Keeping Seattle Moving: Developing a Multimodal Transportation Management Process for Maintaining Mobility During Construction of the Alaskan Way Viaduct & Seawall Replacement Project

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Abstract. The Alaskan Way Viaduct and Seawall Replacement Project (the Project), is a comprehensive effort to replace a 1950's era viaduct (SR 99), which was severely damaged in the 2001 Nisqually earthquake, with a new facility built to current roadway standards. While the process to identify a preferred alternative moves forward, it is expected that any alternative would require extended periods of roadway closure in the corridor to accommodate an accelerated construction schedule and deal with natural and built environment constraints.

SR 99 is a primary north-south route through Seattle, carrying 20 to 25 percent of the traffic traveling through downtown. Currently, the facility carries about 110,000 vehicles trips per day, with daily volumes projected to increase to over 130,000 by 2030. It is anticipated that without any additional improvements during extended periods of roadway closure, north-south downtown arterial streets and Interstate 5 will bear the brunt of diverted SR 99 traffic, causing significant increases in delay for general purpose traffic, transit vehicles and freight.

To address the anticipated increase in traffic, a construction transportation management planning process has been established. The process will provide agencies, stakeholders and the public a general picture of what traffic will be like during various stages of project construction. It will identify strategies that will be implemented during various phases of project construction phases to move people and goods around as effectively as possible.

This paper will discuss the reasons for developing the process, its elements, methodology, recommendations, and how it is being received by the transportation community in the greater Seattle area.

INTRODUCTION

State Route 99 (SR 99) is an important travel corridor that provides access to downtown Seattle, and is one of two primary routes--along with Interstate 5 (I-5)--through the downtown area as well. SR 99 passes through downtown Seattle on the Alaskan Way Viaduct, an elevated double-decked structure paralleling the Elliot Bay (Puget Sound) waterfront. The Alaskan Way Viaduct carries today about 110,000 vehicles on the

average weekday, or about 20 percent of all north-south traffic in central Seattle. Figure 1 provides a profile of the Alaskan Way Viaduct and the downtown Seattle waterfront.

Figure 1: Alaskan Way Viaduct Corridor, Seattle, Washington

The Alaskan Way Viaduct and Alaskan Way Seawall are both at the end of their design life and repairs can't extend their lifespan much longer. In February 2001, the Nisqually earthquake damaged the Alaskan Way Viaduct and exposed a number of vulnerabilities. Improvements to both facilities are required to protect public safety and maintain the transportation corridor. The viaduct and the seawall are both at risk of sudden and catastrophic failure in an earthquake.

The Alaskan Way Viaduct and Seawall Replacement Project (the Project) represents a partnership of three lead agencies: the Washington State Department of Transportation (WSDOT), the City of Seattle, and the Federal Highway Administration (FHWA). In brief, WSDOT is responsible for the viaduct and State Route 99, the City owns the seawall and the Alaskan Way surface street next to the viaduct and the right-of-way under the viaduct and is responsible for many of the utilities in the corridor, and FHWA provides roadway design guidance and environmental oversight.

The project limits are defined as S. Spokane Street in the south and Roy Street in the north. Figure 2 provides a graphical representation of the project limits. However, the project area, for construction transportation planning purposes is much broader to address the wider area impacts to the transportation system during various stages of construction.

Early Alternatives Development

Early project work led to the development of five build alternatives that were evaluated in a Draft Environmental Impact Statement (DEIS), issued in the spring of 2004. In addition to the No-build alternative, there were five build alternatives evaluated in the DEIS.

Figure 2: Alaskan Way Viaduct and Seawall Replacement Project Limits

These included the following:

- Rebuild Alternative.
- Aerial Alternative.
- Tunnel Alternative.
- Bypass Tunnel Alternative.
- Surface Alternative.

