CITY OF TACOMA

East 11th Street Bridge Corridor Study

FINAL REPORT

KPFF CONSULTING ENGINEERS / 11.15.2019

November 15, 2019

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Table of Contents

List of Figures

List of Tables

Appendices

Appendix A – Public Comments
Appendix B –Traffic Memos
Appendix C – Cost Estimates
Appendix D – As-Builts
Appendix E – Previous Studies

- *Final Tideflats Emergency Response Plan*, Fehr & Peers, March 2016
- *5098 11th Street Bridge Floor Beam Review*, Sargent Engineers, Inc., April 13, 2015
- *Tideflats Area Transportation Study (TATS) Final Report*, Fehr & Peers, June 2011
- *Tacoma Tideflats Circulation Study, Executive Summary*, November 1996

Executive Summary

The East 11th Street Bridge Corridor Study was prepared to provide the City of Tacoma (City) with information to determine whether the 630-foot-long bridge over the Puyallup River and adjacent 2,100-foot-long viaduct should be replaced, rehabilitated, or demolished without replacement (see Figure 1). The current structures were built in 1930 to support a four-lane roadway, with sidewalls on both sides. The bridge also supports a 16-inch water main and a large ductbank. Due to deterioration, the bridge and viaduct were closed to all traffic on July 18, 2014. At that time, the bridge carried approximately 2,000 cars a day and provided a primary emergency access and evacuation route to the Tideflats.

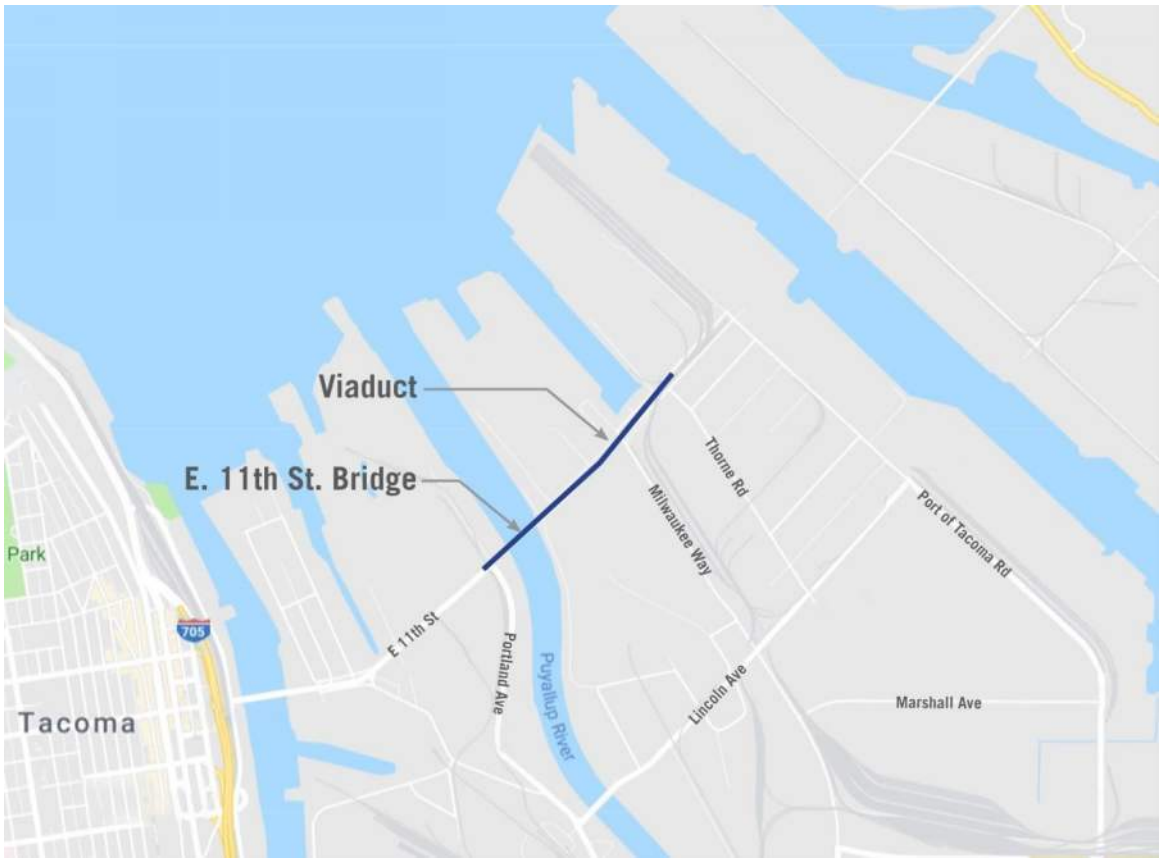


Figure 1: Location Map (Courtesy of Google Maps)

This study was completed before the current Tideflats subarea planning process started in earnest, and is focused on the corridor itself. It is not part of a larger more comprehensive analysis of the transportation and emergency access needs of the Tideflats. This report documents the process and presents the results of an analysis that evaluated a range of alternatives with the goal of recommending a solution and next steps.

Initially, a long list of alternatives was qualitatively screened to identify those that provide the most benefit. The list included replacement and/or rehabilitation of the bridge and viaduct, rehabilitation of the existing structures for limited use, replacement of the viaduct with an at-grade roadway, complete removal of existing structures, and consideration of a new bridge upstream.

The screening criteria considered traffic operations, emergency and evacuation response times, freight mobility and goods movement, Port of Tacoma terminal operations, utility service, and safety for non-motorized users.

Based on the bridge and viaduct's structural type, it is not practical to rehabilitate them for limited use. Therefore, alternatives that would result in one travel lane for emergency vehicles, or one lane of traffic, were dropped from consideration. The most practical rehabilitation solution is to remove the cantilevered sidewalks and reconfigure the remaining 43 feet to accommodate two travel lanes and a 12-foot multipurpose path for pedestrians and bicyclists. A two-lane roadway has sufficient capacity to meet the projected future traffic volumes; however, to provide reliable emergency response and increased evacuation capacity as well as accommodate future growth, a three-lane roadway was considered for the replacement alternatives. The evaluation of the Long List of Alternatives is shown in Figure 2.

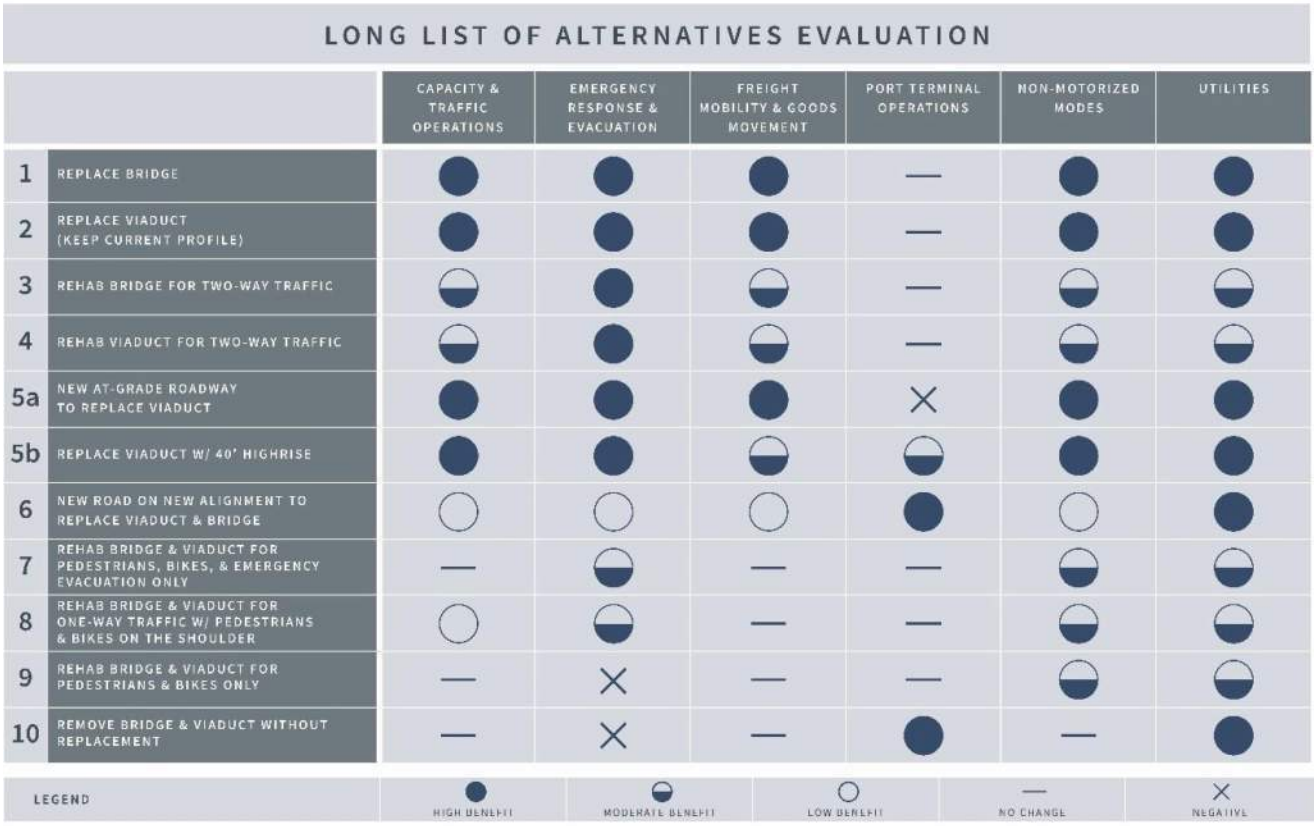


Figure 2: Long List of Alternatives

There is broad support to open the roadway based on a stakeholder survey and public open house meeting comments. Currently, the East 11th Street right-of-way bisects the Port of Tacoma and their partner agency, the Northwest Seaport Alliance (NWSA) West Sitcum Terminal. Demolishing the viaduct and vacating the right-of-way would provide maximum flexibility for NWSA to reconfigure the terminal.

Various alternatives were considered to replace the bridge and viaduct in a different alignment, including a loop ramp from the north end of the existing bridge and construction of a new bridge upstream. Due to the configuration of the existing streets, all of these options would direct traffic to and from the already congested Lincoln Street corridor and would increase response times for emergency vehicles and evacuation when compared to the East 11th Street corridor. These alternatives did not make the shortlist.

A high-level screening of the long list resulted in three alternatives that were evaluated in more detail:

A. Replace the bridge and viaduct with a three-lane roadway, sidewalks, and bike lanes ($120 million).

B. Rehabilitate the bridge and viaduct with a two-lane roadway and multipurpose path ($65 million).

C. Rehabilitate the bridge and replace the viaduct with a 2/3-lane roadway with multipurpose path and a 40-foot high-rise under the viaduct ($85 million).

During analysis of the three shortlisted alternatives, a fourth alternative was added: Alternative D. This alternative includes replacing the bridge and viaduct with a three-lane roadway and multipurpose path, including a 40-foot high-rise on the viaduct. It would cost $100 million, and it has the advantage of improving terminal circulation as well as creating an at-grade intersection with Milwaukee Way. Figure 3 provides a comparison of the benefits for each alternative.

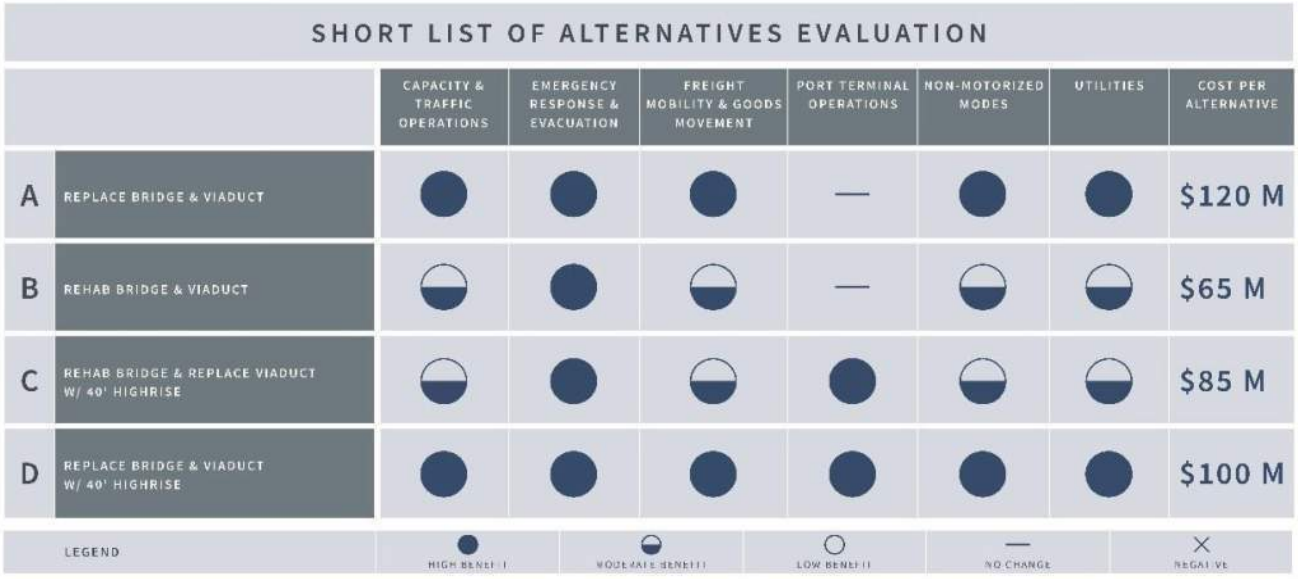


Figure 3: Short List of Alternatives

New structures will have lower maintenance costs, a longer useful life, and more predictable construction costs when compared to a rehabilitated structure. Rehabilitating the bridge and viaduct is feasible and could be $55 million cheaper than a full replacement; however, it would result in a two-lane facility, provides no improvement for terminal circulation, would have less evacuation capacity, and longer emergency response times during congestion periods. There is also more risk with the construction costs for rehabilitation when compared to new construction.

Therefore, demolishing the structures and replacing them with a new three-lane structure that includes a multipurpose path and 40-foot high-rise under the new viaduct (Alternative D) is the recommended solution. When compared to a rehabilitated structure, it will result in a more reliable 100-year structure with lower maintenance costs, increased emergency access and evacuation capacity, new utilities, a climbing lane for enhanced freight movements, and the ability to improve terminal surface movements.

This high-level study was based on existing information and current land use patterns and is focused on the East 11th Street corridor. This recommendation and the information developed in this report should be evaluated as part of the Tideflats Subarea Plan to confirm consistency with the overall goals and objectives for the area, including the Port of Tacoma's Strategic Plan, and Northwest Seaport Alliance's (NWSA) Gateway Masterplan efforts. Any additional structural analysis and traffic modeling should be based on the findings and recommendations of this study.

1. Introduction

The objective of the East 11th Street Bridge Corridor Study was to conduct a high-level study based on previous studies and readily available information to determine whether the East 11th Street Bridge over the Puyallup River and adjacent viaduct should be replaced, repaired, relocated, or demolished without replacement. The East 11th Street Bridge and viaduct are located within the existing East 11th Street right-of-way between Portland Avenue and the Port of Tacoma (Port) office building. See Figure 4.

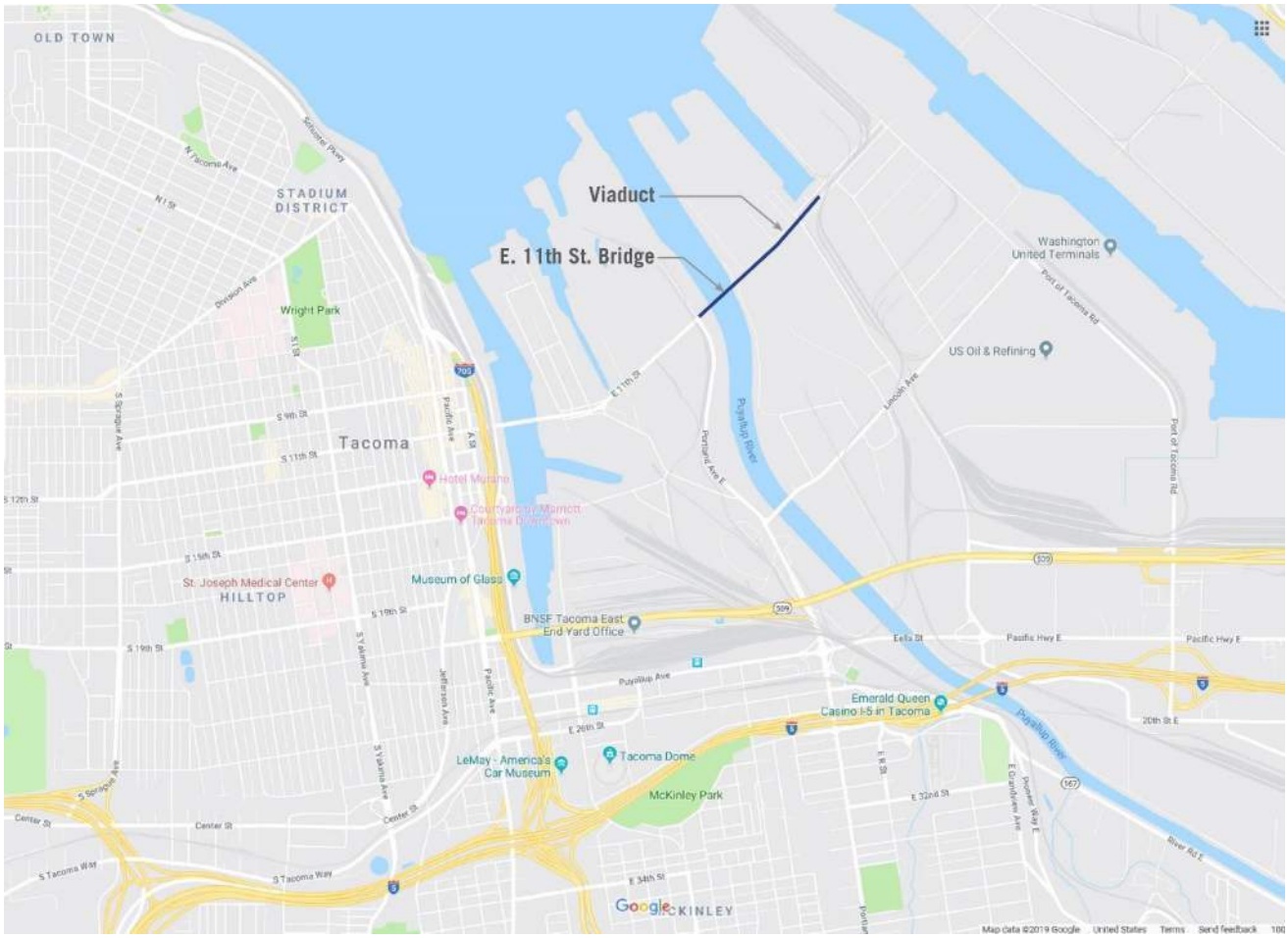


Figure 4: Project Location Map

To determine which solution best meets the community's goals and objectives for the corridor, the study considered:

1. The value of the bridge in providing an evacuation route if improvements are made to the bridge.
2. Improving emergency response based on information developed for the Tacoma Fire Department's *Tideflats Emergency Response Plan*, March 2016.
3. Alleviating recurring and non-recurring congestion.
4. Reducing freight travel times.
5. Improving non-motorized mobility.
6. Evaluating the current location of the bridge or a different location that would improve the functionality of the river crossing.
7. Assessing whether both or either the truss or viaduct section can be rehabilitated instead of replaced.
8. Evaluating whether the viaduct section can be eliminated and East 11th Street realigned to eliminate this barrier to NWSA's West Sitcum Terminal.
9. Determining whether utilities, environmental regulations, Tribal interests, or other issues would place financial or other impacts on the removal or replacement of this bridge system.
10. Assessing impacts to the Tacoma Water Department's existing water main on the bridge for each alternative.

The following previous studies were utilized to determine the feasibility and cost to rehabilitate the existing structures and develop concept designs for the replacement structures.

PREVIOUS STUDIES

The following studies were reviewed at the beginning of the process:

- *Tideflats Emergency Response Plan*, Fehr & Peers, March 2016
- *11th Street Bridge Floor Beam Review*, Sargent Engineers, April 2015
- *Gusset Plate Load Rating*, Sargent Engineers, June 2014
- *Underwater Inspection*, Echelon Engineering, September 2013
- *Routine Bridge Inspection*, City of Tacoma, June 2013
- *Tideflats Area Transportation Study (TATS)*, Fehr & Peers, June 2011
- *11th Street Bridge Rehabilitation Study*, KPFF Consulting Engineers, June 2007
- *Tacoma Tideflats Circulation Study, Executive Summary,* November 1996
- *Load Rating of Truss and Approach Girders*
- *Repair Recommendations*

Any additional structural analysis and traffic modeling would be deferred to later stages based on the findings and recommendations of this study. After documenting the existing conditions, previous studies were reviewed, and a long list of 10 alternatives was developed and qualitatively screened to identify the three alternatives that best met the objectives for the corridor. While the concept plans and cost estimates were developed for these three alternatives, a fourth alternative was identified and included in the evaluation prior to selecting the recommended alternative.

An executive stakeholder committee was formed at the onset of the study comprised of representatives from the Northwest Seaport Alliance and City of Tacoma's Fire, Water, and Public Works Departments. This committee met throughout the process to provide input to the consultant team. Public input was provided in the form of a stakeholder survey during evaluation of the long list of alternatives, and again through an Online Open House and Public Open House meeting when the short list of alternatives was being evaluated. Port of Tacoma staff were briefed on the study during evaluation of the short list of alternatives.

2. Existing Conditions

The existing structures were constructed in 1930 and are comprised of two distinct bridge segments, namely the River Span and Viaduct. The River Span "Bridge" is composed of several steel truss spans with steel girder approach spans. The Bridge segment is approximately 630 feet long and spans the Puyallup River. In 1966, the vertical lift towers were removed, converting the main truss portion of the structure from a movable lift to a fixed bridge. The Viaduct is a multi-span steel girder/concrete deck structure that is approximately 2,100 feet long. It connects to the north end of the bridge and ends near the Port of Tacoma administration building. The space under the Viaduct is paved with asphalt and provides parking for vehicles.

Before it was closed on July 18, 2014, the bridge and viaduct carried approximately 2,000 cars per day and provided access to the Tideflats for general purpose traffic, freight, and emergency vehicles and served as an evacuation route for the north end of the General Central Peninsula.

The bridge also supports a 16-inch water main located on the south side of the bridge and a ductbank on the north side. See Figures 5 and 6. The ductbank is comprised of 18 2-inch conduits. There are also Tacoma Power and Light overhead power lines just south of the bridge. See Figure 7. If the bridge is demolished, the water main and ductbank would be relocated to a new utility bridge similar to the one just downstream of the Lincoln Avenue Bridge or they would be undergrounded. This study did not determine which option would be the better solution.

Figure 5: 16-Inch Watermain

Figure 6: Ductbank

Figure 7: Overhead Power Lines

Under the bridge, on the east bank of the river, is a boat ramp providing river access for the Puyallup Tribe. This ramp must remain or be relocated as part of any alternative. See Figure 8. There is also a 10-inch gasoline/diesel pipeline within the right-of-way operated by Targa Sound Terminal (TST). Between Portland Avenue and Milwaukee Way, the pipeline is at a depth of approximately 60 to 65 feet. See Figure 9. The numbers shown in the figures show the depth below ground.

Figure 8: Boat Ramp

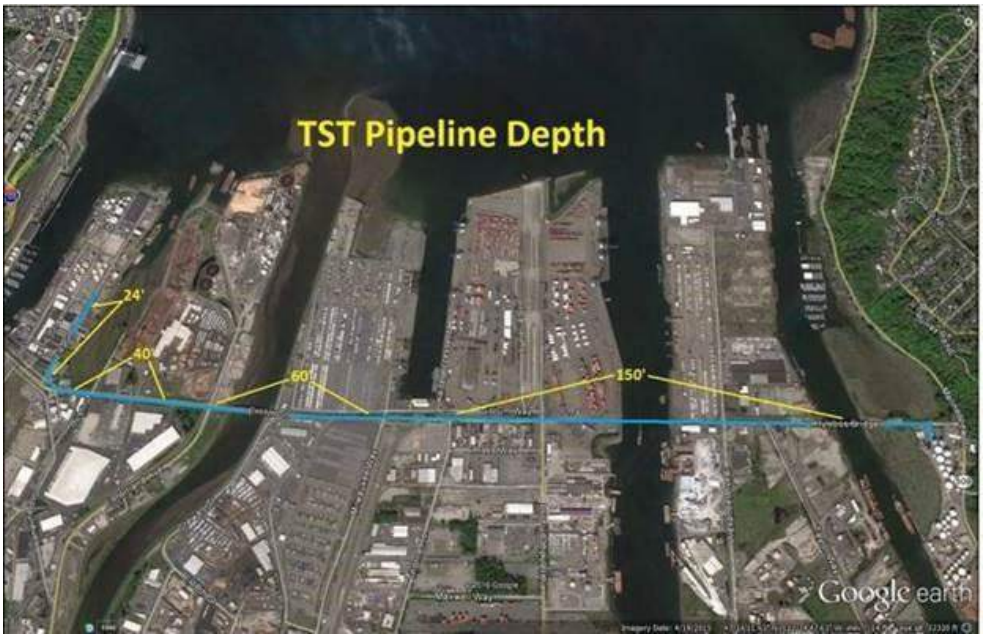


Figure 9: TST 10-inch Gasoline/Diesel Pipeline

3. Evaluation of Alternatives

CRITERIA

The criteria were developed to evaluate how each alternative meets the functional requirements for the corridor. Descriptions for the functional requirements are noted in Table 3 with an explanation for how High Benefit, Moderate Benefit, Low Benefit, No Change, or Negative Benefit are defined. Benefits are compared to the existing closed condition of the corridor.

Table 1: Evaluation Criteria

Functional Requirement	Description
Capacity and Traffic Operations	Based on projected average daily traffic projections, a two-lane roadway will provide an adequate level of service; however, a three-lane facility will provide the flexibility for climbing lanes and additional capacity for unanticipated growth in traffic volumes beyond the year 2020. A one-lane facility would provide a Low Benefit, a two-lane facility would provide a Moderate Benefit, and a three-lane facility would provide High Benefit.
Emergency Response	Opening the corridor for emergency vehicles will provide a benefit for reducing emergency response time. A one-lane facility for exclusive emergency vehicle use would be beneficial; however, it is not a cost-effective solution since it would result in an upgrade to the entire width of the structures that could support two lanes of traffic. A two-lane facility would allow for more reliable response times and a three-lane facility would provide the most reliability, especially during periods of congestion. A one-lane facility would provide a Low Benefit, a two-lane facility would provide a Moderate Benefit, and a three-lane facility would provide a High Benefit.

Freight Mobility and Goods Movement	Opening the corridor for trucks will benefit Freight Mobility and the Movement of Goods. The relative benefit is similar to the capacity and Traffic Operations element. A one-lane facility would provide a Low Benefit, a two-lane facility would provide a Moderate Benefit, and a three-lane facility would provide High Benefit.
Port Terminal Operations	Relocating East 11th Street to a new alignment that does not bisect the West Sitcum Terminal would provide the highest benefit for terminal operations. Replacement with an at-grade roadway would be a negative benefit. Rehabilitating the viaduct would represent a no-change condition, replacement with the same vertical profile with increased spacing would provide a Low Benefit, and replacement of the viaduct with a 40-foot high-rise would provide a Moderate Benefit.
Non-Motorized Modes	A multipurpose path with a fixed barrier between the roadway and the path would create the highest benefit. Bike lanes and sidewalks on both sides would be a Moderate Benefit, and sidewalks either one side or both would be a Low Benefit. A negative benefit would be to have no bike lanes or sidewalks.
Utilities	Replacing the existing 16-inch watermain and duct bank would create the highest benefit. The rehabilitation solutions assume the utility supports would be upgraded, providing Moderate Benefit. A Low Benefit would be provided with improved access assuming nothing is done to the utilities themselves. A negative benefit would result if the structures were demolished and if nothing were done to replace the utilities.
Cost	Planning-level project costs were developed for both the long list and short list of alternatives. See the following section for a description of the Cost Estimating methodology.

Cost-Estimating Methodology

The bridge rehabilitation costs were determined using a unit bid analysis. In addition to the necessary required rehabilitation for safety and gravity loads, costs were also to include for seismic retrofit of the viaduct, truss, and approach spans. For the truss and river approach spans, $1 million was included in the cost estimate to replace the existing truss and girder bearings with seismic isolation bearings. For the viaduct, a seismic retrofit could cost from $20 to $30 million. Additional analysis beyond the scope of this study is required to confirm this cost. For estimating purposes, $25 million is assumed for seismic retrofit of the steel connections and foundations. Detailed costs estimates are included in Appendix C.

The bridge replacement costs were based on square-foot costs. The river spans used an estimated construction cost of $600 per square foot. The viaduct spans used an estimated construction cost of $300 per square foot. The river spans will be significantly more expensive due to longer span lengths and added costs to construct the bridge over water. The bridge replacement costs also included the cost to remove the existing structures.

Construction costs for the civil/roadway elements of the improvements were based on typical unit bid prices.

The total project costs included the following additional costs, which are a percentage of the base construction cost:

- Design contingency – 30%
- Engineering (PS&E) – 10%
- Construction Engineering – 5%
- City of Tacoma Management and Permits – 5%

LONG LIST OF ALTERNATIVES

The initial long list of alternatives considered solutions that included rehabilitating the structures for a range of uses, replacement, demolition, and demolition with construction of a new bridge in a different location. The following 10 alternatives were evaluated:

Alternative 1: Replace bridge structure over the Puyallup River.

East 11th Street is classified as a Principal Arterial and is part of the primary street network. It is also a Primary Street in the Freight Priority Network, and although it is not identified in the Transportation Master Plan as a designated Heavy Haul Route, for the purposes of this study it is considered a Heavy Haul Route. Standard lane widths are used for the travel lanes, bike lanes, sidewalks, and multipurpose paths.

To determine the number of lanes for a replacement bridge and viaduct, the Tacoma Transportation Master Plan (TMP) travel demand model, which incorporates land use forecasts consistent with the Puget Sound Regional Council Land Use Targets, was reviewed. The base year in the model is 2012, and the forecast year is 2040. The model network assumes an existing configuration of the bridge (four-lane profile) in addition to planned projects, such as the SR167 extension and the Port of Tacoma Road interchange improvement project.

As shown in Table 1, traffic volumes on the East 11th Street Bridge would grow by over 90 percent, and there would be approximately 550 vehicles in the westbound direction and 220 vehicles in the eastbound direction during the peak hour in 2040. The total 770 PM peak-hour vehicles and estimated 7,700 annual daily traffic (ADT) volumes in 2040 could be accommodated with a two-lane profile on the bridge, with an optional third lane. A two-lane profile capacity could handle up to approximately 15,000 ADT, while a three-lane profile could handle up to 20,000 ADT, depending on how volumes would distribute by direction and time period. See Appendix A for additional traffic information.

Table 2: Travel Demand Model Traffic Volumes on East 11th Street Bridge

	Estimated PM Peak Hour			Estimated Annual Daily Traffic (ADT)		
Model Year	**EB**	**WB**	**Total**	**EB**	**WB**	**Total**
2012	80	320	400	800	3,200	4,000
2040	220	550	770	2,200	5,500	7,700

While a third lane is not needed based on the traffic volume forecasts, an additional lane could provide additional flexibility. The third lane could be used for one or more of the following purposes:

- Climbing lane for trucks if a high-span bridge is selected.
- Additional capacity for emergency access or evacuation events.
- Additional capacity in case traffic volumes are higher than forecasts, or to handle higher volume peak periods.

