Public Services and Utilities Technical Memorandum

S. Holgate Street to S. King Street Viaduct Replacement Project

Environmental Assessment

June 2008

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LIST OF EXHIBITS

ACRONYMS

BMP	Best Management Practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
City	City of Seattle
DoIT	Seattle Department of Information Technology
EBI	Elliott Bay Interceptor
EOC	Emergency Operations Center
FHWA	Federal Highway Administration
IP	intermediate pressure
kV	kilovolt
LOS	level of service
NEPA	National Environmental Policy Act
Project	SR 99: S. Holgate Street to S. King Street Viaduct Replacement Project
PSE	Puget Sound Energy
SCL	Seattle City Light
SFD	Seattle Fire Department
SIG	Seattle International Gateway
SPD	Seattle Police Department
SPU	Seattle Public Utilities
SR	State Route
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation

Chapter 1 SUMMARY

This technical memorandum describes the existing conditions for public services and utilities along the alignment of the proposed SR 99: S. Holgate Street to S. King Street Viaduct Replacement Project (the Project). In addition, the potential construction and operational effects for public services and utilities and their mitigation measures are discussed.

The project boundaries generally follow the State Route (SR) 99 alignment from approximately S. Walker Street on the south to S. King Street on the north. The study area includes additional area approximately three blocks to the west and east sides of the existing right-of-way.

1.1 Project Description

The Project would replace the existing SR 99 roadway and associated structures between approximately S. Holgate Street and S. King Street. Starting from the south, the proposed alignment would transition from the existing at-grade roadway via retained fill ramps to an elevated structure that would cross over a reconfigured S. Atlantic Street and a proposed tail track serving the Seattle International Gateway (SIG) Railyard. It would then transition back to an at-grade roadway just north of S. Royal Brougham Way, before rising to meet the existing elevated structure in the stretch of roadway located west of Qwest Field. New access ramps would connect Alaskan Way S., just south of S. King Street, to the proposed at-grade section located between the proposed elevated sections.

Surface streets would be modified in several important ways, including the following:

- S. Atlantic Street would cross under the proposed elevated section of SR 99.
- Northbound and southbound lanes of Alaskan Way S. would be split between S. Atlantic Street and approximately S. King Street, with northbound lanes located east of SR 99, and southbound lanes west of SR 99.
- An at-grade tail track serving the SIG Railyard would be relocated. The track would cross S. Atlantic Street, beneath the proposed elevated section of SR 99, and extend north between Alaskan Way S. and SR 99.
- A new two-lane below-grade undercrossing would allow traffic to pass under the tail track when trains are present.

- Colorado Avenue S. would be widened between S. Massachusetts Street and S. Atlantic Street to accommodate truck traffic.

1.2 Affected Environment

In general, public services and utilities within three to five blocks of existing or proposed facilities are identified as being within the study area of potential construction or operational effects. There are exceptions to this rule, however; some facilities (such as hospital emergency rooms) are located outside of the study area, but are included in this analysis because they offer critical services to the project area. Public services and facilities analyzed include law enforcement, fire suppression, emergency medical response, public schools, disaster preparedness, and solid waste collection. Several federal government facilities are also located in downtown Seattle, including postal services. The primary public service providers in the study area include Seattle Police Department (SPD), Seattle Fire Department (SFD), and Seattle Solid Waste Division. Other public service providers in the study area include King County (transit and sewer services), Waste Management, Seattle Emergency Management, Washington State Ferries, and the Port of Seattle.

A number of utility providers within the study area (including municipal agencies and private companies) provide electricity, water, wastewater and stormwater collection, natural gas, and telecommunications services. The construction and operation of project elements would be largely within the public street rights-of-way, where utilities are also generally located. The primary public utility providers in the study area include Seattle Public Utilities (SPU) for the stormwater, water, and sanitary/combined sewer system as well as solid waste services; King County for combined sewer; and Seattle City Light (SCL) for the electrical power system. Private utilities include Puget Sound Energy (PSE), Qwest, Comcast, and a number of other private communications companies.

The existing public services and utilities that would be affected by construction are summarized below.

1.2.1 Public Services

The affected environment for public services includes the following services that are provided by governmental agencies or private companies:

- Fire suppression
- School transportation
- Solid waste collection, disposal, and recycling
- Postal services

- Law enforcement services
- Emergency medical services
- Disaster preparedness

1.2.2 Utilities

The affected environment for utilities includes the following utilities that are owned, operated, and maintained by governmental agencies or private companies:

- Electrical power
- Water
- Sanitary sewer and storm drainage
- Natural gas
- Telecommunications

1.3 Operational Effects and Mitigation

These effects for public services and utilities include increased operational requirements for the public service or utility providers following construction. Operational effects for public services and utilities are presented in detail in Sections 4.1.1 and 4.1.2, respectively.

1.3.1 Public Services Effects

Operational effects likely to affect public services are briefly summarized below:

- Emergency services providers: potential increase in travel time or potential minor delays within the project area for some trips.
- School bus routes through the corridor: potential increase in travel time within the project area for AM peak hour trips.
- Solid waste collection, disposal, and recycling: potential change in traffic patterns and travel time within the project area.
- Postal services: potential change in traffic patterns and travel time at some locations within the project area.

1.3.2 Utilities Effects

Operational effects likely to affect utilities are briefly summarized below:

- Electrical power: relocation of above-ground lines to underground locations; potential right-of-way or easement acquisition would be necessary.

- Sanitary sewer and storm drainage: water quality treatment vaults and pumps would be required for the storm drainage system, increasing maintenance requirements and life cycle costs.

1.3.3 Operational Mitigation

Operational mitigation includes potential mitigation measures to avoid or reduce operational effects of the Project to public services and utilities. These measures include designing the Project to avoid or minimize effects, preparing a consolidated utility relocation plan, and ensuring that adequate access to utility facilities for maintenance and repair will be maintained in the built condition. Operational mitigation is presented in further detail in Section 4.3.

1.4 Construction Effects and Mitigation

Construction effects for public services and utilities are the effects on public service providers or utility providers that are likely to occur during construction. Construction effects are presented in further detail in Section 5.1. Construction mitigation for public services and utilities is discussed in Section 5.2.

1.4.1 Public Services Effects

Construction effects are anticipated for all public service providers during construction, predominantly because of traffic delays during construction and increased difficulty in accessing sites west and east of the project corridor. Major sources of construction-related congestion that may affect response or service times for public services include:

- Increased traffic volumes on surface streets.
- Limited open lanes for the viaduct and Alaskan Way S.
- Realignment of surface streets.
- Construction of retained cuts for the proposed tail track undercrossing and related detours.

1.4.2 Utilities Effects

Construction effects for utilities would result from the relocation or protection in place of existing utilities. Other effects could include disruptions to service or unplanned outages. Such construction effects may include the need for additional staff and resources to:

- Perform field observation/inspection as utilities are constructed.
- Construct utility relocations if such relocations are not constructed by Washington State Department of Transportation (WSDOT).

- Coordinate project status and temporary utility shut-offs with utility customers.
- Perform specialized tasks such as connections to existing utility systems.
- Perform emergency repairs, if needed, due to inadvertent utility strikes during construction.

