

CHAPTER 5 - SOUTH LAKE UNION SUBBASIN CONSTRUCTION IMPACTS

This chapter describes the impacts in the South Lake Union Subbasin from construction of Phases 2 and 3/4 for Alternatives 1 and 2.

In compliance with 40 CFR Part 6, potential environmental impacts have been analyzed. There are no wetlands, floodplains, important farmlands, national natural landmarks, wild and scenic rivers, or barrier islands within or adjacent to the project area. Potential impacts in the South Lake Union Subbasin to historic, archaeological, and cultural sites; air resources; fish and wildlife; and endangered species are discussed where applicable in this chapter. Consistency of the project with the City of Seattle Shoreline Master Program has also been evaluated and is included in this chapter and Chapter 7.

Impacts associated with any of the project alternatives are generally divided into two categories: impacts related to short-term construction activities and impacts associated with the long-term operation of the proposed CSO control facilities. The impacts associated with construction of the project are caused by construction in streets, spoils removal, transport of construction materials, disruption of parking, and other temporary activities required for construction.

Construction-related impacts of alternatives would depend to a great extent on the timing and duration of construction activity associated with the selected alternative. Table 5-1 shows the estimated construction duration for each element of each facility in the South Lake Union Subbasin by alternative. A construction schedule would be developed for the selected alternative that would take into account a number of factors: availability of funding, timing of property acquisitions and permits, extent of environmental mitigation required, and the ability to coordinate with other public projects.

Construction in the South Lake Union area is estimated to take approximately one year to complete; however, except for the area around the East Tunnel Portal Drop Structure in Alternative 1, the impacts would be a few months at each location. Cumulative impacts are discussed in Chapter 9. Mitigation measures to mitigate adverse impacts are provided in Chapter 10.

5.1 EARTH RESOURCES

Under both Alternatives 1 and 2 construction activity would result in short-term impacts to earth resources. Excavation of soils during construction could result in erosion of excavated or stockpiled material. Table 5-2 summarizes the excavation volumes in the South Lake Union Subbasin for both alternatives. A temporary increase in runoff turbidity at construction sites is anticipated, particularly at large scale excavation sites. However, because the construction area is relatively small with a flat to moderate slope, the potential for soil erosion during construction is low, assuming appropriate erosion control measures consistent with City of Seattle and/or King County requirements are employed. The potential exists for encountering contaminated soils during construction. Some contaminated soils may

Table 5-1
South Lake Union Subbasin Facilities
Construction Duration

Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

(* Same facility for Both Alternatives)

<u>Type of Facility</u>	<u>Element</u> (months of construction for element)	<u>Months of Construction</u>
Outfalls	*CSO #125 (1)	1
Conveyance	*CSO #175 (3) Valley Connection (4) South Lake Union CSO Pipeline (1) Lake Union Tunnel CSO Pipeline (2) Central Trunk CSO Pipeline (1)	4
Regulating Structures	Central Trunk Diversion Structure (4) Lake Union Tunnel Regulator Station (6)	10
CSO Control	<u>Elliott West CSO Control Facility</u> <i>East Tunnel Portal Drop Structure</i> (10)	10

Alternative 2 - Partial Separation and Storage

(* Same facility for Both Alternatives)

<u>Type of Facility</u>	<u>Element</u> (months of construction for element)	<u>Months of Construction</u>
Outfalls	*CSO #125 (1) South Lake Union Overflow (4)	4
Conveyance	*CSO #175 (3) Phase 1 Connection (7) South Lake Union Stormwater Pipelines (24) Central Trunk Diversion CSO Pipeline (1)	30
Regulating Structures	Dexter Avenue Diversion Structure (4)	4
CSO Control	<u>South Lake Union CSO Control Facility</u> <i>Storage Tank (8.6 MG)</i> (24) <i>Influent Pump Station</i> (12)	36

Table 5-2
South Lake Union Subbasin
Estimated Volumes of Excavated Material¹
(in cubic yards)

	Alternative 1	Alternative 2
Outfalls		2,750
CSO #125	0 --	2750
Conveyance		233,475
CSO #175	3600 9600	-- --
South Lake Union CSO Pipeline		--
Lake Union Tunnel CSO Pipeline	1080 3000	-- --
Central Trunk Diversion CSO Pipeline		1375
South Lake Union Stormwater Pipelines	-- --	13,500
Regulation Structures		770
Central Trunk Diversion Structure	800	--
Dexter Avenue Diversion Structure	--	770
CSO Control		40,000
East Tunnel Portal Drop Structure	6400 --	40,000
Total Excavated Volume		276,995

¹ Numbers include only excavation volumes and not bedding or backfill materials.
is included except for tunnel spoils which include a 50 percent swell factor.

be suitable for reuse as backfill material. Some areas in the subbasin may be prone to liquefaction during a strong seismic event.

5.1.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Total estimated volume for excavated material for Alternative 1 is approximately 27,000 cubic yards (CY).

Outfalls

No significant impacts to earth resources would occur from the elimination of CSO #125. Some minor sediment disturbance could occur during capping of the existing outfall.

Conveyance

Construction of most of the conveyance facilities would be accomplished using trenchless methods, similar to those described in Chapter 3. Only the Valley Connection, CSO #175 and Central Trunk CSO pipeline could be constructed with open cut or trenchless methods. The trench excavations would be shored to prevent walls from collapsing and to keep adjacent structures from subsiding. Excavation of the conveyance facilities would result in spoils volume of approximately 17,000 CY.

Uncontaminated spoils not used for backfill could be hauled to other construction sites for use as clean fill material. Contaminated sediments are expected to be encountered in the vicinity of Eighth Avenue North and Roy Street at Dexter Avenue during construction of the Lake Union Tunnel CSO Pipeline and Central Trunk CSO Pipeline.

Regulating Structures and CSO Control

Construction of the Central Trunk Diversion Structure and Lake Union Tunnel Regulator Station would generate spoils volumes of approximately 3,400 CY. Construction of the East Tunnel Portal Drop Structure would generate spoils volumes of approximately 6,400 CY. Dewatering could be required during construction. Due to the depth of the excavations, shoring would be required to support the sides of the excavation during construction. Contaminated soils could be encountered during construction of the Central Trunk Diversion Structure.

5.1.2 Alternative 2 - Partial Separation and Storage

Total estimated volume for excavated material for Alternative 2 is about 277,000 CY. This amount is approximately 10 times larger than the estimated volume of excavated spoils for Alternative 1 due to extensive excavation required for the stormwater pipelines.

Outfalls

CSO #125 impacts would be same as for Alternative 1. The South Lake Union Overflow would convey stormwater to Lake Union and serve as an emergency overflow for the South Lake Union CSO Control Facility. Approximately 1,500 linear feet of 72-inch pipe would be constructed using cut-and-

cover methods. The outfall would extend to the mean lower low water (MLLW) level so there would be minor construction impacts to lake sediments. Spoils volumes from the excavation are estimated to be approximately 2,800 CY.

Conveyance

Construction of approximately 10 miles of new stormwater pipe ranging in diameter from 12 to 84 inches would require the excavation of approximately 233,000 CY of spoils. Construction of the 36-inch Central Trunk Diversion CSO Pipeline would require the excavation of approximately 1,400 CY of spoils. Short-term impacts during construction would be similar to Alternative 1.

Regulating Structures

Short-term impacts to earth resources resulting from construction of the Dexter Avenue Diversion Structure would be similar to those discussed for the regulating structures for Alternative 1. Excavation of approximately 800 CY of spoils would be required.

CSO Control

Construction of the storage facility would require large-scale excavation. The excavation would produce spoils volumes of approximately 40,000 CY.

5.2 AIR RESOURCES

5.2.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Outfalls

No significant construction impacts to air resources would occur under Alternative 1. Eliminating overflows at CSO #125 is not expected to require significant excavation.

Conveyance

Construction-related air impacts would be temporary. Construction of conveyance facilities would occur over approximately four months. Fugitive dust from construction and carbon monoxide, sulfur, particulates, and other construction vehicle emissions could temporarily impact businesses, residents, and motorists in the immediate vicinity of construction sites along Eighth Avenue North, Lakeview Boulevard, Broad Street, Roy Street, and Valley Street. Trenchless technology construction methods for some pipelines in the South Lake Union area are recommended to minimize impacts, including dust and exhaust impacts. The South Lake Union Subbasin is located in a marginal non-attainment area for ozone and a moderate non-attainment area for carbon monoxide, and vehicle construction exhaust would temporarily contribute additional quantities of these pollutants. Construction vehicles also could track dust from construction sites to local roadways. Potentially sensitive receptors in the area include restaurants, hotels, and commercial businesses along the lake as well as waterfront and boating activities. Some odors associated with paving and construction equipment also would be created during resurfacing of excavated streets, although these impacts would be temporary.