This portion of East 11th Street is not part of the Bicycle Priority Network; however, it is the City's policy to consider bike lanes in the design or reconstruction of principal arterials. Therefore, 6-foot bike lanes, 7-foot sidewalks, or a 12-foot multipurpose trail were considered in each alternative

The existing 16-inch water main and ductbank will need to be replaced as part of any replacement alternative, and the overhead power lines need to be maintained. The foundations for any replacement bridge will need to avoid impacting the TST 10-inch pipeline. It was not within the scope of this study to determine whether the water main and ductbank should be undergrounded or reinstalled on a replacement bridge.

Assumptions: A temporary bridge may be required to maintain water service and provide construction access. Owners of the ductbank will relocate/or drill under the river at their own expense. For the purposes of this study, the typical bridge cross-section was assumed to include three 12-foot-wide travel lanes, two 6-foot-wide bike lanes, and two 7-foot-wide sidewalks.

River Bridge Replacement Options

The replacement structure type for the river spans is dependent on required vertical clearance and allowable in-water pier locations. If the existing vertical clearance must be maintained, a steel truss main span is likely to be the only feasible option that will maintain the 7-foot structure depth below the deck and match into the southwest approach roadway grades at Portland Avenue. The proposed layout would have a 300-foot main span steel truss and 155-foot approach spans, which could be steel or concrete girders. See Figure 10.

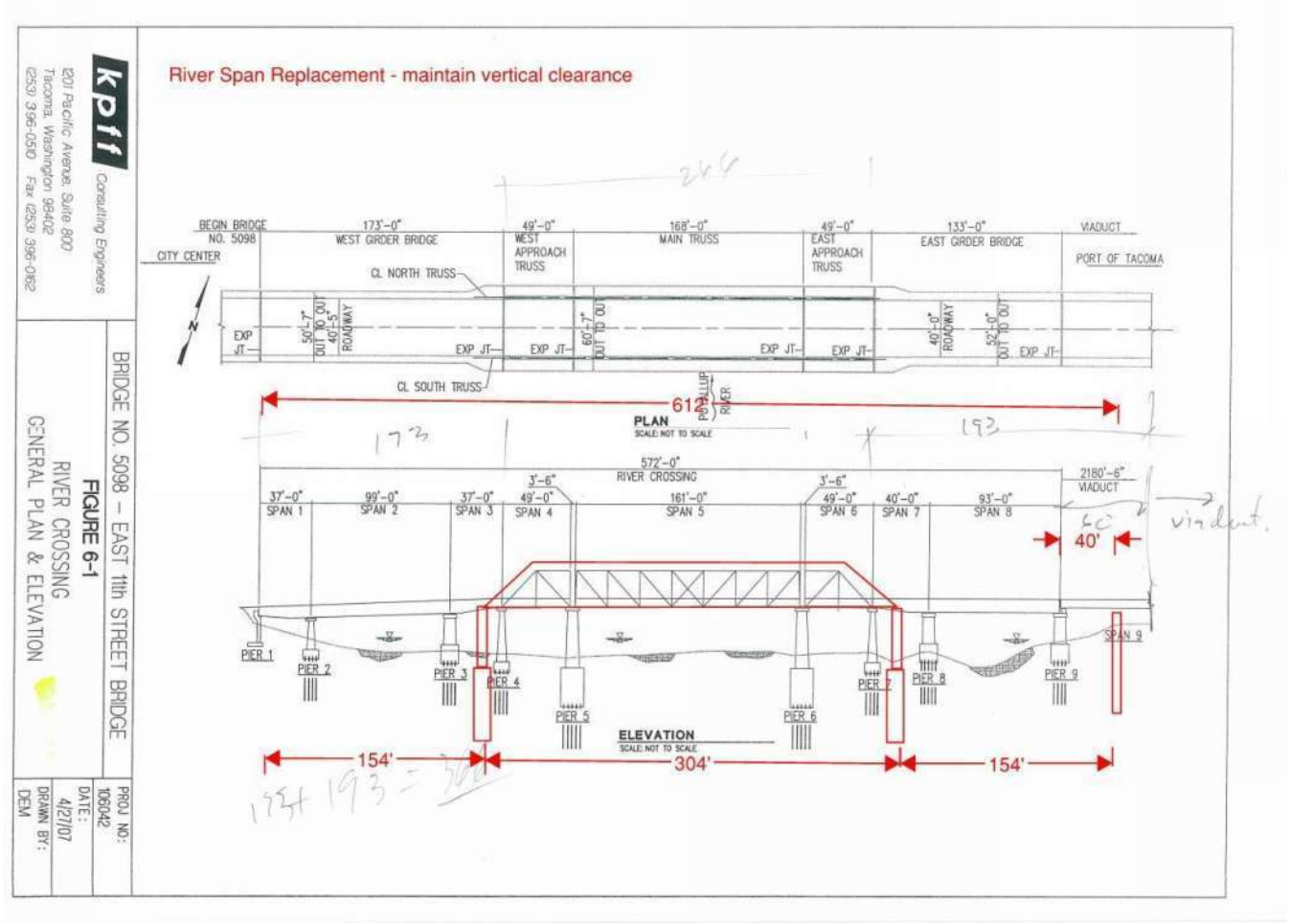


Figure 10: Steel Truss Bridge Replacement Option

If the coast guard approves a lower waterway vertical clearance, the structure depth below the roadway grade could be increased, which would allow for other feasible superstructure types. Potential options include continuous steel plate or box girders and post-tensioned concrete box girders. See Figure 11.

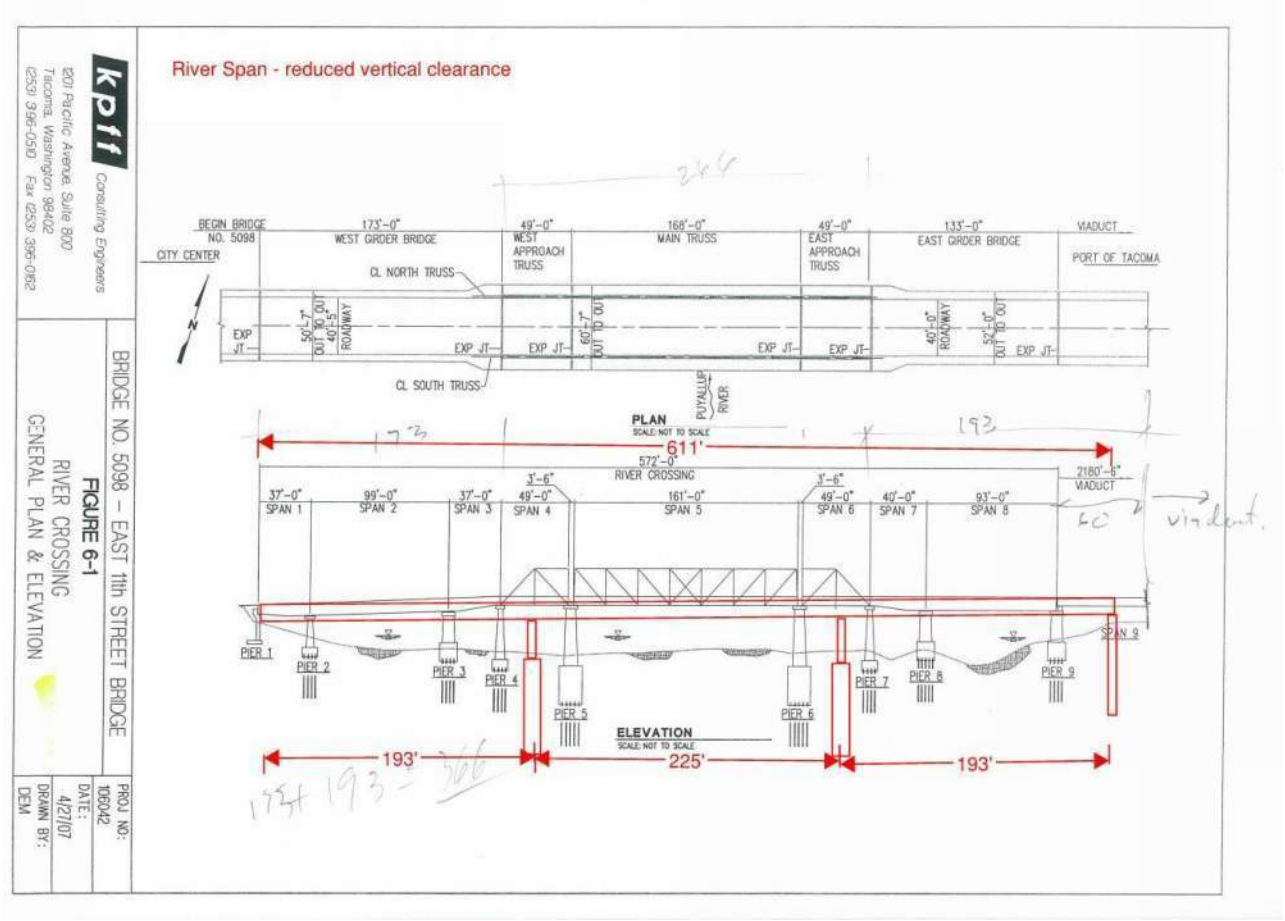


Figure 11: Concrete Girder Bridge Replacement Option

A cable-stayed bridge is another feasible alternative to cross the river; however, replacement costs would be significantly higher than the cost per square foot included in the cost estimate in Appendix C.

For this study, the typical cross section for the viaduct replacement would be the same as the river bridge: three 12-foot wide travel lanes, two 6-foot wide bike lanes, and two 7-foot-wide sidewalks.

Viaduct replacement spans are anticipated to be prestressed concrete girders. Spans lengths could range from 150 feet to 200 feet. Shipping length and weight typically limits the length of girder fabrication; however, the viaduct is only a few blocks from Concrete Tech (girder fabricator), which could allow a longer prestressed girder to be fabricated in the shop. The viaduct span length will need to be balanced with the size and cost of the substructure. Drilled shaft foundations are anticipated due poor soils in this area of Tacoma, including the potential for liquefaction and lateral spreading. The Port has expressed an interest in a 40-foot vertical clearance undercrossing (horizontal clearance unknown), as shown in Alternatives C and D. At this location, the depth of the superstructure would likely be minimized to reduce the slope of roadway vertical grade.

Alternative 3: Rehabilitate existing bridge structure over the Puyallup River.

The rehabilitation alternative considered removal of the existing cantilevered sidewalks and a reconfiguration of the remaining 43-foot width within the inside of the existing truss to accommodate two 12-foot travel lanes with a 3-foot shoulder on one side and a 12-foot multipurpose path on the other. The existing utilities will be maintained.

This study did not include any additional structural analysis. The results of the load ratings from the 2007 11th Street Bridge Rehabilitation Study and the 2014 Gusset Plate Load Rating were reviewed to determine which members of the truss and approach girders would need replacement or strengthening. The replacement bridge superstructure types are based on economical design spans from Chapter 2 of the WSDOT BDM.

Anticipated bridge elements requiring rehabilitation include the following:

Steel Truss:

1. Bottom chord gusset plates strengthening or replacement
2. Steel stringer replacement
3. Steel grid deck replacement
4. Bearing replacement
5. Expansion joint replacement
6. Paint all steel elements
7. Concrete pier spall repairs
8. Scour repair at piers
9. Barrier/railing replacement

River Approach Spans:

1. Exterior steel girder strengthening
2. Deck and sidewalk replacement
3. Bearing replacement
4. Barrier/railing replacement
5. Expansion joint replacement
6. Paint all steel elements
7. Concrete pier spall repairs

At the City of Tacoma's direction, the rehabilitated structures could be designed to a live load criteria that is different than that of the HL-93 truck. However, due to the intended use of the bridge as a freight corridor and proximity to the Port of Tacoma, the City will likely want the rehabilitated structure designed to carry the Heavy Haul vehicle, which, depending on the bridge member, would have similar demands to the HL-93 truck. Rehabilitated and replacement structures shall be based on the following criteria:

- AASHTO LRFD Bridge Design Specifications
- AASHTO Guide Specifications for LRFD Seismic Bridge Design (new structures)
- WSDOT Bridge Design Manual
- FHWA Seismic Retrofitting Manual for Highway Structures (rehab structures)

Alternative 4: Rehabilitate existing viaduct structure.

The rehabilitation alternative considered removing the existing cantilevered sidewalks and reconfiguring the remaining 44-foot width of structure to accommodate the same roadway cross-section as the rehabilitated bridge: two 12-foot travel lanes with a 3-foot shoulder on one side, and a 12-foot multipurpose path on the other. Anticipated viaduct elements requiring rehabilitation include the following:

1. Deck repair and new overlay
2. Vehicle Barrier installation
3. Pedestrian railing replacement
4. Paint all steel elements
5. Concrete deck soffit repairs
6. Wing wall and abutment repairs
7. Expansion joint replacement

Alternative 5: New at-grade roadway on East 11th Street to replace the viaduct structure.

Alternative 5 considered replacing the viaduct with an at-grade roadway, which could be realigned or relocated at a later date, if required to meet changing terminal needs. See Figure 12. The NWSA does not support this option, and in response to their desire to improve terminal circulation, Alternative 5B was developed for replacing the Viaduct with a new structure that includes a 40-foot-high clear high-rise. See Figure 13.

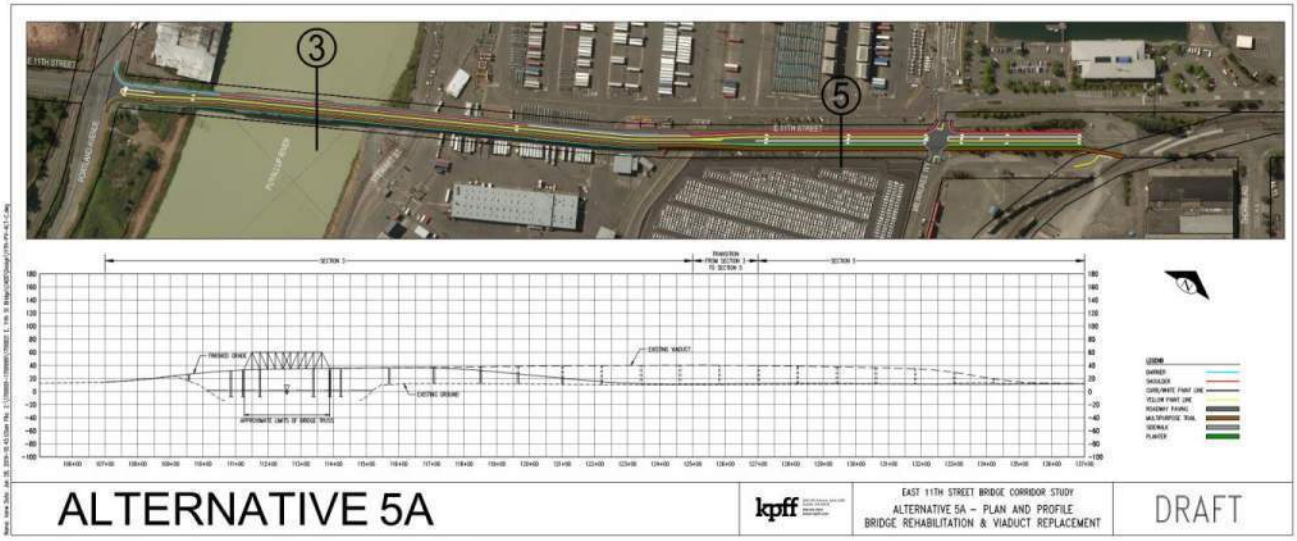


Figure 12: At-Grade Viaduct Replacement

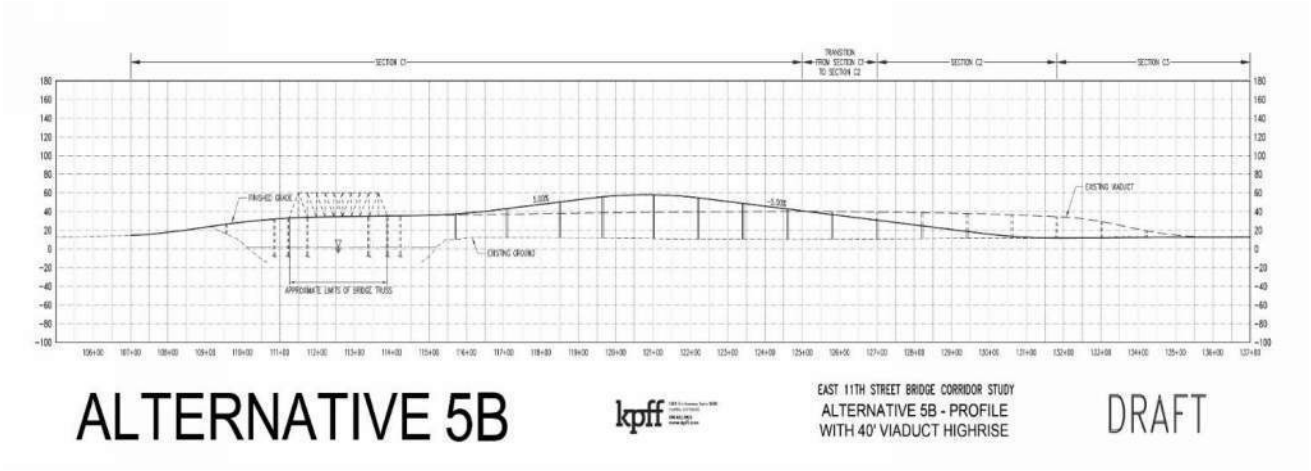


Figure 13: Alternative 5B Viaduct with High-Rise

Alternative 6: New bridge and roadway on a new alignment upstream of the existing bridge. The current East 11th Street divides the West Sitcum Terminal and acts as a barrier for commerce. Demolition of the viaduct would allow the NWSA to reconfigure the existing terminal to better serve existing and future tenant needs. This alternative evaluated two locations upstream of the existing bridge, including the creation of a one-way couplet with the Lincoln Avenue Bridge. See Figures 14 and 15.

Figure 14: New Bridge Locations

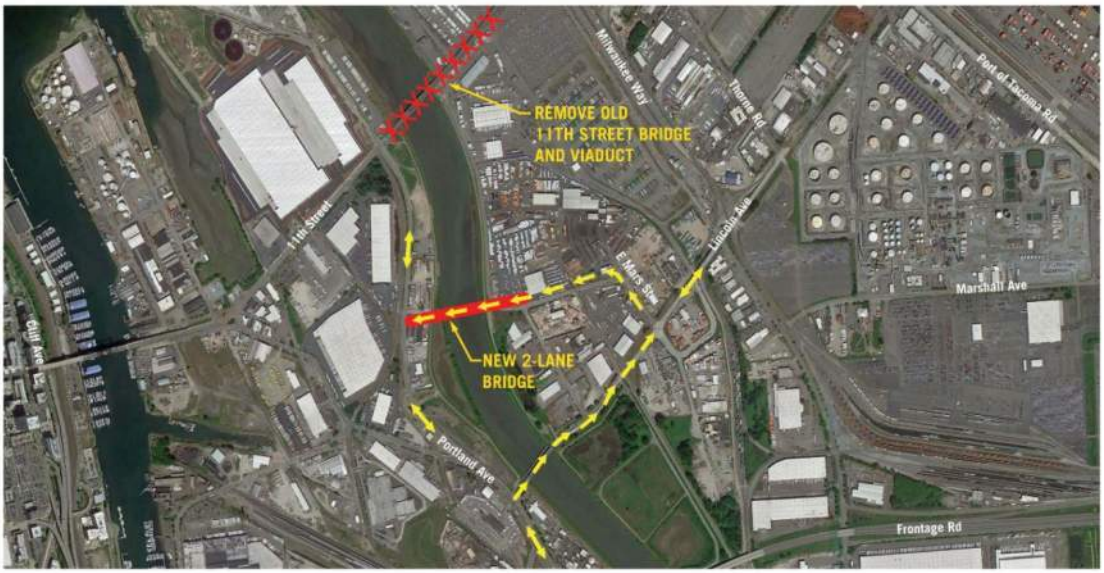


Figure 15: New Bridge with One-Way Couplet

New Bridge Alignment No. 1

The new bridge would be 700 feet upstream from the East 11th Street Bridge. It would form a tee-intersection with Portland Avenue and terminate at the access road serving Horizon Lines. There would likely be impacts to the undeveloped areas between Portland Avenue and the river, and it would impact the existing terminal on Stewart Street.

New Bridge Alignment No. 2

The new bridge would be 2,000 feet upstream from the East 11th Street Bridge. It would form at a tee-intersection with Portland Avenue and terminate on East 18th Street. There would be impacts to the existing terminal on Portland Avenue and East 18th Street. Connections to Stewart Street downstream of the bridge from 18th Street would also be required.

Loop Ramp

The Loop Ramp alternative would not require a new bridge, and could be compatible with a rehabilitation of the existing truss bridge. Traffic would be directed from the north end of the bridge to Stewart Street, and improvements to Steward street would be required to safely accommodate all modes.

Alternative 7: Rehabilitate existing structures for use as an emergency evacuation and pedestrian/bicycle connection only.

This alternative considered a 20-foot-wide roadway surface with a 12-foot travel lane and a 6-foot shoulder. Gates at each end of the structure would restrict traffic to bicyclists and pedestrians, but could be opened by emergency vehicles and for evacuation as necessary. During an emergency event, bicyclists and pedestrians on the structure could use the shoulder to allow for passage of emergency vehicles. This would operate like the Northeast 100th Street I-405 overcrossing in Kirkland.

The structures would be rehabilitated as noted in Alternatives 3 and 4 to meet the reduced live load.

Alternative 8: Rehabilitate the existing structures for use as a one-way, one-lane roadway that would be open at all times.

This alternative assumes rehabilitating the structures to support a 12-foot-wide travel lane with a 2-foot shoulder on one side and a 12-foot-wide multipurpose path on the other side. It would require a useable width of 26 feet.

The structures would be rehabilitated as noted in Alternatives 3 and 4 to meet the reduced live load.

Alternative 9: Rehabilitate existing structures for pedestrian and non-motorized use.

This alternative considered rehabilitating the existing structures to accommodate a 16-foot-wide multipurpose path with gates at either end to restrict vehicular traffic. The minimum width for a multipurpose path on a bridge is 10 feet. However, given the length of these two structures, it would be necessary to provide additional width for light duty maintenance vehicles or an aid car.

The structures would be rehabilitated as noted in Alternatives 3 and 4 to meet the reduced live load.

Alternative 10: Complete removal of all structures.

Removal of the existing structures would require either construction of a new utility bridge over the river to support the 16-inch water main and ductbank or placing them under the river. The scope of this study did not include evaluating options for replacing the utilities. This study assumes the watermain and ductbank would be replaced on a new utility bridge, similar to the one just downstream of the Lincoln Avenue Bridge.

The advantages and disadvantages for each of the 10 alternatives are shown in Table 4.

Table 3: Alternatives Analysis – Long List of Alternatives

		Evaluation	
Alternative	**Name/Description**	**Advantages**	**Disadvantages**
1	**Replace bridge:** This will be a three-lane bridge with bike lanes and sidewalks on both sides.	1. Design life 100-150 years. 2. Piers will be removed from the river improving flow and reducing waterway constriction by logs during flood stage. 3. Maintenance costs lowered. 4. Full functionality: bridge open to all vehicles and trucks. 5. Bridge designed to resist a major seismic event. 6. South approach site distance corrected. 7. Less liability when compared to rehabilitated structure. 8. Ideal alignment for evacuation and emergency access. 9. Improved bicycle and pedestrian safety. 10. Will improve traffic operations at Portland Avenue East / East Lincoln Avenue by diverting some traffic back to East 11th Street. 11. Reopens prior connection and provides additional capacity and resiliency for transportation, including freight.	1. Highest cost. 2. Construction of a single 600-foot span if no piers are allowed in the river/OHW. 3. Temporary work bridge may be required. 4. Demo of existing bridge. 5. Utility relocation (temporary or permanent). 6. Increased overwater coverage. Permits and Section 106. 7. Limited ability to move goods at surface level between bisects port Terminal.

Table 3: Alternatives Analysis – Long List of Alternatives

		Evaluation	
Alternative	**Name/Description**	**Advantages**	**Disadvantages**
2	**Replace viaduct:** Assumptions: This will be a three-lane roadway with bike lanes and sidewalks on both sides. The cross-section will match the replaced bridge.	1. Pier spacing can be optimized to improve terminal activity. 2. Design life increased to 100-150 years. 3. Maintenance cost is lower. 4. Viaduct designed to resist a major seismic event. 5. Full functionality: Viaduct open to all vehicles and trucks. 6. New viaduct will serve as back-up route for emergencies, evacuations, or closure of other bridges crossing the Puyallup. 7. Improved bicycle and pedestrian safety. 8. Improved emergency response times into the central peninsula. 9. Would improve traffic operations at Portland Avenue East / East Lincoln Avenue by diverting some traffic back to East 11th Street. 10. Reopens prior connection, provides additional capacity and resiliency for transportation, including freight.	1. Obtain funding for high construction cost. 2. Construction impacts at the terminal. 3. Utility relocation (temporary or permanent). 4. Demo of existing viaduct. 5. Limits current barrier between West Sitcum Terminal locations adjacent to the viaduct.
3	**Rehab bridge for two-way traffic:** Assumptions: This would be a two-lane roadway with a 12-foot multipurpose trail on the right (upstream) side of the roadway.	1. The design life is increased to 25-50 years max. 2. Improved bicycle and pedestrian safety. 3. Improved ability to sustain a seismic event. 4. Full functionality: Bridge open to all vehicles and trucks. 5. Rebuilt bridge can serve as back-up route for emergencies, evacuations, or closure of other bridges crossing the Puyallup. 6. Improved emergency response times into the central peninsula. 7. Will improve traffic operations at Portland Avenue East / East Lincoln Avenue by diverting some traffic back to East 11th Street. 8. The City retains a historic bridge.	1. High cost relative to a reduced design life. 2. Precision inspection, analytical analysis required to start design. 3. Design solutions are often non-standard. 4. Means and methods of construction are non-standard. 5. Extensive special provisions in the spec package. 6. Staging construction for limited loads. 7. Construction change orders are common. 8. Maintenance costs. 9. Retains current barrier between West Sitcum Terminal locations at the viaduct.

Table 3: Alternatives Analysis – Long List of Alternatives

		Evaluation	
Alternative	**Name/Description**	**Advantages**	**Disadvantages**
4	**Rehab Viaduct for two-way traffic:** This will be a two-lane roadway with a 12-foot multipurpose trail on the right (upstream) side of the roadway.	1. Design life is increased to 25-50 years max. 2. Ability to sustain a major seismic event somewhat improved. 3. Full functionality: Bridge open to all vehicles and trucks. 4. Rebuilt bridge can serve as back-up route for emergencies, evacuations, or closure of other bridges crossing the Puyallup. 5. Improved emergency response times into the central peninsula. 6. May improve traffic operations at Portland Avenue East / East Lincoln Avenue by diverting some traffic back to East 11th Street. 7. Reopens prior connection, provides additional capacity and resiliency for transportation, including freight. 8. The City retains a historic viaduct.	1. High cost relative to a reduced design life. 2. Precision inspection and analytical analysis required prior to starting design. 3. Design solutions are often non-standard. 4. Means and methods of construction are non-standard. 5. Extensive special provisions in the spec package. 6. Staging construction for limited loads. 7. Construction change orders are common. 8. Increased maintenance cost. Commitment to maintain a higher level of maintenance. 9. Retains current barrier between West Sitcum Terminals on each side of the viaduct.
5	**New at-grade roadway to replace viaduct:** Assumptions: The approach on the east side of the bridge will slope up at a maximum 5 percent grade. The roadway will have three lanes and a multipurpose path on the right (upstream) side of the roadway.	1. Pier density is reduced near river and eliminated for 1,500 feet. 2. Reduced maintenance cost. 3. Ramp designed to resist a major seismic event. 4. Full functionality: Ramp open to all vehicles and trucks. 5. New ramp and roadway allow back-up route for emergencies, evacuations, or closure of other bridges crossing the Puyallup. 6. Improved bicycle and pedestrian safety. 7. Will improve traffic operations at Portland Avenue East / East Lincoln Avenue by diverting traffic. 8. Improved emergency response times into the central peninsula. 9. Reopens prior connection, provides additional capacity and resiliency for transportation, including freight.	1. Eliminates Port's ability to move goods from one side of the West Sitcum Terminal to the other side. 2. Loss of parking under structure. 3. Further limits at-grade movements between West Sitcum Terminal. 4. Compromises terminal security.

Table 3: Alternatives Analysis – Long List of Alternatives

		Evaluation	
Alternative	**Name/Description**	**Advantages**	**Disadvantages**
6	**New road on new alignment to replace viaduct:** This would re-route East 11th Street upstream along a new alignment. The current East 11th Street divides the West Sitcum Terminal and limits the Port's flexibility to reconfigure the terminal to meet tenant needs.	1. Connects the West Sitcum Terminal and allows maximum flexibility for terminal reconfiguration. Removes barrier to terminal l expansion. 2. Design life increased to 100-150 years. 3. Piers will be removed from the river improving flow and reducing waterway constriction by logs during flood stage. 4. Maintenance cost is reduced. 5. Full functionality – bridge open to all vehicles and trucks 6. Bridge designed to resist a major seismic event. 7. New bridge can serve as back-up route for emergencies, evacuations, or closure of other bridges crossing the Puyallup. 8. Improved bicycle and pedestrian safety. 9. May improve traffic operations at Portland Avenue East / East Lincoln Avenue by diverting some traffic back to East 11th Street.	1. Obtain funding for high construction cost. 2. Construction of a single 600-foot span if no piers are allowed in the river/ OHW. 3. Temporary work bridge. 4. Demo of existing bridge. 5. Utility relocation (temporary or permanent). 6. Permits and Section 106. 7. Additional right-of-way required. 8. Impacts existing terminal operations. 9. Limited traffic circulation and emergency service benefits compared to existing East 11th Street corridor.

Table 3: Alternatives Analysis – Long List of Alternatives

		Evaluation	
Alternative	Name/Description	Advantages	Disadvantages
7	**Rehab bridge and viaduct for pedestrians, bicyclists, and emergency access evacuations only:** Assumptions: This would provide an 18-foot-wide vehicular rated surface with barriers. 12 feet would be for the emergency vehicle and 6 feet would be a refuge area for bicyclists and pedestrians.	1. Design life increased to 25-50 years max. 2. Bicycle and pedestrian connectivity improved into Tideflats. 3. Improved emergency response times into the central peninsula. 4. The City retains a historic river crossing and viaduct.	1. High cost relative to a reduced design life and reduced purpose. 2. Precision inspection and analytical analysis and design is required. 3. Design solutions are often non-standard. 4. Extensive special provisions in the spec package. 5. Staging construction for limited loads. 6. Accepting high cost with high seismic vulnerability. 7. Construction change orders are common. 8. Does not provide any freight mobility or traffic operations improvements. 9. Retains barrier between West Sitcum Terminal locations. 10. Does not improve traffic circulation or provide congestion relief. 11. Not consistent with community and local business preference to open corridor to vehicular traffic.
8	**Rehab bridge and viaduct for one-way traffic with pedestrians and bicyclists on multipurpose path:** This would be a 26-foot-wide vehicular rated surface with barriers for a 12-foot-wide travel lane, and a 12-foot, two-way multipurpose trail.	1. Design life is increased to 25-50 years max. 2. Bicycle and pedestrian connectivity improved into Tideflats. 3. Some benefits to freight mobility and traffic operations depending on implementation of the one-way traffic. 4. The City retains a historic river crossing and viaduct.	1. High cost relative to a reduced design life and reduced purpose. 2. Precision inspection and analytical analysis is required. 3. Design solutions are often non-standard. 4. Extensive special provisions in the spec package. 5. Limited local community support. 6. Staging construction for limited loads. 7. Construction change orders are common.