1.4.3 Mitigation for Public Services

To address increased challenges in mobility and accessibility during construction, a series of proposals have been developed in coordination with local transit agencies and the City of Seattle. The SR 99/Viaduct Project Initial Transit Enhancements and Other Improvements would provide a range of solutions such as increased bus service, Intelligent Transportation Systems (ITS) measures, and street improvements to be implemented before construction. The following summarizes the potential construction mitigation measures that would be needed during construction of the Project to mitigate for potential effects to public services.

- Coordinate with Seattle and Port of Seattle police and fire departments, transportation divisions, and other appropriate agencies during final design and prior to construction of the proposed facilities to maintain reliable emergency access, identify alternate plans or routes to avoid delays in response times, and ensure that general emergency management services are not compromised.
- Notify SFD regarding any relocation of water lines used for fire suppression, and establish alternate supply lines.
- Coordinate with SPD to obtain adequate staffing during construction for traffic and pedestrian movement control.
- Coordinate the location of construction staging in the south end of the project area to minimize access effects to the South Lander Transfer Station and adjacent tracks.
- Provide additional temporary law enforcement or security officers for site security.
- Coordinate construction-related mitigation with other major projects in the vicinity to minimize utility and traffic disruptions.
- Maintain emergency access for both fire and emergency services.

1.4.4 Mitigation for Utilities

The following summarizes the potential construction mitigation measures that would be needed during construction of the Project to mitigate for potential effects to utilities.

- Coordinate with utility providers to determine which utilities would need to be relocated.
- Prepare a consolidated utility relocation plan for both short-term and long-term relocations based on ongoing coordination with utility providers and extensive use of subsurface utility exploration (SUE).
- Develop contingency measures and policies with utility providers to manage potential utility service disruptions.
- Provide utility protective measures to minimize or avoid potential damage to exposed utilities and remaining pavement structure.
- Coordinate with SCL to provide safety watch during construction, and have emergency electrical power restoration procedures in place to minimize the potential for electrical service interruption.
- Coordinate planned schedule, sequencing, transfer of service, and areas of outages with utility providers.
- Address archaeological resources encountered during utility construction and mitigation in accordance with the recommendations in the Archaeological Assessment Technical Memorandum.
- Address hazardous materials encountered during utility construction and mitigation in accordance with recommendations in the Hazardous Materials Technical Memorandum.
- Use construction methods as needed to minimize the transport of hazardous material or contaminated media along utility trenches in accordance with recommendations in the Hazardous Materials Technical Memorandum.
- Provide emergency access for both fire and emergency services.
- Hold coordination meetings with public service providers to maintain emergency response times during each phase of construction. The frequency of meetings would be determined in future design phases.
- Maintain access to existing utilities within proposed staging areas.

Chapter 2 METHODOLOGY

The objective of this memorandum is to describe the conditions of the public services and utilities along the project area and identify both beneficial and adverse effects that the Project could have on these resources. Information about the utilities along the project area was gathered by reviewing available utility drawings and technical reports. The evaluation of potential effects on public services was based on interviews with the public service agencies and the design staff who have been coordinating with these agencies. Mitigation measures for these effects are also identified.

Potential construction and operational effects on public services were determined by reviewing the traffic analysis prepared for Appendix F, Transportation Discipline Report. The level of service (LOS) results for the Build and No Build Alternatives were studied to help determine potential effects. Effects could include added demands on public services. For example, traffic congestion at intersections due to lane closures and overall congestion during construction could affect response times for fire, police, and emergency medical services, as well as overall mobility and accessibility in the corridor.

Potential effects on utilities were determined by reviewing the utility placement proposed in preliminary project design. The analysis of effects produced planning-level comparative ratings, based on the number, size, and linear feet of the utilities affected, the feasibility of relocating or protecting existing utilities, and the risk factors associated with potential relocation. Where cost or difficulty of relocation were found to be prohibitive, project design modifications were explored in close consultation with the utility providers to minimize utility effects. The planning-level quantity estimates reflected in this analysis may change as additional information is acquired from local utility providers and the roadway and utility designs are updated.

2.1 Literature Review

The following steps have been taken to analyze the potential effects to public services and utilities related to the Project:

- Review of the digital computer-aided design and drafting (CADD) and geographic information system (GIS) data and utility maps provided by utility purveyors and mapped by the project team, in comparison to the Project.
- Review of websites (and available printed materials) of utility purveyors and public services agencies.

- Follow-up discussions with purveyors and service providers as necessary to provide clarification or further information.
- Review of October 2007 conceptual drawings for the S. Holgate Street to S. King Street Viaduct Replacement Project, along with various utilities reports cited in Chapter 7 References.

2.2 Regulations and Guidelines

The following regulations and guidelines provided information that was considered in developing public services and utilities-related effects:

- National Environmental Policy Act (NEPA)/State Environmental Policy Act (SEPA)
- Code of Federal Regulations (CFR) Title 23 – Reimbursement for Utility Relocation
- CFR Title 40 – 1500-1508 Council on Environmental Quality (CEQ) Regulations for Implementing NEPA
- Revised Code of Washington (RCW) 47.44: Franchises on State Highways
- Washington Administrative Code (WAC) 468.34: Utility Franchises and Permits
- WAC 173-201A: Water Quality Standards for Surface Waters of the State of Washington
- WAC 173-204: Sediment Management Standards
- WAC 173-221: Discharge Standards and Effluent Limitations for Domestic Wastewater Facilities
- WAC 173-226: Waste Discharge General Discharge Program
- WAC 173-245: Submission of Plans and Reports for Construction and Operation of Combined Sewer Overflow Reduction Facilities
- WAC 173-270: Puget Sound Highway Runoff Program
- WAC 246-290: Public Water Supplies
- Railroad Franchise Findings Report – Southern Section (PHAROS Corporation 2006)
- Institute of Electrical and Electronics Engineers (IEEE) Standards (electrical design criteria)
- SCL Overhead and Underground Construction Guidelines

- National Electric Safety Code (NESC) and the National Electric Code (NEC)
- WSDOT Environmental Procedures Manual (M31-11)
- WSDOT Design Manual (M22-01)
- WSDOT Utilities Accommodation Policy
- WSDOT Utility Manual (M22-86)
- WSDOT Highway Runoff Manual (M31-13)
- WSDOT Standard Specifications for Road, Bridge, and Municipal Construction 2004 (M41-10)
- City of Seattle Standard Plans and Specification for Road, Bridge, and Municipal Construction (2005)
- Federal Highway Administration (FHWA) Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects (1992)
- FHWA Technical Advisory T6640.8A
- Sections 21 and 22 of the Seattle Municipal Code

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Chapter 3 AFFECTED ENVIRONMENT

3.1 Public Services

This section includes descriptions of the public services affected by the Project. Other community services are described and discussed in the Social Resources Technical Memorandum.

3.1.1 Fire Services

At least four SFD stations are available for first response to fire and medical emergencies in the vicinity of the project area. The Seattle Fire Alarm Center previously located at Fire Station No. 2 is being relocated to the rebuilt Fire Station No. 10, bounded by Yesler Way, Washington Street, and Fourth and Fifth Avenues S. Seattle fire stations serving the project area are summarized in Exhibit 3-1.

Exhibit 3-1. Seattle Fire Stations In or Adjacent to the Project Area

Station	Location	Equipment
14	3224 Fourth Avenue S.	Aid unit, ladder unit, and technical rescue unit
10	105 Fifth Avenue S.	Fire Alarm Center, Resource Management Center, aid unit, ladder unit, engine company, hazardous materials unit, Deputy Chief/shift commander, and staff coordinator
5	925 Alaskan Way	Fire boat, engine company
2	2334 Fourth Avenue	Ladder unit, engine company, medic unit, reserve medic unit, and Safety Chief

Source: SFD (2007).

