I-5 PAVEMENT RECONSTRUCTION PROJECTS

Problem Definition Report

October 2005

Washington State Department of Transportation

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Problem Definition Report

Prepared for

Washington State Department of Transportation
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Executive Summary

Interstate 5 (I-5) stretches from Canada to Mexico and is the main north-south traffic artery in Washington State. The highway connects most of the major cities on the west coast and is the most important corridor for long-distance freight movement up and down the Pacific Coast.

View of southbound I-5 at the convention center in downtown Seattle.

The segment of I-5 through the city of Seattle represents the busiest traffic corridor in the state, carrying over 250,000 vehicles per day. It is an important link to many of the region's jobs, homes, recreational areas, and port facilities. I-5 has a profound effect on the economy of the region and the entire state. Maintaining and enhancing this transportation resource is critically important.

This Problem Definition Report identifies problems in the I-5 corridor, explains the critical nature of the problems and need for action, describes the operational improvements and pavement repair options being considered, discusses how this project is interrelated with other projects and planning efforts in the region, and identifies the next steps in working toward a solution to the problems.

1 Why is the I-5 Pavement Rehabilitation Project needed?

Problem Statement

Existing pavements in this I-5 corridor need to be rehabilitated or reconstructed. The pavements are well beyond their design lives, and distress data and observation show the deterioration that has occurred.

The pavement in this segment of I-5 is over 40 years old and well beyond its design life. It is showing signs of failure. It's not unusual to see long cracks in the concrete panels, and drivers experience rough rides.

The Washington State Legislature has allocated funding to begin to replace or rehabilitate the pavement on I-5 from Northgate to Boeing

Access Road (Seattle/Tukwila city limits). WSDOT is taking the approach that while we are reconstructing the pavement, there is considerable benefits to also improving operations, safety, and possibly stormwater drainage at the same time. WSDOT is therefore taking this opportunity to assess the long-term capital improvement needs in the larger corridor segment from I-405 in Tukwila to I-405 in Lynnwood, a distance of roughly 28 miles. Funding is not currently available for recommended improvements in this larger corridor segment. Exhibit ES-1 illustrates the relationship of these two corridor segments.

Exhibit ES-1
Corridor Location Map

Previous studies have identified a number of safety and bottleneck problems throughout this section of I-5. Many of the bottleneck problems relate to geometric design or lane deficiencies. An example of these problems is the numerous left-lane on- and off-ramps that cause congestion and often confusion for drivers not familiar with the roadway.

Studies have shown that modest operational improvements could smooth the flow of traffic and address some of the points of congestion. In addition, a number of safety improvements are also possible. As a result, WSDOT has concluded that before major pavement reconstruction begins, a Capital Improvement Plan should be developed for the entire corridor from I-405/SR 525 in Lynnwood to I-405/SR 518 in Tukwila.

The need also exists to coordinate any I-5 pavement reconstruction activities with the other major projects in the region. This includes the Alaskan Way Viaduct, the SR 520 Bridge Replacement and HOV Project, Sound Transit's North Link light rail line and long-range planning for the line's extension northward from Northgate.

Finally, a number of environmental issues, including stormwater management, noise, and community cohesion, have been long outstanding issues that will require attention as part of any major pavement reconstruction work.

The purpose of the I-5 Pavement Rehabilitation Projects is to complete a plan for the comprehensive pavement reconstruction of the highway through the city of Seattle, together with those other mobility and environmental improvements that are determined feasible. Meeting these goals will require close coordination among several WSDOT departments, cities, counties, and transit agencies operating within the corridor.

2 What are the existing pavement conditions on I-5?

Most of I-5's concrete pavement through the core of Seattle has exceeded its 20-year design life. Most of the concrete panels that form the roadway surface from NE 205th Street to Boeing Access Road have not been resurfaced since the highway opened during the 1960s, unlike the asphalt sections north of the King County line, which have been repaved a number of times. The majority of the roadway surface is highly deteriorated, rutted, and cracked.

Example of deteriorating pavement.

3 What is WSDOT's pavement repair recommendation for I-5?

WSDOT recommends removing the current concrete and replacing it with 13 inches of portland cement concrete, reinforced with dowel bars on top of 4 inches of hot mix asphalt and a 4-inch crushed surface base.

WSDOT selected this repair option based on the following:

- The 13-inch-thick driving surface allows for several grinding treatments, leading to an overall 60-year service life.

- Over the course of the pavement's life cycle, this option minimizes disruption to the traveling public.
- This option is suitable for extremely heavy traffic loads.
- This option minimizes costs to the user. This option allows us to "get in, get it done, get out, and stay out."

Construction will take place in segments, and WSDOT will develop a plan to manage traffic during pavement rehabilitation to minimize traffic disruptions.

4 What I-5 operational improvements are being considered for further study?

WSDOT is developing a Capital Improvement Plan for the entire corridor from I-405/SR 525 in Lynnwood to I-405/SR 518 in Tukwila. This plan will identify a long-range program of modest improvements that could be carried out as part of the I-5 Pavement Rehabilitation Project. The types of improvements to be considered will generally fall into the following areas:

- Operational improvements to maximize traffic flow efficiency and the people carrying capacity of the existing roadway infrastructure
- Geometric improvements to address the most pressing substandard conditions and improve safety.
- Improvements to enhance transit and HOV operations and access.
- Intelligent Transportation Systems improvements to enhance state of the art driver information
- Noise, stormwater drainage, and other improvements to address key existing environmental issues
- Toll facilities as a means to manage congestion

Only improvements that appear feasible and will not have major impacts or require large-scale investments are within the scope of this project.

5 What other major projects require coordination with the I-5 Pavement Rehabilitation Project?

The I-5 pavement reconstruction activities need to be coordinated with other major projects in the region, including the Alaskan Way Viaduct replacement, the SR 520 Bridge Replacement and HOV Project, Sound Transit's North Link light rail line, and the I-405 project on the east side of Lake Washington with its interfaces with I-5 in Tukwila and Lynnwood. The relationships between the I-5 Pavement Rehabilitation Project and these other major projects are described in more detail in Chapter 2.

Chapter 1 Project Goals and History

This Problem Definition Report identifies problems in the Interstate 5 (I-5) corridor, explains the critical nature of the problems and need for action, discusses how this project is interrelated with other projects and planning efforts in the region, describes the operational improvements and pavement repair options being considered, and identifies the next steps in working towards a solution to the problems.

This chapter discusses the purpose of and need for the I-5 Pavement Rehabilitation Project and the associated Capital Improvement Plan. It describes the roadway from I-405 in Lynnwood to I-405 in Tukwila and provides some of the highway's history.

1 What extent of I-5 will the Capital Improvement Plan and Pavement Rehabilitation Project cover?

The Washington State Legislature has allocated funding to start the replacement or rehabilitation of the pavement on I-5 from NE Northgate Way to Boeing Access Road (Seattle/Tukwila city limits). This 15-mile stretch of highway runs through central Seattle.

Although the Legislature only targeted construction dollars for the section of I-5 between Northgate and Boeing Access Road, the Washington State Department of Transportation (WSDOT) is taking this opportunity to assess the long-term capital improvement needs in a larger segment of the I-5 corridor. The Capital Improvement Plan (CIP) will assess the need for improvements to I-5 from I-405 in Tukwila to I-405 in Lynnwood, a distance of roughly 28 miles. Exhibit 1-1 illustrates the relationship of these two corridor segments.

Exhibit 1-1
Corridor Location Map

WSDOT selected the longer corridor for the CIP because this area between the north and south connections with I-405 hadn't been assessed recently for long-term capital improvement needs. The project may identify longer-term improvements for the areas north of Northgate or south of Boeing Access Road.

2 What is the purpose of the Capital Improvement Plan?

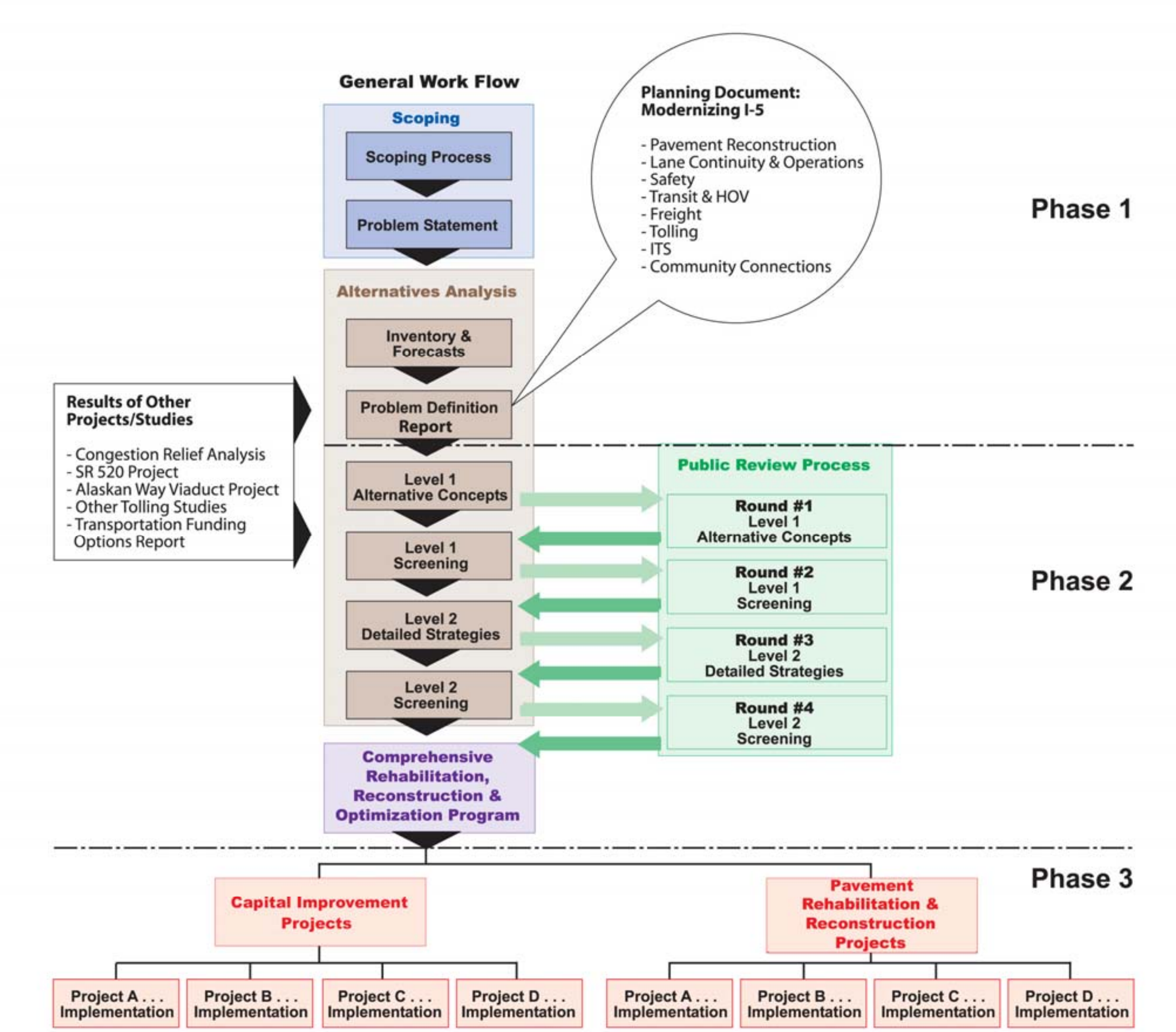
The purpose of the I-5 CIP and Pavement Rehabilitation Project is to complete a plan for the comprehensive pavement reconstruction of the highway, together with those other mobility and environmental improvements that are determined feasible. Meeting these goals will require close coordination among several WSDOT departments, cities, counties, and transit agencies operating within the corridor. The project will consist of three phases, as shown on Exhibit 1-2.