Table 3: Alternatives Analysis – Long List of Alternatives

		Evaluation	
Alternative	**Name/Description**	**Advantages**	**Disadvantages**
9	**Retrofit bridge and viaduct for pedestrians and bicyclists only:** This would have a 12-foot-wide, two-way multipurpose trail with barriers.	1. Design life is increased to 25-50 years max. 2. Bicycle and pedestrian connectivity improved into Tideflats. 3. The City retains a historic river crossing and viaduct.	1. Does not provide any benefit for emergency response evacuation. 2. Does not benefit freight mobility. 3. High cost relative to a reduced design life and reduced purpose. 4. Precision inspection, analytical, and design is required. 5. Design solutions are often non-standard. 6. Extensive special provisions in the spec package. 7. Not supported by local community. 8. Staging construction for limited loads. 9. Accepting high cost with high seismic vulnerability. 10. Construction change orders are common.
10	**Remove bridge and viaduct without replacement:** This would require a Utility bridge for the 16-inch water main, similar to the one next to the Lincoln Avenue bridge. The ductbank may be accommodated on the utility bridge if that were the owner's preference. Ductbank relocation costs assumed at utility owners' expense.	1. Opens up the river for improved flow and fewer constrictions. 2. Capital savings: no bridge maintenance. 3. A new structure all utilities undergrounded or installed on. 4. New utility bridge. 5. Environmental benefits for fish.	1. Means and methods of removal. 2. Dealing with the utilities. 3. Fish windows. 4. No change to freight mobility, traffic operations, non-motorized mobility, and emergency response from today's conditions. 5. Not supported by local community.

The advantages and disadvantages for each alternative were considered in the overall evaluation of the criteria, which is summarized in the long list, are shown in Figure 16. In general, Alternatives 1 and 2, replace the bridge and viaduct, respectively, provide the most benefit, and the rehabilitation Alternatives 3 and 4 provide the next highest benefit. A replacement structure will allow the City to reopen the corridor with a three-lane structure that can provide additional capacity over a two-lane rehabilitated structure. The replacement alternatives will also provide greater reliability for emergency response and evacuation especially during peak congestion periods. The lifespan for a new structure is longer when compared to a rehabilitated structure, and maintenance costs will be lower. Structural performance during a seismic event will also be more reliable with a new structure.

Alternative 5A to demolish the viaduct and replace with a new at-grade roadway would eliminate the current at-grade terminal operations and is not supported by the Port of Tacoma. It was dropped from consideration and a replacement alternative with a 40-foot high-rise considered. Replacing the viaduct with a shorter structure that has 40-foot high-rise will improve terminal circulation without adding cost, and could result in an at-grade intersection of East 11th Street and Milwaukee Way.

Alternative 6, removal of the structures and replacement with a new bridge upstream, does not provide as much benefit as the East 11th Street corridor from a traffic circulation and emergency response standpoint, and would be the most expensive option. The evacuation route would not be as direct, and it would be a longer route for people working in the northeast corner of the central peninsula. Without making substantial changes to the existing street network, access to a new upstream bridge would be dependent on the already congested Lincoln Street corridor.

The Loop Ramp option as a variation of Alternative 6 would not require a new bridge and could be compatible with rehabilitation of the existing truss bridge. From a traffic circulation standpoint, it has the same limitations as a new upstream bridge, although if combined with modifications to the street grid and future terminal changes, it could have an increased benefit. Modifications to the street grid and terminal reconfigurations were not part of this study.

Based on this high-level analysis, the three new alignments were dropped from further consideration. If the NWSA is open to extending a new roadway from the river to Milwaukee Way, there may be a benefit to traffic circulation that makes these options more viable; however, extending the alignments to Milwaukee Way would further impact existing terminals. Costs for these alternatives were not developed because of the significantly lower benefit for emergency response and evacuation and overall improved traffic circulation when compared to making improvements in the East 11th Street corridor.

Alternative 7, one lane for emergency vehicle use only, open to pedestrians and bikes, would provide some benefit for emergency response and evacuation and reestablish a safe route for non-motorized users, and many in the community thought this would be beneficial. Similarly, Alternative 8 would create a single lane one-way travel lane with accommodations for bikes and pedestrians on the shoulder. However, the existing bridge and viaduct structures are such that rehabilitating them to support a fire truck would result in a useable roadway width that could accommodate two lanes of traffic and a multipurpose path/sidewalk. Based on this high-level assessment, it would not be practical to create Alternatives 7 or 8 when two traffic lanes could be created for the essentially the same cost. These alternatives were dropped from further consideration.

There was not much interest from the community to formally open the structure for pedestrians and bicyclists with Alternative 9. This alternative would have no benefit for general traffic, freight movement, or emergency response. Given the length of the structure, it would have to support maintenance vehicles and light-duty emergency vehicles, such as aid cars.

In general, there was no support from the public for Alternative 10, demolish the bridge and viaduct and provide a replace utility bridge for the watermain and the ductbank. However, the NWSA does prefer demolition of the existing structures, especially the viaduct and construction of a new bridge in a different location (Alternative 6).

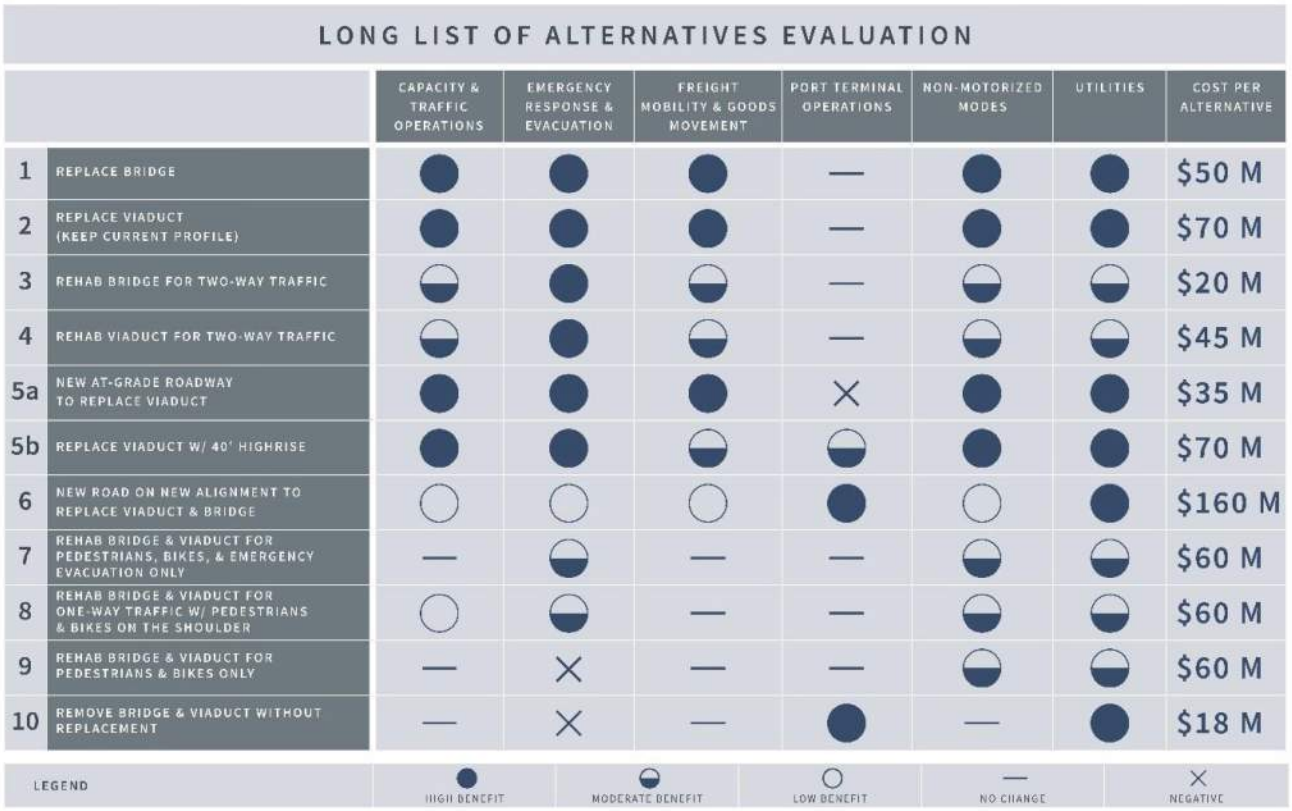


Figure 16: Long List of Alternatives

Short List of Alternatives

In general, the Replacement and Rehabilitation Alternatives provide the most benefit and were configured to create three shortlisted alternatives.

Alternatives that replace or rehabilitate the bridge and viaduct have the most benefit. These represent Alternatives 1 through 4 from the long list. To create the short list, Alternatives 1 and 2 were combined to make Alternative A, Replace Bridge and Viaduct. Alternatives 3 and 4 were combined to make Alternative B, Rehabilitate Bridge and Viaduct. Alternative C was created by combining Alternative 3, Rehabilitate Bridge, and Alternative 5b, Replace Viaduct with 40-Foot High-Rise.

During the evaluation of the three initial short-listed alternatives, a fourth alternative was added. Alternative D is a variation of Alternative A. It includes a 40-foot high-rise under the viaduct, and a 12-foot-wide multipurpose path instead of sidewalks and bike lanes. Having a multipurpose path in lieu of sidewalks and bike lanes would result in a structure that is 10 feet narrower. Concept plans and typical sections for these alternatives are shown in Figures 17, 18, 19, and 20, and were developed based on the following design standards and assumptions.

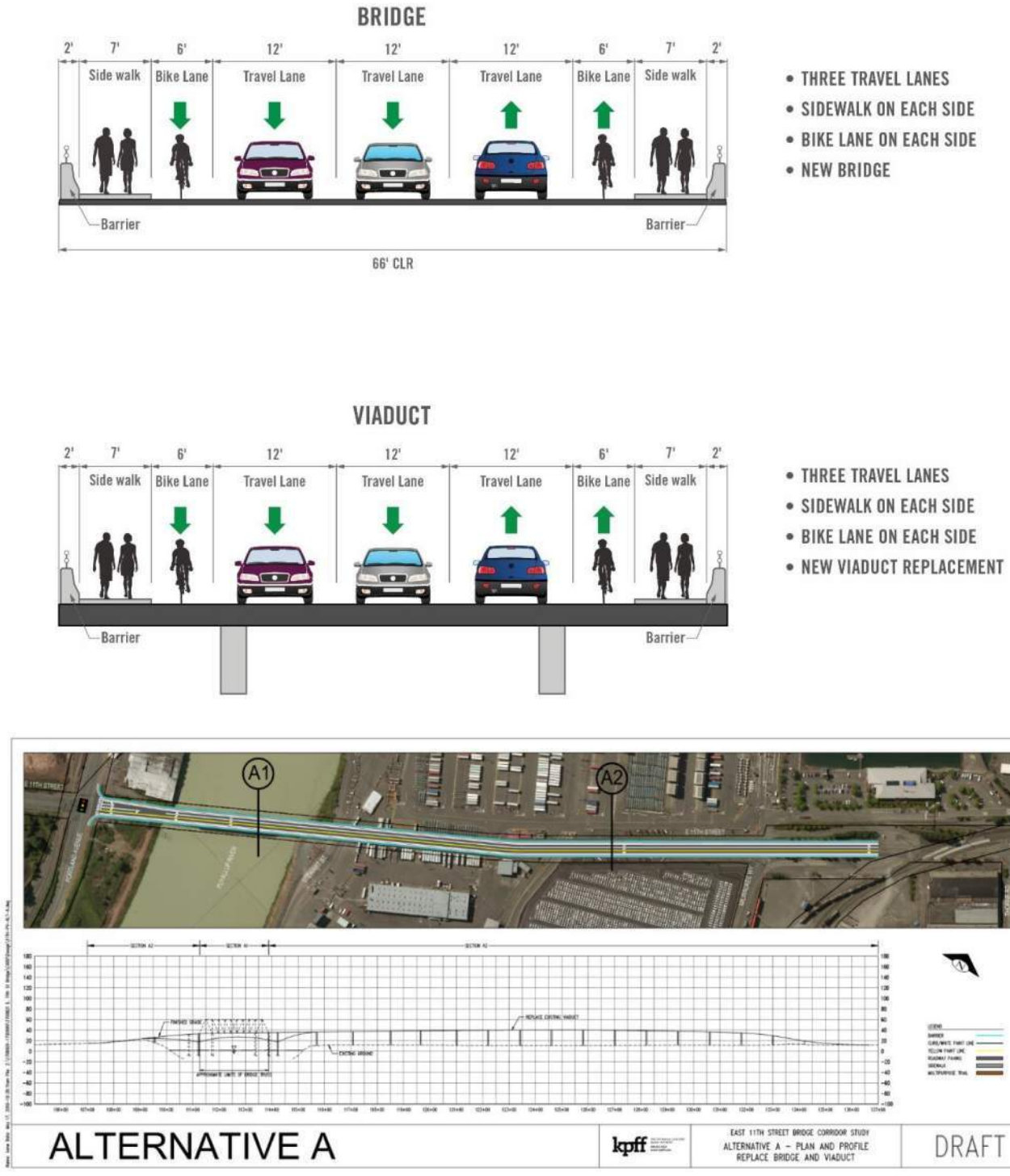


Figure 17: Alternative A

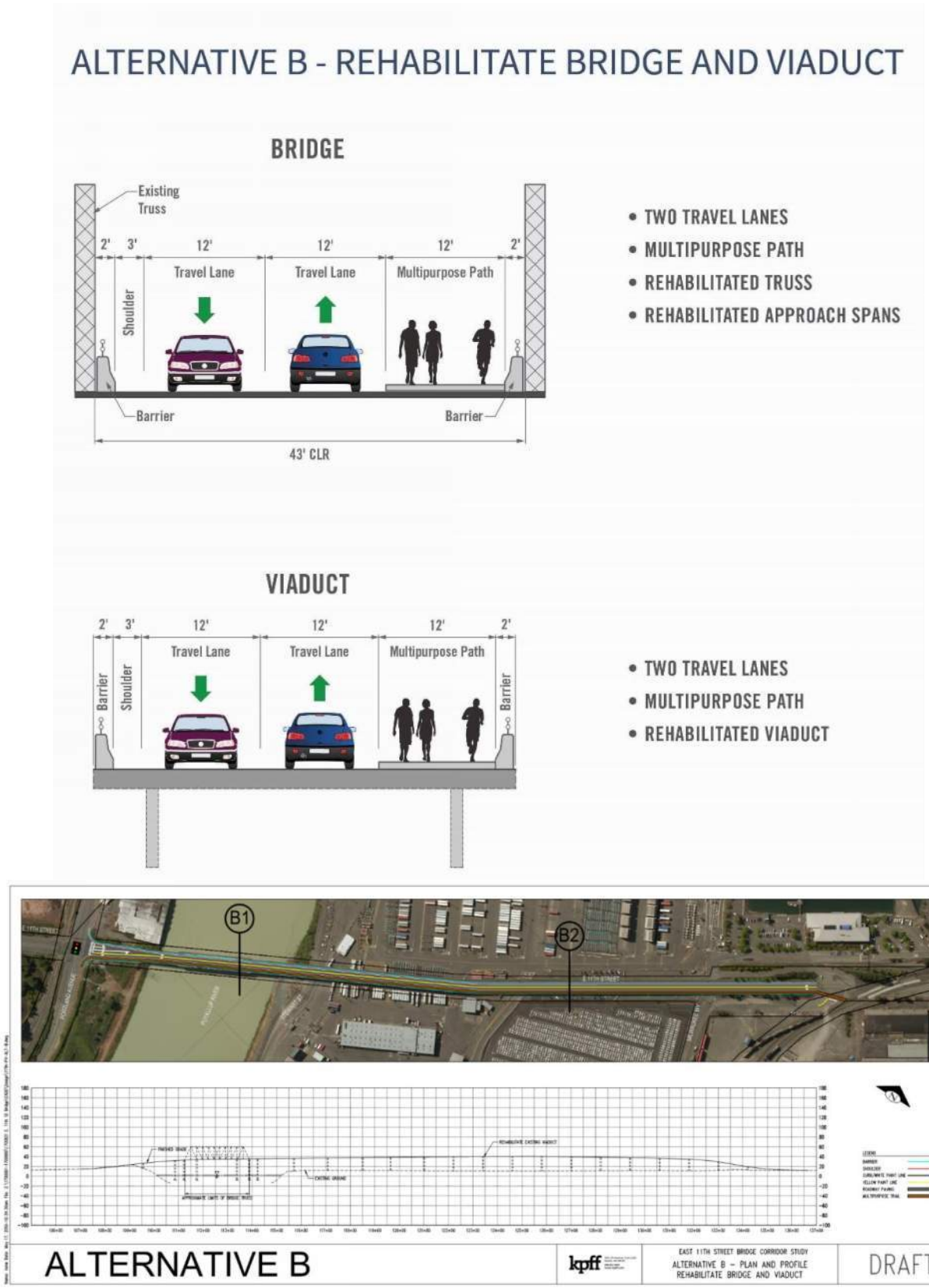
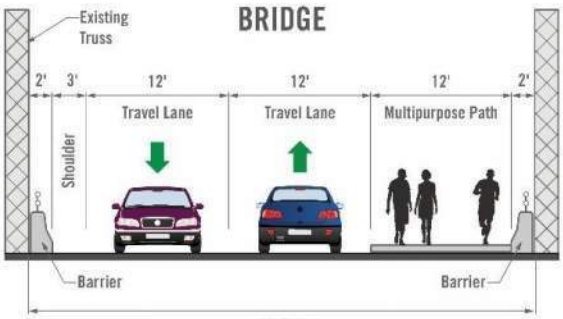


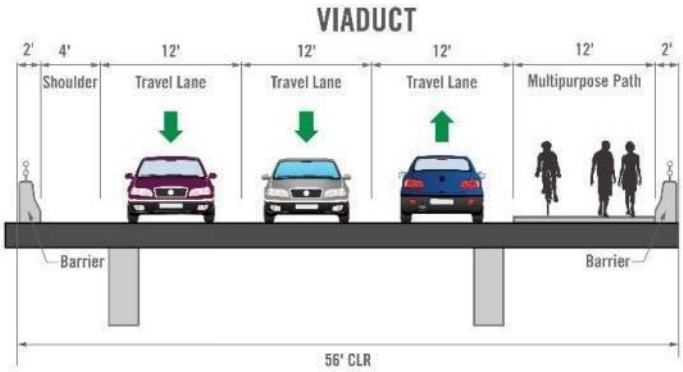
Figure 18: Alternative B

ALTERNATIVE C - REHABILITATE BRIDGE & REPLACE VIADUCT



REHABILITATE TRUSS & APPROACH SPANS / SECTION 3 NTS

- TWO TRAVEL LANES
- MULTIPURPOSE PATH
- REHABILITATED TRUSS
- REHABILITATED APPROACH SPANS



- THREE TRAVEL LANES
- NEW CONCRETE GIRDER SPANS
- VIADUCT REPLACEMENT
- 40' HIGHRISE FOR IMPROVED TERMINAL CIRCULATION
- DECREASED LENGHT OF VIADUCT

VIADUCT REPLACEMENT / SECTION 5 NTS

- TWO TRAVEL LANES
- LEFT TURN POCKET
- MULTIPURPOSE PATH
- NEW INTERSECTION AT MILWAUKEE WAY

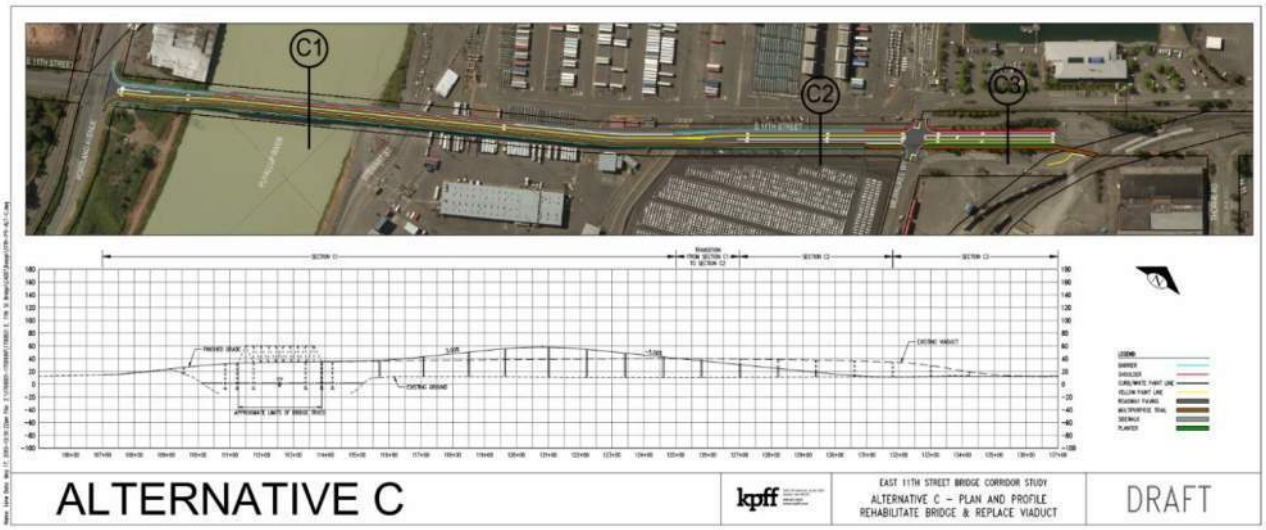
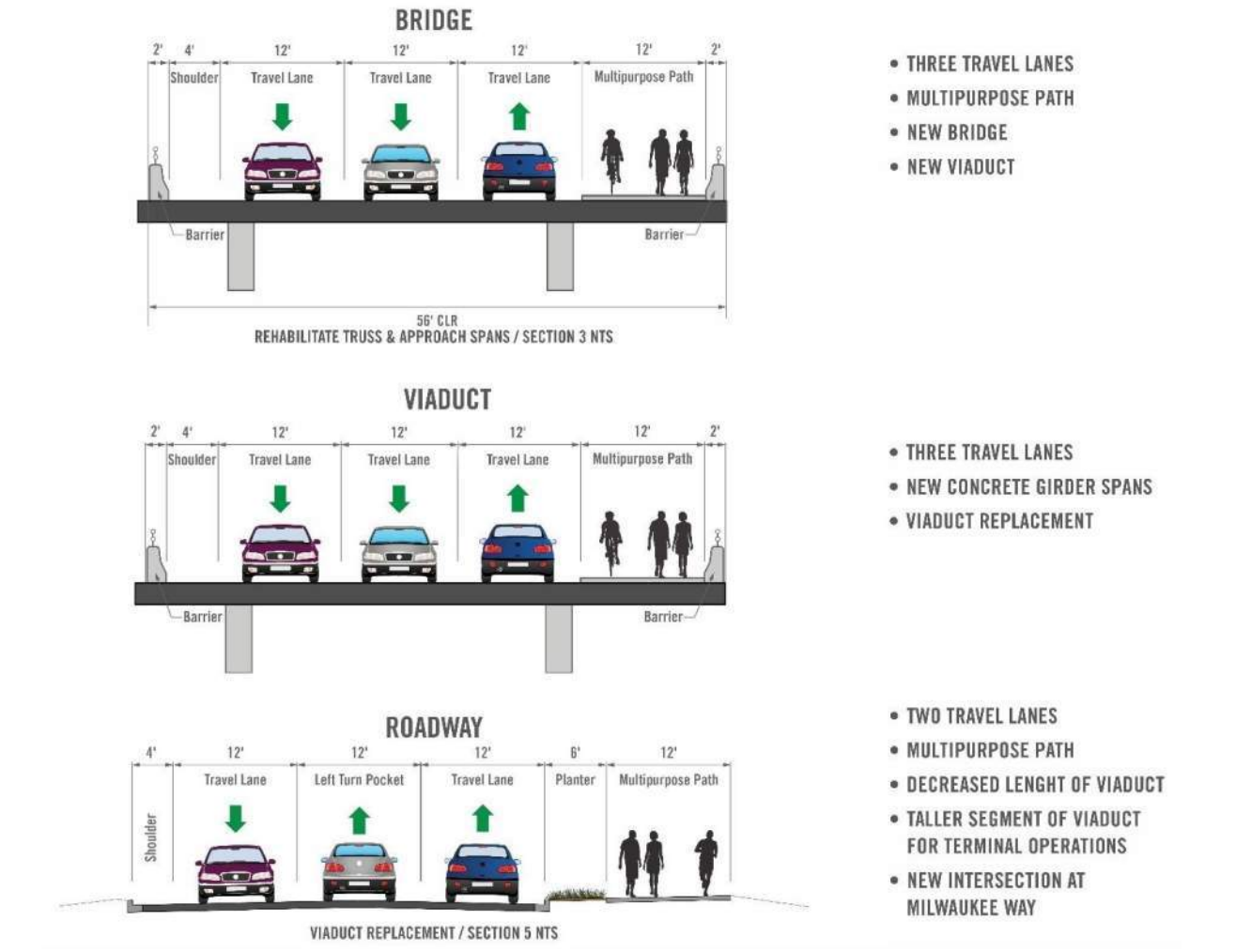


Figure 19: Alternative C



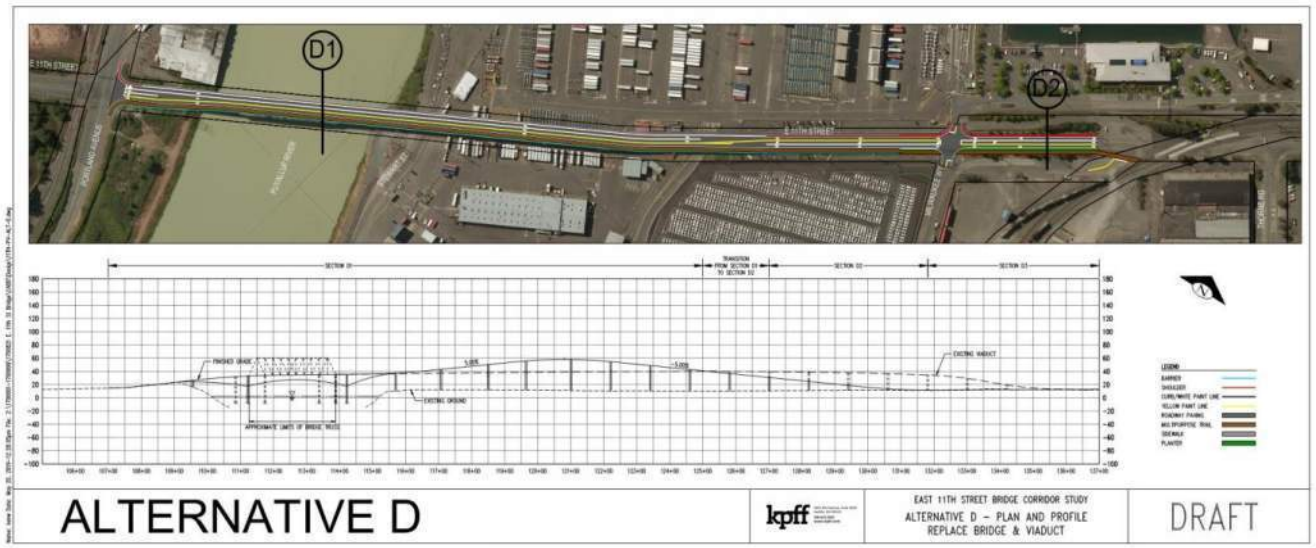


Figure 20: Alternative D

Alternatives A, B, C, and D were qualitatively evaluated against the same criteria as the long list:

1. Capacity and Traffic Operations
2. Emergency Response and Evacuation
3. Freight Mobility and Goods Movement
4. Port Terminal Operations
5. Non-Motorized Modes
6. Utilities
7. Cost Per Alternative

Results of this evaluation are shown in Figure 21.

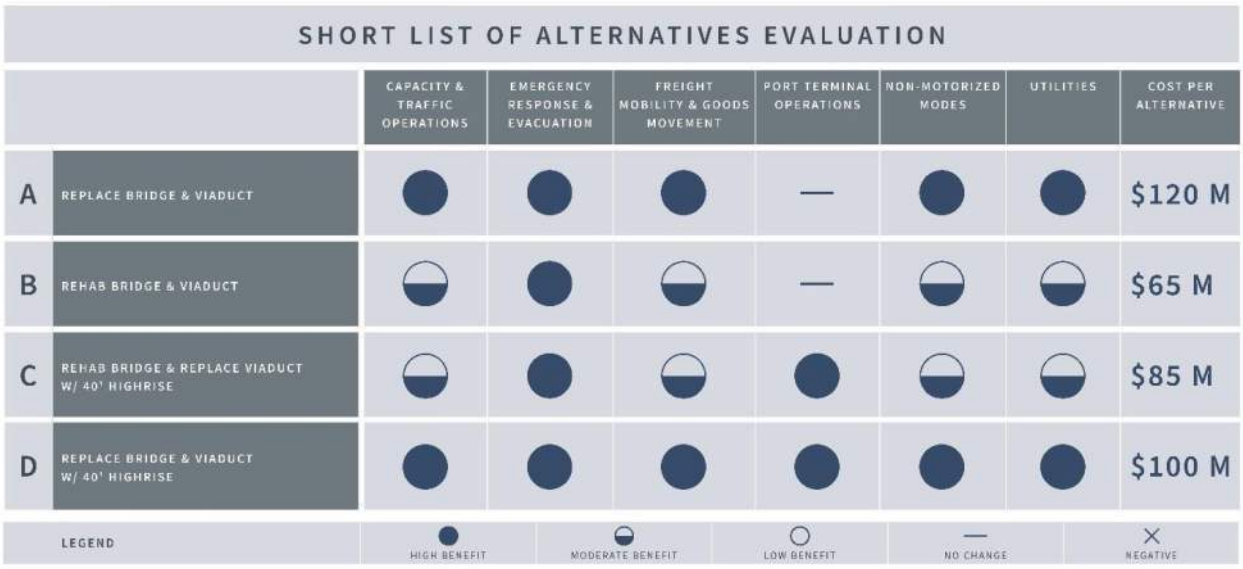


Figure 21: Short List of Alternatives

All of these alternatives provide the same functionality, although Alternative B: Rehabilitate Bridge and Viaduct would only provide a two-lane roadway with a multipurpose path, while the replacement alternatives are based on a three-lane roadway. A three-lane roadway for the replacement option would allow for reliable emergency response during peak periods of congestion and would provide additional evacuation capacity. From an environmental permitting perspective, rehabilitating the structures would be more straightforward than working through the process to demolish the existing structures and constructing a replacement facility that has more overwater coverage. However, a replacement structure is expected to reduce the number of in-water piers.

Replacement of the existing structures with a three-lane roadway with bike lanes and sidewalks (Alternative A) is the most expensive alternative at $120 million. One deficiency with this alternative is that if the viaduct were replaced with the current vertical alignment, it would still be an impediment to the movement of freight between the West Sitcum Terminal. One way to minimize this condition is to change the vertical alignment to provide a 40-foot-high clear bay. This would allow for straddle lifts and other over-height equipment to move between terminals. Alternative D was developed to provide clearance, and reduce the length of the viaduct. Alternative D also replaced the bike lanes and sidewalk with a multipurpose path, which reduces the width of the structure by 10 feet. These changes reduce the cost by $20 million when compared to Alternative A.