After the release of the Draft EIS, the Project team decided to carry forward two alternatives for further evaluation and refinement. These were the Tunnel (six-lane stacked Tunnel) and the six-lane Elevated Structure alternatives. The Elevated Structure was derived for the most part from the Rebuild and Aerial alternatives described in the Draft EIS. A Supplemental DEIS, released in July 2006, was prepared specifically for the Tunnel and Elevated Structure alternatives to evaluate the addition of new construction plans and more information about construction mitigation, changes made to the Tunnel and Elevated structure alternatives, and to seek public input on these changes. Additionally, WSDOT and the City felt that the public needed more current information on the project and this was provided in the Supplemental DEIS.

The two alternatives addressed in the Supplemental DEIS, were similar in character in terms of traffic capacity and connectivity. Both carried three lanes in each direction along the central waterfront. Lane widths were similar, though the Tunnel alternative had reduced shoulder widths to reduce cost. Both maintained a 4-lane section on surface Alaskan Way. The Elevated Structure maintained northbound off ramps and southbound on ramps accessing the central downtown, while the Tunnel alternative provided downtown access just south of central downtown allowing traffic to access downtown using the existing street grid.

The Supplemental DEIS provided significantly more information about construction approaches and their impacts to the local transportation system. Many people asked the Project to consider more than one construction plan to better understand the tradeoffs associated with closing the SR 99 roadway during construction versus keeping it open for much of the construction period. Specifically, people wanted to know what would happen if SR 99 along the central waterfront were completely closed. The theory was that if the project could be fully closed for an extended period of time, the length of construction could be shortened and project costs could be reduced. On the other hand, it was expected that with full closure, traffic impacts on downtown city streets and I-5 would be more severe, with the real potential for increased congestion and travel time during more hours of the day.

Another question asked was regarding mitigation of severe impacts--could the impacts be managed so that there wouldn't be a major degradation to freight, commercial, and recreational activity? Concurrent with the evaluation of the three construction approaches, the Project continued efforts to plan a comprehensive transportation management program focused on mitigation of full or partial closure of the SR 99 corridor. This paper focuses on that effort.

TRANSPORTATION PLANNING FOR CONSTRUCTION MANAGEMENT

Whichever alternative is selected, replacing the Alaskan Way Viaduct will be a major undertaking that will involve years of construction. The project area is constrained by natural features and a dense built environment, and the replacement facility will be constructed in—and adjacent to—the same space that is occupied by the existing Alaskan Way Viaduct facility. Therefore, lane closures, ramp closures, and even full closures of SR 99 will be needed to facilitate construction of a replacement corridor. The construction effort will also affect nearby roadways such as surface Alaskan Way, which provides access to the Colman Dock Ferry Terminal and freight haulers who move in and out of the Port of Seattle terminal facilities along the waterfront.

During construction of a new road and associated structures, for either a Tunnel or Elevated Structure alternative, ramp and lane closures would reduce the amount of traffic that the corridor could accommodate, diverting 50 percent or more of the traffic out of the corridor. Diversion of trips from SR 99 during construction will create strain on other roads and transit systems, and many travelers will be faced with longer trips, increased

congestion on other routes, and reduced access to the waterfront. Periods of full corridor closure would be necessary to accommodate some aspects of the construction. During full closures, traffic would be detoured to parallel city streets and I-5, which are congested today and have limited ability to absorb additional vehicle trips.

Construction Period Traffic Impact Analysis

The Project team investigated the transportation impacts from a fully closed corridor for the six-lane Tunnel Alternative. This scenario would likely produce the most severe strain on the transportation system. For comparison purposes, the Elevated Structure alternative assumed a "partially open" scenario during the most intensive periods of construction. Partially open means that two lanes of traffic in each direction on SR 99 would be provided during peak travel times during the construction period.

Travel demand and traffic operations analyses were conducted to evaluate changes in traffic on both the freeway and arterial street system. The Project team used a travel demand model based on the regional Puget Sound Regional Council travel demand model and configured for the Project. Operations analyses for freeway and expressway segments were performed using the CORSIM model. A comprehensive downtown street intersection model using SYNCHRO was also used in the analysis.