Phase 1: The first phase of the I-5 Pavement Rehabilitation Project consisted of a planning effort to develop a problem statement and assemble needed background data and information. This report documents the findings of Phase 1.

Phase 2: The second phase of the project will build on the Phase 1 findings and produce a CIP for I-5 from Lynnwood to Tukwila (see Exhibit 1-1). The CIP will develop a long-range comprehensive program of improvements, prioritize the components, and identify the steps needed for implementation.

Phase 3: The third phase will begin to implement key early action project elements. The focus will be on completing initial design work and performing any additional planning and environmental reviews needed.

Exhibit 1-2
I-5 Pavement Rehabilitation Project Work Flow



3 Why do we need the Capital Improvement Plan?

WSDOT recognizes that the pavement on I-5 between Northgate and Boeing Access Road through the city of Seattle needs to be replaced or rehabilitated. The existing pavement is over 40 years old and well beyond its design life. It is showing signs of failure. It's not unusual to see long cracks in the concrete panels, and drivers experience rough rides.

WSDOT is taking the approach that while we are reconstructing the pavement, there is considerable benefits to also improving operations, safety, and possibly stormwater drainage. This approach has the following advantages:

- We may be able to implement some of the CIP improvements identified at the same time as the pavement rehabilitation projects.
- We can minimize traffic disruption from construction.
- We can reduce our overall project costs for improvements.

4 What is I-5's role in the region, and why are mobility improvements to I-5 important?

This segment of I 5 is the busiest traffic corridor in the state, carrying over 250,000 vehicles per day. The stretch of I-5 between I-405 in Lynnwood and I-405 in Tukwila is an important link to many of the region's jobs, homes, and recreational areas. Because of the volume of freight moving through this corridor, I-5 has a profound effect on the economy of the region and the entire state.

This segment of I-5 is the busiest traffic corridor in the state, carrying over 250,000 vehicles per day.

I-5 supports:

- Both long-distance trips from other states or Canada and short-distance trips between Seattle neighborhoods.
- Single-occupant vehicle trips and high-occupancy vehicle trips (carpools, vanpools, and buses).
- Critical movement of goods to and from the region's port facilities and to local retail outlets.

Maintaining and enhancing this transportation resource is critically important to the Puget Sound region.

5 Why do we need the I-5 pavement rehabilitation?

The concrete pavement on I-5 is deteriorating. We will need to reconstruct it if we want to maintain the highway's current productivity.

Problem Statement

Existing pavements in this I-5 corridor need to be rehabilitated or reconstructed. The pavements are well beyond their design lives, and distress data and observation show the deterioration that has occurred.

The primary basis for the information contained in this section is WSDOT's Pavement Type Selection report, SR5 PCCP [portland cement concrete pavement] Rehabilitation Study, MP 161.65 (Lucille Street) to MP 177.76 (Snohomish County Line), dated September 11, 2000.

How does WSDOT evaluate pavement conditions?

WSDOT collects pavement condition data on state routes every year. The data includes the following:

- Pavement structural condition.
- Pavement rutting condition.
- Pavement profile condition using the international roughness index.
- Friction, for both flexible and rigid pavement.

Example of deteriorating pavement.

We primarily use the first three indexes to assess the pavement's condition. Pavement structural condition provides an assessment of the pavement's structure, while the remaining indexes provide an indication of ride quality. The indexes are divided into four broad pavement condition categories, as shown in Exhibit 1-3.

Pavement rutting measures the amount of depression in the wheel path of the roadway, measured in inches. Ruts deeper than ½ inch may be hazardous to high-speed traffic, because water can pond in the ruts, causing vehicles to hydroplane. WSDOT attempts to rehabilitate pavement when rut depths are projected to reach ⅓ inch.

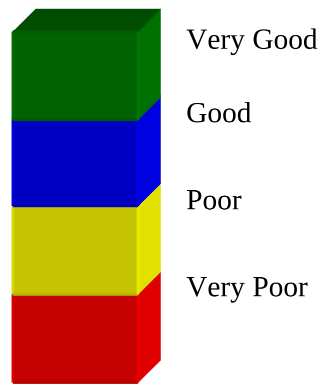
Pavement profile condition, as defined by the international roughness index, is the variation in road profile measured in inches per mile. WSDOT attempts to rehabilitate pavement when the international roughness index value is projected to reach 220 inches per mile.

WSDOT's goal is to achieve a statewide average of 75 percent of all pavement sections rated as "very good", 25 percent "good", and no "poor" or "very poor" sections. WSDOT attempts to plan repairs and rehabilitation when the pavement structural condition is projected to reach 50. All of the I-5 pavement segments currently have some portion rated in the poor or very poor category. (See Exhibit 1-5)

Exhibit 1-3

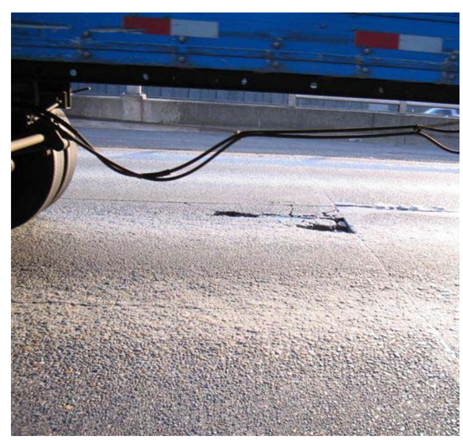
Pavement Condition Categories

Structural Condition	Rutting	Roughness
100	0 inches	0 inches/mile
75	¼ inch	≤ 95 inches/mile
50	⅓ inch	220 inches/mile
25	> ½ inch	> 320 inches/mile
0		



What are the existing pavement conditions on I-5?

Most of I-5's concrete pavement through the core of Seattle is now well-beyond its 20-year design life. The concrete panels that form the roadway surface from NE 205th Street to Boeing Access Road have not been resurfaced since the highway opened, unlike the asphalt sections north of the King County line, which have been repaved a number of times. Many of the concrete bridge decks in this stretch and some of the concrete panels have been replaced or patched; however, the majority of the roadway surface is highly deteriorated, rutted, and cracked. This condition will eventually lead to structural failures of the concrete panels that will require either piecemeal or wholesale replacement.



Deteriorating Steilacoom aggregate on I-5 near the SR 522/Lake City Way exit.

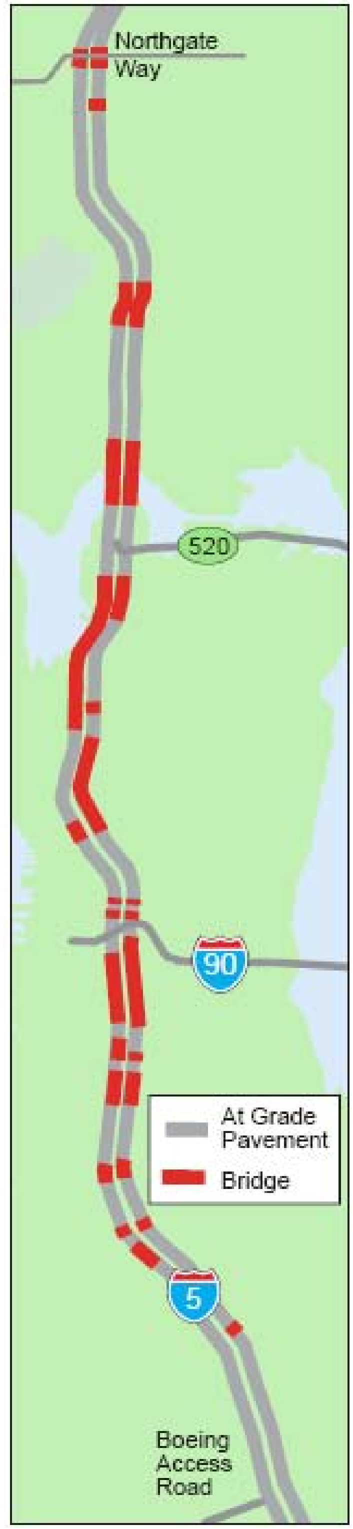
Pavement in the Pavement Rehabilitation Project corridor covers both the at-grade roadway and several bridge structures (Exhibit 1-4). The pavement was built between 1961 and 1968, with improvements in selected areas in 1986 and 1998. On the whole, the pavement is at or near the end of its projected 40-year design life. The existing pavement design consists of 9 inches of jointed plain portland cement concrete pavement over 0 to 4 inches of asphalt or cement-treated base over 5 to 13 inches of untreated base.

WSDOT monitors the pavement and periodically assesses its condition. For the pavement condition assessment, we have divided the I-5 pavement rehabilitation corridor into three segments to help identify and discuss the existing conditions (Exhibit 1-5):

- The 4-mile north segment consists of the corridor between NE Northgate Way and the Ship Canal Bridge.
- The 4.5-mile central segment is defined by the Ship Canal Bridge and I-90.
- The 6.5-mile south segment encompasses the area between I-90 and Boeing Access Road.