Regulating Structures and CSO Control

Air resource impacts would occur during construction, but these impacts would be temporary and would not be significant. Alternative 1 would include construction of the Central Trunk Diversion Structure and East Tunnel Portal Drop Structure in the intersection of Roy Street and Eighth Avenue North and the Lake Union Tunnel Regulator at Republican Street and Eighth Avenue North. Installation of these facilities would occur over a ten-month period. Construction would result in a temporary and localized generation of dust and vehicle exhaust. The area surrounding the construction site is composed of high density commercial uses as well as waterfront restaurants, shops, and boating activities. The majority of construction-related impacts, however, would be localized to the immediate vicinity of construction.

5.2.2 Alternative 2 - Partial Separation and Storage

Outfalls

Construction of the South Lake Union Overflow would require open-trench pipeline construction from the storage facility to the lake. Construction would occur over an approximately four-month period. Construction would result in localized and temporary generation of dust and carbon monoxide, sulfur compounds, and other emissions from construction vehicles in the area. Commercial businesses would be the primary recipients of construction-related impacts, however, impacts would be temporary and would not be significant. Eliminating overflows at CSO #125 is not expected to require significant excavation. Air quality impacts would be minimal.

Conveyance

Widespread short-term air resource impacts would result from construction under Alternative 2. An additional 10 miles of stormwater pipeline would be installed using open trench construction along roadways in the area bounded by Garfield, Interstate 5, Denny Way, Virginia, 7th, Dexter, and Galer. Many receptors would be affected under this alternative, as the area is mostly commercial, with high intensity commercial uses around Lake Union. Dust and vehicle exhaust would create temporary and localized air resource impacts near construction sites. Construction would last approximately two years. Alternative 2 also includes construction of the CSO #175 pipeline, Central Trunk Diversion CSO Pipeline, and Phase 1 Connection similar to Alternative 1. Locations, construction schedules, and potential receptors under this alternative are similar to Alternative 1. Installation of these facilities would require a combined total of approximately 4000 feet (about a half mile) of open trench construction, over a duration of approximately seven months.

Regulating Structures

Under Alternative 2, the Dexter Avenue Diversion Structure would be built over a four-month period near the intersection of Roy Street and Eighth Avenue North. Commercial businesses in the area would be temporarily impacted by exhaust and dust.

CSO Control

Control facilities would include the South Lake Union CSO Control Facility and require significant excavation and accompanying localized and temporary impacts from generation of dust and vehicle exhaust. Construction of the storage tank would require extensive excavation. Excavation would result in localized and temporary dust and vehicle emissions in the vicinity of the project; adjacent receptors include commercial businesses in the area. No construction-related air resource impacts would occur from installation of regulators or pump stations.

5.3 WATER RESOURCES

Dewatering of excavations may be required to keep excavations free of standing water. Dewatering may temporarily affect groundwater levels and result in ground settlement in the vicinity of excavation sites. Groundwater pumped from excavations would likely be turbid and would be discharged to the local combined sewer. The potential exists for encountering contaminated groundwater during construction.

5.3.1 Alternative 1 - CSO Storage and Treatment (The Preferred Alternative)

Outfalls

Surface Water. Because the potential for soil erosion during construction is low, water quality impacts are not anticipated to be significant. However, short-term, localized water quality impacts to Lake Union may occur in the vicinity of CSO #125 during abandonment of this outfall.

Although no in-water construction would occur, construction activities would be within 200 feet of the shoreline. As a result, exposed soils with associated contaminants could wash into Lake Union during rain storms. Contaminants most likely to be associated with construction activities include high levels of suspended solids, petroleum by-products and metals from construction vehicles, and organic debris. Water quality impacts could include localized increases in turbidity, decreased oxygen levels, and increased sediment deposition in the vicinity of construction. Construction of outfall improvements will likely occur during the summer months, when potential water quality sensitivity in Lake Union is the greatest because of reduced circulation, lower dissolved oxygen, and higher water temperatures. The duration of construction impacts, should they occur, could last from several hours to several days, depending upon the degree of soil erosion.

Groundwater. No significant construction impacts to groundwater resources would occur under this alternative. Eliminating overflows at CSO #125 is not expected to require substantial excavation.

Conveyance

Surface Water. Potential construction-related impacts to water quality in Lake Union are associated with possible erosion of sediments exposed during excavation for pipelines. These sediments would be distributed on roadways adjacent to the construction sites, which could then be transported into the storm drainage system and ultimately be discharged to Lake Union. Impacts would be distributed throughout the South Lake Union Subbasin, but limited to the duration of construction. Localized increased turbidity in the vicinity of storm drain outfalls may

result; however, as long as appropriate construction erosion control techniques are implemented, Union Subbasin are not expected to be significant.

Groundwater.

groundwater would likely be encountered during deeper excavations for construction of conveyance facilities under Alternative 1, and some dewatering could be required during

Substantial amounts of dewatering also could induce subsidence at the ground surface and possibly cause adjacent buildings and structures to settle. Contaminated groundwater could be

from sources known to exist in the project area. However, construction would occur west of Westlake Avenue, minimizing potential disturbance to the known petroleum hydrocarbon plume in

discharge, any contaminated groundwater discharged during dewatering could affect water quality in receiving waters by reducing oxygen levels and introducing substances potentially toxic to

existing wastewater treatment facility or treated on-site before being discharged.

Regulating Structures

Construction-related impacts to water quality associated with the Central Trunk Diversion Structure and the Lake Union Tunnel Regulator Station are similar in nature to those employed to minimize off-site transport of soils/sediments, water quality impacts would be short-term and not significant.

Construction of the Central Trunk Diversion Structure and Lake Union Tunnel Regulator Station would require excavation to depths of 22 and 50 feet, respectively.

discussed under Conveyance above.

CSO Control

Constructing the East Tunnel Portal Drop Structure would have minimal potential for direct water quality impacts to South Lake Union. Some increased sediment loading disruption; however, impacts would be temporary and are not expected to be significant.

Groundwater.

Portal Drop Structure. Construction of the structure would require excavation to a depth of over 60 feet. Dewatering could cause minor ground movement in the vicinity of the portal. Potential

5.3.2 Alternative 2 - Partial Separ

Outfalls

Surface Water. Impacts associated with elimination of CSO #125 would be the same as described for Alternative 1.

Groundwater. Groundwater would likely be encountered during construction for the South Lake Union Overflow. Impacts would be similar to those discussed under Alternative 1.

Conveyance

Surface Water. There would be a higher likelihood for soil erosion into Lake Union associated with Alternative 2 because of the increased level of in-street construction. Construction associated with sewer separation within the South Lake Union Subbasin would result in extensive disruption of existing street areas. As with all construction, paved areas immediately surrounding the work area, including staging areas as well as trench areas, typically become dirty as excavated soils spill from construction equipment. These soils, along with associated contaminants, could wash off site during rain events and could ultimately enter south Lake Union through existing storm drains. As a result, construction-related water quality impacts could be more diffuse than described for Alternative 1. Localized increased turbidity and sediment deposition could occur in the vicinity of a number of existing stormwater outfalls, as well as in the vicinity of CSO #125. Because in-street construction would occur over a two-year period, potential impacts could occur over the entire two year construction period.

Groundwater. Groundwater would likely be encountered during construction of the Phase 1 Connection and Central Trunk Diversion CSO Pipeline. Impacts would be similar to those discussed under Alternative 1. The potential for encountering groundwater during excavation for the CSO #175 and South Lake Union Stormwater Pipelines is lower compared to other project conveyance facilities as these pipelines are smaller in diameter and would not require deep excavation. No significant impacts are expected.

Regulating Structures

Surface Water. Impacts would be similar to those described for Alternative 1, however, Alternative 2 does not include the regulator station. Therefore, potential for construction impacts to water quality from Alternative 2 regulating structures would be less than described for Alternative 1.

Groundwater. Groundwater impacts for regulating structures would be similar to those discussed under Alternative 1. However, impacts would be less as no regulator station would be constructed.