3.1.2 School Transportation Services

No public schools operate in the near vicinity of the project area. However, buses serving some of the Seattle public schools travel along the SR 99 corridor or on adjoining local streets on a daily (weekday) basis. School buses make approximately 40 to 50 trips along the project corridor daily. Detailed information dealing with exact routes and times is withheld for security reasons.

3.1.3 Solid Waste Collection, Disposal, and Recycling

Collected residential or commercial waste or self-haul waste is delivered to one of two City-owned facilities operated by the Solid Waste Division, a division of SPU, or to one of two private facilities.

Disposal of Materials from Roadway and Building Demolition

Building materials such as wood and metal are sent to the Eastmont and Rabanco transfer stations, where they are compacted and then transferred by rail to landfills in Oregon and Washington.

Recycling

Two private material recovery facilities serve as the processing and transfer facilities for most of the recyclable materials collected from Seattle residents.

3.1.4 Postal Services

Two U.S. postal facilities are located in the vicinity of the project area. Those facilities close to the project area are summarized in Exhibit 3-2. Each of the primary post offices distributes mail to their respective surrounding areas and has counter service for residents wishing to purchase stamps and mail parcels.

Exhibit 3-2. Postal Services near the Project Area

Neighborhood Center	Location	Facilities
Terminal Finance Station	2420 Fourth Avenue S.	Post offices and automated services
Pioneer Square	91 S. Jackson Street	Post offices

Source: United States Postal Service (2007).

3.1.5 Law Enforcement Services

SPD is divided into five precincts, which include the South Precinct (3001 S. Myrtle Street), the Southwest Precinct (2300 S.W. Webster Street), the East Precinct (1519 12th Avenue), the West Precinct (810 Virginia Street), and the North Precinct (10049 College Way N.). SPD will also have an Emergency Operations Center (EOC) in the new Fire Station No. 10 building. During a declared emergency, the EOC will serve as the seat of Seattle City government. Additionally, the Seattle Police Headquarters shares the Seattle Justice Center at 610 Fifth Avenue with the Seattle Municipal Court.

The Port of Seattle Police also maintain jurisdiction near the project corridor along the waterfront, providing law enforcement response and patrol services for the commercial properties located at the piers and terminals in this geographic area.

Crime prevention for the BNSF Railroad in the vicinity of the Alaskan Way Viaduct is provided by BNSF's own Police Solutions Team. The Police Solutions Team coordinates with other law enforcement agencies to investigate crimes committed on railroad property (Stairs 2003).

3.1.6 Emergency Medical Services

Several hospitals provide emergency medical services to the project area, but all are located outside of the project area. These hospitals include Harborview Medical Center, Swedish Medical Center, and Virginia Mason Medical Center. Their service locations are listed in Exhibit 3-3. Several outpatient facilities and clinics are also located near the project area. For example, many residents in the project area are clients of the Downtown Public Health Center.

Exhibit 3-3. Hospitals and Clinics in the Vicinity of the Project Area

Hospital/Clinic	Location
Harborview Medical Center	325 Ninth Avenue
Swedish Medical Center	747 Broadway
Virginia Mason	925 Seneca Street
Downtown Public Health Center	2124 Fourth Avenue

Sources: Helplinedatabase.com (2007), Group Health (2007), Swedish Medical Center (2007)

3.1.7 Disaster Preparedness

The Office of Emergency Management is a City of Seattle agency devoted to citywide disaster preparedness, response, recovery, and mitigation (SEM 2007). The unit consists of a staff of 12 people whose principal responsibilities involve encouraging individual and community preparedness and providing a key liaison function between the City and its state and federal emergency management counterparts (SEM 2007).

3.2 Utilities

3.2.1 Electrical Power

In the project area, the SCL system uses a combination of overhead and underground electrical transmission and distribution lines. Most of these lines will be relocated prior to the start of this Project. The downtown area, including the SR 99 corridor, is served by a network distribution system. It serves the downtown area from S. King Street to Denny Way, and east to First Hill. One substation—the Massachusetts Substation at Colorado Avenue S. and S. Massachusetts Street—is located in the project area. Overhead and underground distribution lines are also located along streets in the project area.

One 26-kilovolt (kV) radial distribution circuit would be relocated as a result of this Project. This feeder originates at South Substation and runs north along First Avenue S. and Colorado Avenue S. as an overhead line. It then runs from S. Holgate Street to just north of S. King Street on the western edge of Alaskan Way S. From S. Holgate Street to S. King Street, this circuit continues overhead. At S. King Street, it transitions underground, proceeds east to Fourth Avenue S., and then turns south to serve customers outside the project area.

This 26-kV circuit provides electrical service to waterfront terminals, which include Port of Seattle and United States Coast Guard facilities. Pier 48, a commercial building at S. King Street on the east side of Alaskan Way S., and additional customers along S. King Street and Fourth Avenue S. are also served by this feeder (Power Engineers, Inc. 2007).

3.2.2 Water

The existing water mains in Alaskan Way S. and E. Marginal Way S. provide domestic service and fire flows to the piers, fire hydrants, and some of the commercial properties to the east of Alaskan Way S. A majority of the properties east of Alaskan Way S. are supplied by water mains in First Avenue S. and the cross streets.

Within the project corridor, water mains generally run longitudinally along E. Marginal Way S. and continue north along Alaskan Way S. The water mains are connected to the First Avenue S. water main in two places: S. Atlantic Street and S. Royal Brougham Way.

Approximately 21 fire hydrants are located within the project area—generally spaced approximately 200 to 300 feet apart. Dry standpipes are located in multiple locations along the elevated portion of the viaduct. The standpipes are attached to the viaduct support columns and serve both the upper and lower deck. Typically, they are located within 50 feet of a hydrant at ground level to allow a fire pump truck access during a fire event.

The water mains within the project corridor were built at different times over the last 100 years. Consequently, the water mains and appurtenances were built using a variety of construction techniques, materials, and standards. Pipe materials include cast iron, ductile iron, and steel. Newer water mains are ductile iron pipe with restrained joints and/or thrust blocking.

Prior to the mid 1950s, water pipes were typically installed using cast iron pipe with lead joints. Lead joints are very sensitive to construction vibration and settlement. In areas where construction activities have a potential to damage the lead joints, a mitigation plan will be developed in coordination with SPU.

An inventory of the existing water mains can be found in Exhibit 3-4. The inventory includes general location, size, material, year installed, hydrants, and service connections.

Exhibit 3-4. Existing Water Main Inventory for the Project Area

Alaskan Way S. Cross Streets	Water Main Location in Right-of-Way	Pipe Size (inches)	Pipe Type	Year Installed	Number of Hydrants	Number of Service Connections
S. Holgate St. to S. Massachusetts St.	west	12	ductile iron	1989, 1903	4	8
S. Massachusetts St. to S. Atlantic St.	west	8, 10	cast iron	1903	2	4
S. Atlantic St. to S. Dearborn St.	east	12	cast iron	1921, 1955, 1957	5	3
	west	10, 12	cast iron	1903, 1906, 1913	6	5
S. Dearborn St. to S. King St.	west	12	cast iron	1906	4	7

Per SPU, the fire flow requirement for the existing water distribution system in the project corridor is 8,000 gallons per minute with a minimum residual pressure of 50 pounds per square inch.