The cost difference between the Replacement Alternative D and the Rehabilitate Alternative B is roughly $55 million. When comparing the two alternatives, the advantages of a replacement structure are:

- Emergency response times would be more reliable
- Evacuation capacity would be greater
- General traffic capacity would be greater
- The ability to use the third land as a climbing lane
- Performance during a seismic event would be more predictable
- Maintenance costs would be lower

Alternative D-1

Alternative D-1 is a 2-lane replacement option for the bridge and viaduct. It is identical to Alternative D except it has only two travel lanes and not three. The costs for this option are $80 million which is $20 million lower than the 3 lane option and $20 million more than the rehabilitation Alternative B. City staff requested this information be included in the report during the final review.

Maintenance Costs

Maintenance costs for the rehabilitated structures are likely to be roughly twice as high when compared to new structures. Assuming new structures would consist of concrete girders annual maintenance costs for the major components could be $375,000 for new structures and $800,000 for the rehabilitated structures. Table 4; Maintenance Costs for Major Bridge Components identifies which components of the structures were considered to develop these costs. This high-level analysis identifies the difference in maintenance costs between a new structure and a rehabilitated one. There will be additional maintenance for either structure.

Table 4: Maintenance Costs

Maintenance Item	New Bridge			Rehab Bridge		
	Cost	Frequency (years)	Cost per 50 years	Cost	Frequency (years)	Cost per 50 years
Truss Painting – every 25 years, @ $3.5 million	$3,500,000	25	$7,000,000	$3,500,000	25	$7,000,000
Truss Cleaning – every 5 years, at $75,000	$75,000	5	$750,000	$75,000	5	$750,000
Overlay (thin polymer on exodermic deck) – every 15 years at $0.5 million	$500,000	15	$1,666,667	$500,000	15	$1,666,667
River Approach Spans Painting – every 25 years, at $2.5 million	-	-	-	$2,500,000	25	$5,000,000
River Approach Spans Cleaning – every 5 years, at $25,000	-	-	-	$25,000	5	$250,000
Overlay – every 15 years at $0.5 million (rehab includes new deck)	$500,000	15	$1,666,667	$500,000	15	$1,666,667
Viaduct Painting – every 25 years, at $5 million	-	-	-	$5,000,000	25	$10,000,000
Viaduct Cleaning – every 5 years, at $150,000	-	-	-	$150,000	5	$1,500,000
Overlay – every 15/10 years at $2.3 million	$2,300,000	15	$7,666,667	$2,300,000	10	$11,500,000
Additional Inspections Costs for steel				$15,000	2	$375,000
Total Costs for 50 years			$18,750,000			$39,708,333
Estimated Annual Costs			$375,000			$794,167

4. Public Input

Prior to evaluating the long list of alternatives, a survey was sent to key stakeholders and major property owners within a 1-mile radius of the project site. The questionnaire was also sent to City of Tacoma Water and Fire Departments, the Northwest Seaport Alliance, and the Puyallup Tribe. The 11 survey questions, listed below, were developed to better understand current travel routes in the study area and expectations for arterial improvements.

STAKEHOLDER SURVEY

1) What kind of traffic and transportation issues has your staff/customers/etc. experienced after closing the East 11th Street Bridge?

2) How would your staff/customers/etc. travel on roadways in the area around East 11th Street if the bridge and viaduct were reopened? Would you use the bridge?

3) What kind of traffic or transportation issues, if any, do you and your staff/customers/etc. experience when traveling in the study area?

4) Are there changes to the East 11th Street Bridge corridor that would improve service to roadway users, industry, residents, and first responders in the future?

5) What are your thoughts on how these alternatives would affect congestion times and serve freight users?

6) Several of the alternatives would consider improved access for pedestrian and bikes in the area. What would you like the City to consider in the planning and design?

7) What are your thoughts on how to balance potential improvements in the corridor with the need to minimize environmental impacts?

8) Do you have a future vision for the East 11th Street Corridor?

9) Are there other ways you would suggest the City gather feedback from the community?

10) What is the best way for us to keep you and your organization informed?

11) Are there other groups we should make sure we talk to?

Responses were received from the City of Tacoma Departments of Water and Fire, NWSA, Concrete Tech. ILWU Local 23, and the Puyallup Tribe. The full Stakeholder Interview Guide and individual responses are contained in Appendix A – Public Comments.

In general, respondents want to see the roadway reopened, and a few felt even a one-lane bridge could provide some congestion relief and provide an evacuation route. Although the NWSA did not indicate they wanted the bridge removed, they expressed their interest in evaluating the potential for constructing a new bridge on a different alignment that would allow the West Sitcum Terminal to be reconnected.

PUBLIC OPEN HOUSE AND ON-LINE OPEN HOUSE RESULTS

The public was given the opportunity to comment on the short list of alternatives at the Public Open House on March 14, 2019, and through an online open house during a two-week period held at the same time. Eighty-three comments were received and are summarized below.

- Alternative A: Replace Bridge and Viaduct
- Alternative B: Rehabilitate Bridge and Viaduct
- Alternative C: Rehabilitate Bridge and Replace Viaduct with a 40-Foot High-Rise

The following is a summary of the public comments for each alternative. All of the comments are contained in Appendix A.

Alternative A: Benefits

General theme that this option creates more space and allows for use by autos, cyclists, and pedestrians.

This option allows the bridge to reopen for critical emergency access and evacuation, eliminates weight restrictions, and would last longer than a rehabilitated structure.

The additional car lanes would keep traffic flowing, especially during peak periods.

Alternative A: Suggestions for Improvement

General theme that the design provides more bicycle and pedestrian lanes than are necessary for this area, given the limited bicycle and pedestrian traffic. This leads to a higher cost than is necessary.

Concern about the narrowing from separate paths on the bridge to a multipurpose path on the viaduct could cause conflicts between runners, walkers, and cyclists. Also brings up a concern that a street crossing could be dangerous.

Suggestions: Create a barrier between vehicle traffic and bikers/pedestrians. Consider allowing traffic to switch directions in the middle lane depending on traffic needs. Extend the viaduct over train tracks crossing East 11th Street to reduce trains blocking vehicle traffic. Consider devoting one lane for trucks entering the Port.

Alternative B: Benefits

General theme that this option provides an appropriate number of lanes and accommodates uses consistent with the limited pedestrian traffic in the area. It reopens a critical bridge and road across the Tideflats and is more cost-effective than rebuilding the entire structure.

Multipurpose path is aligned with the multipurpose lane on the viaduct, and a single traffic lane would discourage drivers from exceeding the speed limit.

Opening the bridge provides access for emergency vehicles across the Tideflats.

Alternative B: Suggestions for improvement

This alternative may not provide enough travel lanes for emergencies and is not able to accommodate as much traffic during rush hour.

The path is wider than necessary given the pedestrian and cyclist use of the area.

Alternative does now allow for future growth in the area, either with increased vehicle traffic or growth at a key maritime terminal.

The alternative still relies on a structurally deficient viaduct.

Suggestions: Create a designated, physically separated bike path. Extend viaduct over train tracks crossing 11th.

Alternative C: Benefits

General theme that this alternative provides a physical separation between vehicles and the continuous multipurpose path.

Reopens and rehabilitates a critical structure, providing important emergency access and egress in the Tideflats.

This alternative provides an additional car lane and a new intersection at Milwaukee Way.

Alternative C: Suggestions for Improvement

Overall, this alternative accommodates less traffic. It would be preferable to create an additional travel lane, not just a turn lane. The left-turn holding lane at Portland Avenue is too short.

The bridge and viaduct should have same traffic capacity to ensure effective traffic flow.

Concern about the increased maintenance cost of planted area, as well as loss of usable space. Planted area could impact visibility for drivers and pedestrians, and alternative does not provide designated space for cyclists. The path is wider than necessary given the pedestrian and cyclist use of the area.

This alternative reduces the functionality of container yard below. Rebuilding on the corridor is inconsistent with the Port's long-term plans and the Puyallup Land Claim settlement.

Viaduct grades of 5 percent would impact travel during icy or inclement weather.

Suggestions: Consider raising viaduct on earth fill with tunnels below.

Overall Comments

Emergency access and egress is critical, and this roadway should be reopened to provide better access for those with daily commutes to the Port.

Time and cost should be more important factors in selecting an alternative.

Car lanes are more important than walking paths.

Appreciate the inclusion of facilities to support cyclists and pedestrians.

Alternative D

Based on comments from the public meeting and on-line open house, a fourth alternative was created. Alternative D would replace the bridge at its current vertical alignment and replace the viaduct with a 40-foot high-rise. This is similar to Alternative A, except that the viaduct would have a 40-foot high-rise, and the overall width of the structure is reduced by 10 feet from 65 feet to 55 feet. The reduction in width is achieved by eliminating the bike lanes and sidewalks from each side and replacing them with one 12-foot-wide multipurpose path on the south side of the structures. See Figure 20 on page 31.

5. Summary and Next Steps

Based on feedback from stakeholders, property owners, and the City of Tacoma Fire Department, there is broad support for opening the roadway for all travel modes. There is limited support for reopening it for just non-motorized users.

Many in the community thought a one-lane facility providing an emergency access/evacuation route that could also be used for bikes and pedestrians would be beneficial; however, the structural framing of the bridge and viaduct is such that if it were rehabilitated to support a fire truck, the actual useable roadway width could accommodate two lanes of traffic and a multipurpose path/sidewalk.

Demolishing the bridge and viaduct and constructing a new bridge in a different location would allow the NWSA to connect the West Sitcum Terminals; however, the existing street network is such that any new bridge would not provide as much benefit for traffic congestion relief, which would result in longer emergency response and evacuation time when compared to the East 11th Street corridor. Estimated costs for this alternative are roughly $160 million.

Rehabilitating the bridge and viaduct is estimated to cost $85 million, and would result in a two-lane roadway. Constructing a new three-lane bridge has an estimated cost of $120 million. The community and City both recognize that a three-lane facility has greater flexibility to support growth in the area. Given the significant amount of money to rehabilitate a 90-year-old structure and the challenges to acquire funding, the recommendation of this study is to replace the structures. A new bridge and viaduct will have lower maintenance costs, a longer life span, and more reliable performance in a seismic event.

This recommendation and the information developed for this study should be considered in the Tideflats Subarea Plan this is currently underway. The traffic analysis being conducted as part of that study should provide additional information that will confirm how many travel lanes are necessary for the East 11th Street Corridor.

Should the decision be made to replace the structure, the City may want to study how to phase the project. Demolishing the bridge as a separate project will need to consider impacts to the utilities, and how it would affect construction costs for a new structure.

REPLACEMENT OPTION

1. Confirm required clearance with the Coast Guard. The required clearance will impact selection of the bridge type. If the clearance can be lowered to match the Lincoln Avenue Bridge, there will be more options available. If additional clearance is required, matching the grades at Portland Avenue will be challenging.

2. Confirm whether the non-motorized improvements should include sidewalks and bike lanes on both sides or if a multipurpose path is preferred. Given that this is an industrial area with a high freight volume of traffic and that this route would be located on a bridge/viaduct, it seems that minimizing the potential for conflict between different modes would be justification for deviating from the standard and accepting a multipurpose path.

REHABILITATION OPTION

1. Conduct additional structural analysis to confirm assumptions and costs to seismically upgrade the bridge and viaduct. Currently, the assumed costs for this upgrade are $20 to $30 million, which is one-half the rehabilitation costs.

Should future funding become available to restore access across the East 11th Street Bridge, then an additional traffic analysis should be conducted in the Tideflats area to observe travel patterns and modes that may influence traffic distribution and volumes if the bridge were reopened. The study could determine whether a two-lane or three-lane cross-section would be the preferred alternative.

The City/Port/Tribe/County have agreed to develop a subarea plan, which will update land use and transportation forecasts for the Tideflats area. This plan should build on the recommendations of this study and should use the updated transportation forecasts to further describe the expected benefits from implementing the recommended alternative, and reaffirm the expected utility of adding a third lane on the future bridge. See Appendix B for additional traffic information.

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Appendix A

Public Comments

Appendix B

Traffic Memos

Appendix C

Cost Estimates

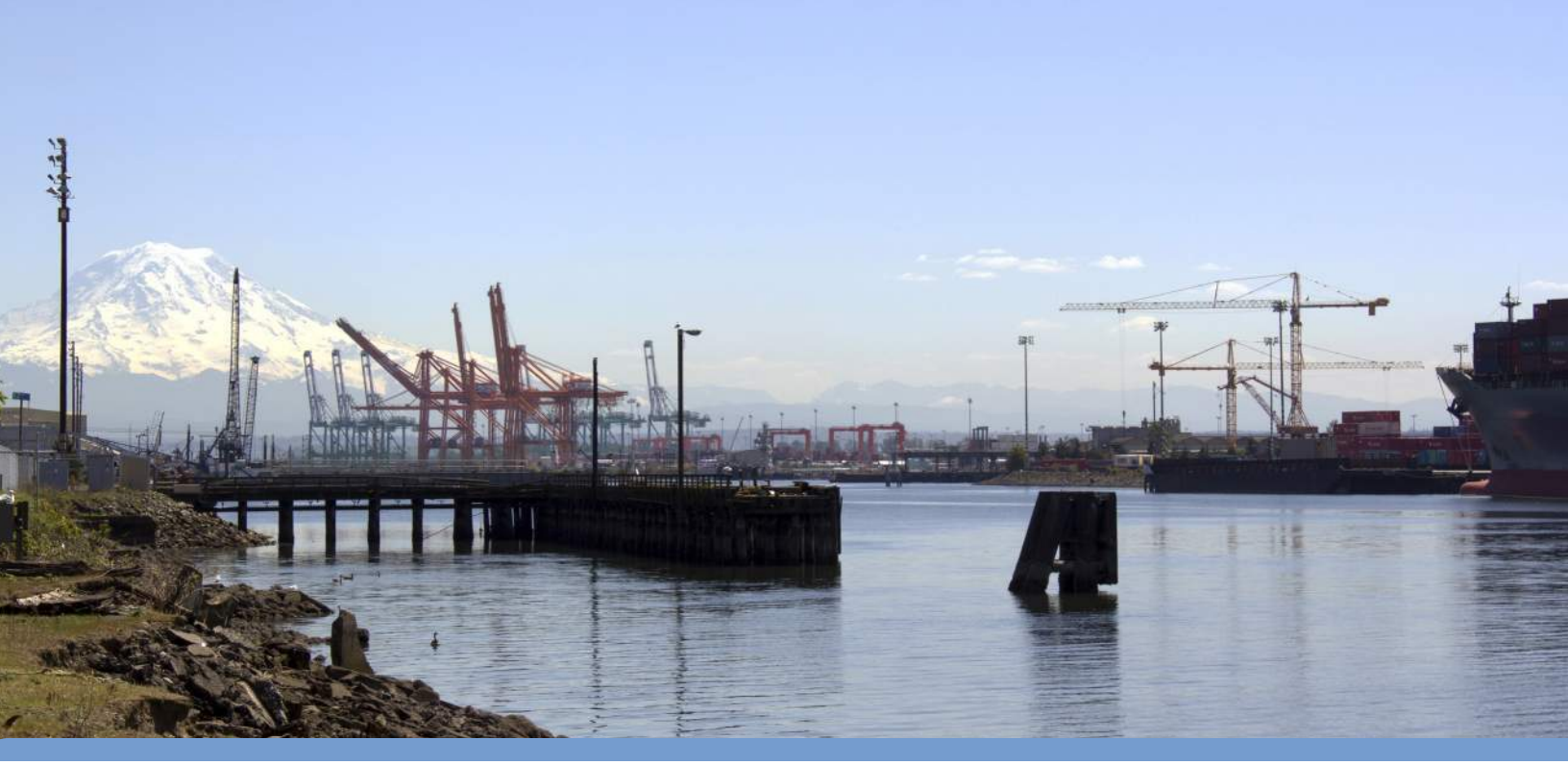
Appendix D

As-Builts

Appendix E

Previous Studies

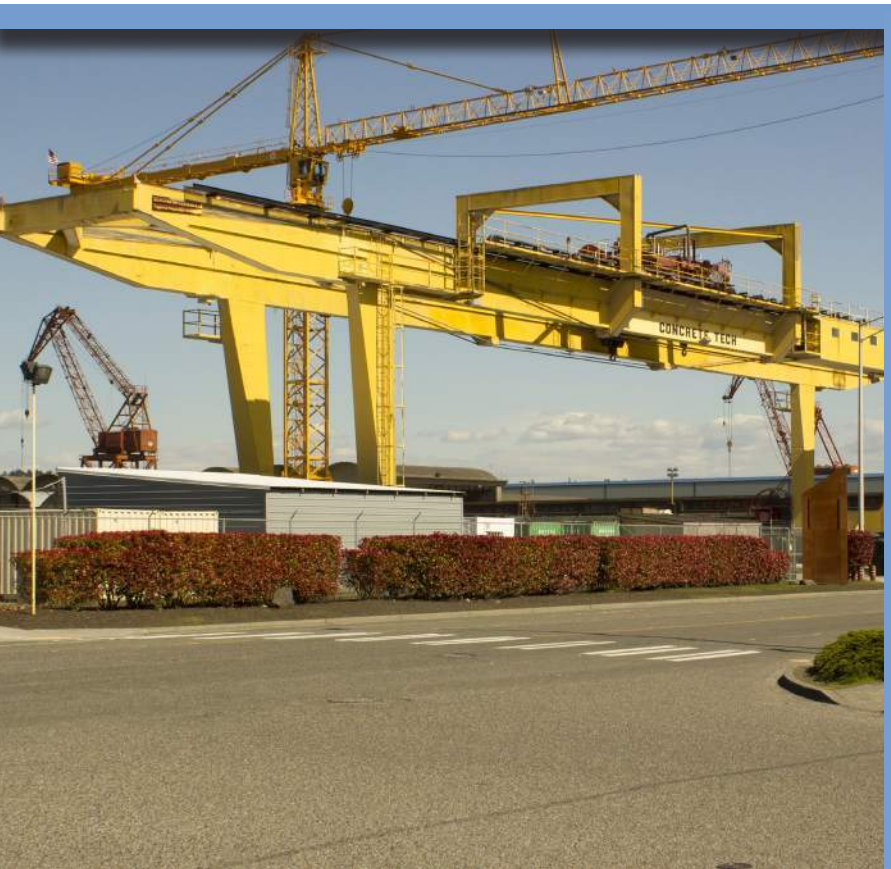
- *Final Tideflats Emergency Response Plan*, Fehr & Peers, March 2016
- *5098 11th Street Bridge Floor Beam Review*, Sargent Engineers, Inc., April 13, 2015
- *Tideflats Area Transportation Study (TATS) Final Report*, Fehr & Peers, June 2011
- *Tacoma Tideflats Circulation Study, Executive Summary*, November 1996



FINAL

Tideflats Emergency Response Plan

MARCH 2016



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ACKNOWLEDGEMENTS

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City of Fife
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Puget Sound Engery
Puyallup Tribe
Tacoma Fire Department
Tacoma Police Department
Targa
US Oil
WSDOT

Consultant Team

Fehr & Peers
TriData

Table of Contents

Appendices

BACKGROUND

The Tideflats area under review is the industrial hub of Tacoma. Among the Tideflats businesses are major shipping terminals, a pulp mill, oil and chemical refineries, oil and chemical storage, salvage and recycling operations, a federal immigration detention facility and a prisoner residential reentry center.[1] As the largest landowner in the area, the Port of Tacoma's successful expansion and development have substantially altered the traffic patterns of the Tideflats. The former arterial street grid based primarily upon East 11th Street and bridges over the Puyallup River and the various Tideflats waterways has been replaced by I-5, SR 509 and arterial spurs serving import/export related activities alongside the expanded waterways. The east-west access and egress have been significantly altered in recent years. The increase in rail and long-haul truck traffic resulting from increased Tideflats area business and the vacation of secondary streets within the Port of Tacoma's expanded container and auto import operations coupled with the development of Northeast Tacoma has led to increased traffic congestion in the corridors leading into and out of the Tideflats area. In addition, recent financial constraints have necessitated the closure of fire stations within the Tideflats.

The purpose of the study is to:

- Build upon the previous Port of Tacoma and City studies that identified the current and planned Tideflats transportation network to conduct an assessment of current and likely future fire and Emergency Medical Services (EMS) capability into and out of the study area.
- Identify the current and anticipated impact of rail and traffic congestion through 2035.
- Identify any proposed/planned street vacations that could also result in increased response times by emergency service providers and impact emergency evacuation of the area.
- Provide proposed mitigation measures to account for the identified impacts created by proposed street vacations.
- Identify and prioritize traffic improvements that preserve or improve emergency response capability and emergency evacuation.
- Map the planning process for the development and implementation of an intelligent transportation system (ITS) within the study area.
- Provide a model of prospective and anticipated long-term locations from which to base emergency response into and out of the study area.

[1] During the business day the population of the Tideflats increases significantly to one of Tacoma's more populous neighborhoods. Some businesses, notably the detention center and prisoner reentry center, function as around the clock operations with significant inmate populations.

- Describe alternative funding strategies for securing the desired outcomes

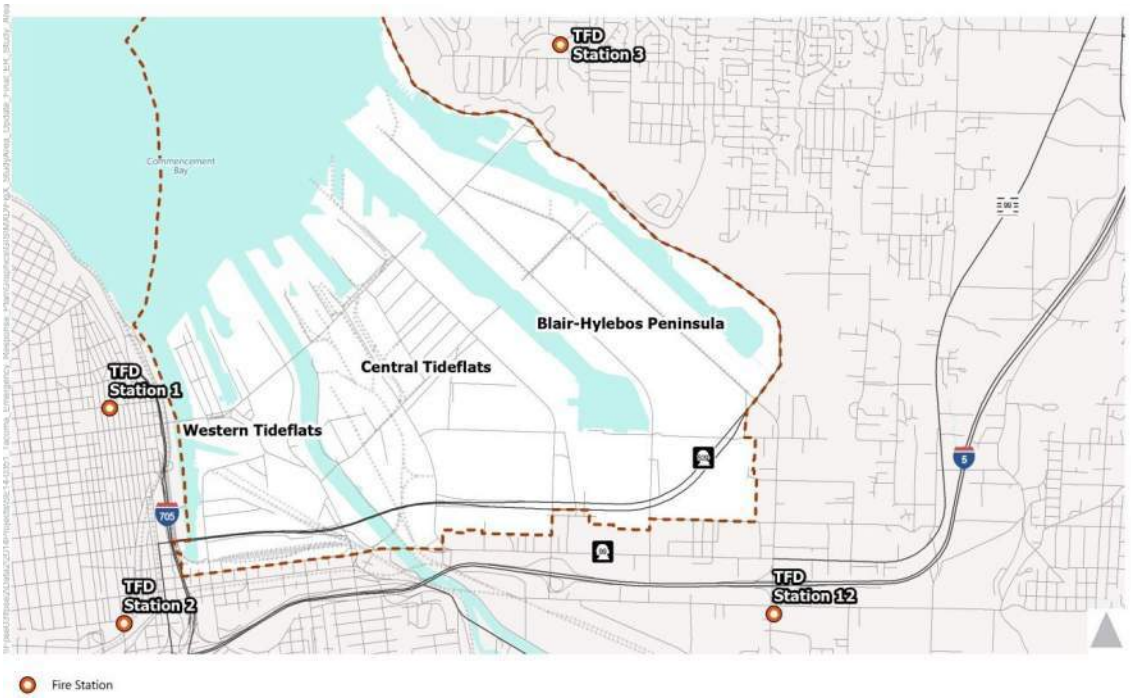
In addition to the City of Tacoma's interest in improving emergency response to the Tideflats, the Port of Tacoma's Land Use & Transportation Plan, developed in consultation with the City of Tacoma in 2014, calls for "addressing transportation congestion on and off the Tideflats, while at the same time identifying transportation improvements that will be necessary to sustain the projected growth at the Port over the next 10 years." [2] The Plan's strategies included a focus to "work with the City of Tacoma and other emergency responders and stakeholders to develop an Emergency Response Plan for the Port of Tacoma Manufacturing and Industrial Center" and to "develop and implement Intelligent Transportation Systems (ITS) improvements", both catalysts for the timing of this Study.[3] Another consideration for the City behind this study is the need to better "ensure that existing and future developments pay for some or all of the costs of capital improvements or new facilities that are deemed necessary, by reason of their respective developments, to reduce existing deficiencies or replace obsolete facilities."[4]

STUDY AREA

The study area is shown in **Figure 1**. The Blair-Hylebos Peninsula is between the Blair and Hylebos Waterways. West of the peninsula is the central Tideflats while the area east of Downtown Tacoma is the western Tideflats.

[2] Port of Tacoma, Land Use & Transportation Plan, 2014, p.33.
[3] Ibid, pp. 29, 45.
[4] City of Tacoma, City of Tacoma Comprehensive Plan, Capital Facilities Element, 2014, p. 2.

Figure 1. Tideflats Study Area



THE EMERGENCY RESPONSE PROBLEM

The emergency response problem has two facets. First, the Tideflats has a mix of land uses and operations that have the potential for serious fire or EMS emergencies. Second, the emergency response times to the Tideflats have increased over the past several years. Each of these factors is summarized below.

TIDEFLATS LAND USE AND OPERATIONS

Within the City of Tacoma, the Tideflats is the highest risk zone for Hazardous Material (HazMat) incidents. Within the area, there is resurgence in manufacturing, particularly on the Blair-Hylebos peninsula. Several of the proposals include operations with higher emergency risk potential. While potentially adding to the demand for fire services, these developments will help restore the economic and tax-generating base within the Tideflats.

There are other key factors that heighten the emergency response needs within the Tideflats:

Geographic

- Location of incidents spread out through entire zone
- Marinas are in fairly remote locations so land response is longer; not quickly or easily accessible by water routes either
- Access to area limited by waterways, rail, vacated streets and closed bridges

Demographic

- Low residential population but a 1575-bed detention center and a 75-bed reentry facility and a high daytime worker population

Physical

- Mostly chemical releases and combustible/flammable liquid spills/leaks
- Large un-sprinkled buildings/yards with high fire load
- Private hydrants with limited water
- Presence of flammable liquid pipelines
- Abundant ignition sources

CHANGE IN EMERGENCY RESPONSE TIMES

The past decade has seen an increase in the Tacoma Fire Departments (TFD) emergency response times to the Tideflats area due to a number of factors. Contributing factors for the response time deficiencies are listed below.

- Temporary blockage of certain roadways within the Port area by Tacoma Rail and other Port operations
- Roadway congestion resulting from local and regional traffic patterns
- Permanent vacation of a portion of Alexander Avenue north of SR509 and other recent street vacations
- Poor roadway surfaces within the Port that make travel difficult for fire apparatus
- Permanent closures of bridges and an increase in truck activity/congestion
- Closure and relocation of fire stations

This section details the existing conditions of these factors and their impacts on emergency response.

FIRE AND EMERGENCY MEDICAL RESPONSE (EMS) OPERATIONS

Response time is critical to effective fire and EMS response. For fires, the key reference point is the phenomenon of 'flashover', which is the point in fire growth where the contents of an area reach their ignition temperature and serious fire damage occurs. It is important to have fire companies arrive on-scene before or at the flashover, which occurs between four and 10 minutes after the beginning of the free burning stage of fire growth. For EMS, research has shown that brain damage occurs within four minutes of the body being deprived of oxygen, and that damage will be irreversible after ten minutes without intervention (American Heart Association). Again, rapid response time is critical to maximize the likelihood of survival in an EMS situation.

As previously shown in Figure 1, there are currently no fire stations or EMS units deployed directly within the Tideflats area. Twenty five years ago, the city had four fire stations situated in the Tacoma Tideflats[5]. Subsequent restructuring and budget reductions resulted in a gradual consolidation and closure of fire stations in the Tideflats. Although the Tideflats area has been identified by the Fire Department as an area

[5] Fire Station 6, located at 1015 E. "F" Street, served as quarters for Engine 6 and the cross-staffed hazardous materials response unit. Fire Station 12, located at 2316 E. 11th Street, was home to Ladder 4. Engine 15 was based out of Station 15, located at 3510 E. 11th Street. Fireboat *Commencement* was assigned to Station 18, 302 E. 11th Street.

with significant industrial fire, explosion, and life safety risks, the reality of resource constraints and relatively low call volume have discouraged relocating a unit there.

As a consequence of the Tideflats area transformation, the Tacoma Fire Department's emergency units and facilities located on or adjacent to East 11th Street were relocated. Fire Stations 6, 12, and 15 (were all eventually closed. Fire Station 3 (206 Browns Point Blvd) is now the closest station to the areas along the Hylebos Waterway, north side of the Blair Waterway, and most of Marine View Drive and Taylor Way. Stations 1 (Downtown) and 12 (Fife) cover the area served previously by Station 6 (areas along the Foss Waterway, Puyallup River, and Port of Tacoma Road). The resident ladder company in the Tideflats (Ladder 4) was moved to Fife (2015 54th Ave. E.) as a result of the elimination of the Blair Bridge. Ladder 4 was then teamed with a new engine company (Engine 12) that serves both Fife and the Tideflats. Former Tideflats based engine companies (Engines 6 and 15) were moved out of the Tideflats area or eliminated. The Department also lost fireboat staffing during this time.

In addition to the units located in Fife, the Fire Department currently provides emergency response into the Tideflats area from units located in Downtown, Northeast and East Tacoma. Most of the responses to the area are from three stations (#1- Downtown Tacoma; #12- Fife; and #3- Northeast Tacoma).

TRANSPORTATION SYSTEM

Existing and Historic Roadway System

The Tideflats area is served by a network of regional and local roadways. Major north-south access is provided by I-5, with the connecting I-705 spur into downtown Tacoma. SR 509 is the east-west spine of the Port area, with connections to I-5 via I-705, Portland Avenue, Port of Tacoma Road, and 54th Avenue. The recently completed Lincoln Avenue Bridge across the Puyallup River provides improved accessibility between the central and western Tideflats.

Access to/from the Tideflats over the past 20 years has been limited by previous and current bridge restrictions, closures, reconstructions and street vacations. As summarized below, these changes have changed travel patterns and disrupted emergency response to various portions of the Tideflats.

East 11th Street Viaduct Closure

Currently the East 11th Street viaduct is closed, which limits emergency response access to the central Tideflats from Fire Station #1 in Downtown Tacoma. There are no active plans to rebuild the viaduct.

Blair Bridge Removal and SR 509

The removal of the Blair Bridge (spanning the Blair Waterway at East 11th Street) also had impacts on emergency response. The new SR 509 connection became the alternative route for traffic and emergency vehicles[6]. Although SR 509 restored east-west access across the Tideflats, the access frequently resulted in longer response times to many locations because the new roadway was farther south than East 11th Street.

The emergency response units in the Fife station, provided as part of the service contract with Fire District 10, provided the initial responding units to emergencies in the central Tideflats following the removal of the Blair Bridge. However, the station location in Fife resulted in longer response times into the northern portions of the area than was the case before the bridge removal, and the units also were less timely responding to events on the Blair-Hylebos peninsula or areas of the Tideflats west of the Puyallup River than was formerly the case.

Hylebos Bridge Reconstruction and Alexander Avenue Vacation

Subsequently, the Hylebos Bridge was closed, leaving Station 15 operating in relative isolation along a narrow peninsula with limited access to the east or west. Following the closure of the Hylebos Bridge, Port staff began discussion with City Public Works staff to repair and reopen the bridge as part of the Port's development plans for the east side of the Blair Waterway.

At the same time, the Port and the Puyallup Tribe were jointly interested in vacating a portion of Alexander Avenue to enable development adjacent to the waterway to occur. In the event that Alexander Avenue was partially or fully vacated, the Hylebos Bridge was needed to provide a second way off the Blair-Hylebos peninsula.

The Port agreed to assist the City to pay the cost to repair and reopen the Hylebos Bridge. In the interim, the Port also agreed to maintain an emergency access corridor through the vacated right-of-way until the bridge repair was complete. The bridge was eventually reopened in May 2012.