WSDOT prepared the latest pavement condition data in 2002 and 2003. Exhibit 1-5 shows the structural condition, rutting, and roughness values at that time. Both northbound and southbound directions of the north segment (from Northgate to the Ship Canal Bridge) contain most of the "very poor" and "poor" pavement structure within the corridor. The pavement in the southbound central segment (from the Ship Canal Bridge to I-90) has predominantly "poor" roughness numbers. The pavement in the northbound central segment and the southbound south segment display the least amount of distress. The northbound direction of the south segment (from I-90 to Boeing Access Road) appears to have the highest amount of pavement sections with "poor" and "very poor" roughness ratings.

Exhibit 1-4
Pavement Structure



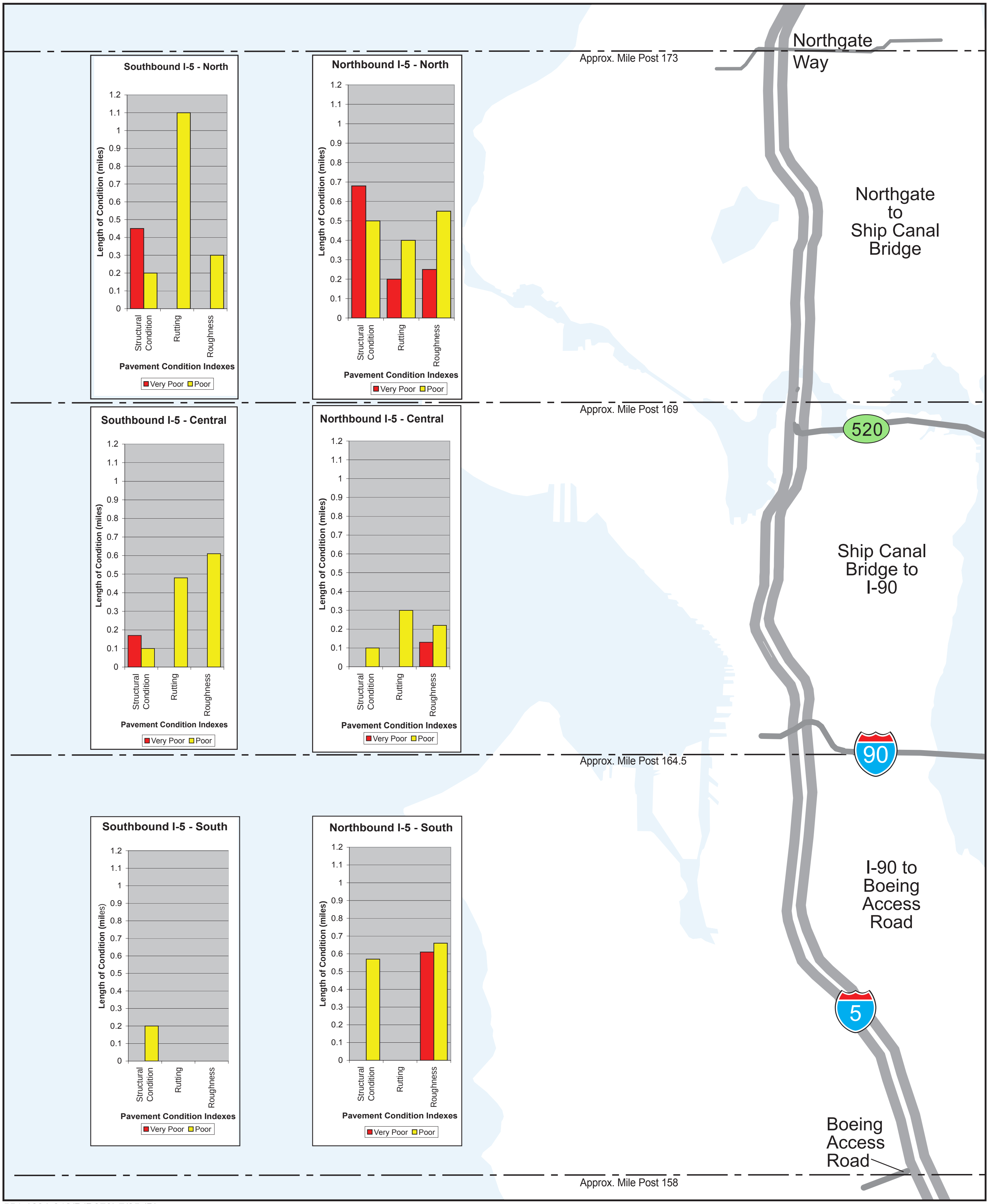


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Exhibit 1-5

I-5 Pavement Conditions

What will happen if the pavement is not rehabilitated or reconstructed?

The I-5 pavement will continue to deteriorate over time, and the ride quality for drivers will continue to worsen. Short-term maintenance to patch large cracks and potholes will become more frequent and cause unexpected traffic disruptions. Wear and tear on private vehicles, including large trucks, will also increase. Drivers will incur more costs for wheel alignment, suspension system, and other repairs.

Traffic accidents will likely increase as traction decreases over time. Large cracks or potholes could also cause drivers to make sudden lane changes, creating the potential for increased accidents.

As the pavement continues to deteriorate, it will eventually lead to structural failures of the concrete panels. Piecemeal or wholesale replacement of the panels will then be necessary.

When will funding be available to rehabilitate I-5 pavement?

State funding ($134 million) will become available in 2013 to start to replace or rehabilitate the pavement between NE Northgate Way and Boeing Access Road. It may take several years and additional funding to complete the pavement reconstruction in this corridor. Assuming a 10-year program, the pavement could be over 55 years old by the time we are able to fully reconstruct it.

State funding will become available in 2013 to start to replace or rehabilitate the pavement between NE Northgate Way and Boeing Access Road.

6 How was I-5 designed?

Engineers began planning a tollway through Seattle shortly after World War II. In the mid 1950s, the highway commission identified a corridor, but in 1956, the Washington State Supreme Court declared the tollway unconstitutional. Six months later, in the name of national defense, the federal government passed legislation to support a massive investment in a national highway system to provide safer and faster highways. The federal government provided 90 percent of the funding to design and construct the national interstate system.

When designing I-5, engineers were concerned with a number of factors, including:

- Land use and population growth.
- Topography.
- Cost.

Engineers planned I-5 to accommodate 20 years of anticipated population and travel growth. Because origin-destination studies showed that 75 to 80 percent of the trips on I-5 will be people commuting to downtown, engineers designed I-5 to serve the Central Business District in Seattle by providing numerous, closely spaced on- and off-ramps in the downtown area. They determined that two general purpose lanes and the use of the reversible express lanes will be sufficient to accommodate travel demand associated with trips through downtown Seattle for the planning horizon of 1980. Today's two-car households, population and employment growth, and land use changes were beyond the engineers' planning horizon.

Aerial photograph of the Ship Canal Bridge construction in 1959.

Seattle Post-Intelligencer Collection, Museum of History and Industry, Seattle; All Rights Reserved.

Seattle's geography created a number of engineering challenges. The hourglass-shaped geography, with Lake Union on the west and Capitol Hill on the east, limited alignment options. To achieve a level roadway with Seattle's hilly topography, engineers removed a large amount of soil between the Eastlake and International District neighborhoods, creating what was commonly referred to as a trench. Communities called for improvements to reconnect their neighborhoods with downtown. Discussion on bridging the gap began in the 1960s with the construction of I-5. During the1970s, the Freeway Park was constructed over I-5 to provide a reconnection.

I-5 construction through central Seattle.

Cost was an important consideration in determining what to build. To build I-5, the state had to purchase approximately 4,600 parcels over 20.5 miles. The state soon began a massive program to relocate several hundred homes, which took place over many years. The State Highway Department selected interchange and ramp locations to reduce cost and impacts on surrounding neighborhoods. In many cases, this resulted in building ramps on the left side of the roadway instead of the right side.

What factors influenced the configuration of I-5?

The basic configuration of I-5 was designed to serve primarily work trips to the downtown Seattle employment center. This is why there are only two through lanes in each direction through downtown Seattle. The left-side ramps were designed to minimize expensive right of way acquisition and land use displacements. Many of these ramps currently serve traffic volumes that are significantly higher than the volumes they were designed for.

Other factors such as densely developed property on both sides of the highway and natural constraints from steep hillsides or water crossings have influenced the current I-5 configuration. Freeway Park and the Washington State Convention and Trade Center constructed over I-5 in downtown Seattle also constrain the ability to widen the facility in the future.

Why do we have reversible express lanes?

The reversible roadway (express lanes) between Northgate and the south end of downtown Seattle opened in 1965. These lanes were built to be reversible to help relieve congestion in the primary commute direction—southbound into downtown Seattle in the morning and northbound out of downtown Seattle in the afternoon. The express lanes continue to serve the highest directional traffic flows during morning and afternoon commute periods. However, traffic volumes and congestion in the non-peak direction have increased significantly in recent years.

I-5 looking south at Lake City Way with reversible roadway in the center.

7 What is the current configuration of I-5?

The basic configuration (number of lanes) for the 28-mile section of I-5 between the north end of I-405 in Lynnwood and the south end of I-405 in Tukwila is usually three to five general purpose travel lanes in each direction. In addition to the general purpose lanes, high-occupancy vehicle (HOV) lanes are provided on the mainline and reversible roadway, as shown in Exhibit 1-5. HOV lanes are not available on the mainline where the reversible roadway exists. Exhibits 1-6 through 1-9 show the configuration of the general purpose lanes along I-5.

In addition to the I-5 mainline roadways, a reversible or express lane roadway exists between Northgate Way and the southern end of the Seattle Central Business District near Yesler Way. This reversible roadway varies from one to four lanes in width and is generally configured to move peak-direction traffic between the northern sections of Seattle and the Central Business District. The lanes operate southbound in the morning and northbound in the evening. Their direction is reversed at midday and overnight through the use of gates, moveable barriers, and signs. Only one lane of the reversible roadway runs from Northgate all the way through the Seattle Central Business District to the merge point with the mainline. The reversible roadway also includes an HOV lane northbound from Lake City Way connecting to the mainline HOV lane at Northgate, and an HOV lane southbound starting on the Ship Canal Bridge and continuing through the Central Business District with exits at Pike/Pine and Cherry/Columbia. The reversible roadway has become an important link in the regional transit network, and the Pine Street transit-only ramp connects directly to the Downtown Seattle Transit Tunnel.