3.2.3 Sanitary Sewer and Storm Drainage

The storm, sanitary, and combined sewer system within the project area varies by function and jurisdiction (e.g., King County and City of Seattle). Seattle has a combined sewer system in the downtown area. Within the project area, the sewer and drainage system consists of combined, separated, and partially separated sewer areas, with a variety of pipe types, regulator structures, low-flow diversions, outfalls, and combined sewer overflows. The King County Department of Natural Resources and Parks, Wastewater Treatment Division (formerly Metro) provides sewage treatment services in the project area.

The project area extends from S. Walker Street to S. King Street along the SR 99 corridor and is served by the King, Royal Brougham, and Lander Sub-basins. The sub-basins are a combination of separated, low-flow diversion, and combined basins.

- **King Sub-basin** – Between S. Dearborn Street and S. King Street, the stormwater basin is combined and drains to the King Street Regulator Station.
- **Royal Brougham Sub-basin** – The Royal Brougham Sub-basin extends from S. Holgate Street to S. Dearborn Street. This area contains both combined and low-flow diversion basins. The system that serves SR 99 and a portion of S. Royal Brougham Way is low-flow diversion. The remaining surface streets are combined basins.

- **Lander Sub-basin** – South of S. Holgate Street, the existing SR 99 storm drains are separated. Flow is conveyed to the Lander outfall.

Wastewater and stormwater flows collected in the Lander, Royal Brougham, and King Sub-basins are conveyed using a system of combined sewer and stormwater pipes (HDR 2007a).

Major Combined Sewer Interceptors

The major combined sewer facility in the vicinity of the Project is the Elliott Bay Interceptor (EBI) (RWE 2002). Within the project area, the EBI extends from S. Spokane Street north to Denny Way. The EBI is subdivided into several sections of various dimensions and materials. From S. Spokane Street to S. King Street, the EBI runs parallel to Colorado Avenue S., turning east at S. Massachusetts Street. The EBI proceeds north on Occidental Avenue S. to approximately S. King Street as a 96-inch concrete pipe. Within or adjacent to the project area there are several regulators, flow diversion structures, and outfalls associated with the EBI.

Outfalls and Drainage System

The project area is almost completely impervious. Ground surface elevations within the project area are approximately 16 feet (as surveyed by David Evans and Associates, Inc., 2006). There are curb and gutter drainage systems along the main arterials (i.e., E. Marginal Way S., Alaskan Way S., First Avenue S., S. Atlantic Street, and S. Royal Brougham Way); however, at other locations a formal drainage system is lacking. The project area drainage system includes bridge drains from the existing viaduct connecting to the existing drainage system via a series of downspouts. The downspouts are attached to the exterior of bent columns on the existing viaduct structure.

Stormwater runoff collected in the project area drains to three different outfalls: Lander, Royal Brougham, and King. Project area drainage basins and threshold discharge areas (TDAs) correlate with these three outfalls. Existing sub-basins that are tributary to these three outfalls include areas that are classified as combined, separated, or low-flow diversion. The low-flow diversion areas are tributary to the combined sewer system during periods of low flow and are diverted to Elliott Bay during high-flow events.

The Royal Brougham Sub-basin also contains pass-through drainage from upstream of the project area; pass-through drainage is conveyed through the 72-inch storm drain pipe located in S. Royal Brougham Way toward the Connecticut Regulator (RWE 2007a).

Major existing hydraulic features within the project area include:

- The West Overflow Control Vault (located near S. Royal Brougham Way just west of Alaskan Way S.).
- The Kingdome Regulator (located at the intersection of Occidental Avenue S. and S. Royal Brougham Way).
- The Royal Brougham outfall.
- The Connecticut Regulator (located west of the intersection of S. Royal Brougham Way and Alaskan Way S.).
- The 96-inch combined sewer pipe (located in S. Royal Brougham Way).
- The 72-inch storm drain pipe (located in S. Royal Brougham Way).
- The King Street Regulator.
- The King Street outfall.
- The 48-inch combined sewer pipe (located in S. King Street).

For more detailed analysis of surface water and storm drainage (including wet weather flow capabilities for secondary and primary treatment), refer to the Water Resources Technical Memorandum.

3.2.4 Natural Gas

The gas infrastructure in the project corridor is owned and operated by PSE. The system consists of medium-density polyethylene (MDPE) and steel pipe, cast iron casings, valves, regulators, and other appurtenances.

Gas facilities in the project area are intermediate pressure (IP) gas lines of 2- to 6-inch diameter. Gas lines in Alaskan Way S. primarily serve customers west of Alaskan Way S. Service on the east side is provided by lines in First Avenue S. Existing service must be maintained until proposed systems can be installed and connected.

An existing 4- to 6-inch-diameter IP natural gas system in Alaskan Way S. begins between S. Holgate Street and S. Massachusetts Street. This system extends northerly to S. Atlantic Street where it turns easterly and exits the project corridor.

At S. Royal Brougham Way, a 2-inch IP gas pipe in a 4-inch casing crosses the project corridor, extending to the westerly side of Alaskan Way S. In addition, three services in S. Royal Brougham Way between Alaskan Way S. and First Avenue S. are fed by this system.

An existing 2-inch natural gas line in S. King Street serves a 2-inch IP gas line in Alaskan Way S. that extends about 500 feet south of S. King Street (Jacobs Engineering, Inc. 2007a).

3.2.5 Telecommunications

The infrastructure owned and operated by communications providers in the project corridor is aerial, underground, or suspended from the viaduct. These systems use fiber optic, coaxial, and copper cable materials and have associated conduits, risers, vaults, manholes, and other appurtenances. Underground lines have been direct-buried, horizontally directionally bored, or installed in open cut trenches.

The systems provide telecommunications and cable television transmission and services ("communications"). Some of the systems are referred to as long haul or transport, while others are distribution and include laterals and service lines to customers. In general, all of the active systems are vital to the customers served and cannot be taken out of service during construction of this Project except during planned cutovers necessitated by construction activities for system relocations.

Four existing communications systems would be affected by this Project. Broadstripe (formerly known as Millennium Digital Media [MDM]), the Seattle Department of Information Technology (DoIT), Integra Telecom (formerly known as Electric Lightwave, Inc. [ELI]), and Qwest have existing facilities located either on the existing viaduct superstructure, on existing utility poles, or buried within railroad property, franchise areas, or roadway right-of-way from south of the project limits to north of the project limits, past S. King Street. In addition, prior to construction of this Project, DoIT plans to construct an aerial communications line from S. Atlantic Street across SR 99 and E. Marginal Way S. to S. Massachusetts Street (Jacobs Engineering, Inc. 2007b).

Chapter 4 Operational Effects, Mitigation, and Benefits

Operational effects are those effects that occur over the long term as the facility is in operation. Unless otherwise noted, operational effects apply to the entire project area.

The construction and operation of the Project would largely be within public rights-of-way, where utilities are also generally located. Project design accommodates, to the extent practicable, utility zones that allow utilities currently within the right-of-way to be relocated within the right-of-way. However, depending on the final design constraints of the Project, private utilities may need to obtain permanent easements outside of the project right-of-way. The need for private utilities to obtain permanent easements would be determined as design proceeds. Access requirements for private utilities located in easements outside the right-of-way will be determined separately from the Project by private providers.