Murray Morgan Bridge

Just prior to the recession in 2007, the Murray Morgan Bridge was closed by the Washington State Department of Transportation due to structural deficiencies. During the closure and reconstruction, the Fire Department redeployed some emergency response to help mitigate the impact of the closure on response times. Those additional resources were discontinued in 2009 due to the continued impact of the

[6] The City Council approved vacation of the approaches to the Blair Bridge in 1995 and in January 1997, following completion of SR 509, the Blair Bridge was dismantled.

recession. The Bridge remained closed until a major repair and reconstruction project was completed in February 2013.

Puyallup Avenue Bridge

The Puyallup Avenue Bridge across the Puyallup River has weight restrictions due to its structural deficiencies. Plans for replacing the bridge are underway by the city.

Planned Roadways

There are several planned roadway projects in the Tideflats area, such as:

- Port of Tacoma Road Interchange- Final design with construction being phased as funding is available
- 54th Ave Interchange- Reconfiguration being studied
- SR 167 extension- Final design; awaiting funding from the State
- Puyallup Avenue Bridge- Rebuild- Under design

Details regarding planned local and regional roadway projects are found in the attached map and table in **Appendix A**.

Pavement Conditions

Streets in the Tideflats handle anywhere from 1,000 to 5,000 trucks a day and upwards of 20,000,000 tons[7] of freight on an annual basis. Most of these streets are not built for this level of truck traffic. Additionally, many of the streets are designated on the Heavy Haul Industrial Corridor. These streets are allowed to handle ocean-going containers with up to 98,000 lbs. of gross vehicle weight. However, none of the streets in the Heavy Haul Corridor were originally built to handle the additional weight on a consistent basis.

The City has enacted Heavy Haul Industrial Corridor design standards, which include the provision of a minimum 10-inch deep asphalt paving section over 2 inches of crushed surfacing top course over 26 inches of crushed surfacing base. Other sections may allow for 10 inches of Portland-cement concrete over base consistent with geotechnical study and design. This standard is being applied to the Port of Tacoma Road rehabilitation project that will replace approximately 1.5 miles of Port of Tacoma Road to bring it up to Heavy Haul Corridor standards.

[7] Tideflats Area Transportation Study and WSDOT FGTS designations

CURRENT FIRE AND EMS OPERATIONS

STAFFING, STATIONS AND UNITS

The Tacoma Fire Department (TFD) is responsible for protecting 62 square miles, including the cities of Tacoma, Fircrest and Fife, which have a total of approximately 218,000 residents. The TFD has 357 uniformed personnel and 15 fire stations that are divided into three battalions. There are 13 engine companies, 4 ladder companies, 5 medic companies, and 2 squad companies. The department employs one safety officer, one technical rescue unit that is cross-staffed at Station 8, one hazardous materials unit that is cross-staffed at Station 12, and two fireboats that are cross-staffed at Station 14. The TFD receives approximately 41,900 calls per year (2014), 69 percent of which are EMS related. The location and staffing details of each station are summarized in **Table 1**.

Table 1. TFD Stations and Staffing

Station	*Address*	*Units*	*Total Staffing*
Station 1	901 Fawcett Avenue, Tacoma	Engine 1, Ladder 1	6
Station 2	2701 Tacoma Avenue South, Tacoma	Engine 2, Battalion 2	4
Station 3	206 Browns Point Boulevard, Tacoma	Engine 3 (ALS Engine)[1]	3
Station 4	1454 Earnest S. Brazil Street, Tacoma	Engine 4, Medic 4	5
Station 7	5448 South Warner Street, Tacoma	Engine 7	3
Station 8	4911 South Alaska Street, Tacoma	Engine 8, Ladder 2, Medic 2, Battalion 3, Tech Rescue 48	9
Station 9	3502 6th Avenue, Tacoma	Engine 9, Battalion 1	4
Station 10	7247 South Park Avenue, Tacoma	Engine 10 (ALS Engine) [1]	3
Station 11	3802 McKinley Avenue E, Tacoma	Engine 11, Medic 5	5
Station 12	2015 54th Avenue E, Fife	Engine 12, Ladder 4, Medic 3, Hazmat 44, Water Tender 51	8
Station 13	3825 North 25th Street, Tacoma	Squad 13/Engine 13[2], Ladder 3	6 or 5
Station 14	4701 North 41st Street, Tacoma	Engine 14/Fire Boat [3]	3
Station 15	6415 McKinley Avenue, Tacoma	Squad 15/Engine 15[2]	3 or 2
Station 16	7217 6th Avenue, Tacoma	Engine 16, Medic 1, Air Rig 43	5
Station 17	302 Regents Boulevard, Fircrest	Engine 17 (ALS Engine)[1], Air Rig 42	3

Notes: 1. ALS Engines are staffed with a paramedic, but do not do transports.

2. Squad/Engine cross-staffed deployed based on daily staffing availability. Normal budgeted Squad staffing is peak-time only, 0700 to 1900 daily.

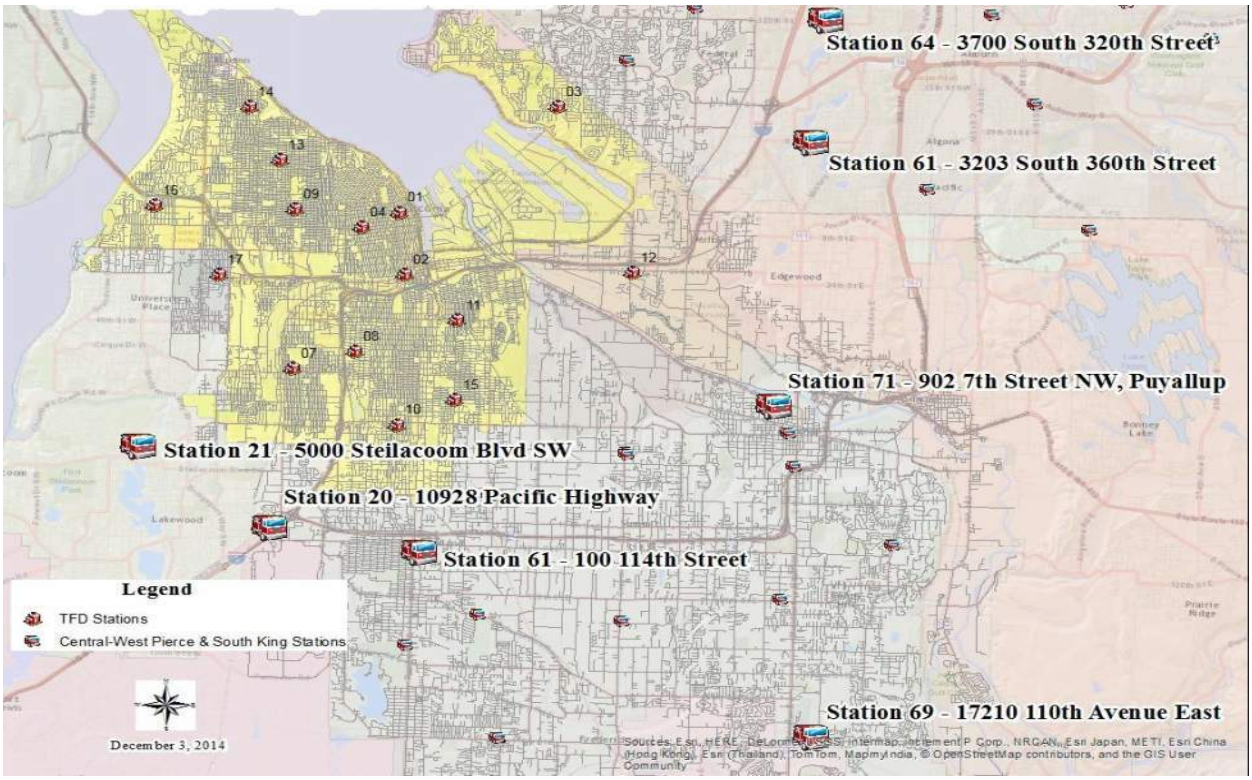
3. Engine 14 is cross-staffed with the Fire Boat.

4. Shading indicates units closest to the Port.

HAZMAT AND TECHNICAL RESCUE CAPABILITIES

Tacoma Fire Department's technical rescue unit and staffing is currently at Station 8, on South Alaska Street. However, the unit is cross-staffed, so deployment and training are constrained by the need to be able to readily respond to other emergencies. Station 12 in Fife provides the Hazmat unit and staffing and is also cross-staffed. There are additional equipment caches at the fire department training facility within the Port. Regional Hazmat and Technical Rescue services include a number of stations in Central and West Pierce County and South King County. However, the response times to the Tideflats area from these units are long as many are between eight and 12 miles away. **Figure 2** highlights the specific locations of the regional Hazmat and Technical Rescue resources.

Figure 2. Regional Special Operations' Stations



MARINE RESOURCES

The TFD maintains three fire boats. Fireboat *Commencement* is a modified hovercraft based surface effect style vessel constructed in the early 1980s. An extensive $4 million renovation of *Commencement* was completed for the vessel in 2006. Fireboat *Destiny* is a new primarily federal DHS grant funded 32' vessel placed into service as a result of an interagency agreement between the Port and the City in 2012. A 50' Metalcraft fireboat, also financed primarily from DHS grant funds, was completed in 2014 and will enter service this year.

TFD fireboats are not staffed fulltime, but cross-staffed by a land company (Station 14) that responds to both land and water incidents. Response times for TFD fireboats are quite long, typically in the 30 to 45 minute range, depending on the actual incident location, availability of a crew, weather, and other factors. The operation of the boats and marine operations generally are ad hoc, with training provided as needed.

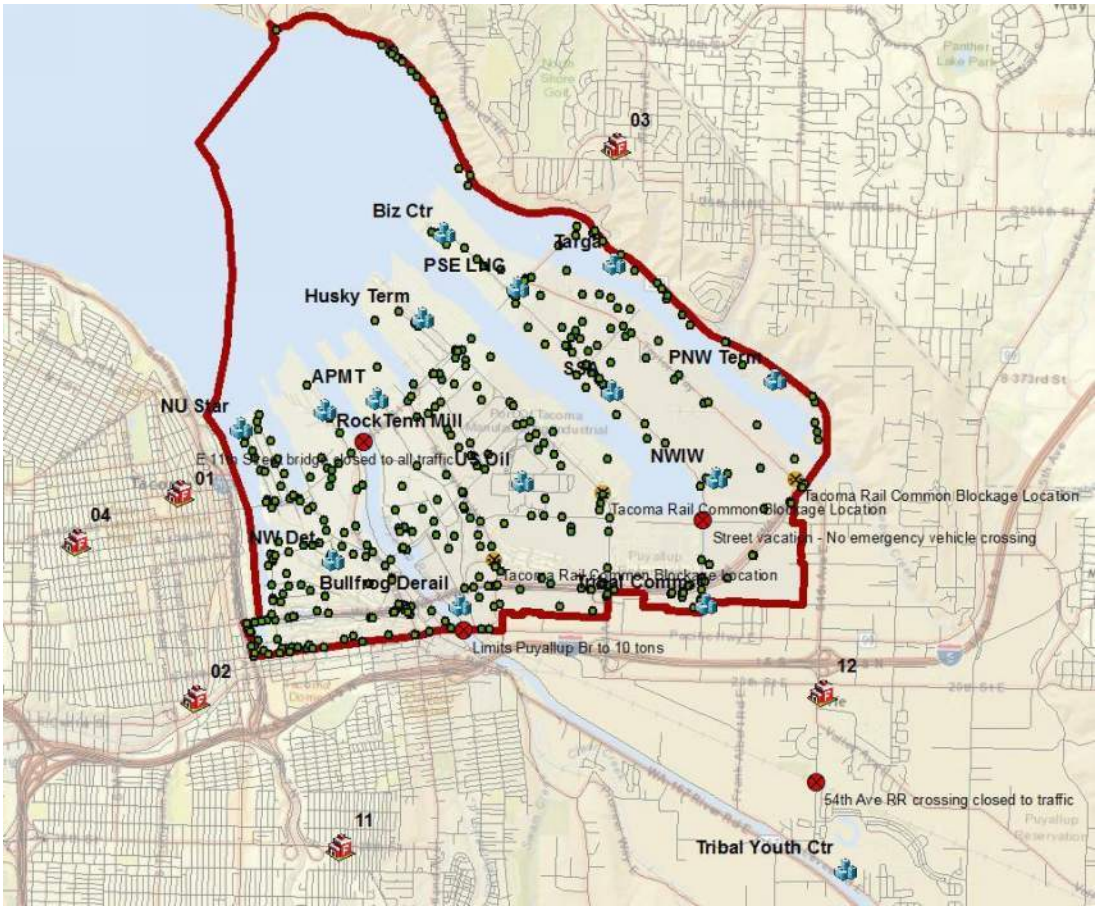
EMERGENCY RESPONSE ANALYSIS – EXISTING CONDITIONS

RESPONSE TIME DATA

The project team evaluated historical incident data from 2012 to 2014 to understand the overall demand in the Tideflats area and the average response times. Approximately 550 calls (requiring the response of just over 1,000 TFD units) occur in the Tideflats area on average each year. Of these, the majority are medical emergencies.

The incident data provided location-based information to understand the spatial distribution of the calls from 2012 to 2014. As shown in **Figure 3,** emergency response calls are distributed throughout the Tideflats area, with the only notable gaps where land is currently vacant.

Figure 3. Locations of Emergency Response Calls, 2012 – 2014



TIME OF DAY VARIATION

Variations in the call volume by time of day also highlight response conditions. Peaks during the morning period from 7AM to 10AM and additional peaks in the afternoon from 1PM to 3PM exist, as shown in **Figure 4**. The first unit average response times also show variations throughout the day. **Figure 5** indicates that the slowest response time is during the morning peak period from 7AM to 8AM, with response times at least five minutes slower than during other times of the day.

The TFD effectively uses peak-load staffing. Adjustments are made in deployment based on demand and the time of day as well as available staffing. The same methodology can be used for the Port, which has a recurring weekday life-cycle with the highest level of demand occurring during weekdays.

Figure 4. Call Volume by Hour of the Day

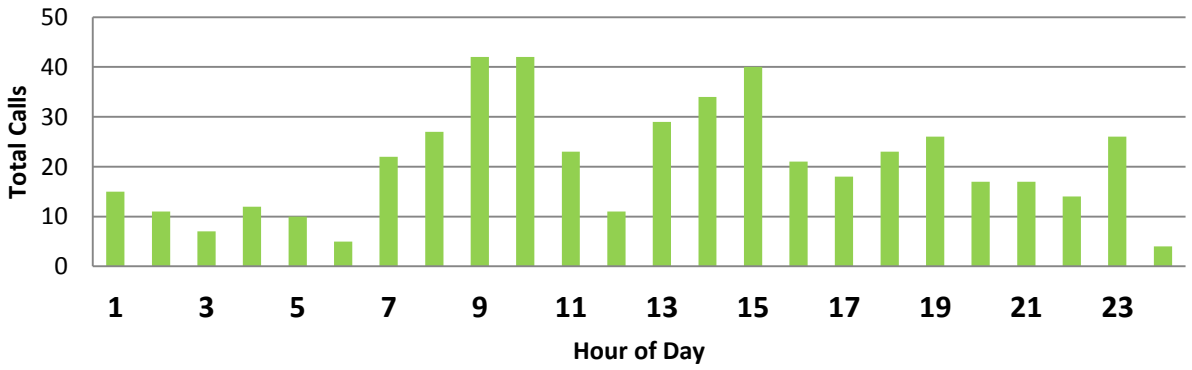
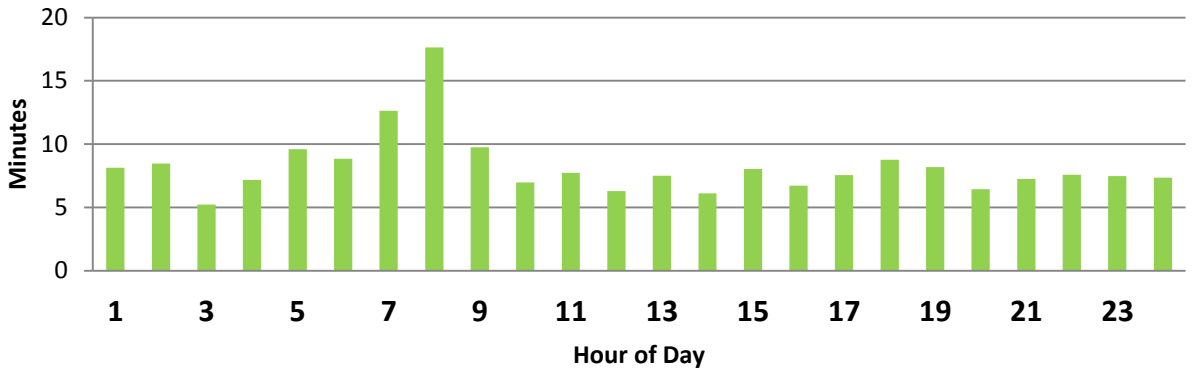


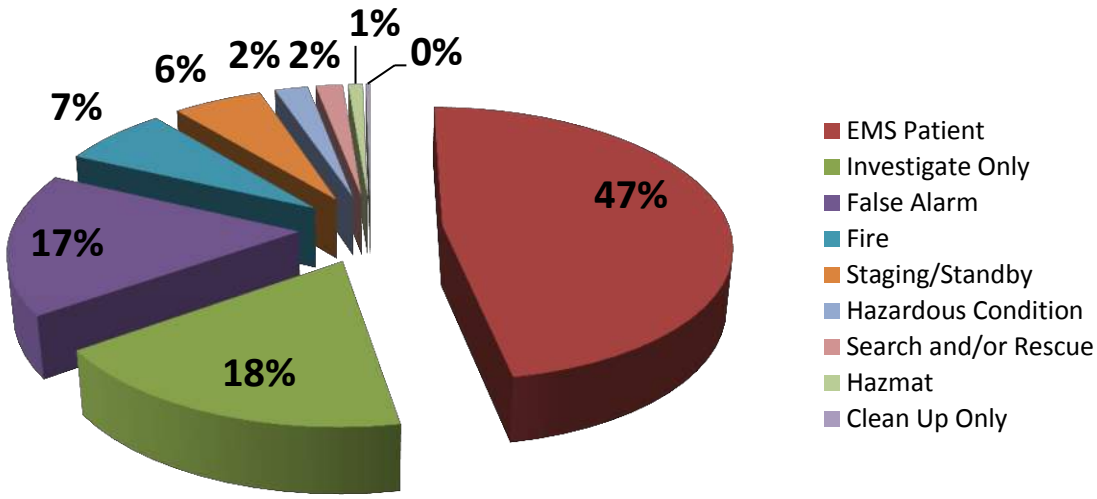
Figure 5. Average Response Times for First Unit by Hour of the Day



CALL AMOUNTS BY TYPE OF EMERGENCY

Historical data was analyzed to understand the relative demand by type of emergency. As shown in **Figure 6** "EMS Patient" calls make up a large portion (47%) of the response type in the Tideflats area, with "Investigate Only" and "False Alarm" comprising 35% of the total call volume.

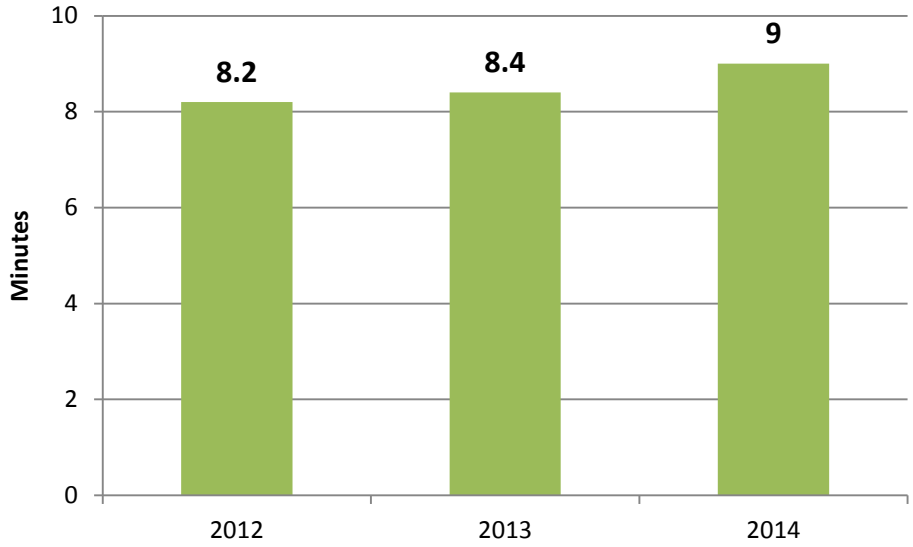
Figure 6. Call Volumes by Type of Incident



AVERAGE RESPONSE TIMES

Comparing the change in response times over time and the historical times to standards set by the Fire Department highlighted the issues surrounding response to the Tideflats area. On average, response times in the Tideflats area have been increasing since 2012. As shown in **Figure 7**, the average total response time for first unit response was 8.2 minutes and increased to a 9.0 minute average by 2014.

Figure 7. Average Response Times by Year



AVERAGE RESPONSE TIME BY CALL TYPE

The performance objectives identified by the Tacoma Fire Department are highlighted in **Table 2**. For example, the standard response time for first responders to a Hazmat incident is 6 minutes and 50 seconds as defined by the performance objectives. These objectives were compared to actual response times by call type in **Table 3**. Both the average response times and the 90th percentile response times for Fire, ALS and Search/Tech Rescue incidents are greater than the standard set by the Fire Department, with Search/Tech rescue over four minutes above the threshold.

The National Fire Protection Association (NFPA) standards define specific components of a response time, with travel time representing a large proportion of that time. NFPA 1710 identifies as standards a 4-minute travel time for the first responding unit and an 8-minute travel time for full alarm capability. The next section specifically evaluates the travel time portion of emergency response.

Table 2. Tacoma Fire Department Performance Objectives

		Total Response Time				
		Fire	EMS	HazMat	Rescue	Marine
Alarm Processing	Pick-up to Dispatch	60 sec.	90 sec.	90 sec	90 sec.	90 sec.
Turnout	Turnout Time 1st Unit	80 sec.	60 sec.	80 sec.	80 sec.	80 sec.
Travel*	Travel Time 1st Due	4:00	4:00	4:00	4:00	4:00
	Travel Time - Balance	8:00	8:00	8:00	8:00	8:00
Total Response Time (TRT)	TRT 1st Due	6:20	6:30	6:50	6:50	22:30
	TRT - Balance	10:20	10:30	10:50	10:50	22:30

*NFPA travel time standards are 4 minutes for 1st due and 8 minutes for balance of companies

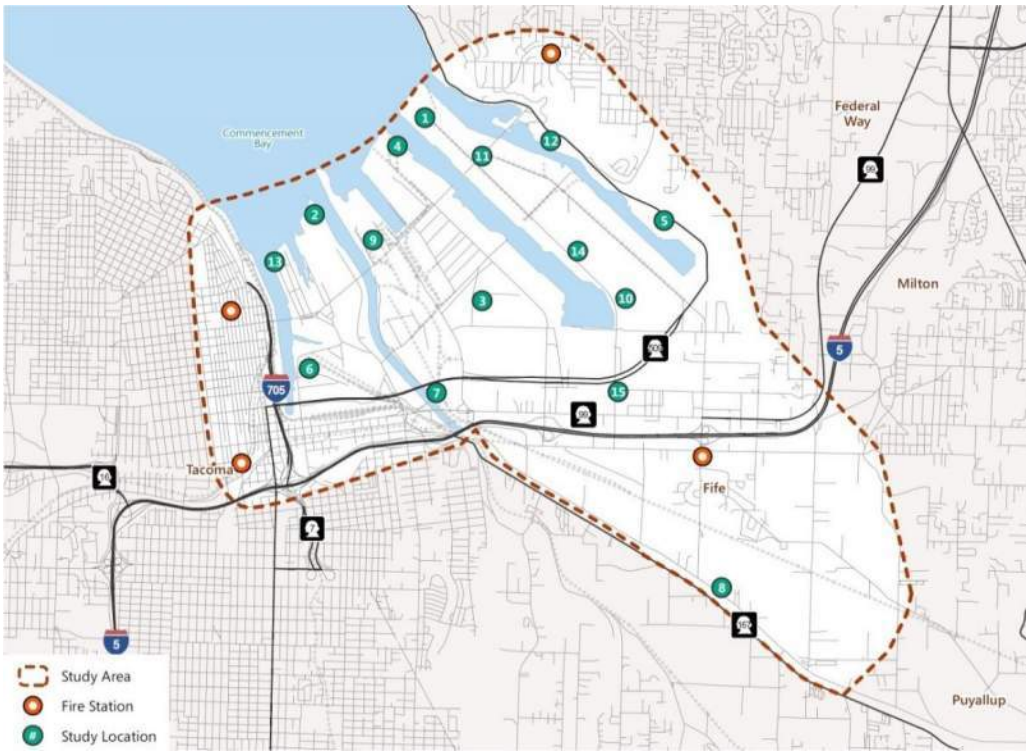
Table 3. Actual Response Times by Call Type Compared to Standards

		Total Response Time			
Fire Incidents		**Standard**	Average	90th Percentile	90th Percentile Compared to Standard
	First Arriving Unit	**6.2**	7.3	10.5	+3.2
	Last Arriving Unit (Full Complement)	**10.2**	11.7	21.2	+8.9
ALS Incidents					
	First Arriving Unit	**6.3**	6.5	9.6	+2.1
	Last Arriving Unit (Full Complement)	**10.3**	8.1	12.9	+0.4
Hazmat Incidents					
	First Arriving Unit	**6.5**	8.9	11.5	+3.7
	Last Arriving Unit (Full Complement)	**10.5**	13.3	23.9	+11.1
Search / Tech Rescue Incidents					
	First Arriving Unit	**6.5**	7.2	12	+4.2
	Last Arriving Unit (Full Complement)	**12.8**	10.7	16.5	+3.7

STUDY LOCATIONS

During a technical committee meeting held in September 2014, the group identified over 20 locations to be analyzed as case studies for the emergency response analysis. This list of 20 locations was trimmed to 15 locations based on input from the committee. The selected locations were primarily illustrative and are not intended to identify or call out specific locations as dangerous or potential problem areas. The final set of study locations are shown in **Figure 8**.

Figure 8. Study Locations



Label ID	Full Name
1	Earley Business Center
2	West Rock Paper Mill
3	US Oil and Refining Company
4	Husky Terminal & Stevedoring
5	PNW Terminal
6	NW Detention Center
7	Bullfrog Junction
8	Puyallup Tribal Youth Center
9	APM Terminals
10	NW Innovation Works (proposed)
11	PSE Liquefied Natural Gas Plant (proposed)
12	Targa Sound Terminal
13	NU Star Energy
14	Marine View Ventures
15	Residential Tribal Community

4-MINUTE AND 8-MINUTE TRAVEL TIME SHEDS

Utilizing the historical response times as calibration, the existing travel time sheds were developed in GIS. Based on NFPA standards, the four minute travel time objective is the desired maximum travel time for the initial responding units to all emergencies. The 8 minute travel objective is the desired maximum travel time for all ALS transport units. The street network and travel speeds were provided by Tacoma Fire Department and the network routing analyst created travel time sheds from each of the adjacent fire stations. The following were assumed road and bridge closures:

- 11th Street Viaduct between E Portland Avenue and Milwaukee Way
- Puyallup Avenue Bridge
- Alexander Avenue north of SR509
- 54th Avenue railroad crossing

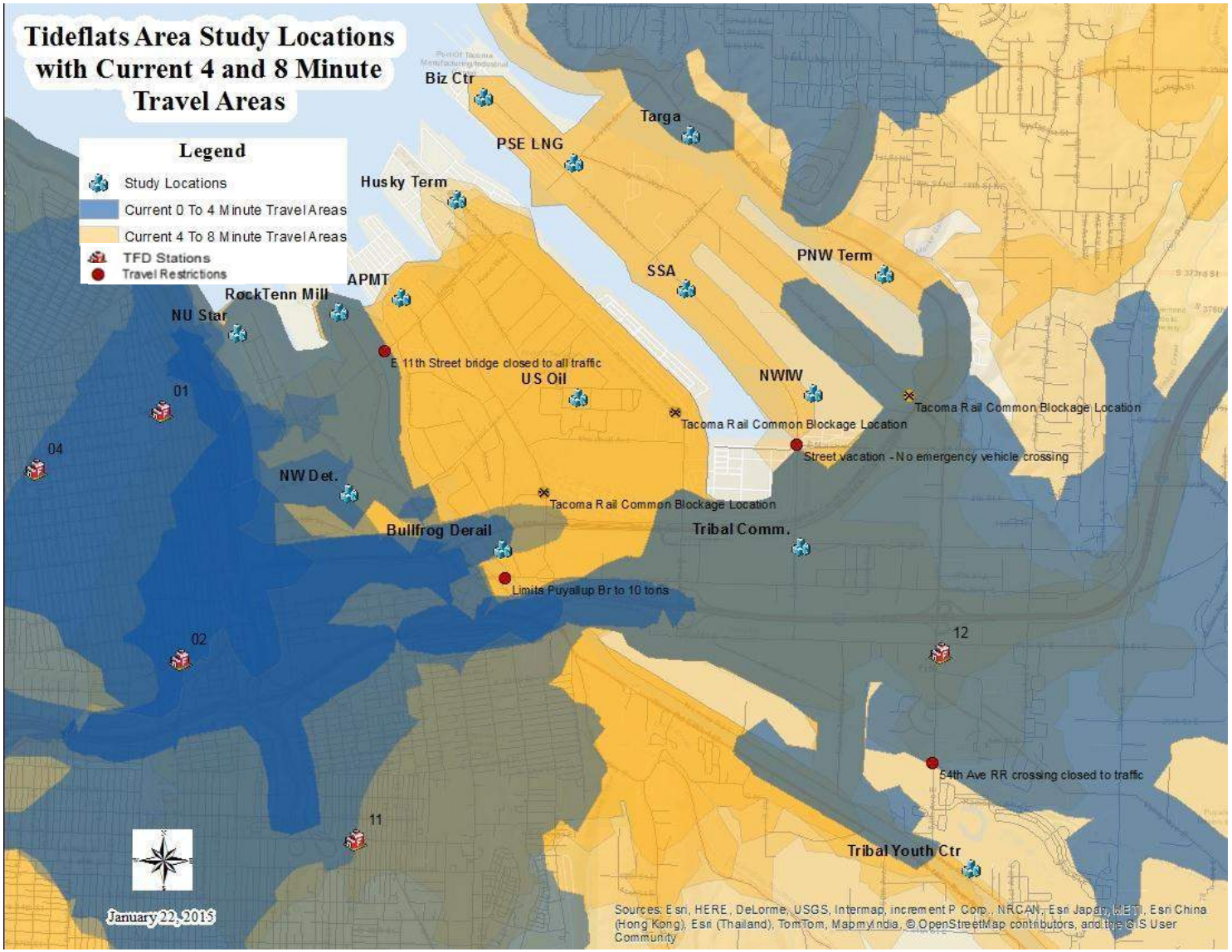
The travel time sheds were based purely on travel time and are not considered the total response time. While the GIS travel shed analysis is good for comparison purposes, previous studies revealed that actual response and travel times are longer than those calculated using this technique.

As shown in **Figure 9**, a large portion of the Tideflats is not reachable within four minutes, while the area is covered by the 8-minute travel time shed.