Exhibit 1-6
HOV Lanes

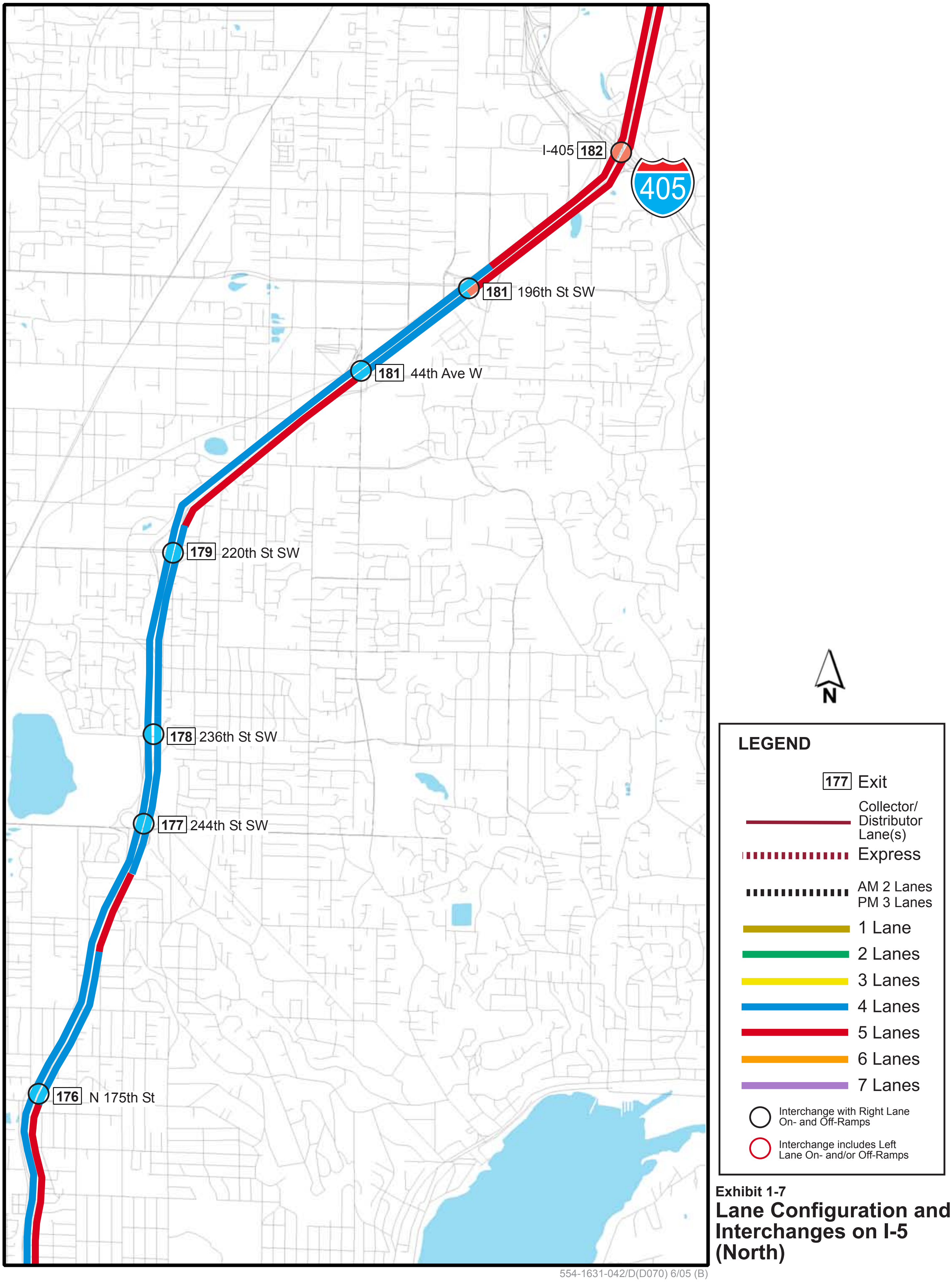

Exhibit 1-7

Lane Configuration and Interchanges on I-5 (North)

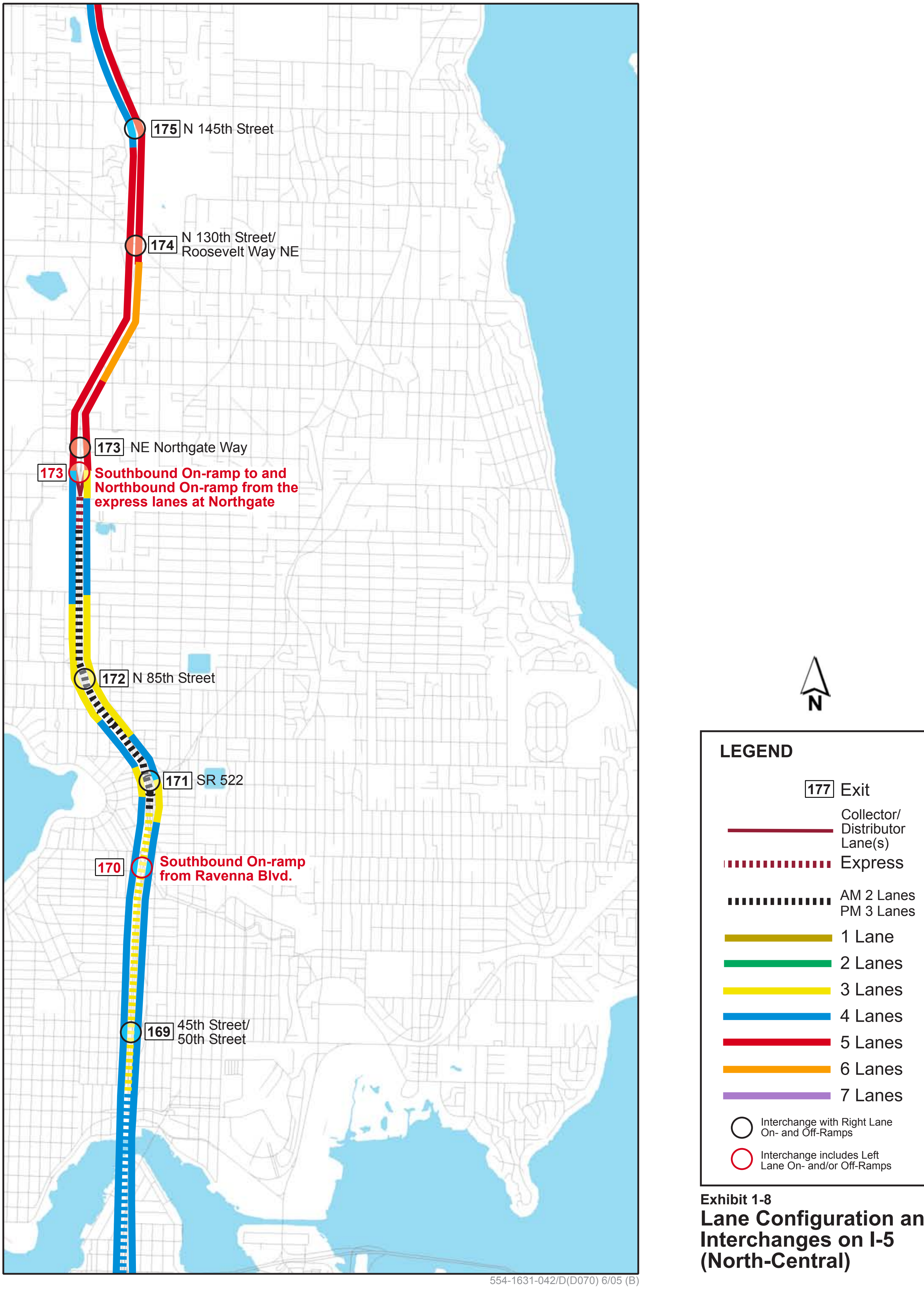

Exhibit 1-8

Lane Configuration and Interchanges on I-5 (North-Central)