CSO Control

Surface Water. Potential construction-related impacts to water quality from CSO control facilities would be greater than those described for Alternative 1 because Alternative 2 includes construction of an additional storage tank in south Lake Union area and an additional pump station. Because these facilities would result in additional excavation, the accompanying potential

for off-site transport of soils and sediments would increase. As described for Alternative 1, increased sediment loads could be conveyed to Lake Union via the storm drainage system; nearly localized, temporary increased turbidity. Assuming appropriate implementation of measures to reduce off-site transport of soils, no significant water quality impacts are expected to occur.

Construction of the South Lake Union CSO Control Facility would require excavation to a depth of 10 feet. Groundwater is likely to be encountered during construction of additional excavation would be required.

Excavation for the CSO control facility would include a substantial construction dewatering effort.

on calculations using existing data, dewatering discharge flows would likely range from 1,000 to 10,000 gpm using a series of wells ranging from 120 to 140 feet deep (Hong West and Associates

contaminated groundwater in the project area. Disturbance of this contaminated groundwater could re-distribute contaminants; discharge of untreated groundwater after dewatering could

introducing toxics of concern. Dewatered groundwater would be treated before discharge to any receiving waterbody (Hong West and Associates 1996a). The existing water table could be

testing would be conducted in the vicinity of areas identified as containing substantial groundwater contamination to collect more information on aquifer thickness, transmissivity and hydraulic

uncontaminated groundwater (Hong West & Associates 1996a).

5.4

RCES

5.4.1

rred Alternative)

Outfalls

No impacts to plants and/or animals due to construction or removal of outfalls are anticipated under Alternative 1. The CSO #125 outfall would be shoreline area are expected to be of short duration.

Fisheries.

under Alternative 1. The existing outfall to south Lake Union, CSO #125, would be excavated away from the shore, cut, and capped. No construction activities would take place in the lake, sediment control methods, no significant impacts would occur.

Shellfish. No construction-related impacts to shellfish are anticipated to result from this alternative. Elimination of CSO #125 would not generate significant quantities of sediment-laden surface runoff, and construction is estimated to be completed within a week.

Conveyance

Plants, Wildlife and Habitat. All conveyance facilities proposed in the South Lake Union Subbasin under Alternative 1 would lie within existing road easements and rights-of-way. Since sewer lines in the City of Seattle are typically located at the centerline of streets, all of the trenching and most of construction activities related to installation of new conveyance facilities would occur on concrete or asphalt surfaces. In certain areas (i.e., where streets are narrow) construction activities may require removal of existing landscape plants and street trees. Weeds, grasses, and invasive shrubs found along urban roadways may also be disturbed or removed. No loss of important wildlife habitat is anticipated during construction of conveyance facilities under Alternative 1. Construction of conveyance facilities would center on existing roadways and active arterials. Urban wildlife occurring in the South Lake Union area are well-adapted to human disturbance. Any wildlife species inhabiting this area (e.g., pigeon, crow, rat, raccoon, starling, etc.) may move to adjacent urban areas to avoid temporary noise and disturbance produced during construction.

Fisheries and Shellfish. No additional construction activities are proposed in or near the waters of Lake Union. No impacts to fishery or shellfish resources would occur from construction of conveyance facilities.

Regulating Structures

Plants, Wildlife and Habitat. Under Alternative 1, construction of regulating structures is not anticipated to adversely or beneficially affect plants and animals within the South Lake Union Subbasin. The Central Trunk Diversion Structure and Lake Union Tunnel Regulator Station would be constructed underground within existing roadway rights-of-way. Similar to conveyance systems, construction of regulating structures would occur largely on concrete or asphalt surfaces. Street trees, landscape plantings, and roadside vegetation may be removed during construction of regulating structures in areas where facilities cannot be entirely constructed within existing roadways. No loss of wildlife habitat is likely to occur during construction of regulating structures.

Fisheries and Shellfish. No additional construction activities are proposed in or near the waters of Lake Union. No impacts to fishery or shellfish resources would occur from construction of regulating structures.

CSO Control

No impacts to plants, wildlife, fisheries or shellfish would occur in the South Lake Union Subbasin under Alternative 1.

5.4.2 Alternative 2 - Partial Separation and Storage

Outfalls

Plants, Wildlife and Habitat. As in Alternative 1, the CSO #125 outfall would be abandoned in place and filled with concrete; impacts to plants or wildlife habitat would be of short duration. The construction of the new South Lake Union Overflow may result in temporary and permanent adverse impacts to plants and wildlife habitat along the southern shore of Lake Union. In accordance with City standards, the outfall would be constructed below the extreme low water mark. The following construction impacts to plants and animals are anticipated to occur:

- ◆ Loss of shoreline vegetation at the location of the new outfall. The outfall of the South Lake Union Overflow is proposed to be located in South Lake Union Park. The park is primarily vegetated in lawn grasses with Himalayan blackberry and giant horsetail growing at the top of the bank along the shoreline. Wetland-adapted plants along the shoreline occur infrequently due to the steepness of the shore. Wetland plants observed include common speedwell, yellow iris, and white willow. Approximately 75 lineal feet of shoreline vegetation would likely be disturbed during trenching and construction activities for the South Lake Union Overflow pipe. Freshwater aquatic plants have not been observed in the vicinity of the new outfall and are not likely to be directly affected during construction.
- ◆ Temporary displacement of migratory and resident waterfowl in the vicinity of the outfall in south Lake Union. Construction noise and activity would likely disturb waterfowl using the South Lake Union Park area and portions of Lake Union immediately adjacent to this park. Migratory waterfowl may avoid use of this area of south Lake Union if construction occurs during the winter season (i.e., November through March), when over-wintering waterfowl are most likely to be present on the lake. Resident waterfowl that commonly use the park area and its vicinity for foraging include Canada geese, mallard, and gulls. Other common bird species that would likely be disturbed include red-winged blackbird, pigeons, crows, and starling. No waterfowl nesting habitat has been observed or is anticipated due to the lack of emergent vegetation along the shoreline.
- ◆ Displacement of resident urban wildlife. Foraging and feeding by resident wildlife (see Section 4.4) may be temporarily disturbed by construction noise and activity.
- ◆ Possible impacts to fish, fish habitat, crayfish, crustaceans, and other invertebrate freshwater organisms. Habitat for fish, shellfish, and freshwater invertebrates occurring along the shoreline or within the littoral zone near the location of the new outfall may be adversely affected during outfall construction.

Construction of the new South Lake Union Overflow is not anticipated to significantly disturb prey species (e.g., salmon, ducks) for bald eagle. Bald eagle in this region forage over a wide area including Lake Union and its vicinity, Lake Washington, and Elliott Bay. According to the USFWS, there is no documented occurrence of bald eagle foraging or perching in the South Lake Union area.

Fisheries. Depending on the final location of the South Lake Union Overflow, sediment runoff from construction could have a temporary impact on two small areas of littoral habitat located in the southern portion of the lake near South Lake Union Park. City of Seattle shoreline

management standards would require the outfall discharge to be sited below extreme low water level. This area of Lake Union may provide spawning habitat for some of the fish species noted in Appendix H, Table H-1. Through compliance with WDFW Hydraulic Project Approval permit requirements to minimize impacts to fishery resources during construction and implementation of proper erosion control methods, these impacts would be minimal and of short duration.

Shellfish. Impacts to shellfish from elimination of CSO #125 are the same as for Alternative 1. Construction activities in the shoreline environment associated with the South Lake Union Overflow could result in short-term erosion and sedimentation of lake waters and temporarily displace shellfish communities. Following construction, shellfish communities would be expected to recolonize disturbed areas.

Conveyance

Similar to Alternative 1, all conveyance facilities proposed in the South Lake Union Subbasin under Alternative 2 would lie within existing road easements and rights-of-way. Trenching, staging, and other construction activities related to installation of new conveyance facilities would occur on concrete or asphalt surfaces. No additional construction activities are proposed in or near the waters of Lake Union.

Plants, Wildlife and Habitat. In certain areas, installation of pipes, manholes, or other structures may require removal of existing landscape plants and street trees. Weeds, grasses, and/or blackberry shrubs found along urban roadways may also be removed or disturbed. Loss of wildlife habitat is not anticipated during construction of conveyance facilities under Alternative 2. Construction would center on existing roadways and active arterials. Urban wildlife occurring in the South Lake Union area are well adapted to human disturbance. Any wildlife species inhabiting this area may move to adjacent urban areas to avoid noise and disturbance during construction. Construction of conveyance structures would occur at a distance of 200 feet or greater from Lake Union; therefore, no adverse impacts to foraging areas or lake habitat used by waterfowl are anticipated.