The northern peninsulas of the Tideflats are the areas most underserved in terms of coverage and long response times. To illustrate, a number of the study locations are not served within the four minute travel time shed, including:

- APMT terminals
- Husky Terminal
- US Oil
- The Earley Business Center
- Marine View Ventures
- Northwest Innovation Works (proposed methanol facility)
- PNW Terminal

Figure 9. Existing 4-Minute and 8-Minute Travel Time Sheds



EMERGENCY RESPONSE ANALYSIS – FUTURE SCENARIO TESTING

To understand impacts of future street network configurations and congestion, travel times were estimated based on proposed 2020 and 2035 transportation projects. Additionally, the Tacoma travel demand model provided speed adjustments based on future congestion for 2020 and 2035 conditions.

TRANSPORTATION NETWORKS (2020 AND 2035)

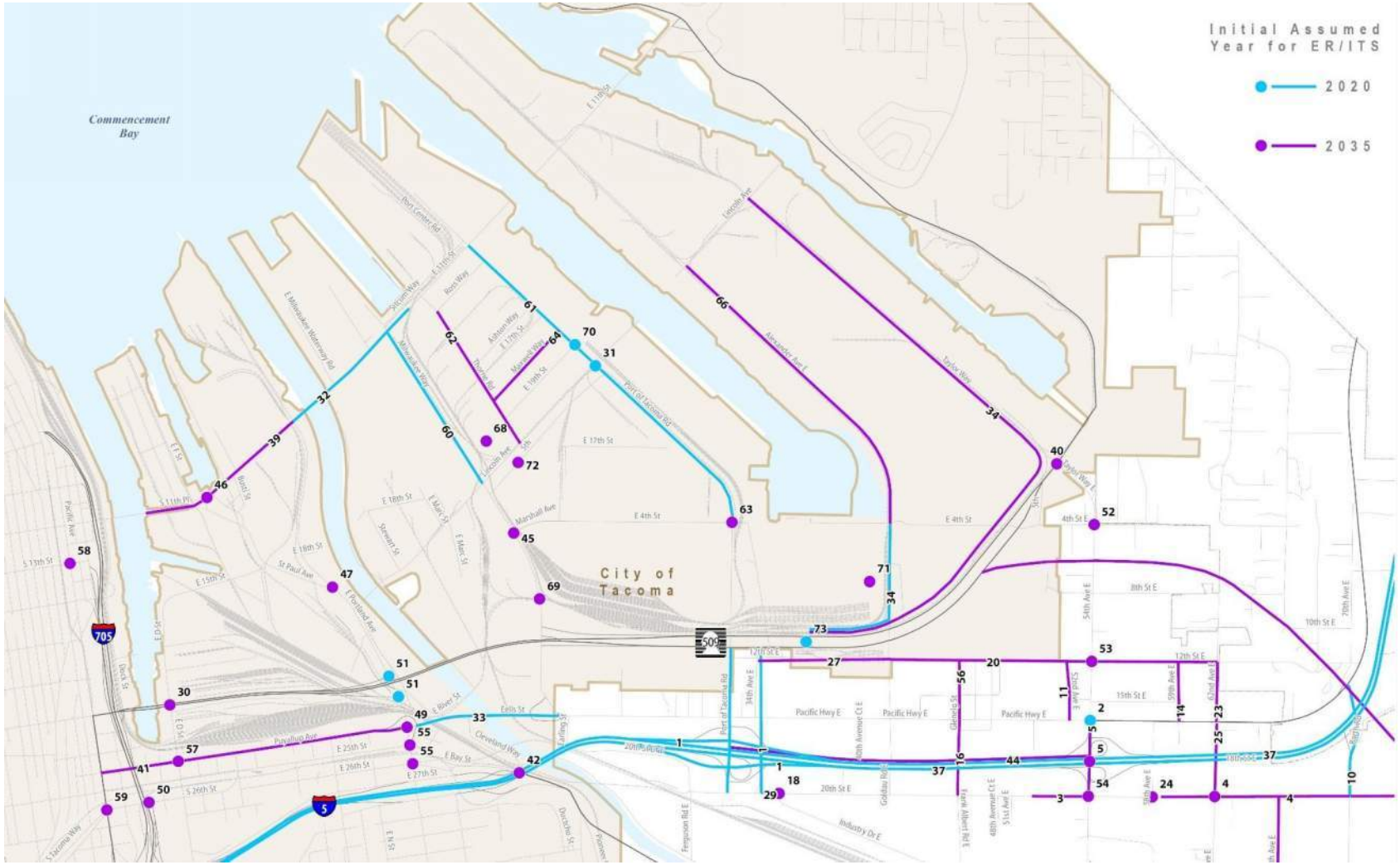
The 2020 network was based on near-term transportation project implementation. **Figure 10** shows the locations of the improvements, with key projects noted below (the numbers refer to the project number in the Figure). The full list of projects including extended descriptions can be found in **Appendix A**.

1. Port of Tacoma Rd Interchange
32. 11th Street viaduct sensitivity tests
33. Puyallup Avenue bridge
37. HOV lanes along I-5
51. Portland Ave off-ramps from SR-509
60. Milwaukee Way vacation

Key projects noted for 2035 incorporate the 2020 projects and include the following:

5. Fife 54th Avenue interchange rebuild
6. D Street ramps from SR-509
36. SR-167 connection
64. Maxwell Way street vacation
66. Alexander Avenue street vacation

Figure 10. Future Projects for 2020 and 2035 Street Networks



RESPONSE TIMES (2020 AND 2035)

In 2020 and 2035, the modifications in the street configurations and future congestion levels only create minor changes in the travel time sheds. Slight improvements in travel time due to new roadway connections are somewhat offset by increases in general traffic congestion. In 2035, the additional street vacations would also diminish the response coverage. Much of the Tideflats area and many of the study locations would still lack response time coverage within the four minute travel time shed, as shown in **Figure 11** and **Figure 12**. Note in each of the following two figures, a darker shade of orange represents areas that are covered in the four minute travel shed in 2020 and 2035 that are within the existing travel shed.

Figure 11. Four Minute Travel Time Shed for 2020 Network

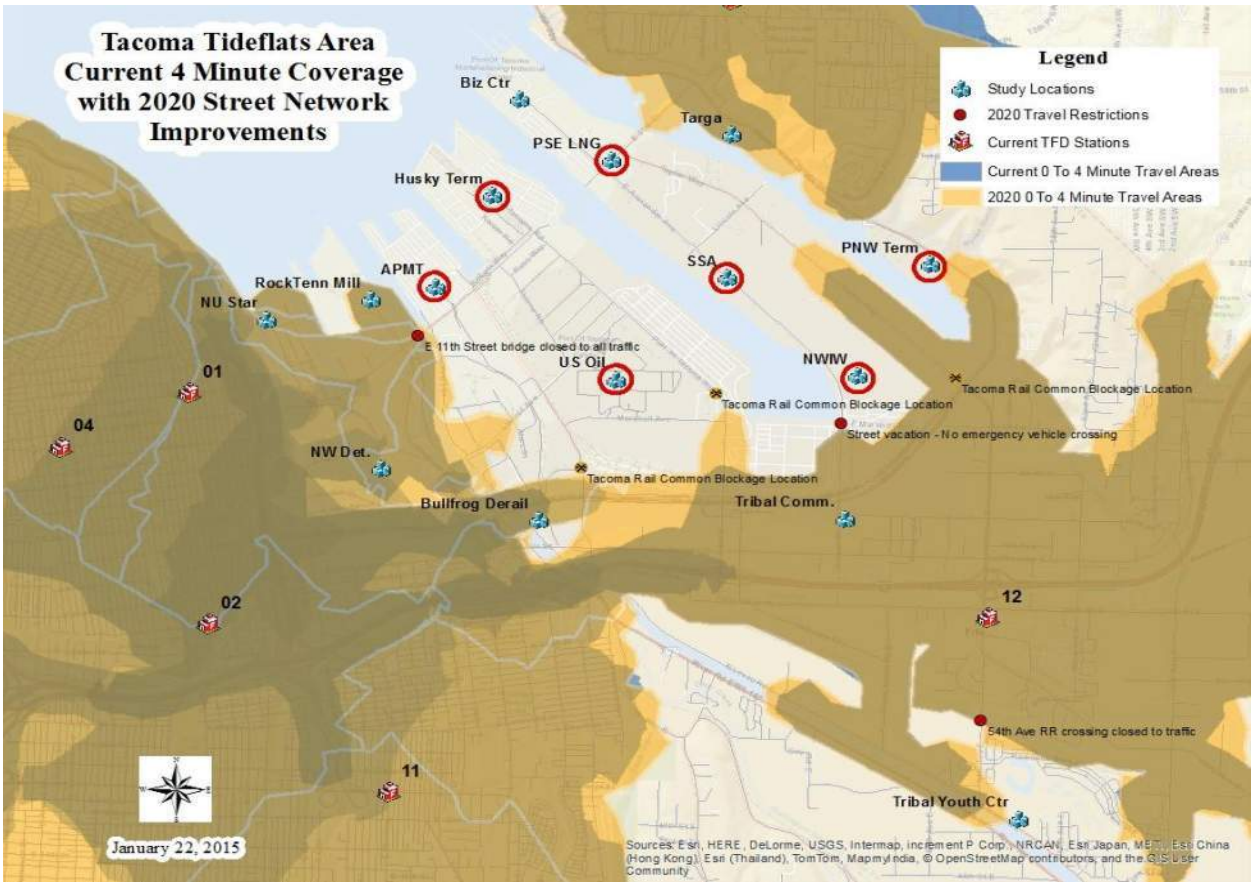
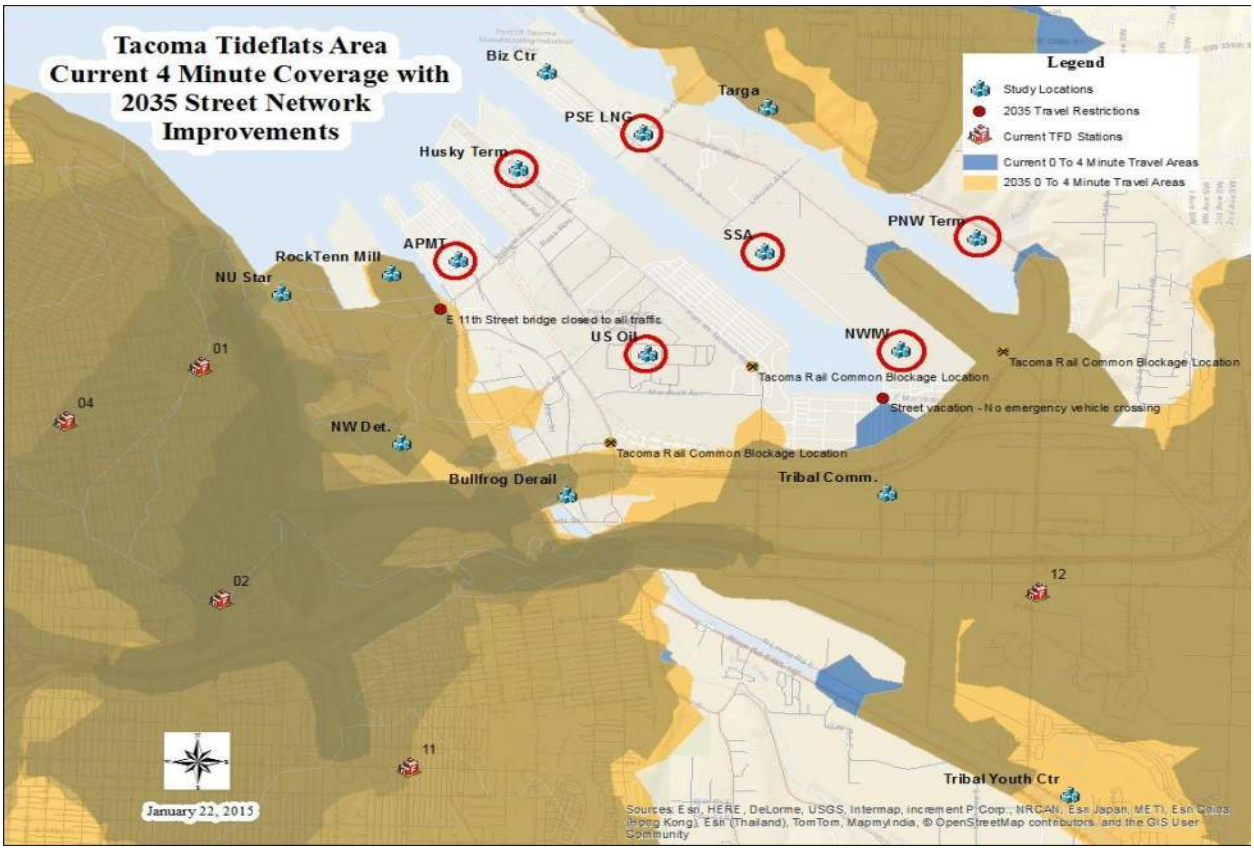


Figure 12. Four Minute Travel Time Shed for 2035 Network



RESPONSE TIME SENSITIVITY TESTS

In addition to evaluating changes to the travel time sheds based on 2020 and 2035 conditions, the project team conducted detailed sensitivity tests on the existing network under a variety of new fire station configurations and bridge re-opening scenarios. These sensitivity tests do not assume other improvements discussed later in the document, including pavement condition and ITS. The scenarios selected involved various combinations of reopening Station 6 and Station 15, creating a new station at the Fire Training Center[8], and reopening the 11th Street Bridge. The following scenarios were evaluated:

- Station 6 open and 11th Street bridge open
- Station 6 open and 11th Street bridge closed
- Station 6 and Station 15 open and 11th Street bridge open
- New Station at Fire Training Center location open and 11th Street bridge closed
- New Station at Fire Training Center location and Station 15 open and 11th Street bridge closed

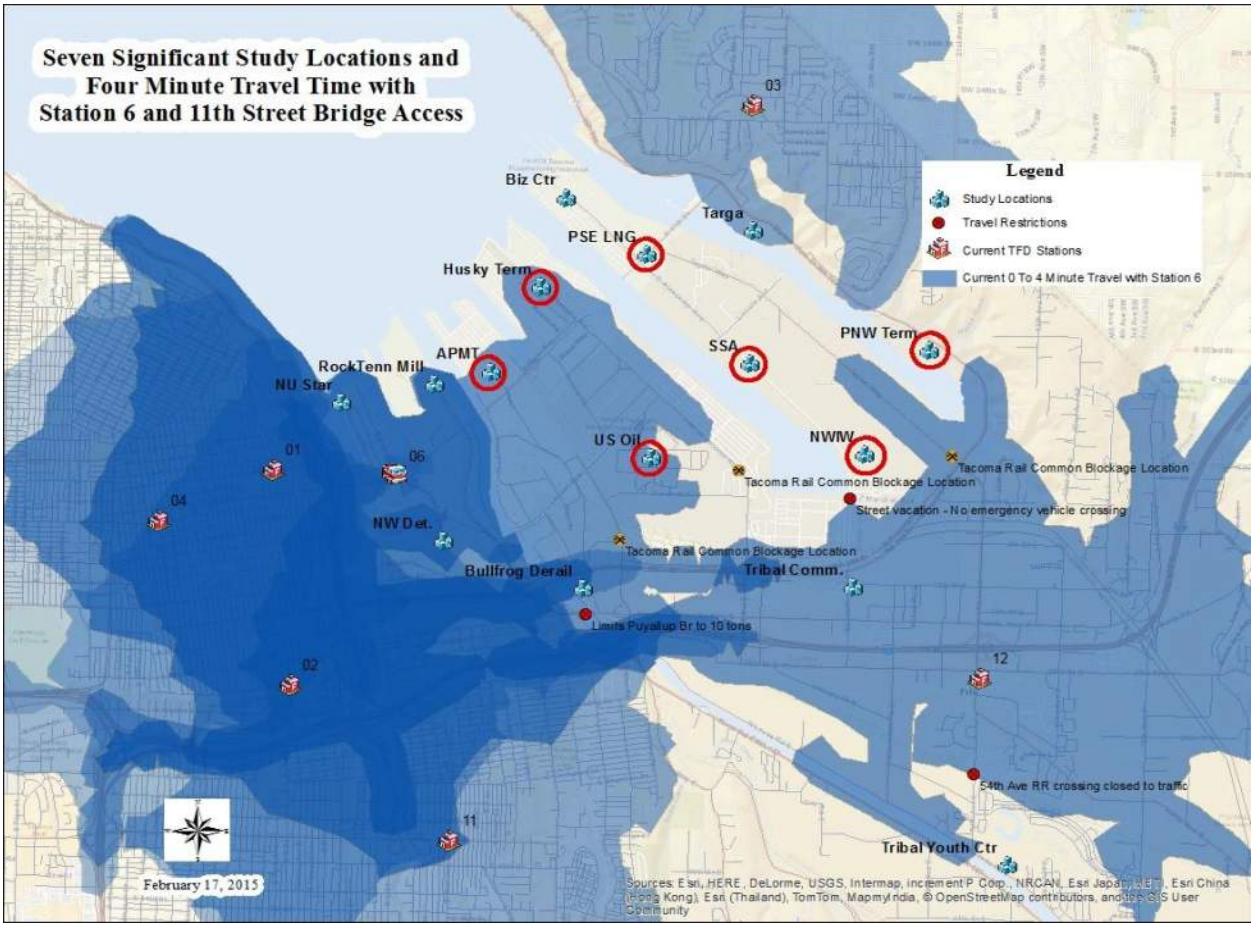
The maps that depict the change in travel time sheds present overlapping four-minute response times. Therefore, darker shades of blue represent areas that are within the four-minute travel time shed of multiple station locations. For each scenario, the study locations that are not covered by the existing four-minute travel time shed are circled on the map for reference.

[8] The fire training center is located on Marshall Avenue east of Milwaukee Way.

Station 6 Open and 11th Street Bridge Open

The opening of Station 6 in coordination with the 11th Street bridge opening provides expanded coverage into the Tideflats area, providing four minute travel time reach to all of the study locations on the central Tideflats. However, a gap still exists on the Blair-Hylebos Peninsula, as no change in the coverage is provided from this scenario as shown in **Figure 13.**

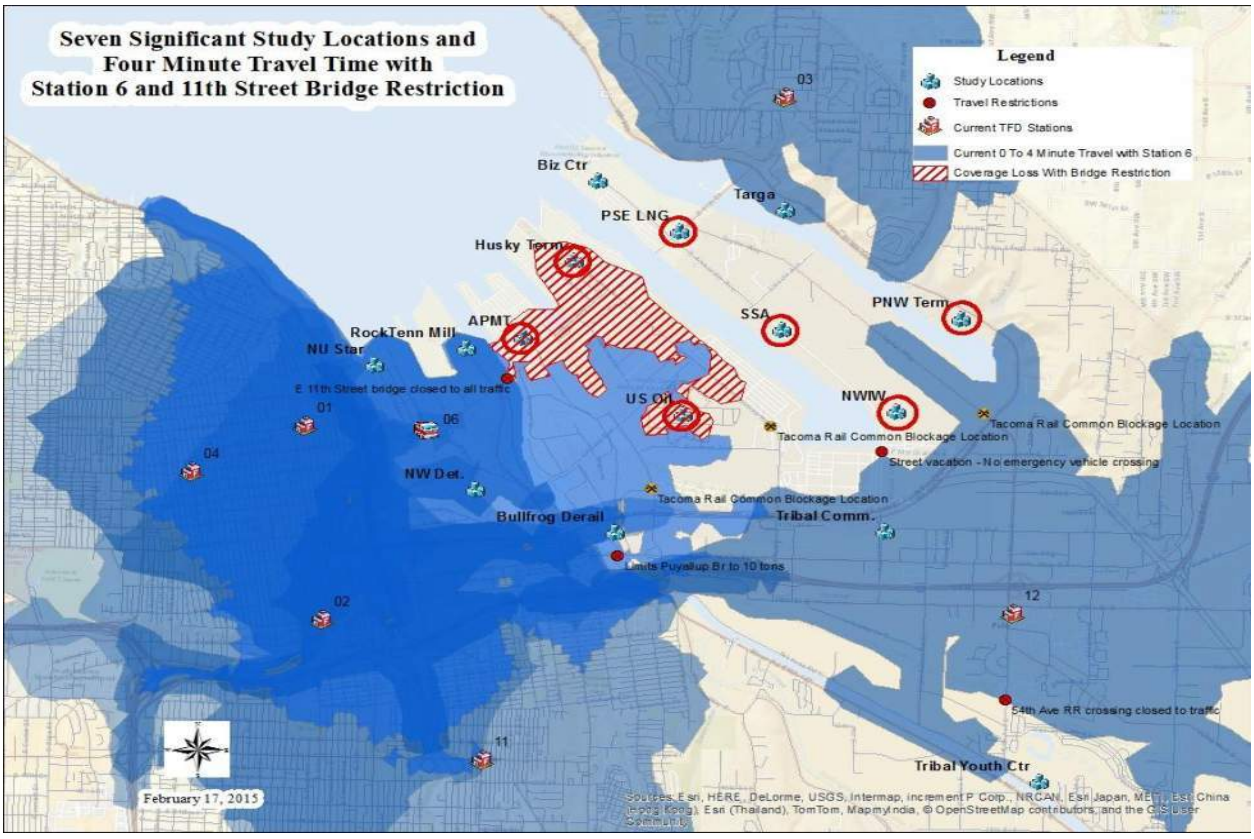
Figure 13. Four Minute Travel Time Shed for Scenario with Station 6 and 11th Street Bridge Access



Station 6 Open and 11th Street Bridge Closed

With a closed 11th Street bridge, the opening of Station 6 does not significantly expand the coverage into the Tideflats area due to the diversion required to reach the central Tideflats via Portland Avenue and Lincoln Avenue. Key study locations such as the APMT Terminal, the Husky Terminal and the US Oil site still are not within the four minute travel shed. Additionally, the gap still exists on the Blair-Hylebos Peninsula as no change in the coverage is provided from this scenario as shown in **Figure 14**.

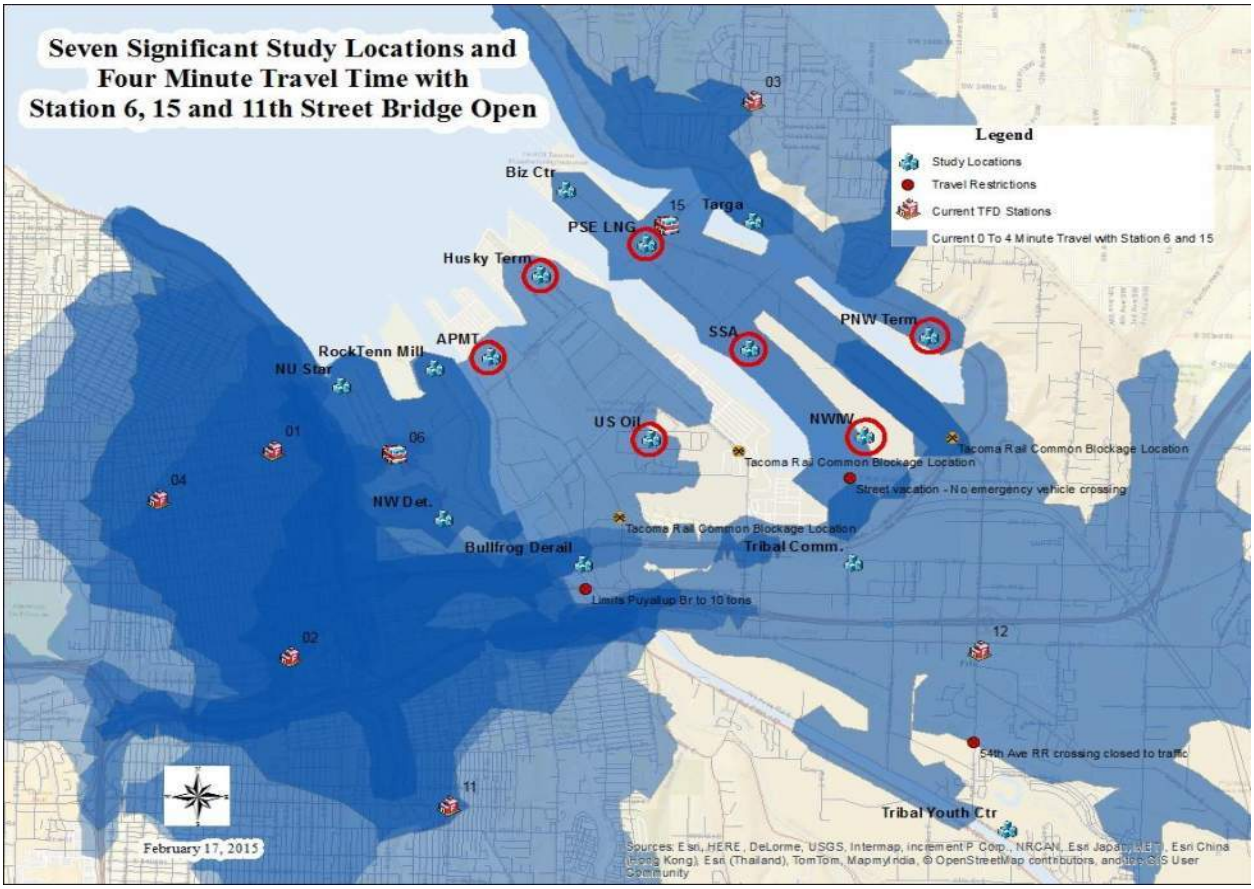
Figure 14. Four Minute Travel Time Shed for Scenario with Station 6 and 11th Street Bridge Restriction



Station 6 and Station 15 Open and 11th Street Bridge Open

The opening of Station 6 and Station 15 in addition to the 11th Street bridge opening provides extensive coverage throughout the Tideflats area, with all study locations reachable within four minutes of travel time. A small portion near Marshall Avenue and Port of Tacoma Road still is outside of the four minute travel shed as shown in **Figure 15**.

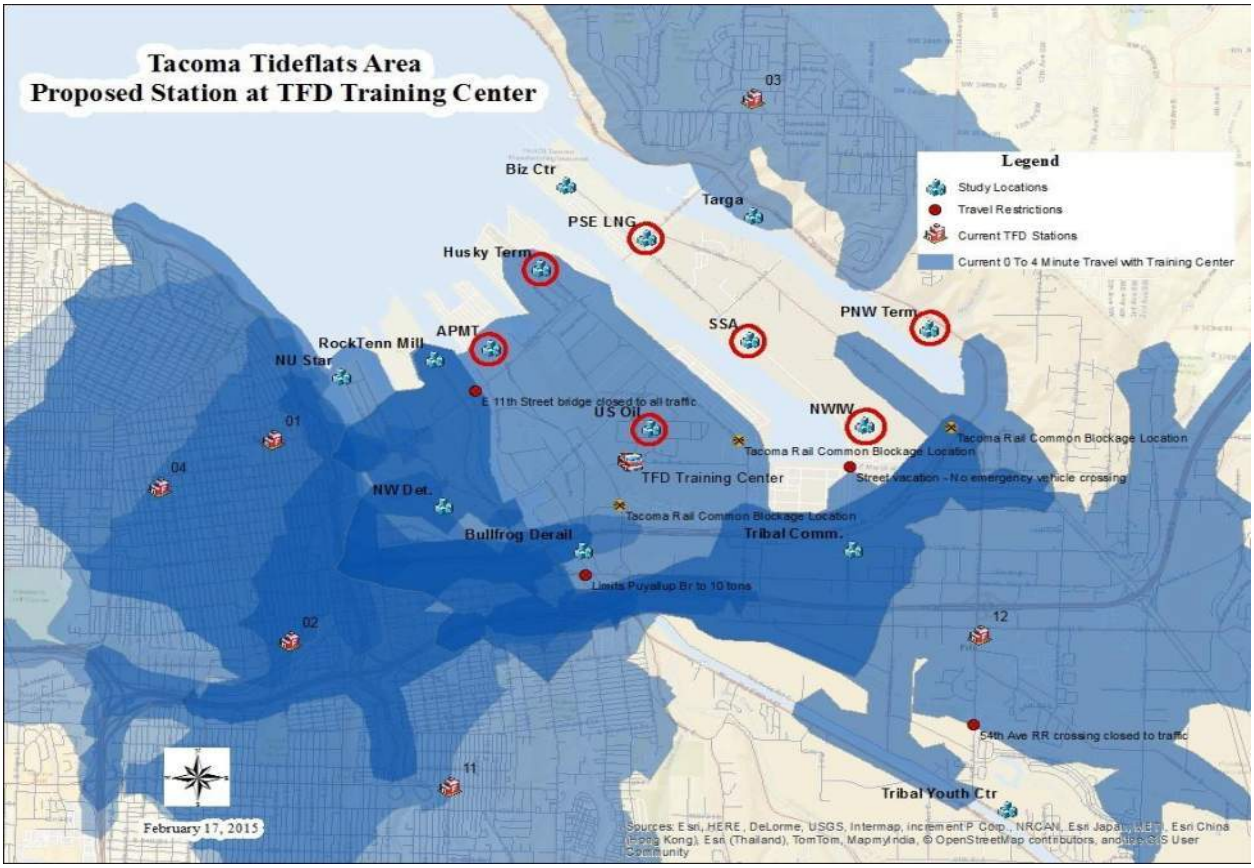
Figure 15. Four Minute Travel Time Shed for Scenario with Station 6, 15 and 11th Street Bridge Access



Station at Training Center Open and 11th Street Bridge Closed

A station at the current TFD training center or another suitable nearby location provides extensive coverage throughout the central Tideflats, even with the 11th Street bridge remaining closed. However, the gap along the Blair-Hylebos Peninsula still exists with the only coverage provided by Station 3 and Station 12 as shown in **Figure 16**.

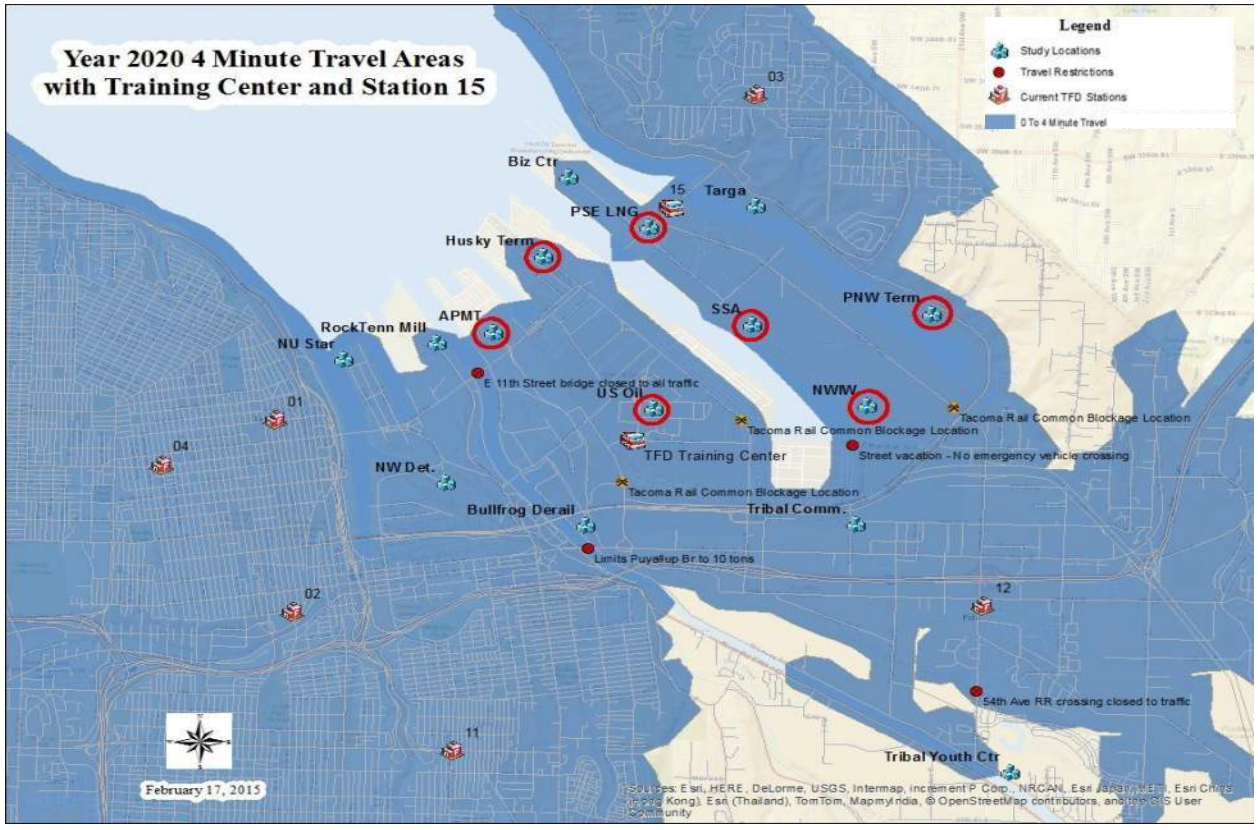
Figure 16. Four Minute Travel Time Shed for Scenario with TFD Training Center



Station 15 and Training Center Station Open and 11th Street Bridge Closed

The combination of Station 15 and the training center or another suitable nearby location opening expands coverage throughout the Tideflats, even with the 11th Street bridge remaining closed. The central location of the training center fills the existing gaps in coverage of the Husky Terminal, APMT Terminal, and the US Oil site while Station 15 covers all locations on the Blair-Hylebos Peninsula as shown in **Figure 17**.