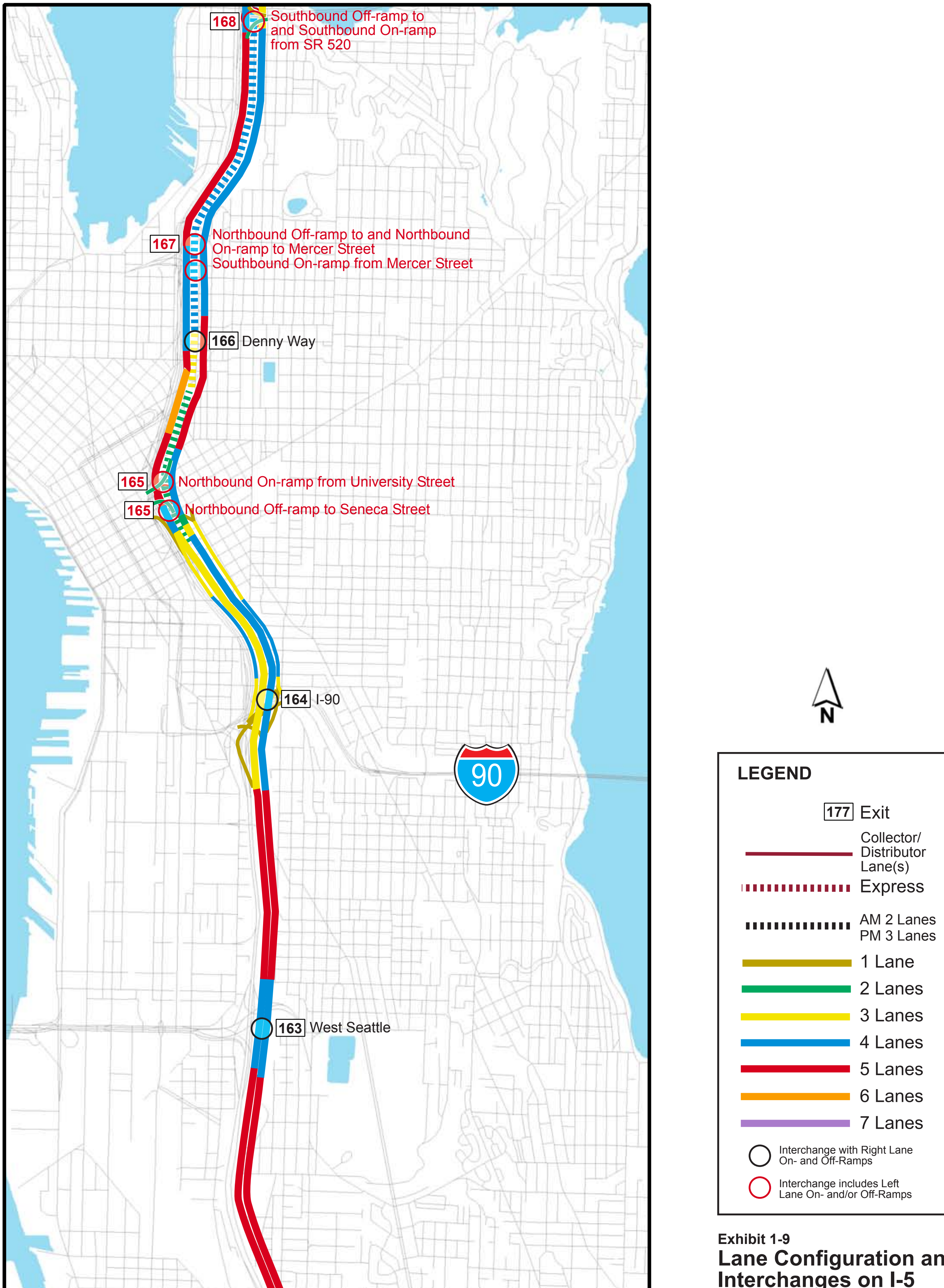

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Exhibit 1-9

Lane Configuration and Interchanges on I-5 (Central-South)

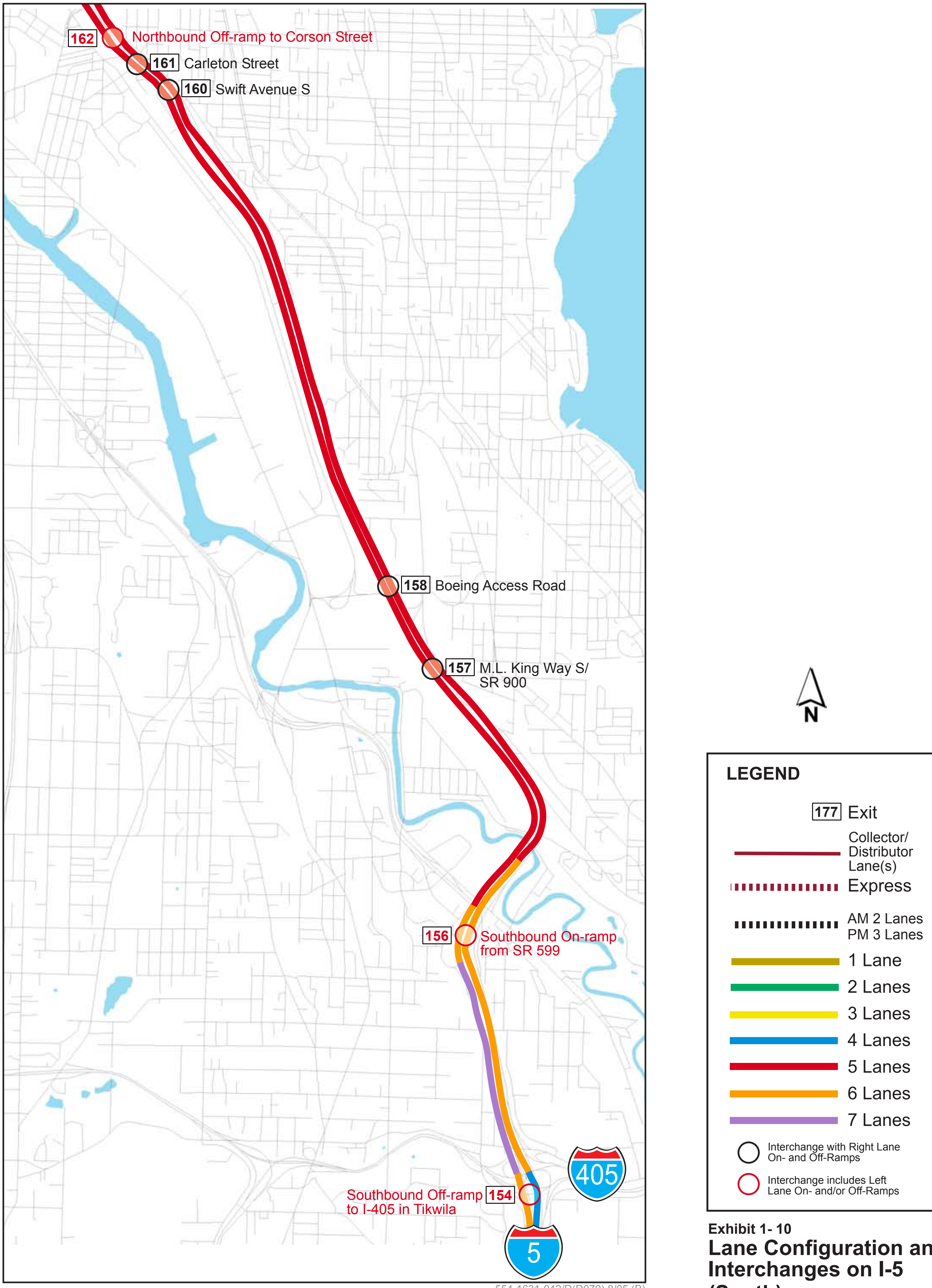


Exhibit 1- 10

Lane Configuration and Interchanges on I-5 (South)

What safety and bottleneck problems are caused by the current configuration?

Previous studies have identified a number of safety and bottleneck problems throughout this section of I-5. Many of the bottleneck problems relate to geometric design, as well as areas with lane deficiencies found in the 40-year-old roadway. An example of these problems is the numerous left-lane on- and off-ramps that cause congestion and often confuse drivers who are not familiar with the roadway. Earlier studies have suggested solutions consisting of minor design modifications or restriping of roadway segments. Other concepts involved capacity improvements with larger positive benefits to regional travel.

This section of I-5 includes 28 full or partial interchanges, or approximately one interchange per mile. In addition, both northbound and southbound collector-distributor roadways exist in the very complex interchange section between I-90 and approximately Madison Street at the southern end of the Seattle Central Business District. Most of the interchanges have conventional right-lane on- and off-ramp connections, but some locations do have left on- and off-ramps, as highlighted on Exhibits 1-6 through 1-9. The ramps connecting to the left side of the highway are mostly in the downtown Seattle area.

What is a collector-distributor roadway?

A collector-distributor roadway refers to one or more travel lanes physically separated from the main freeway travel lanes that connect multiple freeway on- and off-ramps together.

These left-lane on- and off-ramps generally cause more traffic congestion than conventional right-lane connections due to slower vehicles from the on- or off-ramp mixing with faster vehicles in the left lane. The left-lane on- and off-ramps also have a negative effect on traffic operations because of vehicles weaving across general purpose travel lanes. The “Mercer weave” is a notable example; vehicles are required to weave across three to four lanes in a short distance between SR 520 and Mercer Street on- and off-ramps.

View of southbound I-5 at the convention center in downtown Seattle.

The section of I-5 between the University District and Spokane Street is among the most highly constrained sections of highway in the nation. In this stretch, the highway is mostly on or in a structure of some sort, including large bridges, viaducts, stacked roadway configurations, tunnels, and retained cuts and fills. In addition, development lines both sides of the highway, including some of the largest high-rise structures in downtown Seattle. In the heart of downtown Seattle between

Madison Street and Denny Way, the highway is also confined vertically, with the Washington State Convention Center and Freeway Park above and the proposed North Link light rail tunnel passing below the stacked roadways.

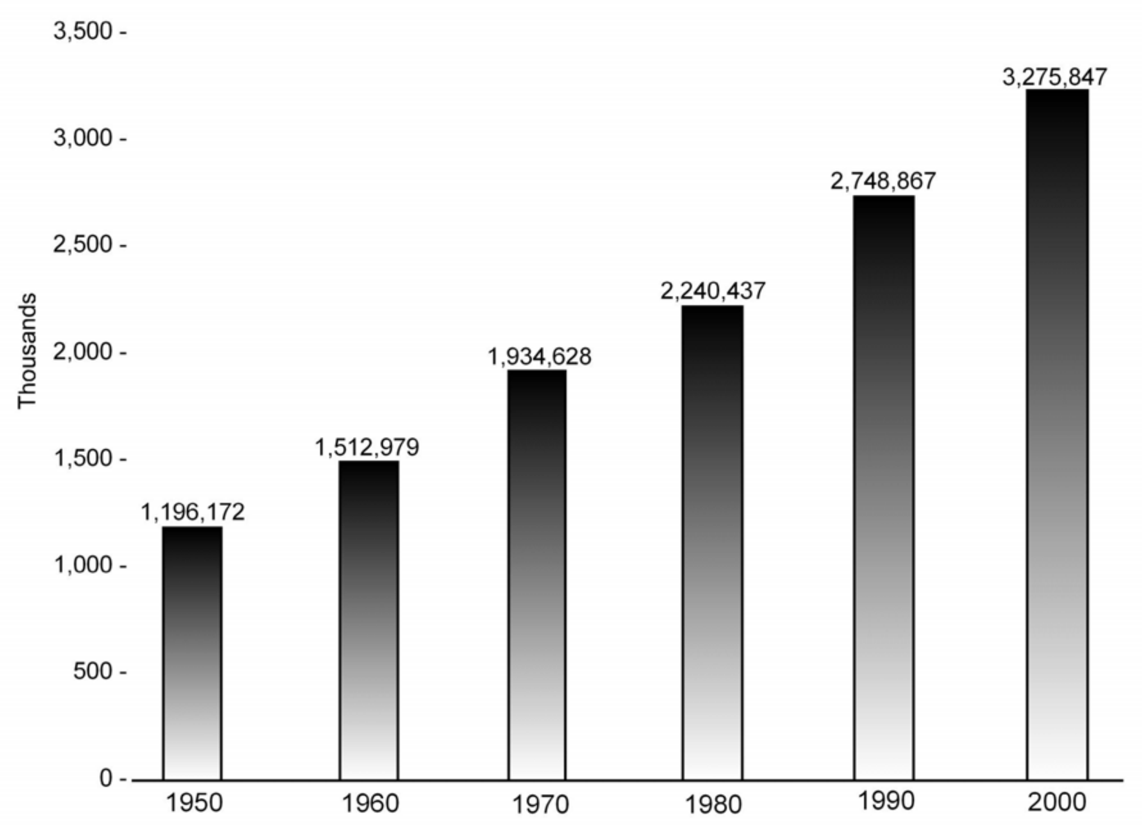
8 What growth trends have emerged since I-5 was planned?