Fisheries and Shellfish. No additional construction activities are proposed in or near waters of Lake Union. No impacts to fishery or shellfish resources would occur.

Regulating Structures

Construction of regulating structures under Alternative 2 is not anticipated to adversely or beneficially affect plants and animals within the South Lake Union Subbasin. The Dexter Avenue Diversion Structure would largely be constructed underground within existing roadways. No street trees or landscaping would likely be removed at the diversion structure location at Roy Street. Similarly, impacts to wildlife habitat, fishery or shellfish resources are not likely to occur during construction of regulating structures under Alternative 2.

CSO Control

Plants, Wildlife and Habitat. Construction of the South Lake Union CSO Control Facility is not likely to result in loss or removal of street trees or other roadside vegetation. Wildlife habitat is highly urbanized and limited to green spaces along active arterials. Wildlife species potentially occurring in the vicinity are well adapted to noise and disturbance and would not be further affected by this project.

Fisheries and Shellfish. No additional construction activities are proposed in or near waters of Lake Union. No impacts to fishery or shellfish resources would occur.

5.5 ENERGY

Impacts to energy resources would be the similar for Alternatives 1 and 2. There would be short-term energy impacts during construction of the South Lake Union facilities. At some locations, electrical energy could be used to operate construction equipment such as dewatering pumps, generators, fans, or lighting. Fossil fuels would be used to operate machinery and vehicles. No natural gas is expected to be utilized for the project. Alternative 2 would use more electricity and fuels because of the extensive amount of pipes required. The No Action Alternative would have no impact on energy resources.

5.6 ENVIRONMENTAL HEALTH

5.6.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

The small quantities of materials likely to be present during construction include gasoline and diesel fuels, hydraulic fluids, oils, lubricants, solvents, paints, and other chemical products. Some of these materials are considered hazardous. A spill of one of these chemical products could potentially occur during construction as a result of either equipment failure or worker error. Impacts would depend on the location of the spill, the amount and type of material spilled, and the timing of emergency response actions. However, no significant impacts are expected to occur as long as construction activities comply with Ecology's *Stormwater Management Manual for the Puget Sound Basin* (Ecology 1992). There is a minor risk of transportation-related spills of hazardous materials on roadways within the project area. The most commonly transported hazardous materials are petroleum and petroleum-related fuels, which are transported largely in vehicle fuel tanks (AAI 1994b). Amounts would be typically less than 50 gallons. The risk associated with this project would be comparable to those associated with other large-scale construction projects in the area.

Contaminated soils, sediments, or groundwater could be exposed during excavation in the South Lake Union Subbasin. Petroleum hydrocarbons associated with Leaking Underground Storage Tanks (LUSTs), spills, or other releases could be encountered during excavation. Large areas of near-surface petroleum contaminated soils have been documented in the vicinity of two service stations north of Mercer Street between Boren and Westlake Avenues (Seattle Office of Management and Planning 1995). If disturbed during construction, contaminated substances could directly expose workers involved in excavation activities as well as other individuals in the vicinity through transport in blowing dust, stormwater runoff, or vapors. However, with adherence to EPA, Ecology, Puget Sound Air Pollution Control Agency, and City of Seattle protocols, these impacts would not be expected to pose significant environmental health risks. In addition, most construction would occur west of these large areas of contamination, minimizing the chance for worker exposure. Excavation in the northern portion of the subbasin near the south shore of Lake Union could encounter wood waste fill and possible releases of methane gas. Fire hazards could occur if ignition sources were present during initial excavation activities. However, any methane that is encountered should be quickly diluted in open air below flammable concentrations.

5.6.2 Alternative 2 - Partial Separation and Storage

Impacts would be similar to those discussed for Alternative 1.

5.7 NOISE

Noise levels in the vicinity of construction sites would temporarily increase during construction of the facilities proposed for either Alternative 1 or 2. The duration of construction activity would vary by facility and by alternative (see Table 5-1). Construction noise would typically be more noticeable during the nighttime (i.e., 10 p.m. - 7 a.m.) and in areas where background noise levels are low (i.e., residential neighborhoods).

5.7.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Outfalls

Minor short-term noise impacts would occur from elimination of CSO #125.

Conveyance

Construction activities associated with pipeline installation would include pavement breaking, trench excavation, pipe laying, and backfilling. Construction would occur in segments of approximately 25 to 100 feet. Because of the construction sequencing, noise levels would generally increase for a period of two weeks along a given portion of the alignment. Depending on the types of construction equipment being utilized, noise levels could range from 81 to 91 dBA (includes background noise levels) at a distance of 50 feet (Table 5-3). Construction traffic and trucks (generating peak noise levels ranging

Table 5-3
Typical Construction Noise
(in dBA)

Type of Equipment	Range of Noise Levels at 50 feet	Average Noise Level at 50 feet
Earth Moving:		
Front Loaders	73-84	n/a
Backhoes	73-93	85
Bulldozer	77-96	87
Dump Trucks	78-89	88
Materials Handling:		
Concrete Mixers	75-87	85
Concrete Pumps	81-83	n/a
Cranes (movable)	76-87	83
Cranes (derrick)	86-88	88
Stationary Equipment:		
Pumps	69-71	76
Generators	59-82	78
Compressors	74-87	81
Impact Equipment:		
Pneumatic Wrenches	83-88	85
Jack Hammers	81-98	88
Pile Drivers	95-106	101 (peak)

Source: EPA 1974.

from 80 to 87 dBA) would impact noise levels along residential streets (i.e., near CSO #175). The conveyance facilities in the South Lake Union Subbasin would be constructed along or near major arterials where existing noise levels range between 65 to 70 dBA during the daytime (7 a.m. -10 p.m.). Short-term increases in noise levels would be noticeable to sensitive receptors (e.g., businesses, residences, pedestrians) in the immediate vicinity of construction sites. Some construction could occur at night to minimize impacts to sensitive transportation resources, however, this could impact sensitive noise receptors (i.e., Marriott Residence Inn, residences).

Regulating Structures

Temporary noise impacts during construction of the Central Trunk Diversion Structure and Lake Union Tunnel Regulator Station would be similar to those described for the East Tunnel Portal Drop Structure (see below). The nearest receptors are businesses.

CSO Control

Construction of the East Tunnel Portal Drop Structure would last approximately one year. Construction activity would temporarily increase noise levels in the immediate vicinity of the portal. Excavation equipment would generate noise levels ranging from 80 to 85 dBA at a distance of 50 feet. The nearest receptors to the construction site are businesses, which may experience short-term increases in noise levels. If groundwater is encountered, temporary sheetpiling would be required during excavation. Pile drivers, if necessary, could generate peak noise levels up to 101 dBA.

5.7.2 Alternative 2 - Partial Separation and Storage

Outfalls

Short-term noise impacts related to construction of the South Lake Union Overflow would be similar to those described for Alternative 1.

Conveyance

Noise impacts from construction of 10 miles of stormwater pipeline would be similar to those described for Alternative 1, however, impacts would occur over a longer period of time and in a larger area than Alternative 1. Many residences and businesses would experience a temporary increase in noise levels. Construction trenching would move along streets about 25 to 50 feet per day, however, many sensitive receptors (i.e., residences) would be impacted since over 10 miles of pipe would be installed. Noise from construction traffic and trucks could increase noise levels along local residential streets. Noise levels could range from 80 to 87 dBA when a heavy truck passes. Construction activity in residential areas would be prohibited during the nighttime (10 p.m. to 7 a.m.) when ambient noise levels are the lowest.

Regulating Structures

Noise impacts from construction of the Dexter Avenue Diversion Structure are the same as for Alternative 1.

CSO Control

Construction of the South Lake Union CSO Control Facility would take approximately two years to complete. Sensitive receptors in the vicinity of the storage facility are businesses. Dewatering and sheetpiling may be necessary during construction. Use of pile drivers could generate peak noise levels up to 101 dBA.

5.8 LAND AND SHORELINE USE

All proposed South Lake Union facilities for Alternatives 1 and 2 would be constructed underground. Construction impacts (e.g., dust, truck traffic, noise, visual changes) would impact adjacent land uses. However, most of the project area is commercial/industrial land uses and currently has high traffic and noise levels. In addition, construction impacts are short term. Before construction, all applicable shoreline, land use, zoning, and construction permits would be acquired by King County and Seattle (see Permits section under 1.14 and Table 1-4 for a list of probable permits required by the project). The City of Seattle owns the property on both sides of Eighth Avenue North just north of Mercer Street and have vacated Eighth Avenue North between Mercer and Broad. King County would need an easement to cross the vacated portion of Eighth Avenue North.