As reflected in the analysis, during the fully closed Tunnel scenario, trips that normally use the Alaskan Way Viaduct did some combination of the following:

- Shifted to other routes.
- Changed modes.
- Chose new destinations.

Based on the results of the analysis, alternate routes (i.e., I-5, parallel arterial streets), will require mitigation strategies that foster changes in mode, time of travel, destination, and trip frequency. Demand modeling projects that over 60,000 daily vehicle trips shifted to parallel routes when the SR 99 corridor is closed for construction. Traffic analysis also showed that downtown parallel routes have some ability to absorb some of the traffic diversion, especially if parking restrictions are in place to add travel lanes. Changes in time of travel will be needed to shift some trips to off-peak or shoulder periods. Transit speed and reliability could be improved by transit signal priority, queue jump lanes and HOV and transit-only lanes, which help induce mode shift.

Developing Management Strategies for Construction Impacts

The Project team established a goal and set of objectives to help provide a framework to develop traffic mitigation strategies to prepare for project construction. The goal is to manage traffic to keep people and goods moving to and through downtown Seattle during the construction of the Alaskan Way Viaduct and Seawall Replacement Project. Several objectives were identified to help reach this goal:

- encourage more people to take transit;
- maintain transit speed and reliability;
- increase capacity on city streets;
- improve traffic operations on downtown streets and highways;
- give travelers more information before and during trips;
- give people more choices and incentives to driving alone;
- provide alternate truck routes and travel information; and
- prioritize corridors for police, fire and ambulance vehicles.

Taking the results of the analysis and framework established in the Project's goal and objectives for the construction transportation management process, the following outcomes were developed.

Encourage more people to take transit.

Parallel streets and I-5 have little additional capacity to accommodate vehicle trips displaced from SR 99, particularly during the morning and evening commutes. Regardless of the mitigation program that the Project establishes, congestion on these parallel routes will limit the ability to carry additional vehicles. Therefore, the Project must emphasize expanded use of more efficient modes, such as transit, carpooling and vanpooling.

Maintain transit speed and reliability.

Traffic diversion to routes parallel to SR 99 will increase congestion throughout the system. Strategies coming out of the transportation planning process should help to preserve transit mobility despite prevalent congestion on the street network.

Increase capacity on city streets.

Street expansion to accommodate additional traffic is generally not possible within the study area, which is densely developed. However, by prohibiting parking and loading during the peak periods (or all day in some cases) on heavily traveled corridors, additional lane segments can be provided through the downtown area. These lane segments can be allocated to general-purpose use, or in some cases reserved for specific uses such as transit.

Improve traffic operations on downtown streets and highways.

Strategies should be identified to help operate the overall transportation network more efficiently. Optimally, re-timing traffic signals and restricting some movements to improve traffic flow on downtown streets, and improved monitoring of the freeway network and possibly some low cost operational improvements on I-5 mainline and Express Lanes are among the strategies that can help improve traffic operations relative to unmitigated conditions.

Give travelers more information before and during trips.

To help travelers more easily make good travel choices, the planning process should identify comprehensive enhancements to the region's traveler information systems, with a focus on the greater downtown Seattle area.

Give people more choices and incentives to driving alone

Reducing the total travel demand will be critical since roadway and transit service capacities are limited. Trip reduction strategies can both reduce the amount of traffic diverted from SR 99, and also reduce some of the existing traffic on alternate routes to make room for diverted trips.

Provide alternate truck routes and travel information.

The transportation planning process for construction should identify potential alternate routes for the 4,000 daily truck trips. These options will need to be refined throughout the project development process based on construction phasing and staging. Further, strategies should be identified to improve the quality and accessibility of traveler information, specifically geared to freight haulers.