The initial planning for I-5 construction occurred in the late 1950s. At the time, the facility was designed for traffic projections 20 years into the future, or around 1980. Population in King County increased from approximately 935,000 in 1960 to 1,270,000 in 1980 (a 36-percent increase). Today, the King County population exceeds 1,800,000 (almost double the 1960 population). As a result, the I-5 corridor serves a significantly larger population than originally envisioned during initial planning for the corridor. Other regional growth trends, such as the emergence of suburban employment centers and households with two wage earners, were not anticipated during the initial planning for I-5.

Exhibit 1-11 shows the population growth in the four-county Puget Sound region between 1950 and 2000. The population has increased from 1.2 million people in 1950 to nearly 3.3 million people in 2000.

Exhibit 1-11

Population Growth in the Puget Sound Region Between 1950 and 2000



Source: Puget Sound Regional Council. Puget Sound Trends: Historical Population Change, 1950-2000. July 2001.

9 How much have traffic volumes and congestion increased in the I-5 corridor?

Both daily and peak-hour traffic volumes on I-5 have changed little in recent years, while travel overall throughout the region has continued to grow (Exhibits 1-12 and 1-13). This pattern is indicative of the highly congested conditions that exist on I-5 both during rush hours and throughout much of the day and on weekends. Peak-hour traffic volumes on the Ship Canal Bridge grew at a fairly steady rate from the mid-1970s until the late 1980s with little change over the last 15 years. Daily volumes show a similar growth pattern, but growth continued somewhat longer into the early and mid-1990s, as more and more traffic spread beyond the peak periods.

Exhibit 1-12
Average Daily Traffic Volumes

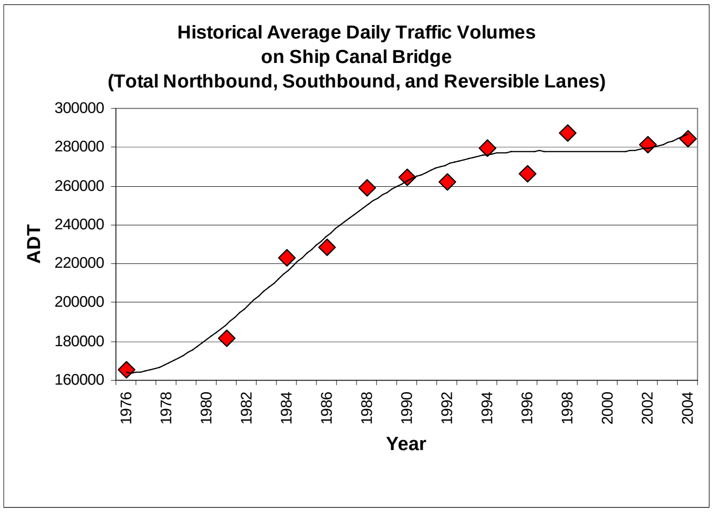
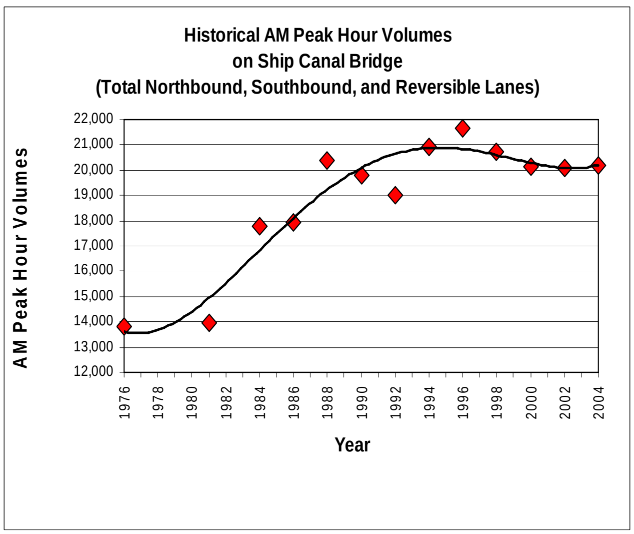
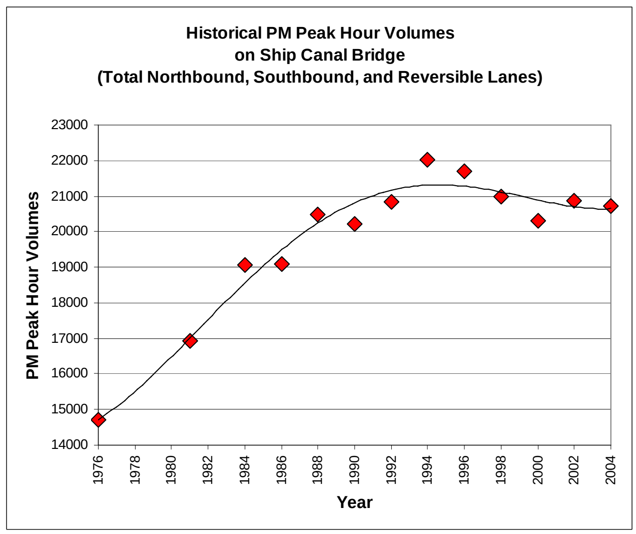
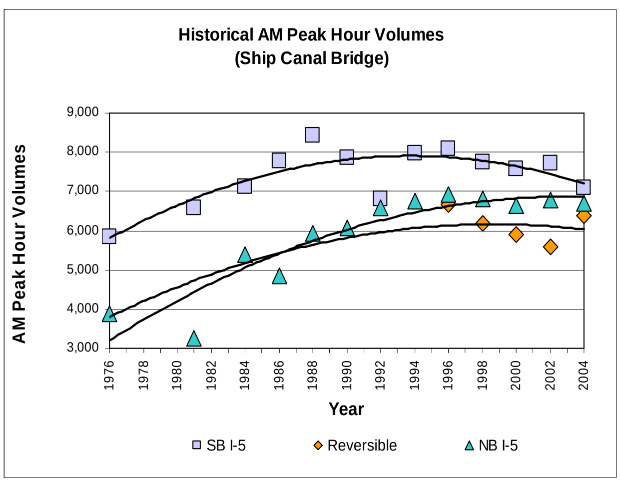
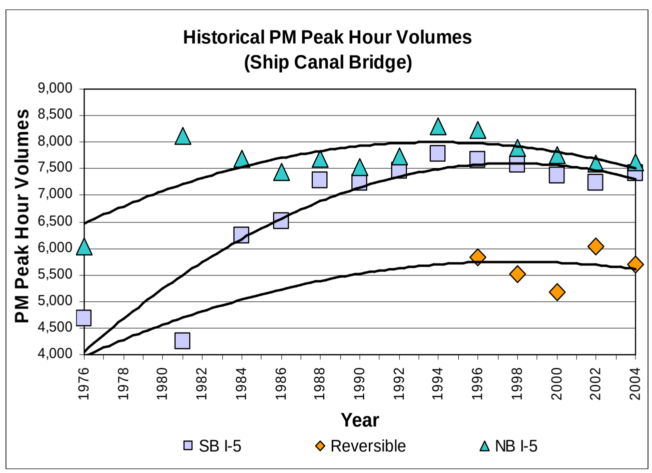


Exhibit 1-13
Peak Hour Traffic Volumes









How has traffic congestion been affected by the traffic volumes?

Traffic congestion on I-5 in the Puget Sound region is among the worst in the nation. Traffic jams are common in both directions of I-5 through downtown Seattle for many hours of each weekday, and they have become common at midday and in the afternoon on Saturdays and Sundays.

Although the higher-volume traffic flow north of downtown Seattle continues to be southbound in the morning and northbound in the afternoon, peak hour flows have become less directional over time. Without the added capacity from the express lanes, traffic congestion in the southbound direction has recently become similar to traffic congestion in the northbound direction during the PM peak period.

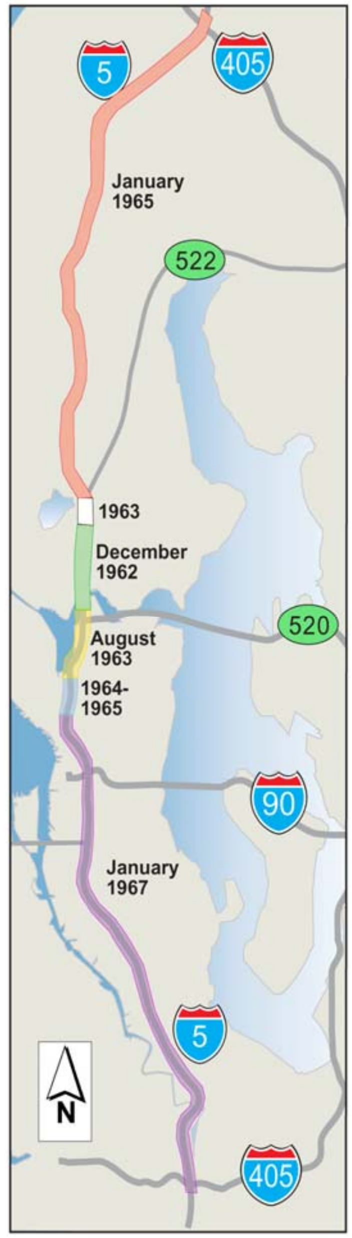
10 What improvements have been made to I-5 since its initial construction?

Since its original construction in the 1960s, the I-5 mainline and reversible roadways through Seattle have seen many modest improvements, including adding general purpose and high-occupancy vehicle (HOV) lanes and modifying or restricting the use of a number of ramps. The last major construction was associated with the completion of I-90 and the I-90 extension to 4th Avenue South nearly 15 years ago. Exhibit 1-14 shows construction dates of the different I-5 segments.