Figure 17. Four Minute Travel Time Shed for Scenario with Station 15 and the TFD Training Center Station



SUMMARY OF COVERAGE SHED ANALYSIS

While response coverage doesn't change substantially in the 2020 or 2035 network conditions, modifications to fire station opening configurations significantly affect the response sheds in the Tideflats area. Additionally, the 11th Street bridge closure has a major impact on providing coverage to study locations such as APMT Terminal and the Husky Terminal. However, even with the 11th Street Bridge remaining closed, converting the Fire Training Center into a station and re-opening Station 15 on the Blair-Hylebos Peninsula expands the coverage throughout the Tideflats and ensures the entire area is within a four minute travel time.

Each of these scenarios encompasses various operating and capital cost elements that should be considered when evaluating the overall benefits of each scenario. Additional modifications to response times may be possible with improvements in pavement conditions or through Intelligent Transportation Systems, as discussed below.

POTENTIAL IMPACTS ON COVERAGE SHEDS

PAVEMENT CONDITION

Good pavement conditions are important to emergency response time, as poor pavement can necessitate a slower travel speed along portions of a corridor, exhibiting a similar effect as traffic calming devices. Research has documented that traffic calming or other impacts to a smooth traveling surface can require deceleration and slow emergency response by anywhere between two and ten seconds per location. Applying these estimates to local conditions, the rehabilitation of the 1.5 mile portion of Port of Tacoma Road could reduce the emergency response time along that corridor by an estimated 10 to 30 seconds. Improvements to the surface condition of Taylor Way could reduce travel time in that corridor by 15 to 40 seconds. The travel time savings could extend the current 4-minute travel shed an average of between 550 and 1,400 feet further north along Port of Tacoma Road and an average of between 750 and 1,900 feet further north along Taylor Way, based on a traveling speed of 40 mph.

Because freight trucks and emergency response vehicles have similar operating characteristics, the improvement in pavement conditions would also benefit freight mobility. With these shared benefits, pavement replacement represents a near-term opportunity that serves a variety of stakeholders in the Tideflats area.

INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

Another opportunity to improve response times is Intelligent Transportation Systems (ITS). A concurrent ITS study was performed to examine strategies to improve emergency response and freight movements within the area.

The study identified an overall ITS Strategic Plan and specific steps to be taken following the study completion, leading to the eventual phased or full build out of the ITS. This study considered the results of the Washington State Department of Transportation (WSDOT) Statewide Intelligent Transportation System Plan, updated in 2013, that identified an unfunded priority need for ITS on I-705 and SR 509 as well as WSDOT's current ramp metering operations along I-5 that affect traffic patterns on I-5 and SR 509.

Based on the results of a user survey, stakeholder interviews, and input from a project committee, the team developed a set of user needs that represent the collective. The needs are focused around seven ITS areas listed below.

1. Data Communications
2. Safety
3. Real-time Traffic Management
4. Regional System Management
5. Freight Management
6. Weather Information Management
7. Traffic Operations Evaluation

From the user needs and stakeholder input, the team developed a set of potential goals for the ITS Strategic Plan that would also align with the goals and policies from the City of Tacoma Comprehensive Plan Container Port Element and the goals from the Port of Tacoma Land Use and Transportation Plan. The goals and strategies helped frame a concept of operations for the ITS system as a whole and identified relevant ITS strategies that may be appropriate for improving emergency response to the Tideflats. The benefits of particular ITS strategies are noted below.

- **Video-sharing**
  - Improved coordination between agencies
  - Detailed viewing of incidents before response arrives
  - Understanding of current traffic conditions and any road blockages
  - On-site routing improvement with video surveillance
- **Cameras at railroad crossings**
  - Better routing around potential blockages
  - Savings of up to one to three minutes depending on the location of the blockage, the notification timing and the availability of alternative routes
- **Signal preemption on priority corridors**
  - Savings of between 10 and 30 seconds per intersection for emergency response
  - Reduction in travel time of up to 30 seconds along certain corridors in total
- **Updated signal coordination**
  - 7-25% reduction in overall vehicle delay
  - Specific impact on emergency response not confirmed and would depend on whether the incident occurs during periods of peak travel demand[9]

[9] While the benefits were not quantified for this study, regularly updating signal timing can be a cost effective way to reduce congestion and queuing. Note that the 54th Street Avenue corridor has been reviewed previously by WSDOT and they have been unable to identify changes that may significantly improve travel times in that corridor.

RECOMMENDATIONS – A SET OF TRADE-OFFS

STRATEGIES

Improvements to emergency response in the Tideflats can come from various strategies. Each of these strategies provides certain emergency response benefits, along with both capital and operating costs. Following are a list of the available overall strategies:

- New or modified roadway infrastructure (e.g. new connections, road widening, improved pavement conditions, etc.)
- Operational improvements using Intelligent Transportation Systems (e.g. signal coordination, emergency preemption, traveler information, coordinated dispatch Computer Aided Dispatch (CAD) etc.)
- New or modified fire/paramedic facilities in the Tideflats
- Designation of Emergency Response Corridors as a means to alleviate impacts due to street vacations and closures. These Emergency Response Corridors would be prioritized for street and ITS improvements to ensure consistent access and travel times for emergency response services and as potential evacuation corridors.[10]

The recommended approach was developed from looking at tradeoffs among these strategies over different time periods.

RECOMMENDATIONS

The project team assembled a set of recommendations that can address emergency response needs over the short (0-5 years), medium (5-10 years) and long term (10+ years). These

[10] Although review of Tideflats area evacuation plans was not part of the scope of this study, the technical team partners who assisted the consultant in the performance of the study acknowledged that recent changes in Tideflats streets and bridges should cause those plans to be reviewed and updated, if needed.

preliminary recommendations are based on the following observations of the analyses conducted to date:

- Existing emergency response is poor as compared to fire department standards in several portions of the Tideflats.
- Response times are not significantly affected in 2020 or 2035 with the planned roadway projects. There are several roadway improvements (e.g. POTR interchange, Puyallup River bridge replacement) that will improve overall accessibility to/from the Tideflats, but these will not substantially affect response times given the locations of the existing fire stations. General increases in traffic congestion would offset some of the roadway improvements.
- Implementing ITS Strategies and maintaining good pavement conditions would assist in emergency response and provide other transportation benefits, but they would not be enough to provide a 4-minute emergency response to the entire study area.
- As shown previously in Figures 5 and 6, the primary underserved areas are the central Port area along Port of Tacoma Road, along with the Blair-Hylebos Peninsula. Our analysis indicates that rebuilding the East 11th St Viaduct would help response times to areas along East 11thStreet and Port of Tacoma Road to the north of Lincoln Ave.
- The team has identified an option to build a new Fire Station on Marshall Avenue at the existing Fire Training Center or another suitable nearby location. Analysis shows that this station would allow full emergency response service to properties along POTR and connecting streets, along with the Thea Foss area (combined with Station #1). Based upon the preliminary design and feasibility study of that facility completed by Lawhead Architects in 2014, only an addition is needed to enable the assignment of a first responding unit out of that facility. Moreover, if the unit is only to be stationed there during the business day (0700 to 1900 hours, Monday through Friday), the operation could commence without the addition as an interim improvement.
- The East 11th St Viaduct replacement would not be needed (for emergency response) if a first responding unit is assigned to the Fire Training Center or another suitable nearby location. However, replacing the viaduct would provide improved overall traffic circulation and redundancy of access for emergency response.

- There are no identified transportation improvements that would improve emergency response services to the Blair-Hylebos Peninsula sufficient to meet the four minute guidelines. Reopening Station # 15 is the only way to substantially serve the Blair-Hylebos Peninsula, even if a new Marshall Avenue station is built
- As redevelopment occurs in the Tideflats, and as new utilities are installed, all reconstructed streets designated within the Heavy Haul Industrial Corridor should be built according to those standards. Any new street projects should attempt to restore a full cross-section as opposed to half of a street as the extreme loading may compromise the interface between the old and new sections.

Beyond the specific recommendations related to transportation infrastructure and fire station locations, there are staffing and operations recommendations identified through a review of current emergency response into the Tideflats which include the following:

- Improve the planning, coordination, and response capabilities to the Tideflats region by organizing a new Special Hazards and Marine Response (SHMR) division within the TFD.
- Create a two-person Advanced Life Support (ALS) unit/squad. Place the unit at the fire training facility or a re-opened Station 15 with the unit being staffed during weekday hours
- Add one TFD Captain (40 hour) and one Hazardous Materials Specialist/ Engineer (40 hour) to coordinate all planning, inspections, and response activities within the Tideflats region. The coordinator should be responsible for the coordination and policy development for all of the TFD's special hazards' programs.
- Staff one fireboat with two persons 24/7 (one officer and one technician/ pilot) and continue the policy of cross-staffing the boat with Station 14's crew to augment the fireboat's two-person fulltime crew.
- Provide the required funding for the hazards and response initiatives needed for Tideflats through a surcharge or other funding source paid for by new developments and current operators/shippers within the Tideflats region, and those that ship hazardous commodities by rail through Tacoma.

- Work with the State Department of Ecology to explain the hazards associated with the Port and other transportation systems, especially the oil trains.

PHASING OF EMERGENCY RESPONSE PROJECTS

This section identifies a potential phasing plan to lead towards a long-term improvement to Tideflats emergency response. The timing of these actions is approximate, depending on available funding and sequencing of other projects within the study area. The potential phasing plan is presented in **Table 3.** Short-term cost estimates for the roadway projects, ITS elements and the Fire/EMS facilities are included in **Table 4, Table 5** and **Table 6**, respectively. The location of certain ITS projects along with the location of the proposed Emergency Response Corridors are shown in **Figure 18**.

Table 4. Potential Project Phasing

	Roadway infrastructure	**Operational Improvements Using Intelligent Transportation Systems (Refer to Figure 15, pg. 42)**	**Fire/EMS Facilities**
Short Term **(0-5 years)**	• Puyallup Ave Bridge Replacement • Port of Tacoma Road Interchange • I-5 HOV lanes and ramp metering • Port of Tacoma Road Rehabilitation • Taylor Way Rehabilitation Continue other local and regional projects • E 11th St Viaduct – Retrofit or Rebuild - Pre- Design Study	• Establish agreements / MOU regarding operation and maintenance of ITS Infrastructure • Construct initial ITS Infrastructure needed for basic information sharing among stakeholders • Set up Port of Tacoma "Port Traveler Information" website* • Add "Port Travel Information" option to the State's 511 system • Establish video-sharing between Port, City (Fire, PW, and Rail) and WSDOT** • Add cameras to key locations including existing at-grade rail crossings • Install signal preemption for existing signals on priority corridors • Update signal coordination for signals on Pacific Highway and 54th Avenue NE	• Assign first response unit to Fire Training Center or another suitable nearby location during the business day (temporary) • Reopen Station #15 for fire and EMS

*The Port could provide a link to relevant cameras, WSDOT flow maps and travel times, construction schedules etc. Once set up, it would require little maintenance on the Port's end. They could direct freight operators to the site that would be seen as a one-stop shop for traveler information. This information would also be available to the City as needed for emergency response planning or other coordination.

** WSDOT and Tacoma Fire already share a video link. The Port could make a similar link through WSDOT or a cloud-based system to enable sharing of selected cameras

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	Roadway infrastructure	**Operational Improvements Using Intelligent Transportation Systems (Refer to Figure 15, pg. 42)**	**Fire/EMS Facilities**
Mid Term **(6-10 years)**	• Continue other local and regional projects	• Complete remainder of ITS infrastructure, including WSDOT program on I-705 and SR 509 • Develop Tideflats Advanced Transportation Management System, linking agency stakeholders, private entities, and the public • Design and begin implementation of new traffic signal system for City of Tacoma • Evaluate feasibility of Variable Message Signage at modified Port of Tacoma road interchange • Update signal coordination along Port of Tacoma Road as part of the interchange modification	• Open new or expanded fire station on Marshall Avenue at Fire Training Center or a nearby suitable location; Provide 24/7 service. • Determine ongoing needs for Station #15
Long Term **(10+ years)**	• Reopen East 11th Street Viaduct or comparable facility • Rebuild 54th Avenue Interchange • Complete SR 167 Extension (Phase 1 initially) • Continue other local and regional projects	• Implement adaptive traffic signal control system • Continued maintenance, upgrades and integration of Advanced Transportation Management System	• Continue to upgrade facilities

*The Port could provide a link to relevant cameras, WSDOT flow maps and travel times, construction schedules etc. Once set up, it would require little maintenance on the Port's end. They could direct freight operators to the site that would be seen as a one-stop shop for traveler information. This information would also be available to the City as needed for emergency response planning or other coordination.

** WSDOT and Tacoma Fire already share a video link. The Port could make a similar link through WSDOT or a cloud-based system to enable sharing of selected cameras

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Table 5. Short Term Roadway Infrastructure Costs

Project	Cost (millions)	Notes on Project Costs
Puyallup Ave Bridge Replacement	$38.7	Includes replacement of sections F16A & F16B (western portion)
Port of Tacoma Road Interchange	$44.4	Phase 1 is fully funded and includes one-way couplet of Port of Tacoma Road and 34th Avenue E while Phase 2 is partially funded and includes modification of I-5 SB on and off-ramp at the interchange.
I-5 HOV lanes and ramp metering	$548.0	Currently under design and construction with a three year construction timeline for completion with HOV lanes and meters between SR16 and the Pierce County line
Port of Tacoma Road Rehabilitation	$8.9	Reconstruction of Port of Tacoma Road from E 11th Street to Marshall Way
Taylor Way Rehabilitation	$8.5 - $11.1	Based on project cost of Port of Tacoma Road rehabilitation and input from the Port of Tacoma and Tacoma Public Works
E 11th St Viaduct – Retrofit or Rebuild Pre- Design Study	$0.5	Conduct study to determine feasibility of rebuild or retrofitting viaduct. Examine combination of at-grade + bridge and full viaduct options

*Note that funding for these projects is from a number of federal, state and local sources

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Table 6. Short Term ITS Cost Estimates for Emergency Response

ITS Element	Cost Range	Notes on Deployment
Construct initial ITS Infrastructure needed for basic information sharing among stakeholders	$150,000 - $230,000	Costs will vary depending on scope and need once gaps in the Port Security network are identified. Low-range estimate assumes only the costs to splice/pull the fiber needed along Taylor Way for strategic camera placements. Assumes the use of existing city-owned overhead fiber cable along Taylor Way
	$775,000 - $1,050,000**	Medium-range cost based on full installation of new fiber along Taylor Way. Includes low-end estimate costs
	$2,200,000 - $2,990,000**	High-range estimate involves major fiber construction where gaps exist and where overhead fiber would be buried. It is meant to represent the most conservative estimate for ITS fiber needs. Includes burying overhead fiber along Taylor and all medium-range estimate costs from above
Establish video-sharing between Port, City (Fire, PW, and Rail) and WSDOT	Minimal cost based on MOUs	Port Security is capable of sharing video via IP address with secure login information. TFD and WSDOT currently share video and can leverage the future Viewpoint system as a means of hosting a collective platform for video sharing. Cost of Viewpoint is already assumed as part of the software contract with TFD
Add cameras to key existing at-grade rail crossings	$260,000 to $350,000	Fixed cameras on poles at up to seven high volume crossing locations identified by TFD and Tacoma Rail. Required amount may be reduced based on Port Security camera locations, ability to share current poles, and possible relocation of existing cameras.
Install signal preemption for existing signals on priority corridors	$65,000 to $150,000	Range of 6 to 10 total signals updated with preemption along Emergency Response Corridors within the Tideflats

*Note that the signals at 54th Avenue/SR99 and 54th Avenue/I-5 off-ramps are included in both the Pacific Highway and the 54th Avenue signal coordination cost elements

**Costs for ITS fiber infrastructure are additive. The medium-range estimate includes the elements in the low-range and the high-end estimate includes the low and medium-range cost elements

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ITS Element	Cost Range	Notes on Deployment
Update signal coordination for signals on Pacific Highway	$99,000 to $135,000*	9 total signals re-timed and coordinated between 54th Avenue and E Portland Avenue including the two ramp terminal signals off of Port of Tacoma Rd and 54th Avenue due to coordination requirements
Update signal coordination for signals on 54th Avenue	$55,000 to $75,000*	5 total signals re-timed and coordinated between I-5 and SR509
ITS Coordinator	1 FTE	Based on final deployment level of ITS elements and the need between agencies for coordination

*Note that the signals at 54th Avenue/SR99 and 54th Avenue/I-5 off-ramps are included in both the Pacific Highway and the 54th Avenue signal coordination cost elements

**Costs for ITS fiber infrastructure are additive. The medium-range estimate includes the elements in the low-range and the high-end estimate includes the low and medium-range cost elements

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Table 7. Short Term Fire / EMS Facilities Costs

Project	Cost	Notes on Fire/EMS Facilities Costs
Assign first responding unit at Fire Training Center or other suitable nearby location during the business day (temporary)	-	More refined cost estimates are needed for this project. Operating costs for this facility are estimated to be $500,000 per year. If a temporary structure was needed nearby, capital costs would be between $500,000 and $1,000,000 to construct.
Reopen Station #15 for fire and EMS	-	More refined cost estimates are needed for this project. Operating costs for this facility are estimated to be $1.5 million per year. The estimated cost to renovate the station would be approximately $470,000.
Expand the central Tideflats business day responding unit to 24/7 fire and EMS service	-	Expansion to a 24/7 unit would cost approximately $1 million in annual operating costs; however this unit would not have fire response capability. To expand to a three-person engine, the estimated operating costs would be $1.5 million per year. The capital costs for this expansion would be approximately $3-$4 million for additional engines and crew quarters and vehicle storage at the existing Training Center.

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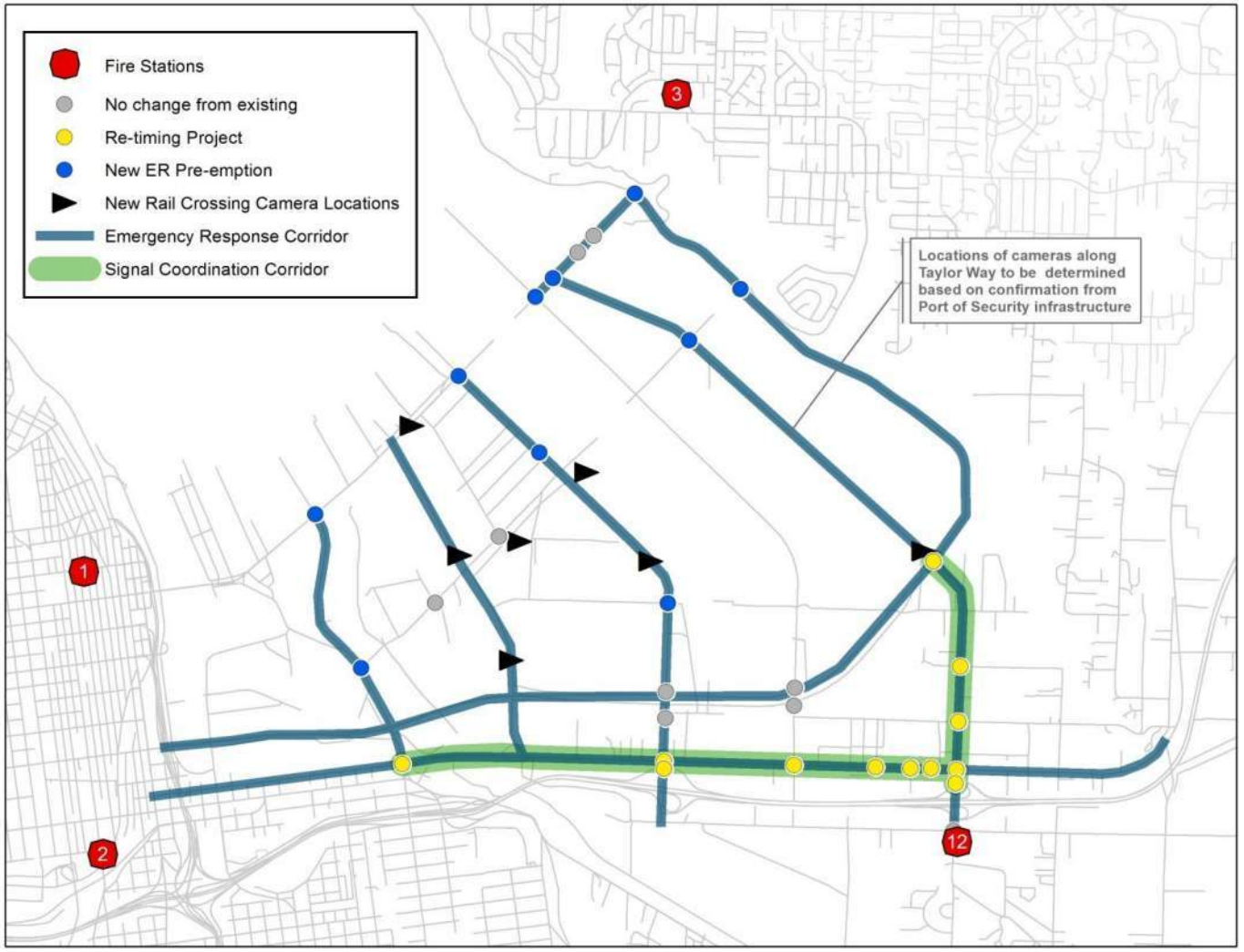
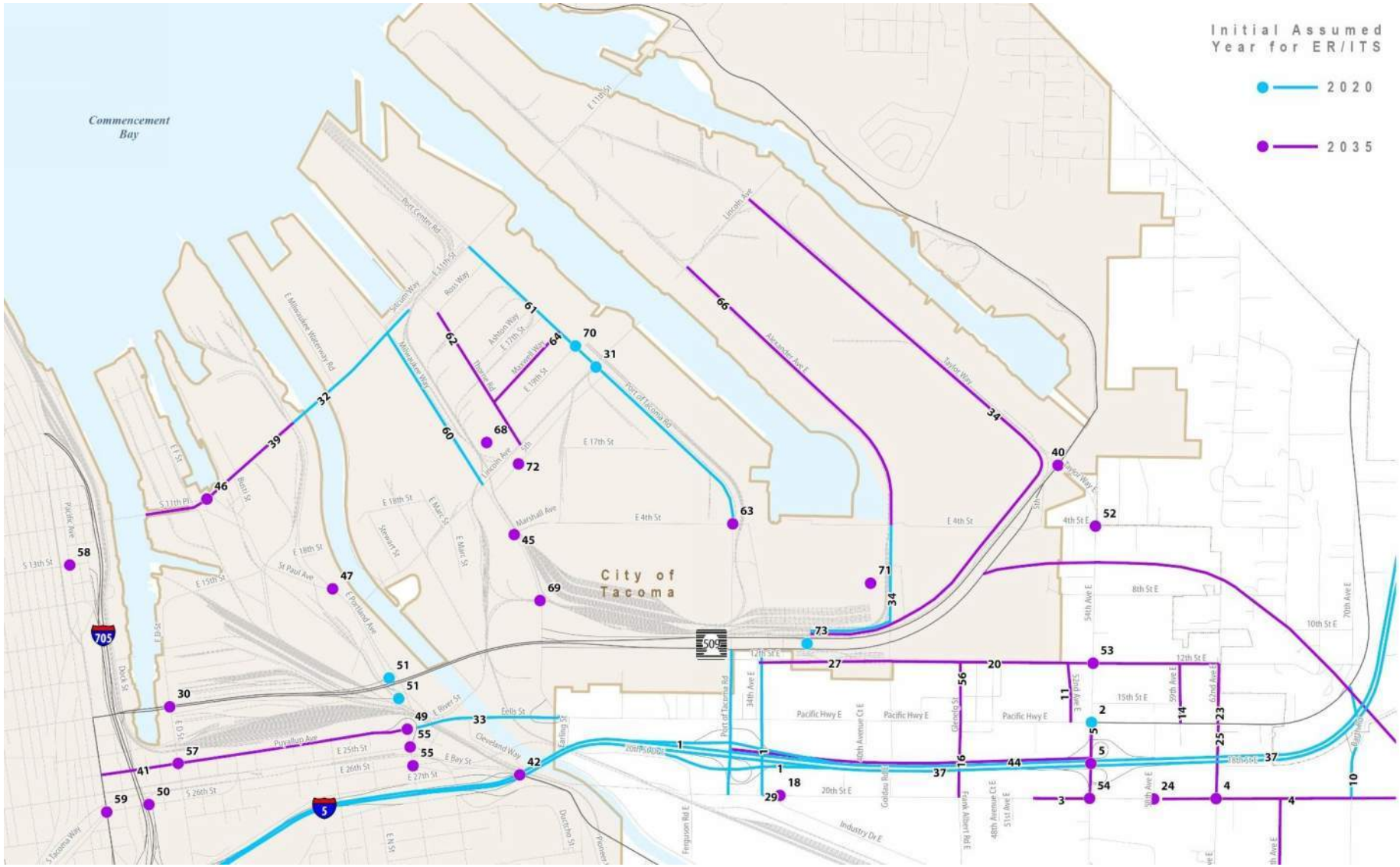
Figure 18. ITS Project Recommendations



APPENDIX A: 2020 AND 2035 PROJECTS

Attached Map and Table: Future Local and Regional Transportation Projects



ID	Project Name	Project Description
1	Port of Tacoma Rd Interchange - Phase 1	Purchase ROW and construct new SB off-ramp from I-5. Wetlands mitigation is the only construction funded part of this stage. Will also include truck route along 34th Ave and 12th Street to PoT Road
2	Pacific Hwy / 54th Ave Intersection Improvement	2nd WB left-turn lane
3	20th St E - Expansion	5 lane profile from 50th to 54th Avenue
4	20th St E - Reconstruct	Bike lanes/SW add from 59th Ave E to 70th Ave E. New signal at 62nd Ave E
5	54th Interchange / I-5	Rebuild interchange and intersections from pacific Hwy to 20th St E
6	Valley Ave E reconstruction	54th Ave E to Brookville Gardens. Widen to 3-lanes with roundabouts at 58th and 62nd Ave E
7	54th Ave E - Grade separation	Separation at UPRR
10	70th Ave E - Reconstruction	Reconstruct 4-lane from 20th St E to Pacific Hwy E. Replace the I-5 bridge
11	52nd Ave E - New Road	New road from pacific Hwy to 12th E

ID	Project Name	Project Description
12	70th Ave E - RR overpass	Construct an overpass structure above UPRR
13	70th Ave E - Expansion	Reconstruct to 5-lane section from N Levee R to 43rd St E. Mostly developer funded
14	Extension of 59th Ave E	Pacific Hwy E to 12th St E extension. Funded by Tribe. **Completed 2012**
15	N Levee Rd - Expansion	3-lane expansion from 54th Ave to Freeman Rd. Is broken into 3 segments (54th Ave/70th Ave cut points)
16	Frank Albert Rd Overcrossing I-5	Extend Frank Albert Rd from 20th St E to Pacific Hwy
18	20th St E and Industry Dr	New Signal
19	48th St E - Expansion	3-lane expansion and signalization. Largely developer funded from 70th Ave E to Freeman Rd
20	12th St E - Expansion	From 62nd Ave to Alexander Ave. 3-lane roadway
22	20th St E - Expansion	70th Ave E to Freeman Rd. E. 3-lane roadway with bike lanes
23	62nd Ave E - Expansion - North Segment	3-lane roadway from Pacific Hwy to 12th St E

ID	Project Name	Project Description
24	20th St E / 58th Ave E	New Signal
25	62nd Ave E Overpass	Extend 62nd Ave E from 20th St E to pacific Hwy.
26	New Connector Arterial @ 32ND Street E - 54th Ave E to Frank Albert Rd	3-lane roadway. Tribal funded
27	12th St E - Extension	3-lane extension form Alexander Ave to 34th Ave E
28	66th Ave E - New road	From 20th St E to 26th St E. Developer funded
29	20th St E - Expansion	3-lane from Industry Dr to 34th Ave E
30	SR-509 / D Street Slip ramps	The project will construct a half diamond interchange at East D Street and SR-509. An interchange justification report (IJR) is required for approval of the added access to SR-509. The project includes public/private partnerships that are developing. Awaiting WSDOT confirmation of IJR
31	Lincoln Ave / Port of Tacoma Rd - New signal	This project will install a new traffic signal or other traffic control device at this intersection. Additional funding is required.

ID	Project Name	Project Description
32	E 11th St Viaduct – Retrofit or Rebuild	Rebuild or retrofit viaduct. Examine combination of at-grade + bridge and full viaduct options
33	Puyallup Ave Bridge - Rebuild	Rebuild for removal of weight restrictions and expansion of lane capacity
34	Extend A/D Rail Line	Extend the line across Alexander Ave to Taylor Ave. Port is planning to increase arrival/departure train lengths from 8,000 to 10,000 feet
35	Freeman Rd - Expansion	3-lane profile from River Rd to 20th St E
36	SR-167 Extension Phase 1	Tolled extension of SR-167 to SR-509
37	Add HOV Lanes on I-5 from SR-16 to Federal Way	Two-way HOV lanes
38	Valley Ave - Expansion	Widen to 4 lanes and widen east approach
39	11th Street East Corridor Improvements	This project is recommended by the East Foss Transportation Study. It calls for a redesign of the East 11th Street corridor from the Murray Morgan bridge to the Puyallup River. It also includes improvements to the St. Paul and F Street intersection. As of 2013, this project is NOT fully funded. The unmet funding need will be determined during the design phase.