Prioritize corridors for police, fire and ambulance vehicles.

The planning process should pay particular attention to corridors that are most frequently used by emergency responders, and also considers how other recommended strategies can be best employed to aide emergency responders.

Pulling It Together

Work on developing traffic mitigation strategies began from the early stages of the project. Many of these strategies were already included in regional and local transportation plans or were applied successfully in other large corridor construction projects. The Project team identified 13 key focus areas to help in the categorization of candidate traffic mitigation strategies. These focus areas are:

- Transit Strategies—Service Improvements
- Transit Strategies—Speed and Reliability
- Traffic Operations (Freeway and Arterial)
- Travel Demand Management
- Traveler Information
- Freight
- Emergency Services
- Waterfront Access
- Ferry Access
- Parking
- Pedestrians and Bicyclists

- Special Events
- Construction Site Access

Well over 150 strategies were identified, though strategies that addressed the top seven categories above were considered the most crucial for addressing the majority of traffic impacts from project construction. The following summarizes the strategies being considered as traffic mitigation for construction.

Transit Strategies—Service Improvements

- Increased service hours for routes slowed down by traffic diversion and routes that serve neighborhoods that use SR 99 such as West Seattle, Ballard/Queen Anne, and North Seattle.
- Additional coaches to provide additional service.
- Expanded use of the Elliott Bay Water Taxi.

Transit Strategies—Speed and Reliability

- Transit-only lanes on selected streets.
- Business and transit access (BAT) or transit/HOV only lanes on city streets.
- Transit signal priority at critical intersections.

Traffic Operations (Freeway and Arterial)

- Expanded on-street parking restrictions.
- Modifications of traffic signals and intersection control.
- I-5 freeway lane use and ramp operations changes.
- Rechannelization of streets to facilitate improved operations.
- Expanded network of cameras for detection and monitoring of traffic incidents and general operations.
- Enhancements to traffic management centers.

Travel Demand Management

- Expansion of employer subsidized transit passes.
- Expanded carpool and vanpool programs.
- Marketing to support demand management programs and services.
- Neighborhood-based efforts to encourage travel alternatives and help with trip planning.
- Outreach to employers in affected areas.
- Promotion of alternative work hours and telecommuting.

Traveler Information

- Project specific construction information website.

- Expansion of WSDOT FLOW map (http://www.wsdot.wa.gov/traffic/seattle/) to include coverage of additional Seattle arterials.
- Updated 511 traveler information phone system.
- Traffic advisory radio.
- Freeway and arterial variable message signs.
- Next bus arrival sign monitors.
- Stadium and special event traffic management plan updates.

Freight

- Designate alternate freight routes through central business district.
- Freight access and mobility improvements.
- Re-orient delivery practices.
- Provide real-time freight route and congestion information.
- Expanded WSDOT FLOW map and new SDOT arterial FLOW map to include freight routes, including alternate routes.
- Modification of Seattle commercial vehicle loading zone program elements.
- Freight community speaker's bureau.

Emergency Services

- Expansion of the downtown traffic signal pre-emption network for major fire and medic unit travel corridors.
- Additional staff at local fire stations to maintain incident response times.
- Expansion of traffic police and parking enforcement in downtown and stadium areas during peak travel periods.
- Expansion of traffic incident management system upgrades, including enhanced detection, monitoring and response services, and develop a utility services access plan for emergency conditions.

Waterfront Access

- Maintenance of east-west pedestrian routes to/from the waterfront.
- Connections between Colman Dock ferry terminal and Seattle Aquarium.
- Relocation of loading zones for deliveries and maintain access for waterfront deliveries and pickups.
- Provision of short-term parking (off-street), especially serving waterfront piers.
- Shuttle service to serve central and north waterfront.
- Ensure seasonal access to cruise terminal at Pier 66 for passengers and deliveries.