The following information is based on the conceptual design for utilities prepared in support of this document. These conceptual design plans identify the locations of existing utilities and proposed utility relocations at key intersections in the project corridor. The operational effects summarized below are presented as potential risks and benefits.

4.1 Operational Effects

4.1.1 Public Services

Potential operational risks for public services for the Project involve changes that may affect access, response times, and travel time. The Project includes a number of changes that are expected to affect traffic operations, including new access to and from the SR 99 mainline in the stadium area and enhanced freight mobility between the SIG Railyard and the Terminal 46 container terminal.

The proposed compound intersection at S. Atlantic Street and the elimination of S. Royal Brougham Way between First Avenue S. and Alaskan Way S. could affect public services by increasing travel time through the corridor somewhat. This could result in potential travel time delays for emergency and non-emergency services for certain trips, reduced access for public services due to traffic congestion during certain peak hours, and delays to both public transit and private transport.

As modeled and discussed in Appendix F, Transportation Discipline Report, the tail track bypass (undercrossing) would not noticeably affect operations on the SR 99 mainline or the on- and off-ramps. On the mainline, the most congested segment would be south of S. King Street, where LOS E conditions are forecasted for the southbound PM peak. The most congested ramp segment would be the King Street on-ramp, where LOS E conditions would occur for northbound travel during the PM peak. For a detailed description of roadway LOS with and without the Project, see Appendix F, Transportation Discipline Report.

Although Fire Station No. 5 is outside the study area (near Colman Dock at the foot of Madison Street), it is an important emergency services facility. Traffic operations on Alaskan Way, as well as those on connecting east-west arterials, could affect response times and egress from this waterfront fire station north of the study area. However, the Project would not degrade traffic conditions along the waterfront and is not expected to affect fire station operations compared to No Build (baseline) conditions.

The new access provided by the below-grade undercrossing would result in a potential operational benefit for emergency response vehicles. Emergency vehicles would no longer experience potential delays due to frequent tail track blockages between First Avenue S. and Alaskan Way S., but instead could proceed using the undercrossing.

4.1.2 Utilities

Potential operational risks associated with utilities could affect capacity, disrupt service, or impair access and maintenance functions, although it is anticipated that these risks would be minimized or avoided through refinements in the project design.

The location of the roadway and support structures could complicate long-term maintenance of underground utilities when these structures are in the immediate vicinity of the utilities, although utility locations will be considered in roadway design. Where foundations or structures might limit access, these would be addressed on a case-by-case basis during final design. Access and maintenance functions are being addressed as design proceeds, and efforts are being made to reduce conflicts wherever possible.

Electrical

A number of electrical lines would be relocated to underground duct banks as a result of this Project. While underground lines are typically less susceptible to weather, trees, and accident-related damage, they are also more difficult to troubleshoot and have different access requirements. Because some portions of the electrical system may be located outside existing right-of-way, access would be addressed in easement agreements with the affected property owners.

Sanitary Sewer and Storm Drainage

The system components that would address stormwater management issues would include stormwater treatment facilities, pump stations, detention vaults, or larger pipes that provide conveyance and in-line storage. These components would require regular maintenance to ensure proper operation, the same as existing facilities. Privately owned storm drainage conveyances would be the responsibility of the property owners.

SPU has noted that there would be long-term operational and maintenance effects if the Project requires the duplication (or mirroring) of facilities on both sides of the project corridor. SPU indicates that side sewer lines are the responsibility of the property owners, so extending the length of individual services across the SR 99 corridor would be a long-term operational effect to individual property owners (SPU 2003). At the preliminary design stage, it is anticipated that the number of side sewers would be substantially reduced; however, all currently active side sewer connections would be maintained. (Many of the existing side sewers have been inactive for many years.)

Determination of the final location of underground utilities would not be made until a later design stage. Coordination with SPU will continue throughout project design to reduce these potential operational effects.

Natural Gas

Natural gas lines would typically be relocated under surface roadways. It is likely that lane closures for maintenance access would continue to be required. As a private purveyor, PSE will be responsible for relocating the gas facilities and obtaining permits for use of the right-of-way.

Telecommunications

Telecommunication lines attached to the existing viaduct would be replaced underground, and future maintenance access may require lane or roadway closure. Because some portions of the telecommunication systems may be located outside existing right-of-way, access would need to be addressed in the easement agreements.

4.2 Benefits of the Project

Project elements such as new traffic signals and the addition of a northbound on-ramp and southbound off-ramp to improve access to the mainline are expected to improve traffic conditions. The S. King Street/Alaskan Way S. and First Avenue S./S. Royal Brougham Way intersections are locations where improvements are expected. The S. Atlantic Street undercrossing would provide an alternate route for all traffic when railroad cars occupying the tail track block the primary surface street route. This enhancement would reduce congestion, improve emergency service response time, and support consistent access for both emergency and non-emergency services.

The proposed access ramps connecting SR 99 to the southbound lanes of Alaskan Way S. and the northbound lanes of the proposed Alaskan Way S. frontage road would enhance connections to and from both the project corridor and adjacent areas. These enhancements would improve response times for emergency services and facilitate access to both emergency and non-emergency services.

Utility system upgrades that would enhance system reliability and capacity could provide long-term operational benefit. The Project would reduce the risk of unplanned loss of electric power by relocating numerous electric lines to underground duct banks. Underground lines are generally less susceptible to damage from weather, trees, and vehicle accidents. The Project also reduces risk to utilities through the permanent placement of utilities in new or upgraded utility corridors designed to meet current codes and standards.

At the preliminary design stage, it is anticipated that the number of side sewers would be substantially reduced; however, all currently active side sewer connections would be maintained.

4.3 Mitigation Measures

The guidelines below would help to reduce operational effects of the Project to public services and utilities. The following operational mitigation is specifically for the Project. Operational mitigation for indirect or cumulative effects is discussed in Chapter 6.

Because the location of utilities would affect the degree of operational as well as construction effects, a consolidated utility relocation plan could be prepared consisting of key elements, including existing, temporary, and new locations for utilities and access; sequence and coordinated schedules for utility work; and a detailed description of service disruptions. This plan would be reviewed by and discussed with affected utility providers to reduce effects, both as the design proceeds, and prior to the start of construction.

Where feasible, utilities would be relocated prior to roadway construction to avoid potential operational effects. The avoidance of operational effects would include ensuring that adequate access to utility facilities for maintenance and repair will be maintained in the built condition.

Along with design aspects of the utilities systems, complying with the guidelines and regulations cited below will help to reduce operational effects of the Project to public services and utilities:

- City and state energy, building, fire, and other applicable code requirements for all design aspects of the roadway facility.
- Relevant operational utility policies and strategies listed in the adopted City of Seattle Comprehensive Plan, Utilities Element (i.e., level of service, conservation strategies, and coordination of service providers).

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Chapter 5 CONSTRUCTION EFFECTS AND MITIGATION

Construction effects would vary in time and intensity over the Project's construction period of approximately 4 years, 4 months. Section 5.1.1 describes the potential construction effects to public services. Section 5.1.2 describes the potential construction effects to utilities. This section begins with a general overview explaining the approach used to determine construction effects to utilities, followed by construction assumptions relating to utility relocations, and a brief introduction to construction sequencing. The next subsection describes the potentially affected utilities and gives a general description of the construction effects to utilities. Finally, mitigation measures for potential effects to public services and utilities are discussed in Section 5.2.