5.9 RECREATION

5.9.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Outfalls

Temporary construction impacts to the children's play area on the southern end of Lake Union would occur as a result of the elimination of CSO #125.

Conveyance

Construction of the Valley Connection would temporarily impact the southern portion of South Lake Union Park. Construction activities (e.g., noise, dust, traffic) would be noticeable to users of the park. Access to the southern portion of the park may be restricted during construction. The existing bicycle/pedestrian path north of the Valley Street traffic lanes would be detoured during construction. Construction of other conveyance facilities would not affect park and recreation areas.

Regulating Structures

The bicycle lanes on both sides of Dexter Avenue North could be closed during construction of the Central Trunk Diversion Structure. Sidewalks would remain open during construction. The bicycle lane would be restored to its original condition following completion of construction.

CSO Control

No impacts to recreation would occur during construction of the East Tunnel Portal Drop Structure.

5.9.2 Alternative 2 - Partial Separation and Storage

Outfalls

The South Lake Union Overflow would be constructed through a portion of South Lake Union Park. Park activities would temporarily be disrupted in this area. As in Alternative 1, the children's play area on South Lake Union would be temporarily impacted during elimination of CSO #125.

Conveyance

There would be impacts similar to Alternative 1 to recreation resources from construction of the conveyance facilities in the South Lake Union subbasin, however, additional impacts to bicycle lanes could occur from construction of 10 miles of stormwater pipes.

Regulating Structures

Temporary impacts on recreation resources from construction of the Dexter Avenue Diversion Structure are the same as for the Central Trunk Diversion Structure in Alternative 1.

CSO Control

There would be no impacts to parks or recreation from construction of the South Lake Union CSO Control Facility.

5.10 AESTHETICS

Currently, views of Lake Union and downtown Seattle skyline are the predominant visual amenities in the proposed South Lake Union project area. Views are influenced by development patterns and topography. Urban design elements are discussed under Section 5.11 Historical and Cultural Preservation. All South Lake Union facilities for Alternatives 1 and 2 would be constructed below grade. During construction, aesthetic qualities in vicinity of construction would be temporarily degraded due to dust, noise, and movement of construction vehicles. Aesthetic impacts would be greater for Alternative 2 due to more pipelines and a large storage tank constructed in south Lake Union, therefore requiring approximately three years for construction compared with approximately three months for construction of Alternative 1 South Lake Union facilities. Construction impacts are short term and would not be significant.

5.11 HISTORICAL AND CULTURAL PRESERVATION

Based on the initial identification of historic structures that may be adversely affected by the preferred alternative, a more detailed survey was completed by an Historic Architect. In early 1997, properties along the preferred alignment (i.e., Mercer Street from Fourth to Eighth Avenues North) were surveyed for their historic and architectural significance (Boyle-Wagoner Architects 1998). The survey was consistent with procedures in 36 CFR 800.4. The survey serves as a preliminary evaluation as to the eligibility of each property to meet criteria of National Register of Historic Places, Washington Heritage Register, or City of Seattle Landmark designation. Nineteen properties were surveyed.

Table 5-4 lists the properties that are potentially eligible for nomination to national, state or city landmark registers based on the preliminary review. The Historic Architect and King County will present the survey results to EPA, ACHP, and OAHP and determine appropriate monitoring requirements and protection methods to reduce impacts to the six potentially eligible historic properties.

**Table 5-4
Historic Properties Potentially Eligible for Nomination
To National, State and/or City Landmark Registers**

Property/Landmark Name	Location	Preliminary Eligibility
T. Duncan Building/ Seattle Business Center	550 Mercer Street – 557 Roy Street	CSL
Auditorium Apartments	605 Fifth Avenue North	CSL
The Marquee Apartments	600 Queen Anne Ave. N./ 10 Mercer Street	NR; SHR; CSL
Seattle Department of Parks & Recreation Shops Maintenance Shops	804 Roy Street	NR; SHR; CSL
Wm. O. McKay Ford-Lincoln Automobile Dealership	601-609 Westlake Ave. N.	CSL
Lane Hardwood Floors	965 Valley Street	CSL

CSL – City of Seattle Landmark

SHR – State Heritage Register

NR – National Register

5.11.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Outfalls

No impacts to historic structures or archaeological deposits are expected from removal of CSO #125. The Ford Motor Company Assembly Plant/Craftsman Press Building, which probably meets Seattle City Landmarks or National Register of Historic Places (NRHP) criteria (Table 5-5), is southeast of the CSO pipe outfall, at the corner of Valley Street and Fairview Avenue North. The Schooner *Wawona* is listed on the NRHP and is moored at Waterway No. 4, west of the CSO outfall pipe. The proposed construction would not affect the historic properties. The proposed construction would be in an existing disturbed pipeline right-of-way which has a low probability for archaeological deposits. If construction is modified to extend to the area outside the disturbed pipeline right-of-way, a high probability for historic archaeological deposits exists.

Conveyance

CSO #175. No impacts to archaeological deposits are expected. The proposed pipeline in Lakeview Boulevard is not near any recorded historic standing structures; however, construction in Galer Street and Eastlake Avenue is near the Zymogenetics/Lake Union Steam Plant. The proposed pipeline is on the edge of a steeply sloping landform and does not have a high potential for hunter-fisher-gatherer resources. Some early settlement took place northeast and above the south end of Lake Union, but the Lakeview Boulevard area does not appear to have potential for early historic period archaeological deposits.

Valley Connection. Historic structures and historic archaeological deposits may be adversely affected by construction of the pipeline. The Brace Lumber Company and the Ford Motor Company Assembly Plant/Craftsman Press Building may meet Seattle City Landmarks designation or NRHP criteria (see Table 5-5). The historic structures may be affected during construction excavation by vibration from heavy construction equipment and/or ground settling during trench excavation (Hansen 1996). The pipeline trench may intersect early historic archaeological deposits associated with David Denny's Western Lumber Mill which operated at the south end of Lake Union. Potential historic archaeological materials include wharf pilings, historic artifacts, and wood debris from lumber mill operations. The area has been covered with different kinds of fill material, including fill from regrading operations.

South Lake Union CSO Pipeline. Historic structures and/or hunter-fisher-gatherer and historic archaeological deposits may be adversely affected by the pipeline. The east end of the pipeline would pass over 150 feet north of the Pacific Lincoln-Mercury/William O. McKay Company Ford Building, which may meet Seattle City Landmarks designation or National Register of Historic Places criteria (see Table 5-5). The building may be adversely affected by ground settling and/or vibration during construction excavation (Hansen 1996). The pipeline would be excavated in a landform which is covered with fill and is a moderate to high probability area for hunter-fisher-gatherer and historic archaeological deposits. The north edge of a historic period Duwamish village or camping area is directly south of Roy Street. The proposed pipeline may intersect historic period archaeological deposits, such as pilings, historic artifacts, and mill waste from early lumber mills as well as pilings and other material associated with an 1890s streetcar

Table 5-5
South Lake Union Subbasin
Historic Structures Which May Be Adversely Affected
By Alternatives 1 and 2

Proposed Alternative	Property/Landmark Name	Location	Evaluation Status
1,2	Zymogenetics/Lake Union Steam Plant	1179 Eastlake Ave East	
1,2	Seattle Department of Parks and Recreation Maintenance Shops	804 Roy Street/Eighth Avenue North	SC-SLU(3)
2	Seattle Wholesale Floral	960 Republican Street	SC-SLU(2)
2	J. F. Michener & Son	1015 Republican Street	SC-SLU(2)
2	U.S. Naval Reserve Armory	860 Terry Avenue North	Determined eligible for NRHP/Possibly eligible as SCLD/SC-SLU(1)
1,2	Brace Lumber Company	965 Valley Street	SC-SLU(2)
1,2	Ford Motor Company Assembly Plant/Craftsman Press	1155 Valley Street	HSPDA/SC-SLU(1)
2	Crawford's Office Furniture	435 Westlake Ave North	SC-SLU(2)
2	Antique Liquidators	503 Westlake Ave North	SC-SLU(2)
2	Antique Distributors	507 Westlake Ave North	SC-SLU(2)
2	Hugo Loewy Co.	515 Westlake Ave North	SC-SLU(3)
1,2	Pacific Lincoln-Mercury/ William O. McKay Co Ford	607 Westlake Ave North	SC-SLU(1)/Possibly eligible as SCLD