WSDOT has achieved additional general purpose and HOV lanes by reducing lane and shoulder widths and widening a number of structures, particularly those south of the Seattle Central Business District. In addition, we have added an extensive system of ramp metering and provided HOV queue bypasses at many of the meters. Many of the bridge decks have been rebuilt, and most of the major structures have been the subject of an ongoing program of seismic retrofit.

No major capacity expansion of I-5 has occurred in this corridor. This is primarily due to the significant physical constraints in the corridor between the University District and Spokane Street and past regional transportation policy decisions. Expansion of I-5 in the heart of downtown Seattle is highly constrained horizontally by tall buildings on both sides of the highway. Expansion is also constrained vertically by the Washington State Convention Center and Freeway

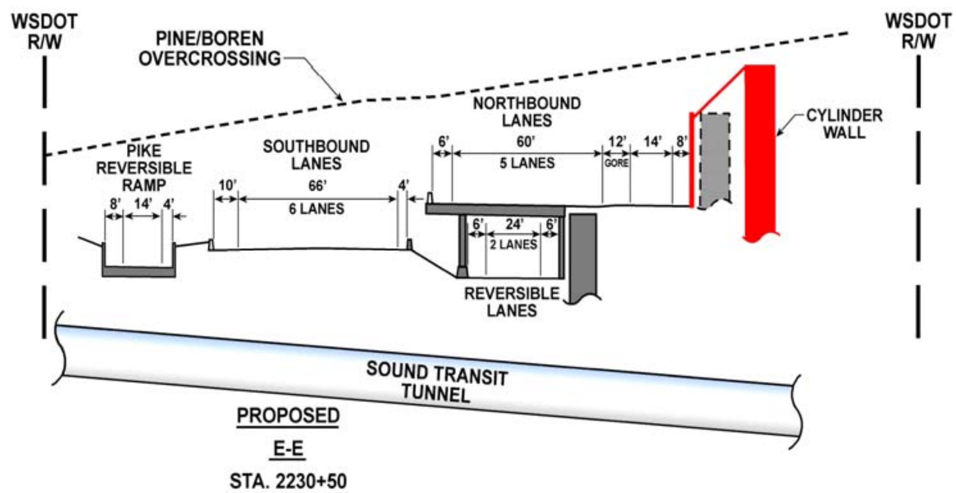
Exhibit 1-14
I-5 Construction Dates



Park above and the planned North Link light rail tunnel below the highway, as shown on Exhibit 1-15. A major capacity improvement through this area will be very costly and is not in the scope of this study.

Exhibit 1-15

Cross Section of I-5 in Downtown Seattle



11 What can we conclude about I-5's future?

The concrete pavement on I-5 will need to be reconstructed to maintain the highway's current productivity. Reconstruction has been ongoing since the late 1980s, with the replacement or reconstruction of many of the highway's bridge decks and some highly deteriorated concrete panels. During the spring and summer of 2005, we rebuilt sections of pavement through downtown Seattle. The reconstruction of the rest of the roadway pavement in the pavement rehabilitation corridor will likely be a long process carried out in phases over many funding cycles. It will also result in periods of significant traffic disruption, as has been experienced with the recent work through downtown Seattle.

Funds are not likely to be available to undertake a major expansion of I-5's capacity. In addition, studies since the late 1980s, such as the SR 520 Bridge Replacement and HOV Project and the Congestion Relief Analysis, indicate that expansion of the highway to carry more vehicles will be highly disruptive and extremely costly and will have many impacts. Therefore, the region has decided building a high-capacity transit system in the corridor is the preferred approach to ensure future mobility and provide the people-moving capacity to ensure the region's health.

Studies have also shown that modest operational and safety improvements could smooth the flow of traffic and address the most severe points of congestion. As a result, WSDOT has concluded that before major pavement reconstruction begins, a Capital Improvement Plan (CIP) should be developed for the entire corridor from I-405/SR 525 in Lynnwood to I-405/SR 518 in Tukwila.

The primary purpose of this CIP will be to identify a long-range program of modest improvements that could be carried out as part of the pavement reconstruction. The types of improvements to be considered will generally fall into the following areas:

- Operational improvements to address key bottlenecks and choke points and maximize the people-carrying capacity of the existing roadway infrastructure.

- Geometric improvements to address substandard conditions where feasible and improve safety
- Improvements to enhance transit and HOV operations and access
- Developing state-of-the-art driver information and other Intelligent Transportation Systems improvements
- Improvements to address existing environmental issues, including noise and stormwater drainage where feasible
- Consideration of the use of tolls as a means to manage congestion on the I-5 express lanes

Only improvements that appear feasible and will not have major impacts or require large-scale investments are within the scope of this project.

Chapter 2 Pavement Reconstruction and Capital Improvement Plan Context

The purpose of this chapter is to establish the context for the Capital Improvement Plan and identify the major issues that the plan should address. We have established this framework by reviewing state, regional, and local plans; the current funding outlook; and past and current studies of I-5, as well as ongoing projects such as the SR 520 Bridge Replacement and HOV Project and Sound Transit's North Link Light Rail Transit Project.

In developing a plan to modernize I-5, WSDOT must consider the following factors:

- State, regional, and local transportation plans and policies
- Funding realities
- Findings of the many past studies of the highway for improving mobility
- Freight mobility
- Safety and traffic accidents
- Impacts of and relationships among the other major transportation projects in the corridor, including transit
- Environmental regulations, particularly for noise and stormwater
- The urban context of the I-5 corridor and neighborhood conditions

1 What transportation plans and policies need to be considered for the I-5 project?

What do adopted state plans and policies say about I-5's future?

The Washington Transportation Plan provides a blueprint to guide the state in implementing programs and developing a budget for the state transportation system. The transportation system needs identified in the Washington Transportation Plan include a number of congestion relief improvements along the I-5 corridor. These improvements are listed and described in the *Washington State Highway System Plan: 2003-2022*.

Exhibits 2-1 and 2-2 list the 20-year transportation improvement projects proposed in the Highway System Plan for I-5 between I-405 in Tukwila and I-405 in Lynnwood.

How do adopted regional and local plans and policies relate to I-5's future?

Puget Sound Regional Council – Vision 2020

Vision 2020 is the long-range growth management, economic, and transportation strategy for the region encompassing King, Kitsap, Pierce, and Snohomish Counties. The region's vision is for diverse, economically and environmentally healthy communities framed by open space and connected by a high-quality, multimodal transportation system that provides effective mobility for people and goods.

What is a multimodal transportation system?

A multimodal transportation system is a system that incorporates many types of transportation, including pedestrian, bike, transit, car, rail, freight, and others.

Vision 2020 demonstrates the region's commitment to establishing a balanced, multimodal transportation system by including improvements that increase the availability of alternatives to automobile travel and emphasize the importance of direct and easy connections between travel modes. Improvements to highways and roadways that will benefit the I-5 corridor include:

- Expanding capacity to improve circulation to and between centers.
- Improving highway safety and efficiency.
- Widening highways where necessary.
- Completing an interconnected system of HOV lanes on highways serving congested corridors.

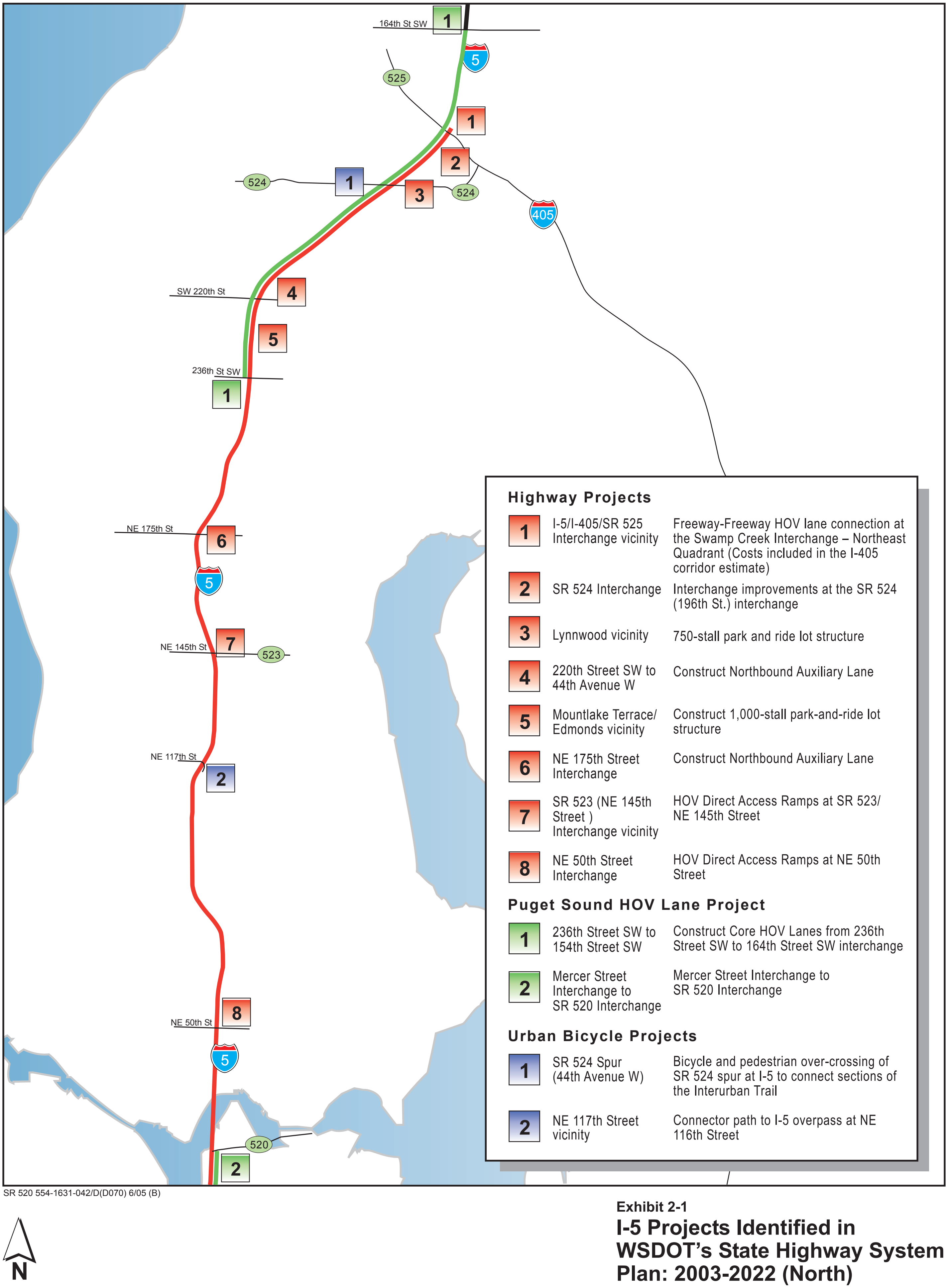


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Exhibit 2-1

I-5 Projects Identified in WSDOT's State Highway System Plan: 2003-2022 (North)

