DSN041-SEP-1 (KC) or SEBI-Brandon-KC-SEP

Alternative DSN041-SEP-1 (KC) controls King County's Brandon St CSOs by separating the combined sewer system (CSS) into separate systems to manage storm and sanitary flows. This alternative assumes full separation where the existing CSS becomes a separated storm sewer system, and a new sanitary sewer system is constructed. This alternative is an independent alternative which would control King County CSOs.

Design Criteria

- King County CSO Peak Flow Rate: 35.2 MGD
- Sanitary Peak Flow Rate (Peak DWF): 0.4 MGD[1]

Description

Alternative DSN041-SEP-1 (KC) consists of full separation of the Brandon St CSO Basin, approximately 288 acres of flat terrain in an industrial/commercial area. The alternative consists of converting the existing CSS to a separated storm sewer system and constructing a new separated sanitary sewer system. For planning-level purposes, this alternative has been developed assuming a vacuum sewer system as the new sanitary sewer system. However, the sanitary sewer system will be finalized during preferred alternative development. Options include conventional gravity sewers, vacuum sewers, grinder pump systems, and pump station systems. This alternative assumes that the existing Brandon St CSO Outfall would be converted to a storm outfall, eliminating the Brandon St CSO Outfall. See Section 6.1 and Appendix F.3 for more details about sewer separation and CSO control processes.

The main components of this alternative would include:

- New separated sanitary sewer system
    - A central vacuum station.
    - Approximately 250 vacuum valve pits (assumed one vacuum pit per parcel in the Brandon St CSO Basin).
    - Modifications to approximately 250 side sewer connections (assumed one side sewer connection per parcel in the Brandon St CSO Basin).
    - Up to approximately 27,200 ft of 4-inch-diameter[2] vacuum sewers to convey sanitary sewer flows into the Elliott Bay Interceptor (EBI). Area to be fully separated is shown in Figure G.5.2-2.
- Combined sewer system
    - Reuse existing CSS as new storm sewer system. Area to be fully separated is shown in Figure G.5.2-2.
- Stormwater Treatment

[1]Peak dry weather flow (DWF) based on flow monitoring of the Brandon Trunk in August 2009. Additional flow monitoring may be required to finalize design sanitary flow rate.
[2]Cost estimate of new sanitary sewer system assumed vacuum sewers that are 4 inches in diameter for planning purposes only. Diameters will be further evaluated during preferred alternative development.

- Stormwater discharges need to meet water quality standards under the City of Seattle's Drainage Code.
- Utilize on-site best management practices (BMPs) that include:
  - Bioretention,
  - Green roofs,
  - Permeable pavement, and
  - Filterra® units.

- Modifications to the Brandon St Regulator Station.

Sewer Separation

Alternative DSN041-SEP-1 (KC) consists of installing a new sanitary sewer system parallel to the existing combined sewer system that will discharge into the EBI. For planning-level purposes, it is assumed that the new separated sanitary sewer system would be a forced vacuum system.

Sanitary flows from each of the parcels would be routed via gravity to a vacuum valve and vault. A vacuum station, housing two or more vacuum pumps, would induce a negative pressure and draw from the vacuum sewers connected to each individual vacuum valve vault. The maximum expected lift is between approximately 30 and 40 feet.

For this alternative, the central vacuum station would be located adjacent to the EBI. As air is drawn through the system, sewer gasses are extracted; thus, odor control would be required to reduce odors.

Table 1 summarizes the main components assumed with the vacuum sewer system for this alternative in the Brandon St CSO Basin.

Table 1. Components for Vacuum Sewer Separation Process

- Up to approximately 250 vacuum valve pits (1 per parcel) included in the 8 blocks of project area.
- Side sewer connection/separation for up to 250 parcels.
- Up to approximately 27,200 ft of 4-inch-diameter vacuum sewers from the side sewers to the Central Vacuum Station.
- Central Vacuum Station, consisting of at least 3 vacuum pumps and a collection tank housed in a building.
- Ancillary Facilities: Generator and Odor control system

Flow Diversion and Discharge

A new discharge structure into the EBI will be required for this alternative. Sanitary sewer flows collected from the Brandon St CSO Basin area would discharge into a new discharge structure located adjacent to the EBI. Final location of the discharge structure will be evaluated during preferred alternative development. The Brandon St Regulator Station would be abandoned.

Storm sewer flows would be conveyed via the existing CSO outfall from the Brandon St CSO Outfall Station into the Lower Duwamish Waterway. For planning purposes, it is assumed no modifications to the existing outfall station and outfall would be required.

Stormwater Treatment

Sewer separation provides the ability to route sanitary flows to the EBI while stormwater continues to discharge into the Lower Duwamish Waterway. Sewer separation does not eliminate the contamination that is inherently associated with stormwater discharges, namely oil, grease, floatables, heavy metals, and organics. Regulatory requirements will require treatment for the stormwater discharges to satisfy water quality standards into the Lower Duwamish Waterway.

To satisfy water quality standards, impervious areas for each parcel and right-of-way would be routed to an appropriate BMP. For this alternative, the Brandon St CSO Basin was divided into units, and each parcel was evaluated for available area for BMPs and amount of impervious area.

For parcels with difficult siting or with contamination issues, Filterra® units were used to meet the water quality standards. Filterra® units are approved by the Washington Department of Ecology to treat stormwater. They meet or exceed water quality criteria for total suspended solids (TSS), heavy metals, and organics. Filterra® units are self-contained bioretention and are sized to treat runoff from a pre-determined area.

Since the objective of stormwater treatment is water quality, infiltration was not a requirement, and rain gardens and permeable pavement were sized to provide the maximum treatment and included underdrains.

Additional modeling would be needed to determine the overall pollutant loading reduction from this alternative.

Construction Assumptions

King County's Tabula cost estimating program, vendor quotes, and costs from similar project experience was used to develop a Class 5 estimate for this alternative. The attached documentation lists the construction assumptions used.

- New 4-inch-diameter vacuum sewers—Costs were estimated in the conveyance pipe costing tool of Tabula.
- Vacuum sewer system—A vendor quote for the proposed vacuum system was provided by Air-Vac.
- Side sewer connections—A unit cost per connection was derived from previous King County project experience and applied to this alternative.
- Stormwater treatment—Cost estimates for green stormwater infrastructure were used to estimate stormwater treatment costs. Sizing was determined using City of Seattle Pre-Sized Calculator for water quality. Filterra® costs and sizing were provided by a local distributor.