SCLD - Seattle City Landmark Designation

SC-SLU(1) - 1995 Seattle Commons/South Lake Union Building Survey (buildings likely to meet SCL designation or NRHP criteria)

SC-SLU(2) - 1995 Seattle Commons/South Lake Union Building Survey (may meet SCL designation or NRHP criteria)

SC-SLU(3) - 1995 Seattle Commons/South Lake Union Building Survey (not anticipated to meet SCL or NRHP criteria)

HSPDA - 1975 Historic Seattle Preservation and Development Authority Inventory

line which ran on a trestle through the area in what is now Westlake Avenue North. An early City of Seattle dump along the old Lake Union shoreline may also be transected by the pipeline. The Sanborn Fire Insurance map (Sanborn Map and Publishing Company 1893) shows two cabin structures within the street right-of-way at the intersection of Eighth Avenue North and Thomas (now Roy Street) (see Appendix M). The cabin on the north edge of what is now Roy Street had three rooms and was at the northeast corner of the intersection. A second cabin had two rooms and an outhouse and was on the south side of Roy Street, directly east of the intersection of Eighth Avenue. Remnants of the cabins may have been capped by fill.

Lake Union Tunnel CSO Pipeline. One historic structure and/or hunter-fisher-gatherer and historic archaeological deposits may be adversely affected by the pipeline. One historic structure is recorded near the north end of the pipeline north of the intersection of Roy Street and Eighth Avenue North. The Seattle Department of Parks and Recreation Maintenance Shops are on the east side of Eighth Avenue North at the intersection of Roy Street. The property probably does not meet Seattle City Landmarks or NRHP criteria (see Table 5-5). The Eighth Avenue North alignment between Mercer Street and Republican Street bisects an area historically used by the Duwamish as a camping area and village. The area may have hunter-fisher-gatherer archaeological deposits. Buried historic period archaeological deposits from early lumber mill operations and historic period occupations may also exist.

Central Trunk CSO Pipeline. No impacts are expected for historic structures, but hunter-fisher-gatherer and/or historic archaeological deposits may be adversely affected. No historic structures or properties are recorded near the proposed pipeline right-of-way. Areas covered by Denny Regrade fill at the southwest end of Lake Union are at the east end of the pipeline. The north edge of a historic period Duwamish village or camping area is directly south of Roy Street, which suggests the area has a moderate to high probability for archaeological deposits. Pipeline construction may intersect both hunter-fisher-gatherer and historic period archaeological deposits.

Regulating Structures

Central Trunk Diversion Structure. No historic structures or properties are recorded in the immediate vicinity of the diversion structure, and no archaeological deposits are anticipated in the excavation for the diversion structure.

Lake Union Tunnel Regulator Station. No historic structures are recorded in the vicinity of the regulator station but hunter-fisher-gatherer and/or historic period archaeological deposits may be adversely affected by the regulator station. The regulator structure would be on the south edge of an area historically used by the Duwamish as a camping area and village, suggesting a potential for construction excavation to intersect hunter-fisher-gatherer archaeological deposits. Buried historic period archaeological deposits from early historic period occupations may also be encountered.

CSO Control

One historic structure is recorded in the immediate vicinity of the drop structure and hunter-fisher-gatherer and/or historic archaeological deposits may be adversely affected. The Seattle Department of Parks and Recreation Maintenance Shops are on the east side of Eighth Avenue North at the

intersection with Roy Street. The property probably does not meet Seattle City Landmarks or NRHP criteria (see Table 5-5). The structure may be adversely affected by ground settling during construction excavation and/or vibration caused by heavy equipment during construction (Hansen 1996). The structure would be on the north edge of a Duwamish camp or village on the west edge of an area covered by fill during Denny Regrade operations. Both hunter-fisher-gatherer and early historic period archaeological deposits may be encountered, if excavations penetrate fill.

5.11.2 Alternative 2 - Partial Separation and Storage

Alternative 2 would require considerably more open-cut trench excavation in street rights-of-way than Alternative 1.

Outfalls

CSO #125 impacts would be the same as Alternative 1. Based on pipeline location, historic structures and/or historic archaeological deposits could be adversely affected by the South Lake Union Overflow pipeline. The U.S. Naval Reserve Armory at the north end of Terry Avenue North has been determined eligible for listing on the NRHP by the Washington Office of Archaeology and Historic Preservation (Appendix L). The Floral building is on the corner of Terry Avenue North and Republican Street and the Brace Lumber Company building is on the west side of Terry Avenue North at the intersection with Valley Street. Both structures may meet Seattle City Landmarks designation or NRHP criteria (Appendix L). The historic structures may be adversely affected by ground settling during construction excavation and/or vibration caused by heavy equipment during construction (Hansen 1996). The north end of the pipeline trench may intersect early historic archaeological deposits associated with David Denny's Western Lumber Mill which operated at the south end of Lake Union. Cultural materials could include wharf pilings, historic artifacts, and wood debris from lumber mill operations.

Conveyance

CSO #175 impacts would be the same as Alternative 1.

Phase 1 Connection. Two historic structures and/or historic archaeological deposits may be adversely affected. The pipeline could be adjacent to two historic structures. The Ford Motor Company Assembly Plant/Craftsman Press Building is at the corner of Valley Street and Fairview Avenue North, at the northeast end of the proposed pipeline. The structure probably meets Seattle City Landmarks designation or NRHP criteria (see Table 5-5). The J. F. Michener and Son Building on the southwest corner of Republican Street at Boren Avenue may meet Seattle City Landmarks designation or NRHP criteria. Both structures may be affected by ground settling during pipeline excavation and/or vibration caused by heavy equipment during construction. Historic archaeological deposits in the proposed pipeline alignment may be encountered under fill from the Denny Regrade and lumber mill operations. Cultural materials could include pilings, historic artifacts, and sawmill waste from the historic lumber mills operating at the south end of Lake Union.

South Lake Union Stormwater Pipelines. As many as 63 unevaluated historic structures, and 12 significant historic structures, and five urban design elements may be adversely affected, in addition to hunter-fisher-gatherer and historic period deposits. Because the proposed facilities

would be constructed throughout such a large neighborhood, specific impacts cannot be specified for individual structures. Potential impacts to historic structures can be suggested with a review of the number of recorded historic structures in the South Lake Union neighborhood (Appendix L). Sixty-three structures may meet Seattle City Landmarks designation or NRHP criteria. Six Seattle City Landmarks, one National Register of Historic Places structure, one structure determined to be eligible for listing on the NRHP, three National Register of Historic Places/Seattle City Landmarks, and one Washington Heritage Register/Seattle City Landmark are recorded in the South Lake Union neighborhood. In addition, five urban design elements may be affected by construction excavation. Unevaluated and significant historic structures may be adversely affected during pipeline construction by settling during pipeline excavation and/or vibrations from operation of heavy equipment during construction. The partial separation option includes several areas near Westlake Avenue North that have a high probability for hunter-fisher-gatherer archaeological deposits. The option also includes an old ravine centered on Westlake Avenue North that has a moderate to high probability for historic archaeological deposits. Remnants of an 1890s streetcar line and an 1870s coal railroad may also occur in Westlake Avenue North. Proposed pipeline excavations may intersect archaeological deposits in the area.

Central Trunk Diversion CSO Pipeline. Historic archaeological deposits associated with the Western Lumber Mill as well as potential hunter-fisher-gatherer cultural deposits may be adversely affected. The Sanborn Fire Insurance maps have a number of structures on the south side of Mercer Street. This alignment would require detailed historic and cultural analysis before construction. The historic structures may be adversely affected by ground settling during open-trench construction excavation and/or vibration caused by heavy equipment during construction (Hansen 1996).

Regulating Structures

The Dexter Avenue Diversion Structure at Dexter Avenue and Roy Street is on the edge of an area historically used as a Duwamish camping area. No historic structures or properties are recorded on the Sanborn Fire Insurance maps at this intersection. The potential exists for hunter-fisher-gatherer archaeological deposits to be discovered in the excavation for the diversion structure. A detailed cultural analysis would be required before construction of this facility.