5.1 Construction Effects

5.1.1 Public Services

The construction effects discussion addresses the short-term effects of the Project on public services and facilities, including:

- Potential delays to medical or police emergency response times.
- Potential effects to fire suppression, e.g., access to fire hydrants may be temporarily obstructed, or response times could be delayed.
- Changes for some school bus routes.

The net effect to public services would be increased traffic congestion and delay on the primary streets (such as First Avenue S. or Alaskan Way S.) affected by construction and on surrounding roads around the construction area. This would have a direct effect on emergency vehicle access to and through the corridor. Response times for police, fire, and emergency medical aid to locations within and near the construction area would likely increase, particularly when congestion is compounded by stadium events in the area. A particular emergency service response that could be affected due to increased congestion on Alaskan Way during the construction period would be the dive rescue team responses along Alaskan Way (north of the Project's construction area).

Increased travel time could be experienced by other public services, such as solid waste and recycling collection and disposal, postal services, and school bus routes.

Fire Suppression Effects

During construction, fire hydrants would need to be relocated. Most of these relocations would occur along at-grade sections (surface streets) requiring sidewalk and street curb relocations. Water line relocations during construction could temporarily affect water supplies used for fire suppression.

Law Enforcement Services Effects

Construction of both at-grade and elevated sections could require additional police support services to direct and control traffic and pedestrian movements. Traffic mobility during construction in heavily traveled areas could be more difficult, especially during peak hours, and before and after stadium events. WSDOT would maintain security at sites and staging areas during construction. Law enforcement services outside of the project area may be affected due to changes in traffic patterns on local roads during construction.

School Bus Route Effects

Delays for school buses and other school traffic could occur from time to time due to traffic congestion, lane or roadway closures, or changes in traffic patterns on local roads. Major north–south school bus thoroughfares could be affected. Minor effects to travel times for school bus routes would continue throughout construction.

Solid Waste Collection and Disposal Effects

Travel times for solid waste collectors and haulers may be affected. Solid waste haulers could experience delays or disruptions in collection routes during construction activities. Collection and haul routes outside of the project area also may be affected due to changes in traffic patterns on local streets.

Demolition of the existing viaduct within the project corridor would generate large volumes of concrete (see the Alternative Description and Construction Technical Memorandum). In general, this concrete could be ground into aggregate for reuse on-site or as part of the construction operation, or it could be hauled to an approved off-site location for processing. In addition, other waste and debris generated during construction would need to be collected and disposed of.

Disaster Preparedness Effects

Construction activities may affect disaster response during each of the construction phases. Disaster response outside the project area may also be affected due to changes in traffic patterns on local streets.

5.1.2 Utilities

Approach Used to Determine Construction Effects to Utilities

An extensive network of utilities is located in the project area. Potential construction effects to utilities are determined based on review of available utility maps, discussions and meetings with utility representatives, data and literature review, and utility mapping. See Chapter 7, References, for reports that have been consulted regarding effects to and relocation of existing utilities.

Exact locations and depths of critical utilities and effects on them will need to be verified with utility providers during design stages and prior to construction of the Project. Utilities would be reviewed on a case-by-case basis to determine which need to be protected and supported in place during construction. Before final design and construction, the exact locations and depths of underground utilities would be field verified (by potholing where appropriate), and condition checks would be conducted as necessary. Prior to potholing, checking for hazardous materials would be performed as discussed in the Hazardous Materials Technical Memorandum.

The analysis of potential effects to utilities includes the direct construction effects associated with temporary and permanent utility relocations. These effects include pavement demolition, excavation, backfill, repaving, ground support systems, dust and noise monitoring, relocation effects to other localized utilities, traffic disruptions, and the increased risk of schedule delays, temporary service outages, and construction accidents.

The conceptual design on which the analysis of effects is based will continue to be refined in close consultation with utility providers, as design proceeds.

Construction Assumptions Relating to Utility Relocations

Construction would require portions of the extensive network of utilities to be temporarily relocated and moved again to their final locations, while other portions would be moved only once. Below is a summary of the current construction assumptions for the Project.

- Initial utility relocations to temporary or permanent locations prior to roadway construction are anticipated to take approximately 12 months. The relocations during this period represent the initial utility relocations prior to Traffic Stage 1; additional relocations would continue to occur as necessary, through completion of the Project.
- Utilities would primarily need to be relocated only once for this Project. Utilities would be relocated within the SR 99 corridor.

- Construction would typically take place 5 days per week, 10 hours per day, but may occur up to 24 hours per day, 7 days per week at times during the construction period. Some night or weekend work may be required for roadway crossings, tail track relocation, or other critical construction phases. Maintenance activities affecting water services are typically scheduled at nights or on weekends to reduce effects to commercial customers.
- Utilities would be designed in accordance with current applicable standards and adopted comprehensive plans.
- The capacity of electrical transmission and distribution lines entering and exiting substations would be maintained.
- The location of manholes and other maintenance access points will be based on safety considerations and coordination with utility providers to facilitate future operation and maintenance of utility systems. The final location of access points will be determined in future design phases and during construction.
- SPU and SCL have adequate supply to meet the utility demands of the Project during construction as well as ongoing operation and maintenance.
- Temporary connections to customers would be established before relocating utility conveyances to minimize effects of service disruptions.
- The project design team will continue to meet with and coordinate closely with both municipal and private utilities to minimize effects to utilities during construction, including acceptable safe relocation of maintenance access points.
- The existing SPU water main in E. Marginal Way S. and Alaskan Way S. would be replaced with two water mains, one on the west side and one on the east side of the project corridor. The water main on the east side would be constructed first and provide water along the corridor for domestic use and for fire flows during construction. The 12-inch-diameter water main on the west side would be constructed later during the Project. The two water mains would be connected at strategic locations throughout the corridor to create a looped system to provide equivalent fire flow and capacity to the existing water system.
- The Project would use ASCE standard subsurface utility exploration (SUE) for mapping and locating existing utilities, as well as the "One Call" system for locating and marking utilities during construction.

This will reduce the number and frequency of inadvertent utilities strikes.

- Existing utilities that are to remain in service during various phases of construction would be monitored for vibration and settlement.

Construction Phasing

Effects to utilities during construction are directly related to construction phasing. Construction phasing identifies which utilities need to be relocated during which stage, allowing for planning of activities such as excavation, foundation construction, and demolition. See the Alternative Description and Construction Technical Memorandum for a detailed discussion of construction phasing and durations.

Direct Effects to Utilities

Utilities could be affected during construction, depending on their depth below grade, material composition, the construction excavation limits, the exact location of the proposed transportation facility, the associated foundation, and other factors. Direct effects to utilities from construction activities would be generated by pavement demolition, excavation, backfill, repaving, disruption of ground support systems, and temporary service outages. Additionally, relocation of some utilities may have a subsequent effect on other utilities near relocation activities.

The potential effects are described broadly in this section. Design solutions have sought to avoid existing utility lines and major hydraulic structures, such as large-diameter conveyance lines and regulator and diversion structures. These efforts reduce the utility relocation effects. In addition, the Project has been designed to accommodate the utilities currently located in the project area, although it is important to note that the Project may need to move some utilities from existing locations.