Ferry Access

- Provision of ferry related traveler information.
- Maintain pedestrian and bicycle access to Colman Dock ferry terminal.
- Maintain auto access to Colman Dock.

Parking

- Programs and projects to encourage shift from long-term parking to short-term parking.
- Implement electronic parking guidance system.
- Develop a Seattle parking guidance website.
- Develop a downtown parking marketing program.
- Create a parking brokerage.
- Require a construction worker parking management plan for the project's General Contractor.

Pedestrians and Bicyclists

- Re-route and maintain bicycle lanes and access where impacted.
- Provide for safe bicycle and transit operations on 3rd Avenue.
- Maintain safe and sufficient pedestrian corridors connecting Colman Dock with downtown streets.
- Implement wayfinding and signage systems for 1st Avenue, side street corridors and regional transportation hubs.
- Target marketing and instructional programs to encourage safe bicycle commuting in downtown.
- Enhance pedestrian safety and traffic operations along waterfront through application of the best safety practices available.

Special Events

- Tailoring special event traffic management plans to consider construction congestion, including transit priority treatments for regular buses and special shuttle services.
- Increase special shuttle services providing access to and from events.
- Implement event day parking restrictions.
- Add additional parking and traffic enforcement at special events.
- Provide a website and other outreach services targeted to special event traffic.

Construction Site Access

- Construction worker job access study to determine optimum access options.
- Study feasibility of allowing use of construction haul routes for construction worker access.
- Implement ITS for work zones, including variable speed limits.
- Provide on-site parking for construction workers.
- Provide direct marketing of alternative travel options to contractors and their workers.

NEXT STEPS

In March 2007, an advisory ballot was put forward for the voters of the City of Seattle. The vote asked for their preference of a modified Tunnel alternative and the Elevated Structure alternative. By substantial margins, the voters said no to both options. Based on the results of the election, the Washington State Governor, City of Seattle Mayor and King County Executive decided to move forward with improvements in the north and south sections of the Project while a collaborative process was conducted for the central waterfront section.

While the lead agencies work through the process for the central waterfront, the Project will begin work on the north and south improvements. Work will begin on the final design for these improvements, which will replace or fix approximately 55 percent of the seismically vulnerable viaduct and improve public safety and mobility. These projects are defined as follows:

- Temporarily stabilize the Alaskan Way Viaduct's foundations near the Colman Dock Ferry Terminal.
- Upgrade fire suppression, lighting, emergency egress, and ventilation systems in the Battery Street Tunnel.
- Stabilize the Alaskan Way Viaduct to withstand earthquakes from Lenora Street to Battery Street Tunnel.
- Build new SR 99 interchange in the stadium area (Safeco Field and Qwest Field).
- Prepare for construction with transit enhancements and other improvements to help manage traffic on downtown Seattle streets and provide access to waterfront businesses.

Work on identifying construction traffic mitigation strategies for these early implementation projects is underway and it's likely that a number of strategies that were identified for the work in development of the Tunnel and Elevated Structure alternatives will be equally applicable to the early implementation projects. The project lead agencies along with partners from King County, Port of Seattle and others will work to identify the most appropriate mitigation projects and programs for these early implementation projects.

CONCLUSIONS

The construction transportation management planning process will be an on-going process well into the future. Much of the work to develop transportation management strategies for early implementation projects and the central waterfront alternative has been built on a solid foundation of traffic mitigation projects and programs that have been identified to date. Many of these strategies have been presented to the public and stakeholders at meetings and the Project's website. The most promising strategies assembled to date have received generally positive feedback from lead agency staff, stakeholders, and the public.

Mitigation for traffic impacts has brought the State, City, transit agencies, freight, and other interests to the table to identify possible multi-modal solutions to construction traffic impacts. Many solutions that have been identified could provide permanent investments in enhancements to the transportation infrastructure that may not have been possible without the project. The Project is readily aware that investments in construction management strategies could enhance the operations of the downtown transportation system well after the project is completed.

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