CSO Control

South Lake Union CSO Control Facility. The area bounded by Valley Street, Broad Street, Eighth Avenue North, Thomas Street, and Fairview Avenue North has been identified as having historic interest. The area also has numerous residences and portions of the Western Lumber Mill on the Sanborn Fire Insurance maps, indicating a potential for historic archaeological deposits. The area also has a potential for buried hunter-fisher-gatherer archaeological deposits that would have been on the south edge of Lake Union and adjacent to a small stream and ravine. A detailed cultural analysis would be required before construction of this facility.

5.12 TRANSPORTATION

Short-term transportation impacts during construction could include increased traffic congestion due to construction detours and additional truck and worker trips, temporary lane closures, displaced street parking, and disrupted vehicular access to adjacent properties. However, most of the pipelines in South Lake Union would be constructed with trenchless methods, thereby reducing traffic impacts. Table 5-6 shows the estimated construction duration in days, worker trips per day, and average and maximum daily roundtrip truck trips for each South Lake Union Subbasin facility. There could also be short-term impacts to marine, rail, pedestrian, and bicycle traffic.

Traffic in the South Lake Union Subbasin is typically congested, and construction activity could significantly impact the existing traffic situation on several major arterials. Impacts would vary depending on timing and duration of construction activity, size and capacity of affected streets, and the projected volume of construction traffic. It is estimated that the projected volume of construction traffic would be about 1 percent more than the average daily traffic on any of the affected arterial roadways. The majority of the construction related traffic would utilize Highway 99, Broad Street, West Mercer Street, and Interstate 5.

5.12.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

Projected construction related trips for Alternative 1 in the South Lake Union area are presented in Table 5-7.

Outfalls and Conveyance

Construction activity to eliminate CSO #125 would not result in transportation impacts. Pipeline construction within street rights-of-way may require the temporary closure of traffic lanes and cause short-term disruption of vehicular access to abutting properties. Since construction would proceed at a rate of 25 to 100 feet per day, transportation impacts affecting a particular street segment should be limited to one to two weeks. Construction may also temporarily displace on-street parking which could adversely impact some businesses. It may be possible to use trenchless technologies for proposed conveyance facilities in this subbasin. The impacts discussed here would be worse case resulting from conventional open-cut trench construction methods. Traffic impacts associated with trenchless methods would be substantially less than with conventional methods. Whenever possible, construction staging areas would be located to minimize impacts to major arterials.

Construction for CSO #175 would temporarily disrupt traffic on Lakeview Boulevard. Street parking would be temporarily displaced. Some construction is also expected in the intersection of Eastlake Avenue North and Galer Street. Construction of the Valley Connection between Fairview Avenue and Westlake Avenue North would mainly occur in existing street right-of-way to the north of the Valley Street traffic lanes. The existing pedestrian/ bicycle path north of Valley Street would be rerouted during construction. Construction is expected in the intersection of Valley Street and Fairview Avenue North. Between the South Lake Union CSO Pipeline and the east portal, the pipeline would be constructed using trenchless methods.

Table 5-6
South Lake Union Subbasin
Estimated Construction Duration, Workers and Truck Trips
(in roundtrips)

Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

	Outfalls¹		Conveyance²		Regulating³		CSO Control⁴	
Construction Duration	5 Workdays (1 week)		90 Workdays (4 months)		225 Workdays (10 months)		225 Workdays (10 months)	
Workers	5/Day		25/Day		10/Day		15/Day	
Truck Trips	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.
Dump Trucks	0	0	3	9	2	9	2	9
Concrete Trucks	0	0	1	5	1	5	5	16
Delivery Trucks	1	2	<1	4	<1	3	<1	3

Alternative 2 - Partial Separation and Storage

	Outfalls⁵		Conveyance⁶		Regulating⁷		CSO Control⁸	
Construction Duration	90 Workdays (4 months)		640 Workdays (30 months)		90 Workdays (4 months)		1,000 Workdays (46 months)	
Workers	10/Day		35/Day		10/Day		35/Day	
Truck Trips	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.
Dump Trucks	2	9	3	9	2	4	3	24
Concrete Trucks	1	5	2	19	1	5	1	50
Delivery Trucks	<1	3	<1	4	<1	3	<1	4

¹ Includes CSO #125.

² Includes CSO #175, Valley Connection, South Lake Union CSO Pipeline, Lake Union Tunnel CSO Pipeline, Central Trunk CSO Pipeline.

³ Includes Central Trunk Diversion Structure and Lake Union Tunnel Regulator Station.

⁴ Includes East Tunnel Portal Drop Structure.

⁵ Includes CSO #125 and South Lake Union Overflow.

⁶ Includes CSO #175, South Lake Union Stormwater Pipelines, Phase 1 Connection, Central Trunk Diversion CSO Pipeline.

⁷ Includes Dexter Avenue Diversion Structure.

⁸ Includes South Lake Union CSO Control Facility storage tank and influent pump station.

Table 5-7
Alternative 1 - CSO Storage and Treatment
South Lake Union Subbasin Truck Trips¹
(in roundtrips)

	Outfalls²	Conveyance³	Regulating⁴	CSO Control⁵	TOTALS
Construction					
Dump Trucks	0	1990	318	548	2,856
Concrete Trucks	0	440	97	156	693
Delivery Trucks	0	423	0	0	423
Total Truck Trips	0	2,853	415	704	3,972
Worker Trips	100	2250	2250	3375	7,975
Total Roundtrips During Construction	100	5,103	2,912	4,079	12,194
Operation	0	0	6/month	1/month	7/month

¹ Truck trips are based on all materials moved for the project including concrete, pipes, etc. Size of truckloads used are: 18 CY for seventy-five percent of the dump truck trips and 9 CY for twenty-five percent of the dump truck trips; 8 CY for concrete; 24" pipe - 5 per truckload; 36" pipe - 4 per truckload; 48" pipe - 3 per truckload; 60"+ - 1 per truckload; and 10 50-foot pilings per truckload.

² Includes CSO #125.

³ Includes CSO #175, Valley Connection, South Lake Union CSO Pipeline, Lake Union Tunnel CSO Pipeline, Central Trunk CSO Pipeline.

⁴ Includes Central Trunk Diversion Structure and Lake Union Tunnel Regulator Station.

⁵ Includes East Tunnel Portal Drop Structure.

The Lake Union Tunnel CSO Pipeline would be constructed beneath Eighth Avenue North between Republican and Roy streets. The pipeline would be microtunneled most of the length and would go under the sunken section of Broad Street. Tunnel portals would be required at the intersections of Eighth and Roy for tunneling and Eighth and Republican for removal of the microtunnelling machine. Traffic would be detoured around the tunnel portals during construction. On street parking would be displaced along portions of Eighth Avenue North during construction. Roy Street would be closed between Broad Street and Dexter Way North for approximately one year during construction of the East Tunnel Portal Drop Structure. The Central Trunk CSO Pipeline would be constructed within the closed portion of Roy Street. Transportation impacts resulting from the closure of Roy Street are discussed in the next section.

Regulating Structures

A portion of Dexter Way North would be closed for up to several months during construction of the Central Trunk Diversion Structure which would increase congestion in the area. The existing bicycle lane on Dexter Way North could be closed or rerouted during construction. Construction of the Lake Union Tunnel Regulator Station in the intersection of West Republican Street and Eighth Avenue North would last approximately six months. Construction activity would increase congestion at this intersection.

CSO Control

Currently the city-owned property between Roy Street and Broad Street is leased by the 701 Dexter Building for employee parking. Construction at the site would impact approximately 50 vehicles that currently park in this area. Displacement of the on-street parking on Roy Street and Dexter Way North would also occur. The loss of parking in this area would require businesses and employees to find alternate parking during construction.

5.12.2 Alternative 2 - Partial Separation and Storage

Projected construction related trips for Alternative 2 in the South Lake Union area are presented in Table 5-8.

Outfalls

At least one traffic lane between Lake Union and Republican Street could be closed during construction of the South Lake Union Overflow. Temporary lane closures would increase congestion and displace on-street parking.