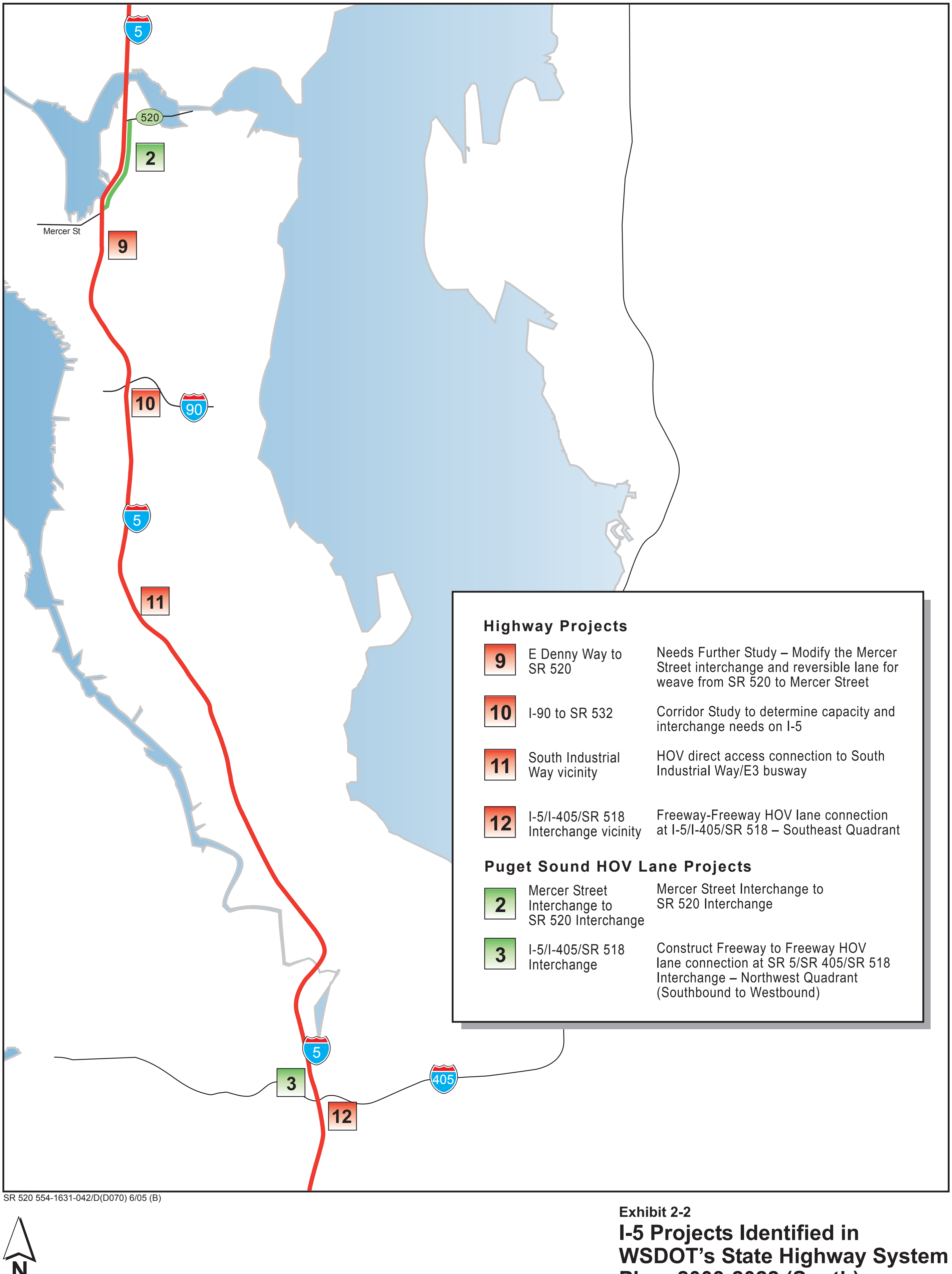

Exhibit 2-2

I-5 Projects Identified in WSDOT's State Highway System Plan: 2003-2022 (South)

Completing the central Puget Sound high-occupancy vehicle (HOV) system is both a high regional priority and one of WSDOT's highest priorities. The I-5 projects included in Destination 2030 and shown in Exhibit 2-3 will improve direct access connections to the HOV system between Tukwila and Lynnwood.

City of Seattle – Seattle Center City Access Strategy

Seattle Department of Transportation is in the process of developing strategies for improving mobility to and around Seattle's Center City. The Center City Access Strategy identifies 20 different projects to maximize access within the Center City by improving and integrating public transit, bicycle, and pedestrian networks.

What is Seattle's Center City?

The Center City is a collection of unique but connected neighborhoods that includes Uptown, South Lake Union, Denny Triangle, Belltown, Pike and Pine, the Commercial Core, First Hill, Capitol Hill, Pioneer Square, and the Chinatown/ International District.

Improving the efficiency of entering and exiting highways is an important component of the Center City Access Strategy. For I-5, projects identified as part of the Center City Access Strategy include the following:

- Constructing new collector-distributor roadways (within existing right of way) to reduce weaving on I-5 at downtown exits.
- Reconstructing the Spokane Street/I-5 interchange and reconfiguring access to I-90 and northbound I-5.

The Center City Access Strategy also identifies projects to improve transit and HOV access to and from I-5 via city streets, as well as projects to improve pedestrian and bicycle crossings of I-5.

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N

Exhibit 2-3

I-5 Improvement Projects from PSRCís Destination 2030

2 What is the outlook for funding major improvements to I-5?

The current 20-year State Highway System Plan has identified billions of dollars in safety, preservation, and mobility projects. However, revenue sources are limited, the project selection process is highly competitive, and even needed projects may not receive funding. Even with the recently enacted gas tax increases, no funding for major expansions to I-5 is being considered, and the other major transportation improvements in the Puget Sound region will need regional funding and possibly tolling.

The Puget Sound region is facing two very expensive safety and preservation projects: the Alaskan Way Viaduct and SR 520 Bridge replacement projects. State funding proposals have included dedicated funding for the viaduct and city and county projects. WSDOT will prioritize the I-5 pavement rehabilitation projects to coordinate with planning and construction work on the Alaskan Way Viaduct and SR 520 projects, as well as with Sound Transit's planning on the North Link light rail project and the Seattle Monorail Project's planning on the Green Line.

3 What have past and current studies and projects concluded about improving mobility in the I-5 corridor?

I-5 has been the subject of numerous studies of ways to expand its capacity, particularly in the highly congested area from Spokane Street north to the University of Washington. This stretch of I-5 is the most heavily traveled; has the most complex infrastructure of ramps, bridges, viaducts, and tunnels; and contains major highway interchanges with SR 520, Mercer Street (the unbuilt Bay Freeway), I-90/SR 519, and Spokane Street (the unbuilt West Seattle Freeway). I-5 is highly affected by traffic on SR 520 and I-90 and has therefore been included in many studies of these highways.

I-5 through Downtown Seattle at night

What has the SR 520 Project concluded regarding ways to expand I-5 to handle more traffic?

Both the SR 520 Bridge Replacement and HOV Project and the Trans-Lake Washington Study (which preceded the current effort) identified and evaluated a wide range of ideas for expanding I-5 to accommodate possible increases in SR 520 traffic resulting from an expansion in capacity across the lake. These studies have considered the following alternatives:

- Adding lanes to I-5 as far north as Lake City Way and as far south as Spokane Street.
- Eliminating the congested traffic weaves between the SR 520 interchange and the Mercer Street interchange to the south, as well as the weave from the NE 45th Street on-ramp to the SR 520 southbound off-ramp.
- Adding a new roadway or tunnel that will allow SR 520 traffic to bypass I-5 and gain direct access to Eastlake Avenue and the Mercer corridor.

What were the I-5 options explored by the SR 520 Project?

Recently, the SR 520 team developed three alternatives, as detailed in Exhibits 2-4 and 2-5, for increasing capacity along I-5 to the south through downtown Seattle as far as I-90. The purpose of this work was to understand how additional traffic from an eight-lane SR 520 might be accommodated on I 5 once the added traffic reached I 5 and headed south.

Tunnel Option

The Tunnel Option will construct a new tunnel with two lanes in each direction between Mercer Street and Yesler Way to allow traffic to bypass downtown Seattle. Southbound I-5 traffic will connect to the tunnel using a new single-lane off-ramp built between the SR 520 on-ramp and the Mercer Street off-ramp and will emerge just south of Yesler Way. Several of the downtown on- and off-ramps will be adjusted (e.g., the Mercer on-ramp will move to the right side of the highway) to remove additional conflict points.

Typical highway tunnel portal.

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N

Exhibit 2-4

Traffic Operations near SR 520 with the SR 520 8-Lane Alternative

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N

Exhibit 2-5

Traffic Operations near I-90 with the SR 520 8-Lane Alternative

For northbound I-5 traffic, the tunnel will begin near Dearborn Street as a two-lane off-ramp under the northbound lanes. The northbound tunnel will connect back to I-5 near Mercer Street by adding one lane to the mainline. A connection will also be provided for the northbound traffic from the tunnel to the reversible roadway (express lanes). The added lane at Mercer Street to mainline I-5 will be dropped, and traffic will be forced to merge back into the adjacent lane at the SR 520 off-ramp. Similar to the southbound direction, several of the downtown on- and off-ramps will be adjusted to remove additional conflict points. Exhibit 2-6 shows a cross section of the tunnel option in downtown Seattle.

Exhibit 2-6
Cross Section of the SR 520 Tunnel Option in Downtown Seattle