All underground utility relocations share relatively common construction effects, including pavement demolition, excavation, repaving, ground support systems, groundwater control, relocation effects to other localized utilities, dust and noise control requirements, traffic disruptions, and lane or sidewalk closure. For aboveground utilities, direct effects typically include placement of new or temporary poles and disruption of utility service during the cutover from existing to temporary service feeds and again when permanent utilities are completed.

Other than the major facilities mentioned above, most underground utilities within the project area could be affected. Utility pipes, conduits, cables, and other infrastructure in construction areas would need to be relocated, protected, or otherwise avoided during construction. Pipes that cannot be supported or protected in place would be relocated. Utility designs are being coordinated with the respective owners and will be reviewed and approved on a case-by-case basis prior to being relocated using the owner's established criteria.

Removing concrete pavement and installing roadway foundations are anticipated activities with potential adverse effects to vibration-sensitive underground utilities, such as water lines. The cast-iron, lead-joint water lines could require replacement or joint reinforcement before these construction activities begin.

Temporary or permanent relocation of utilities might be required prior to constructing fill embankments, foundations, or soil improvements. Underground utilities beneath and near fills might settle or displace laterally or experience vertical and lateral loading due to embankment loading and settlement of subgrade soils beneath the fill. In addition, abandoned utilities that are not plugged could become conduits for water or gases, which could affect existing and future facilities.

Effects could arise if contaminated soil or groundwater is encountered during construction activities such as utility relocations or excavation. Some existing electrical transmission lines in the project area are high-pressure systems containing a dielectric fluid, which would need to be carefully handled if removal became necessary. For additional discussion on hazardous materials, see the Hazardous Materials Technical Memorandum.

For aboveground utilities, direct effects typically include placement of new or temporary poles. Lane or sidewalk closures and utility service interruptions could be necessary during the cutover from existing to temporary service feeds, and again when permanent utilities are located in their final position.

Inadvertent damage to underground utilities could occur during construction. While such incidents do not occur frequently, they could temporarily affect services to customers served by the affected utility.

Utility construction activities could also affect access to businesses near construction areas by creating detours, delays, and temporary displacement of parking or loading areas. As with any major construction project, construction-related activities could cause increased localized congestion, traffic delays, and truck traffic. In addition, water lines and fire hydrants could be obstructed, which could affect utility services and fire suppression capabilities if alternative supplies are not provided.

There is some inherent risk during construction of running into a utility line that is not accurately identified in the base mapping. It is not economically feasible to provide an exact horizontal and vertical location of all existing utilities within a project area. Generally, the more critical utilities or critical locations are field verified during design.

The following potentially affected utilities within the project area have been included in the conceptual design plans. Final design will need to account for all existing utilities, including utility lines smaller than the sizes indicated.

- The local storm drainage and combined sewer systems would be replaced in accordance with current standards. This would include installation of new inlets, collector and conveyance pipes, manholes, water quality vaults, stormwater detention vaults, and pump stations as determined by design. These structures may be used for water quality treatment, flow control, containment of discharges during fire flow events, or controlling diversions to the combined sewer system. Existing control structures (regulators and diversion structures) and major pipes that enter these structures would not be relocated in this project. They would be monitored and protected in place as determined after geotechnical evaluation. For further discussion of these issues, refer to the Water Resources Technical Memorandum.
- Water distribution mains (8- to 12-inch lines), large water feeder mains (16- to 48-inch lines), water services, and hydrants would be relocated.
- Sanitary sewer mains (8- to 12-inch lines), large conveyances (16- to 48-inch and 60-inch and greater), and manholes would be relocated.
- IP gas lines, valves, and regulators would be relocated.
- Telephone services and fiber-optic cable lines would likely be relocated into a common duct bank for the entire length of the Project. Portions of these relocations may occur prior to roadway construction.
- The 26-kV electrical radial distribution feeder that is mostly overhead would be relocated. Construction for the underground portions would include trenching, concrete-encased duct bank construction, installation of vaults, pulling cable, and service connections. Overhead portions would include setting wooden power poles, stringing cable, and making service connections.

As the engineering data is preliminary, the potential utility effects are generalized. The conceptual engineering data will continue to be refined, and more detailed information will be available further in the design process.

5.2 Construction Mitigation Measures

This section discusses mitigation measures considered to help minimize potential construction effects to public services and utilities. Proposed mitigation measures are based on NEPA principles, WSDOT and City of Seattle policies, mitigation proposed for similar projects, and coordination with affected agencies. These measures will need to be refined, and additional or more specific mitigation measures will be developed as the planning and design process continues.

Construction mitigation is based on construction phasing, which will be refined throughout design development. For a complete description of the overall construction phasing, including traffic detours and staging, refer to the Alternative Description and Construction Technical Memorandum.

WSDOT, the City of Seattle, and King County have identified the need for ongoing coordination of the various construction activities. A new committee, the Downtown Transportation Operations Committee, will be created to support construction activities in the greater downtown Seattle area. It will be charged with the monitoring and coordination of transportation construction activities to address the effects of that construction.

This Downtown Transportation Operations Committee will lead the coordination efforts to ensure multimodal transportation operations are as effective as possible during downtown project construction activities. This committee will provide for real-time communications and information linkages to better manage the multimodal transportation network.

WSDOT will also continue coordinating with City of Seattle and Port of Seattle police and fire departments, regional transportation agencies, and other appropriate agencies during preliminary and final design of the Project to plan for reliable emergency access. This would include alternate plans and routes to avoid delays in response times and ensure that general emergency management services are not compromised. Early notice about detours or lane restrictions will be provided to emergency and non-emergency public service providers.

Additional coordination could occur with the police and fire departments. For example, WSDOT will notify and work with SFD regarding any water line relocations that could affect water supply for fire suppression and establish alternate supply lines prior to any breaks in service. WSDOT will also coordinate with local police departments to ensure adequate staffing during construction for traffic and pedestrian movement control and other necessary policing efforts.

Other measures could include:

- Provision of backup on-site electrical generation as applicable to provide temporary electric service to customers as determined by SCL on a case-by-case basis.
- Development of a notification and response plan for unplanned utility outages, including a customer service plan and contact information for utility customers to be used during construction.
- A public service contact plan that identifies up to two contacts for each service provider to allow for redundancy in notification. The two primary contacts would then be responsible for coordinating with appropriate staff within the organization to discuss Project-related information.

5.2.1 Public Services

Construction mitigation measures for public services include the following.

Fire and Emergency Medical Services

Intelligent traffic signal controls could be used at signalized intersections as a partial mitigation measure for response time effects for fire and emergency medical services, particularly during construction. This would include E. Marginal Way S. and Alaskan Way S., as well as adjacent streets that can be reasonably expected to see increases in volume as a result of construction traffic diverted from surface streets.

During water line and fire hydrant relocation, advanced coordination and schedule notification would be provided to affected fire stations and SPU, to allow for advanced planning and reduce the effects associated with service interruptions.

Law Enforcement Services

The need for additional police support services could be addressed by providing additional law enforcement officers in the area during construction.

School Bus Routes

The Seattle School District has rerouting plans in place for times when the viaduct is closed. It is anticipated that the School District will implement rerouting plans to address school bus travel through the corridor during those limited times when the viaduct would be closed due to construction.