Conveyance

Short-term transportation impacts from modifications to CSO #175 are the same as discussed for Alternative 1. The portion of the Phase 1 Connection along Valley Street would be constructed north of the traffic lanes as described for the Valley Connection under Alternative 1. Construction of 10 miles of stormwater pipe would temporarily impact many local and residential streets in the South

Table 5-8
Alternative 2 - Partial Separation and Storage
South Lake Union Subbasin Truck Trips¹
(in roundtrips)

	Outfalls²	Conveyance³	Regulating⁴	CSO Control⁵	TOTALS
Construction					
Dump Trucks	310	22,480	65	3512	26,367
Concrete Trucks	45	542	23	1375	1,985
Delivery Trucks	188	1650	0	46	1,884
Total Truck Trips	543	24,672	88	4933	30,236
Worker Trips	900	22,400	900	35,000	59,200
Total Roundtrips During Construction	1,443	47,072	988	39,933	89,436
Operation	0	0	1/month	6/month	7/month

¹ Truck trips are based on all materials moved for the project. including: concrete, pipes, etc. Size of truckloads used are: 18 CY seventy-five percent of the dump truck trips and 9 CY for twenty-five percent of the dump truck trips; 8 CY for concrete; 24" pipe - 5 per truckload; 36" pipe - 4 per truckload; 48" pipe - 3 per truckload; 60"+ - 1 per truckload; and 10 50-foot pilings per truckload.

² Includes CSO #125 and South Lake Union Overflow.

³ Includes CSO #175, Phase 1 Connection, South Lake Union Stormwater Pipelines, Central Trunk Diversion CSO Pipeline.

⁴ Includes Central Trunk Diversion Structure.

⁵ Includes South Lake Union CSO Control Facility storage tank and pump station.

Lake Union area. Pipeline construction should proceed at a rate of 25 to 100 feet per day. Vehicular access to residences and businesses could be temporarily disrupted and on-street parking would be temporarily displaced. Construction of the Central Trunk Diversion CSO Pipeline would result in short-term transportation impacts to Dexter Way North between Roy Street and West Republican Street and West Republican Street between Dexter Way North and Westlake Avenue North.

Regulating Structures and CSO Control

Transportation impacts from construction of the Dexter Avenue Diversion Structure are the same as for Alternative 1. No streets would be closed during construction of the South Lake Union CSO Control Facility.

5.13 PUBLIC UTILITIES AND SERVICES

As described in the Affected Environment (Chapter 4) there are public utilities located throughout the South Lake Union Subbasin which could be impacted during construction of the proposed facilities. Eighth Avenue North has a six-inch gas line, a 12-inch water line and a sewer line within the street right-of-way. There is the potential for accidental utility disruptions during construction. Some of the conveyance facilities would make numerous utility crossings. Some of these utilities would need to be supported during construction. There would be a greater likelihood of utility disruptions under Alternative 2 since more streets would be excavated to install the new stormwater pipelines. There would be minimal impacts from construction of the Mercer Street Tunnel due to the depth of the excavation, which would place it beneath utilities. Minor impacts to public services could occur during construction of either alternative due to road closures or restraints. The No Action Alternative would result in no impacts to public utilities and services.

5.14 SOCIOECONOMICS

Consistent with EPA's *Draft Environmental Justice Guidance* (EPA 1996), an analysis of potential impacts to minority or low-income populations in the South Lake Union Subbasin was performed. No minority or low income populations would be disproportionately affected by construction of outfalls, conveyance, regulating structures, or control facilities. Census data for the South Lake Union area indicate that there are no census tracts or blocks with minority populations exceeding 50 percent (see Chapter 4.0). Although average income levels are lower and the amount of assisted housing stock higher south of Lake Union than citywide, low-income populations would not be disproportionately affected by facility construction. First, most facilities would be constructed in public road rights-of-way and would not require acquisition of or direct disturbance to any property owned or occupied by low-income individuals. Second, traffic, noise, environmental health, and air-related construction would be dispersed throughout the subbasin and would have impacts on a variety of businesses and residents, regardless of income status or ethnic origin. Because commercial land uses predominate in the South Lake Union area, businesses are substantially more likely to be affected by construction activities. Area businesses are not predominantly owned by minorities. Mitigation measures would be applied where necessary, also regardless of income status or ethnic origin.

5.14.1 Alternative 1 - CSO Storage and Treatment (the Preferred Alternative)

The total project costs for all Alternative 1 project components that would be constructed under Alternative 1 is an estimated \$161 million in 1997 dollars. A construction grant of \$35 million has been awarded to King County and Seattle for the project. The remainder of funding would come from sewer fees.

Outfalls

Construction to eliminate overflows from CSO #125 would be minor and would not result in any impacts to area businesses. Construction activities would result in positive employment impacts in the short-term, as an estimated five workers per day for 5 workdays would be required (see Table 5-6).

Conveyance

No significant impacts to businesses from construction of the CSO #175 conveyance pipeline. This pipeline would be constructed in Lakeview Boulevard, a predominantly residential street, and under Interstate 5. Construction of the proposed Valley Connection, South Lake Union CSO Pipeline, Lake Union Tunnel CSO Pipeline, and Central Trunk CSO Pipeline would take over approximately 4 months, although the pipelines could be constructed at different times. Construction could temporarily restrict access to businesses along Valley Street; in the vicinity of Broad, Valley, and Eighth Avenue North; and in the vicinity of Dexter Avenue and Roy Street. Although some construction (i.e., Eighth Avenue North, Broad Street) would be performed using trenchless technologies, construction could temporarily alter traffic flow, restrict on-street parking opportunities, and create dust, fumes, and noise that could be objectionable to area business patrons near tunnel portals and staging areas. While business patronage could be reduced during construction, these impacts would be temporary and would only occur for short periods along any one section of the pipeline route. No businesses would be closed during construction; thus, impacts would not be significant. Construction of conveyance facilities would employ an estimated 25 workers for 90 workdays (see Table 5-6). This would be a positive short-term impact.

Regulating Structures and CSO Control

Impacts associated with regulating and control structures would include temporary restriction of ingress and egress from businesses in the vicinity of Dexter Avenue at Roy Street; in the vicinity of Republican Street and Eighth Avenue North; and along Roy Street between Dexter Avenue North and Broad Street. Impacts related to traffic flow, parking, noise, dust, and fumes would be similar to those associated with outfall and conveyance facilities. The duration of impacts would be approximately 4 months for the Central Trunk Diversion Structure, 6 months for the Lake Union Tunnel Regulator Station, and 10 months for the East Tunnel Portal Drop Structure. No businesses would be closed during construction. Construction of regulating structures and control facilities would employ approximately 25 workers for 225 workdays. This would be a positive short-term employment impact.

5.14.2 Alternative 2 - Partial Separation and Storage

The total project costs for all Alternative 2 project components that would be constructed under Alternative 2 is an estimated \$309 million in 1997 dollars. A construction grant of \$35 million has been awarded to King County and Seattle for the project. The remainder of funding would come from sewer fees.

Outfalls

Impacts from elimination of overflow at CSO #125 would be similar to Alternative 1. Construction of the South Lake Union Overflow would occur over a four-month period and could partially restrict access temporarily to some businesses from Republican Street to Lake Union. Construction impacts including traffic and parking restrictions, dust, fumes, and noise would be similar to those discussed for Alternative 1. Approximately 10 workers would be employed for 90 workdays, resulting in temporary positive employment impacts.

Conveyance

Construction of stormwater pipelines could result in large-scale, temporary disruptions to businesses located in the area bounded by Garfield Street, Interstate 5, Denny Way, Virginia Street, Seventh Avenue North, Dexter Avenue, and Galer Street. This area is dominated by commercial businesses that could be temporarily impacted by construction, depending on the location of excavation and the degree of access restrictions to businesses in the vicinity. Impacts would include temporary restriction of ingress and egress from businesses and a potential reduction in patronage due to construction dust, fumes and noise. Although the total stormwater pipeline project would take up to 2 years to complete, construction impacts would be temporary and would be of short duration for individual businesses as pipelines would be constructed in segments. This would avoid large-scale disruption of transportation or business activity or disturbance to residents. Impacts from the construction of CSO #175 and the Central Trunk Diversion CSO Pipeline would be similar to Alternative 1. Construction of the Phase 1 Connection would occur in Fairview Avenue, Valley Street, and Boren Street, taking up to seven months to complete construction. Impacts to businesses would be similar to those discussed under Alternative 1. Conveyance facility construction would result in a temporary, positive employment impact. An estimated 35 workers would be employed for about 2 and a half years (see Table 5-6).

Regulating Structures and CSO Control

Impacts associated with the Dexter Avenue Diversion Structure would be similar to Alternative 1. In addition, a South Lake Union CSO Control Facility, consisting of a pump station and storage tank, would be constructed for about four years to construct. Some temporary disruption of business in the area would be expected, but impacts would be similar to those discussed under Alternative 1. Construction of regulating structures would require approximately 10 workers over 90 work days. CSO control construction would require an estimated 35 workers for almost four years (see Table 5-6).