.

[6] 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.

[7] The 72-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.

[8] 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*.