Solid Waste Collection and Disposal Effects

Construction waste and debris could be disposed of at a number of disposal facilities in the Puget Sound region. A portion of the debris, including clean wood waste, metals, gypsum, and other materials, could be recycled at facilities such as Seattle's recycling and disposal stations. Sufficient capacity exists at area transfer stations and regional landfills to accommodate the construction waste and debris generated from construction activities. The disposal of construction waste and debris is unresolved at this time.

Waste processing haulers and facilities should be informed that additional loads would occur during construction. Additional haul trucks, operators, or train cars may be required.

Disaster Preparedness

WSDOT will continue coordinating with City of Seattle, Seattle Office of Emergency Management, the Port of Seattle, and Washington State Ferries during construction so that these agencies would be informed of scheduled project activities and locations.

5.2.2 Utilities

Before final design and construction, the exact locations and depths of underground utilities would be field verified (by potholing where appropriate), and condition checks would be conducted as necessary.

During final design, WSDOT will develop construction methods and Best Management Practices (BMPs) in consultation with the utility providers to provide site-specific spacing and protection measures. These measures would minimize issues such as lack of access, damage to facilities, settlement, vibration, groundwater dewatering, and hazardous materials and provide erosion and sediment control. WSDOT would perform installation according to agency regulations, utility provider requirements, and proper BMPs.

WSDOT would prepare a consolidated utility relocation plan for both short-term and long-term relocations, consisting of key elements that include existing, temporary, and new locations for utilities, sequence and coordinated schedules for utility work, and a detailed description of service disruptions. This plan would need to be reviewed and approved by the affected utility providers prior to the start of construction to reduce effects.

The following mitigation measures would require advance planning:

- Develop measures and policies with utility providers to address contingency plan requirements to manage any potential utility service disruptions during construction.
- If inadvertent damage to underground utilities occurs during construction, WSDOT would contact the appropriate utility provider immediately to restore service.

- Provide traffic revision equipment and personnel as required during utility relocations.
- Conduct construction activities during off-peak hours whenever possible to lessen traffic effects.
- Provide protective measures, such as pipe and conduit support systems, trench sheeting, and shoring during construction to minimize or avoid potential damage to exposed utilities and remaining pavement structure.
- Use construction techniques to avoid or minimize vibration effects to utilities.
- Coordinate with SCL to provide safety watch and standby crew to minimize the interruption of power to customers and to speed up the power restoration in the event of accidental interruption of power caused by construction activities.
- Coordinate construction-related mitigation with other major projects in the vicinity to minimize utility and traffic disruptions.

City of Seattle standards (along with other guidelines listed in Section 2.2) would be used with approved designation on a case-by-case basis to determine which underground utilities would need to be relocated. Existing piping, conduits, buried cable, and buried utilities that encroach on areas required for construction would be removed and relocated within the existing right-of-way wherever feasible.

WSDOT will work with utility providers to coordinate the planned schedule, sequencing, and areas of outages. These design issues will need to be coordinated as part of preliminary and final design.

WSDOT will need to prepare a coordinated utility communication plan to coordinate services to customers and minimize or avoid temporary disconnections each time a utility line is relocated. The limits on shutdowns would be documented in the plan as specified by the utility provider to minimize long-term effects. Utility providers will need to notify customers in advance of planned service disruptions.

Construction in the project area could encounter contaminants such as petroleum, metals, and polycyclic aromatic hydrocarbons (PAHs) in the fill soils, as well as creosote-treated timbers and wood debris. To the extent that soil and groundwater removed during construction is contaminated, there would be requirements for special handling and disposal and provisions to provide for the health and safety of workers and the public, as well as to protect the environment from releases of contaminants or crosscontamination. See the Hazardous Materials Technical Memorandum for further detail.

The Archaeological Resources Section 106 Technical Report discusses potential archaeological resources and mitigation within the project area. The mitigation measures identified in that document would be implemented for utility construction that may occur prior to roadway construction so that archaeological resources are preserved during utility construction.

Utility Construction Sequencing

During construction, utility service would need to be maintained to existing customers. During future design phases, any locations where services cannot be provided during construction, or that are no longer needed, would be identified. Such locations would need to be evaluated on a case-by-case basis, in coordination with public and private utility providers and emergency service providers, to determine the appropriate action during construction. Temporary services may be required, such as water service for domestic and fire suppression systems. The method for providing temporary services will need to be determined on a case-by-case basis in future design phases. Factors relating to the design of temporary services are the duration of the temporary service, needed capacity of services, and construction activities adjacent to the temporary services.

Chapter 6 INDIRECT AND CUMULATIVE EFFECTS

Indirect effects, as defined by the CEQ regulations, are effects "which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable" (40 CFR 1508.8). Indirect effects may include growth-inducing effects and other effects on land use, population density, or growth rate patterns and related effects on natural systems. In other words, indirect effects are changes that occur because the Project was constructed that would not otherwise have occurred. Indirect effects can be operational or construction-related and include both adverse effects and benefits.

Cumulative effects, also as defined by CEQ regulations, are "the effect on the environment which results from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative effects can be operational or construction-related. Areas included in consideration of cumulative effects for the Project include transportation projects, land use and development planning projects, and planned upgrades to local utility infrastructure.

6.1 Indirect Effects

No indirect effects are anticipated for public services or utilities.

6.2 Cumulative Effects

6.2.1 Public Services

Cumulative effects to public services could result from overlapping construction schedules in the larger project area. An example could be traffic effects from lane closures resulting from other private development projects overlapping with Project construction. This could result in longer emergency response times and travel time delays for other public service vehicles. Traffic detours and delays from a number of projects in the same or adjacent areas of the city could pose difficulties in determining efficient routes for these services.

The cumulative effect of the Project in conjunction with Phase 2 of the SR 519 Intermodal Access Project would result in an overall operational benefit for public services, as these projects would provide smoother connections both east-west and north-south.

During construction, any overlap in construction schedules should be minimal. WSDOT anticipates that the SR 519 Phase 2 Project's First

Avenue S./S. Atlantic Street intersection improvements should be substantially completed by spring 2009, and all SR 519 Phase 2 work should be completed by June 30, 2011. The S. Holgate Street to S. King Street Viaduct Replacement Project's initial utility relocation work is not scheduled to commence until June 2009, 8 months prior to Traffic Stage 1. The only roadway restrictions during Traffic Stage 1 would be that the southbound SR 99 lanes would be reduced to two lanes during the last 6 months of Traffic Stage 1 (roughly from January 2011 through June 2011).

Fire Suppression

Overlapping construction schedules for water line construction or relocations could result in temporary disruptions to water services necessary to support fire suppression in the project area.

Solid Waste

If construction of the Project overlaps with construction of other planned actions, construction and demolition activities would generate solid waste that could contribute to cumulative effects for solid waste management facilities. Mitigation measures would be implemented, such as coordination with the solid waste management facilities, to reduce these effects. In addition, as other projects are subject to separate environmental review, it is anticipated that mitigation measures applied to these planned actions would reduce the overall combined effects.

6.2.2 Utilities

In general, cumulative effects to utilities could result from overlapping construction by increasing the risk and frequency of service disruption. Potential utility outages would affect businesses and residential customers as well as public services. Services to customers could be temporarily disconnected each time a utility line is relocated.

Potential cumulative benefits of these projects would be realized through the upgrade of the utility infrastructure in the project area to the latest standards.

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