ID	Project Name	Project Description
40	SR 509, Taylor Way, & 54th Ave Improvement	This project includes intersection improvements as identified by Blair Hylebos Terminal Redevelopment Plan (BHTRP), SSA/Puyallup Tribal Terminal, and Tideflats Area Transportation Study (TATS). Anticipated developer funding includes $4.8M. As of 2012, this project is NOT fully funded.
41	Puyallup Avenue Road Diet	The Puyallup Avenue project scope includes Pacific Avenue to Portland Avenue. The new road will be designed to lessen pavement, add facilities for active lifestyles (such as bike lanes), rain gardens, and other boulevardtreatments.
42	I-5 Variable message signs into Port	ITS VMS strategies for Port access
43	Canyon Rd Extension	Pioneer Way across river to 70th Ave E
44	I-5 - CD lanes	54th Ave to Port of Tacoma Rd
45	Milwaukee Way / Marshall St	New signal
46	St Paul Avenue/ E 11th Street intersection	Construct signal or roundabout
47	St Paul Avenue/ Portland Avenue intersection	Construct signal

ID	Project Name	Project Description
49	Portland Avenue/Puyallup Avenue intersection	Widen intersection with additional left turn/through lanes
50	S 26th Street/I-705 northbound off-ramp intersection	Add signal
51	Portland Avenue on and off ramps at SR 509	Add traffic signals and modify channelization
52	54th Avenue E/4th Street	Add signal
53	54th Avenue E/12th Street E intersection	Create an eight-phase signal operation with protected left turns
54	54th Avenue E/20th Street E intersection	Widen approach legs and rechannelize
55	Portland Avenue/25th and 26th Streets	Add traffic signals
56	Frank Albert Rd - Expansion	From Pacific Hwy to 12th St E
57	E D St / Puyallup Ave	Change signal phasing and add left turn pocket to SB approach
58	Pacific Ave / 13th St	Restripe EB RT lane as shared TH/RT

ID	Project Name	Project Description
59	Pacific Ave / Tacoma Way / 26th St	Restripe EB RT lane as shared TH/RT
60	Milwaukee Way Street vacation	Based on development
61	Port of Tacoma Road Rehab	Grant-funded for surface rehab
62	Thorne Rd - Heavy Haul Improvements	Surface rehab
63	Marshall Ave/ Port of Tacoma Rd	Add signal
64	Maxwell Ave Street Vacation	Based on development
66	Alexander Ave Street Vacation	Based on development
68	Transfer Yard Connection to Lincoln	New crossing required
69	West End Yard Reconfiguration	Would add a 3rd at-grade crossing on Milwaukee Way
70	Washington United Terminal - Double Ending	New at-grade crossing across Port of Tacoma Rd

ID	Project Name	Project Description
71	Pierce County Terminal - Double Ending	New at-grade crossing on Alexander Ave east of PC Terminal
72	Lincoln Avenue "wye" installation	Fire access could be affected by the new track under the Lincoln Ave. Bridge
73	At-grade crossing of SR-509 near Alexander Ave	Upgrading existing crossing system to cantilevered structure over NB lanes. Wiring upgrade for SB lanes. Exempt signage to be installed to allow school buses and hazmat vehicles to pass if there is not signal to stop

TACOMA FIRE DEPARTMENT BENCHMARKS - 2014

TFD response benchmarks specify the minimum criteria needed to effectively and efficiently deliver fire suppression, emergency medical services, and special operations response. These response goals protect the citizens of Tacoma and the occupational safety and health of Tacoma firefighters. For the purposes of this report, the Commission on Fire Accreditation International, *Fire & Emergency Service Self-Assessment Manual, 8th Edition,* and *Standards of Cover, 5th Edition,* were used as guidelines in the development of TFD response goals.

Anatomy of a 9-1-1 Call

CALL

Citizen calls 9-1-1

DISPATCH

9-1-1 center processes call and dispatches units

TURNOUT

From when units are dispatched to when crews are dressed in appropriate protective gear and in the apparatus ready to go

TRAVEL

From when unit starts moving to arrival on-scene.

Call Processing Time

This measure tracks the time elapsed from the receipt of a 9-1-1 call to the completion of the dispatch directing firefighters to respond. Performance benchmarks are 60 seconds for fire incidents and 90 seconds for EMS and specialty incidents. (*AP = Actual Performance)

		Fire	AP*	EMS	AP	Haz-Mat	AP	Tech Rescue	AP	Marine	AP
Alarm Processing (TFD receipt of call)	Pick-up to Dispatch	1:00	1:41	1:30	1:26	1:30	1:05	1:30	2:41	1:30	3:36

Turnout Times

This measure tracks the time elapsed from the receipt of notification of the emergency to the beginning point of travel time to the incident. Performance benchmarks are 60 seconds for critical and urgent EMS incidents and 80 seconds for critical and urgent fire and specialty incidents.

		Fire	AP*	EMS	AP	Haz-Mat	AP	Tech Rescue	AP	Marine	AP
Turnout	Turnout Time 1st Unit	1:20	1:12	1:30	1:33	1:30	1:15	1:30	1:19	1:30	2:27

Travel Time

This measure tracks the time elapsed from when the company goes en route to arrival on-scene of a critical or urgent emergency incident. TFD travel time benchmarks are based on fire management zone (FMZ) population density criteria, as established by CFAI. Performance benchmarks for the first arriving company on-scene of a critical fire or EMS incident is 4:00 in metro/urban FMZs, 5:00 in suburban/limited FMZs and 10:00 in rural FMZs or less for 90% of incidents.

Performance benchmarks for the balance of the first alarm (effective response force) arriving on the scene of a critical or urgent fire or EMS call is 8:00 in the metro/urban FMZs and 10:00 or less in the suburban/limited FMZs and 14:00 or less in rural FMZs or less for 90% of incidents.

There is no fire management zone or effective response force associated with Marine response. Actual travel time performance for Marine operations was 21:45 for the 1st due.

		Zone	Fire	AP	EMS	AP	Haz-Mat	AP	Tech Rescue	AP
Travel	Travel Time 1st Due	Metro/Urban	4:00	5:27	4:00	5:59	4:00		4:00	3:22
		Suburban/Limited	5:00	8:07	5:00	6:07	5:00		5:00	
		Rural	10:00	9:28	10:00	6:53	10:00	9:02	10:00	
	Travel Time ERF	Metro/Urban	8:00	10:56	8:00	9:38	8:00	2:43	8:00	3:42
		Suburban/Limited	10:00	11:41	10:00	10:14	10:00		10:00	
		Rural	14:00	11:02	14:00	9:12	14:00		14:00	

Total Response Time

This measure tracks the time elapsed from when TFD receives a 9-1-1 call until units arrive on the scene of an emergency incident. Total Response Time is the sum of 9-1-1 dispatch, turnout and travel time and is considered industry best practice in performance reporting.

		Zone	Fire	AP	EMS	AP	Haz-Mat	AP	Tech Rescue	AP
Total Response Time (TRT)	TRT 1st Due	Metro/Urban	6:20	5:27	6:30	5:59	6:50		6:50	3:22
		Suburban/Limited	7:20	8:07	7:30	6:07	7:50		7:50	
		Rural	12:20	9:28	12:30	6:53	12:50	9:02	12:50	
	TRT ERF	Metro/Urban	10:20	10:56	10:30	9:38	10:50	2:43	10:50	3:42
		Suburban/Limited	12:20	12:30	10:00	12:50	10:00		12:50	
		Rural	16:20	11:02	16:30	9:12	16:50		16:50	

Industrial Fire Management Zone

Fire management zone benchmark and baseline performance objectives are determined by population density. We have adopted the suburban standard for the industrial (Tideflats) fire management zone based on the risk hazards present in the zone.

Suburban* - An incorporated or unincorporated area with a population of 10,000 to 29,999 and/or any area with a population density of 1,000 to 2,000 people per square mile.

	Travel Time			
	1st Unit	2nd Unit	Balance of 1st	Performance
Benchmark	5:00	8:00	10:00	90%
Baseline	6:30	10:24	13:00	90%

Rural* - An incorporated or unincorporated area with a total population of less than 10,000 people or with a population density of less than 1,000 people per square mile.

	Travel Time			
	1st Unit	2nd Unit	Balance of 1st	Performance
Benchmark	10:00	14:00	14:00	90%
Baseline	13:00	18:12	18:12	90%

*CFAI, Fire & Emergency Service Self-Assessment Manual, 8th Edition, pp. 71-72.

TFD Summary Tideflats Resource History, 1990–2014

In 1990, the City of Tacoma budgeted a total of 379.3 full-time equivalent positions (FTEs) in TFD. Of the total, 367.3 FTEs were budgeted in the General Fund, representing about 34.3% of the total budgeted General Fund positions. An additional 12.0 FTEs were budgeted in the EMS Fund. TFD's 1989–1990 biennium General Fund expense total of $39,132,042 represented 20.5% of the total General Fund expenses.[1]

At that time, TFD was organized into two bureaus. Staff of the Operations Bureau was assigned to 15 engine companies, four ladder companies, two full-time fireboats, a cross-staffed hazardous materials unit and three advanced life support (ALS) emergency medical ambulances each staffed with two firefighter/paramedics. The above units operated out of 18 active fire stations.[2]

Four of those fire stations were situated in the Tacoma Tideflats. Fire Station 6, located at 1015 E. "F" Street, served as quarters for Engine 6 and the cross-staffed hazardous materials response unit. Fire Station 12, located at 2316 E. 11th Street, was home to Ladder 4. Engine 15 was based out of Station 15, located at 3510 E. 11th Street. Fireboat *Commencement* was assigned to Station 18, 302 E. 11th Street.

Engine 6 was staffed as a four-person company. Ladder 4 and Engine 15 were both three-person companies while the crew of Fireboat *Commencement* was two persons.[3]

In addition, Fireboat *Defiance*, staffed with three firefighters, was based out of Fire Station 5, located at 3301 Ruston Way.

Finally, Pierce County Fire District 10 provided emergency response to Fife and the unincorporated portion of the Tideflats from its station, located at 2015 54th Avenue East, in Fife, with a minimum daily staff complement of three firefighters.

During the previous decade, increases to TFD staffing occurred for the fireboat program, which replaced TFD's original 1929 fireboat with two modern British built Surface Effect Style (S.E.S.) fireboats, assigned to Station 18, the existing fireboat station in the Thea Foss Waterway and to Station 5, a new fire station on Ruston Way constructed for that purpose.[4]

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[1] See Table 1, City of Tacoma, Comparative Personnel Summary, 1989–2016, and Table 2, City of Tacoma, 1989–2016 Budgeted Expenditures..

[2] TriData Corporation, Tacoma Fire Department Resource Allocation Study, 1992, pp. 4-1, 4-9.

[3] Ibid., p. 4-9.

[4] Tacoma Fire Department News Release, June 3, 1982. Although arguably designed to be operated by a crew of two, one boat was staffed with a crew of three for non-fire suppression safety operations. See also "First S.E.S. Multi-Purpose Fireboat in the World: City of Tacoma, Washington, USA," April 1986. Two other fireboat stations, one in the Tideflats and one on the west side of Tacoma, recommended by a 1974 U.S. Department of Commerce study, were never constructed. See Tony F. Mitchell to Jack Creighton, October 15,1979, and comments in response to a June 12,1979, letter from the U.S. Department of the Interior, Public Works Department Shoreline Permit File No. 141.198, cited in Eileen F. Lewis to Ray E. Corpuz, Jr., "Fire Department Facilities," February 20, 2001, p. 2n.

In addition, in 1988, TFD assumed responsibility for ALS emergency transport. Prior to 1988, paramedic response units were not equipped to transport, as that work was performed by private ambulance companies. Otherwise, operational staffing remained unchanged from 1986.[5]

Fireboat *Commencement*

In 1991, City Manager Ray Corpuz, Jr., directed staff to perform a study of TFD. TriData Corporation was contracted to perform the work following a Request for Proposals by the City.

The resulting Resource Allocation Study, completed in March 1992, included several recommendations to improve the function of the department. Higher level management positions and more staff were proposed for Fire Prevention and Emergency Medical Services (EMS) to "reflect the increasing importance and complexity" of those programs.

The study also recommended that the City work long term to increase the number of four-person companies and reposition one ladder company to provide better response to South Tacoma.

Within the Tideflats, if restricted budgets required it, the Study recommended that the Fireboat *Commencement* be cross staffed using the crew of Engine 6 and the staff currently assigned to the boat be redeployed to increase staffing on other companies.[6]

The fireboat recommendation was timely as an economic recession then underway was expected to reduce General Fund revenues so that a shared reduction of $4 million from the General Fund departments was needed in 1992. Instead of cross staffing one of the fireboats, Fire Chief Stan Thaut reduced the fireboat program to a single staffed three-person company at Station 5, closing Station 18 and saving an estimated $417,672 in 1992.

Following completion of the Study, additional funding cuts were made to TFD so that General Fund budgeted staffing for the 1993–1994 biennium declined 9.6% from adopted 1991–1992, a drop of 35.4 FTEs.[7] As part of the City's budget strategy, Mayor Karen Vialle and City staff initiated a discussion with Port of Tacoma Commissioners and some related marine businesses to consider alternative funding to permanently staff the second fireboat. The Port Commissioners were not persuaded that such a role was needed or appropriate for the Port. Speaking for the Port, Commissioner Pat O'Malley explained at that time, "The problem is, we really don't have a direct role in city services. That is not our job. I don't see the port commission (paying) for the fireboat."[8]

[5] Resource Allocation Study, p. 4-5.
[6] Ibid., pp. iii-xiii, 4-1 through 4-60.
[7] See Table 1.
[8] "Fire Department Budget Cut Considerations Includes Long Look at Fire Boats," Northwest Dispatch, April 29, 1992, p. 1; Robert M. Wells, "Mayor Defends Stance on Fireboat Closure," Morning News Tribune, May 9, 1992, p. B1.

Port Commissioner Bob Earley added that Port staff investigated the implications of reduced fireboat services earlier in 1992 and concluded there would be no negative consequences for the Port.[9]

Blair Bridge Removal – Construction of SR 509

The recurrence of vessel allisions with the Blair Bridge, the frequency of vessel and rail traffic and the Tribal Settlement Agreement prompted the decision to remove the Blair Bridge and vacate a portion of East 11th Street. These factors, which led to the Bridge's removal, had the most impact upon TFD's emergency response capability within the Tideflats.

The bascule style drawbridge over the Blair waterway was part of the network of bridges along East 11th Street that connected the Tideflats and Northeast Tacoma with Downtown Tacoma. As the Port developed its container related export and import business, the Blair Bridge and the proximity of East 11th Street became major impediments to Port growth generally, especially on the Blair peninsula. The bridge had an opening of 150 feet, a sufficient length when completed in 1953 but increasingly inadequate for vessels in operation during the 1980s.[10] An historian later noted:

> Routing a thoroughfare through the busy industrial Tideflats had its problems. Bridge openings stalled traffic. Over the years cargo ships became larger and had increasing difficulty negotiating the narrow opening the bridge provided. Collisions became all too frequent.[11]

Over a 12-year period ending in 1988, the Blair Bridge was struck eight times by ships. A collision in the fall of 1988 by a Panamanian freighter closed the bridge for two months for repairs.[12]

As part of the Land Settlement Agreement with the Puyallup Tribes in 1988, partial funding was identified to reconstruct or bypass the Blair Bridge. Following the settlement, the Port and the Washington State Department of Transportation pushed ahead with proposals for bridge removal and replacement of the East 11th Street corridor with an alternate route south of Port development that eventually became SR 509.[13]

The proposed severing of East 11th Street at the Blair Bridge and the alternative routing of traffic to SR 509 presented a truly significant operational challenge for TFD. East 11th Street not only served as the primary access into the Tideflats, it was the arterial tie between Northeast Tacoma

[9] Wells, op. cit.
[10] Kit Oldham, "Port of Tacoma – Thumbnail History, Part 3," HistoryLink.org, June 25, 2008, p. 3
[11] Priscilla Long, "Tacoma's Blair Bridge is Closed and Demolition Begins on January 23, 1997," HistoryLink.org, June 7, 2008, p. 1.
[12] Ibid.
[13] Puyallup Tribe of Indians, "History: Land Settlement of 1988" at puyallup-tribe.com; Long, op. cit.; Oldham, op. cit.

and the rest of the city. Bisecting East 11th Street by removal of the Blair Bridge significantly affected all of the Tideflats based TFD units. Ladder 4 and Engines 6 and 15 were cut off from a portion of the Tideflats that left the Blair peninsula exposed and subjected Northeast Tacoma to longer response times for the full unit complement to any fires or greater emergency alarms. Although SR 509 restored east-west access across the Tideflats, the access frequently resulted in much longer response times to many locations because the new roadway was much farther south than East 11th Street.

Besides TFD's operational concerns, there was significant public opposition to the proposal to remove the Blair Bridge and bisect East 11th Street. Representatives from other Tideflats businesses, Northeast Tacoma residents and members of the local medical community voiced their opposition, complaining that Port related improvements interfered with existing business, prolonged commute times and extended the time required for emergency vehicles to respond to incidents and to arrive at local area hospitals. In 1995, more than 150 people attended a meeting at the Port concerning the bridge removal, at which, nearly all the attendees opposed the project.[14]

Part of the environmental review conducted for the project eventually identified a need for an additional fire station and engine company based in the Blair peninsula. Despite the identified need, there was no statutory authority or precedent for the Port, the State and/or other related parties to pay to the City the recurrent operational expenses of TFD resulting from the project.

Port staff and TFD leadership surveyed a number of sites along the proposed SR 509 corridor for possible sites for a new station. The location of 54th Street and East-West Road was considered. However, at that time the City perceived it would be less than ideal to situate a station along the outer perimeter of the service area. Follow-on discussions led by TFD Fire Chief Richard Moore led to a proposed service agreement with Pierce County Fire District 10, whereby the District's employees were consolidated into TFD and the District became part of the TFD service area with TFD units based out of the District station in Fife.[15]

The City Council approved vacation of the approaches to the Blair Bridge in 1995 and in January 1997, following completion of SR 509, the Blair Bridge was dismantled. Over the next ten years, the Port completed major lease agreements with Hyundai Merchant Marine and Evergreen America that led to a dramatic expansion of the Port's container operation.[16]

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[14] Some Tideflats area businesses were vocal critics of the Port's development plans and resulting street vacations. For example, see Testimony of Jeff Brown, Operations Manager, Pioneer America, February 10, 2004, before the City of Tacoma Hearings Examiner, Alexander Avenue Vacation. (Taped Hearings, Hearings Examiner File 124.1206); Long, op. cit.

[15] City of Tacoma Resolution No. 32691, "Agreement for Consolidation of Fire Department Operations and Facilities," July 12, 1994. The Port provided a one-time payment of $1,930,000 "for fire-service related improvements in the Tideflats area" as part of the provisions of an Interlocal Agreement between the Port and the City approved November 1, 1994. The funds were used by TFD to build the new Fire Training Center on Marshall Avenue in the Tideflats. Interlocal Agreement Between the Port and City of Tacoma, November 1, 1994, p. 1.

[16] Long, op. cit., p. 2.

Fire District 10 and Fircrest Service Agreements

As indicated above, as a consequence of the service agreement with Fire District 10, Ladder 4 and Medic 3 were moved to the District fire station (renamed Station 12) in Fife, and Engine 12, a new engine company, was staffed at the station, paid from District service contract fees. The HazMat unit was relocated to Station 12, cross staffed from the resident engine and ladder. The Fife station was located approximately one mile southeast of the proposed location for the new Blair peninsula based fire station at 54th and East-West Road.[17]

The 1995–1996 General Fund biennial budget included funding for over 50 new TFD positions as a result of new service contracts with Fircrest and Fire District 10, an increased EMS Levy and an internal City study of Fire Department overtime that traded positions for overtime funding. In addition to new engine and medic companies, staffing for fire prevention and public education efforts were doubled, as recommended in the TriData Study. The Fire Prevention Division was raised in importance to a third bureau overseen by an additional deputy chief. Otherwise, the additional operational staffing was used to establish flexed fourth positions for additional units including outlying companies such as Engine 3 in Northeast Tacoma and Engine 10 in South Tacoma. A firefighter/paramedic position was added to the staffing of Engine 17, moved to the Fircrest Public Safety Building in Fircrest, as part of the service agreement with that city. With the increase, TFD's General Fund staffing increased to 33.5% of all General Fund positions compared to 30.6% of positions in 1993–1994. TFD's budgeted 1995–1996 General Fund budget represented 22.1% of the total budgeted General Fund expenses. As part of the operational changes, Engine 6, no longer part of the HazMat team, was cross staffed with the Fireboat *Commencement* to again make possible the operation of two fireboats.

The number of positions funded in the EMS Fund increased by nearly 16 FTEs to a total of 46 positions as a result of the increased EMS Levy. Overall, TFD budgeted staffing increased to 429.3 FTEs.[18]

Initiative 695: Closure of Fire Station 5, Loss of Staffed Fireboat *Defiance*

In 1999, conservative professional initiative promoter Tim Eyman proposed to the voters Initiative 695 (I-695), to repeal the graduated Motor Vehicle Excise Tax and replace it with a flat $30 annual fee for most vehicles. In November of that year, the initiative was approved by a 56.2% majority. Although later declared unconstitutional by the Washington State Supreme

[17] City of Tacoma, Resolution No. 32691, "Agreement for Consolidation of Fire Department Operations and Facilities," July 12, 1994.
[18] Ibid., Michael Fitzgerald to Richard E. Moore, "Fire Overtime & Staffing Analysis," August 17, 1994; City of Tacoma Substitute Ordinance No. 25547, "A Proposition to Place Before the Voters an EMS Levy of $.42/$1,000 Assessed Valuation [increased from $.195/$1,000] for Six Years," August 2, 1994; City of Tacoma, Ordinance No. 25744, "Agreement for Fire Department Services," August 1, 1995; City of Tacoma, Ordinance No. 25816, December 19, 1995; See Tables 1 and 2. The increase also coincided with the consolidation into the EMS Special Revenue Fund of staff formerly funded from a separate transport revenue funded enterprise fund.

Court, most of the major provisions of the initiative were subsequently signed into law by the State legislature in an effort to support the will of the voters.

Before I-695, the state charged motorists about 2.2% of vehicle value to license a vehicle each year. About 47% of the resulting tax funding was devoted to state transportation needs with 29% more of the proceeds devoted to local public transit support. About 24% of the funding was provided to counties and cities including Tacoma.[19]

Although I-695 certainly served its short term purpose of providing tax relief to Washingtonians, it significantly reduced available public transportation funding. In the ten years following its passage, Eyman himself estimated the tax reduced public funding by $9.75 billion.

During the campaign for the initiative, opponents proclaimed that passage of I-695 would cause dire impacts to state transportation and local government funding. Although many of the claims were overblown or the impacts were not realized, there were significant impacts.[20]

Locally, passage of I-695 resulted in the loss of more than $7 million of recurring General Fund revenue to the City of Tacoma annually. TFD's share of the resulting budget reduction totaled $1,443,145 for 1999. The reduction resulted in closure of Fire Station 5 on Ruston Way and the elimination of 14 positions including TFD's only remaining dedicated fireboat crew. Part-time fireboat operations continued using the cross-staffed (formerly backup) fireboat based out of the Thea Foss Waterway.[21]

The loss of the staffed fireboat occurred at a time when marine traffic in the Puget Sound was increasing significantly and the increased potential for major marine emergency events was recognized. Shortly after the Station 5 closure, a fire near the Tyee Marina destroyed a $250,000 pleasure boat.[22]

Following that fire and resulting public criticism of TFD's marine firefighting capability, TFD submitted multiple proposals to finance part-time or full-time operation of a staffed fireboat. Although the State provided some temporary funding to assist counties and cities impacted by

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[19] Ed Friedrich, "10 Years After I-695 Changed the Tax Structure, Is Kitsap Better Off?" Kitsap Sun, October 31, 2009, pp. 1-2.

[20] Paul Guppy, "Initiative 695 One Year Later: The Sky Didn't Fall," Washington Policy Center, January 2001, pp. 1-2. A contrasting view is provided in "Initiative 695/ Overview and Impact," Permanent Defense, pp. 1-3. For example, passage of I-695 temporarily or permanently caused delays or cancellation of dozens of transportation projects due to lack of funding. The initiative also repealed A $2 per vehicle clean air tax that provided nearly half of the State's air pollution abatement and enforcement funding. See "Referendum 49 Projects Shelved by Initiative 695," Central Kitsap Reporter, June 11, 2008, p. 1; "I-695 and Air Pollution," ecy.wa.gov/programs/air/NEWS.

[21] Kim Eckert, "Less Protection If Station Closed," The News Tribune, December 5, 1999, pp. B1-B2; Eileen F. Lewis to Ray E. Corpuz, Jr., "Tacoma Fireboat Operational Issues," June 5, 2002.

[22] Al Gibbs, "Payoff Time at Port of Tacoma," The News Tribune, March 11, 2001, pp. D1-D2; Ronald Stephens to Eileen Lewis, "Hits and Near Misses in Puget Sound," July 3, 2001; Kim Eckert, "Boaters Learn Cost of Closing a Fire Station," The News Tribune, March 2, 2000; Chuck Gould, "The Tragic Loss of the M/V Legend," Norwesting, April 2000, pp. 40-44.

the initiative, due to the temporary nature of the funding the Tacoma City Manager directed those funds to the new 800 MHz public safety radio system instead.[23]

By 2002, Fire Chief Eileen Lewis felt compelled to warn City Manager Corpuz that TFD might be unable to provide a timely or effective marine emergency response to a marine emergency in our service area. This was true because "(1) the [cross staffed fireboat] crew is already engaged; (2) trained staff is unavailable, or (3) the [twenty-year old] vessel is not operational. Under the current operational conditions, the Department has documented several instances where the fireboat's delayed arrival or absence affected the Department's response."[24]

The warning was made following two multi-alarm marina fires in Seattle in 2002, after which the City of Seattle added two staffed fireboats and retrofitted the *Chief Seattle* to improve its performance. The backup fireboat *Alki* was moved from Elliott Bay to Fisherman's Terminal to "help keep watch on the City's freshwater marinas." The retrofit and the new boats increased "the ability of the Seattle Fire Department to respond with greater power, speed and pumping capacity."[25]

Despite the Chief's warning, continued complaints from boaters and recognition that the marina community in Tacoma faced a similar proportional risk of significant property loss from fire, staffing assistance for TFD's marine firefighting program was not provided. To this day, the fireboat program is still cross staffed with an engine crew. [26]

Although staffing for the fireboat program remained unchanged, TFD's fireboat equipment inventory was significantly improved with the assistance of federal grants following the September 11, 2001, terrorist attacks. In 2005, assisted by a $750,000 Federal Assistance to Firefighters Grant and $375,000 received from the Puyallup Tribe, TFD undertook to complete a $4 million major restoration and renovation of the fireboat *Commencement*. Of the project total,

[23] Chuck Gould, "Nobody's Home at Tacoma's 911!" Norwesting, April 2000, p. 6; Sissi Longthorpe to Tacoma City Council, "Reinstatement of Fire Boat," May 17, 2000; Carol L. Sloman to Mayor [Brian] Ebersole and Members of the Tacoma City Council, May 15, 2000; Bryan Winchell, "Playing With Fire," Tacoma Reporter, June 2000, p. 7; Tacoma Fire Department, "Resumption of Staffing, FB5, August 1, 2000;" Tacoma Fire Department, "Fireboat Staffing at Station 5 – Memorial Day to Labor Day," (undated 2001); Michael Fitzgerald to Eileen F. Lewis, "Fire Station 5 Fireboat/Aid Car Funding," October 29, 2001; Michael Fitzgerald to Nancy V. Forster, "Fire Service Reductions: Fire Station 5," March 21, 2001.

[24] Eileen F. Lewis, "Tacoma Fireboat Operational Issues."

[25] "Alki Fireboat to Move Closer to Lake Union," Seattle Post Intelligencer, May 19, 2002; "Fire Facilities & Emergency Response Levy, Fireboats: Background," seattle.gov/fleetsfacilities/firelevy/facilities/marine.

[26] Lewis, op.cit. The lack of marine response resources was noted during the Buracker & Associates review of TFD and its service area completed in 2002, which recommended that a partnership between the Port and the City be used to fund and staff one fireboat. Carroll Buracker & Associates, A Strategic Plan for the City of Tacoma Fire Department, May 2, 2002, pp. 145-146. It is important to note that the Port of Tacoma does not own or operate a marina.

$2 million was financed by the City internally as a loan to TFD, repaid from non-General Fund service contract proceeds. The loan repayments will be completed in 2021. [27]

In addition, in 2010 the Port entered into an agreement with the City to allow TFD to staff and operate a $675,000 aluminum fire/patrol boat purchased by the Port primarily with Federal Port Security Grant funds. The new boat entered service in 2012, enabling TFD to reduce operation of the *Commencement* for most fireboat roles, preserving that vessel and reducing TFD marine operating costs.[28]

Finally, in 2013, using primarily Federal Port Security Grant funding, TFD contracted for the construction of a new 50 foot aluminum fireboat. The $2.1 million dollar vessel that was completed last year and should arrive in Tacoma shortly is capable of faster speeds and comparable pumping capacity to the *Commencement* and is expected to serve as the primary fireboat for some time.[29]

Additional Eyman Initiatives, Dot Com Crash and Hylebos Bridge Closure

The units in the Fife station, provided as part of the service contract with Fire District 10, provided the initial responding units to emergencies in the Blair peninsula following the removal of the Blair Bridge. However, the station location in Fife resulted in much longer response times into the northern portions of the peninsula than was the case before the bridge removal and the units also were less timely responding to events on the Hylebos peninsula or areas of the Tideflats west of the Puyallup River than was formerly the case.

Following the cutting of East 11th Street, Engine 6 on the western edge of East 11th Street and Engine 15 on the eastern edge of the same were left in their former but now compromised positions, with reduced response zones and reduced support. By early 2001, Fire staff accepted that both units needed to be moved. Then, in January 2001, Assistant Public Works Director Craig Sivley reported to TFD that the Hylebos Bridge was inoperative and an assessment determined it was likely the bridge would not be repaired.

The Hylebos Bridge closure left Engine 15 even more isolated, "perched at the end of a narrow peninsula bounded by the Hylebos and Blair Waterways, unable to respond to calls adequately either to the east or west."[30]

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[27] Tacoma Fire Department News Release, "Department of Homeland Security (DHS) Grant to Provide Fire Boat Refit," March 10, 2005; Michael Fitzgerald to Jim Duggan, "Fire Boat Grant as of 11-26-08;" December 2, 2008; Michael Fitzgerald to Ronald Stephens, "$2M Loan for the Fireboat," March 6, 2009; Yvonne Chisa to Michael Fitzgerald, "2008 Fireboat Internal Loan Note," August 25, 2011.
[28] Resolution No. 38126, October 19, 2010; Seattle Times, "Tacoma Welcomes New $675,000 Fireboat From Canada," May 5, 2012.
[29] Resolution No. 38697, July 23,2013; Jim Duggan to All TFD, "TFD Update," October 3, 2013.
[30] Eileen F. Lewis to Ray E. Corpuz, Jr., "Fire Department Facilities," February 20, 2001; Tacoma Fire Department Special Order #01-07, January 16, 2001.

Following meetings with Port and Public Works officials, TFD staff concluded it was "apparent that a series of likely projects in the Port area will gradually eliminate 11th Street as an operational arterial by the end of this decade." Staff began the planning to move both engine companies.[31]

Additional resources were not then available to aid the department in such moves and TFD was subsequently required to make additional budget cuts. The announcement about the Hylebos Bridge coincided with impacts from initiative promoter Eyman's I-722, an effort to reduce annual growth in the State property tax to 2%. The timing of the proposed initiative constrained local governments because they were forced to reduce their budgets whether the initiative would pass or not. Reductions at the City of Tacoma resulted in a $1.7 million General Fund 2001–2002 budget reduction for TFD.[32]

In 2002, as part of an ongoing program to conduct internal performance audits of City operating departments and programs, the City's Office of Management and Budget contracted with Carroll Buracker & Associates to conduct a review of TFD. The Buracker study recommended the relocation of both the existing Station 6 and Station 15. Station 6 was proposed to be moved to the Dome District in the vicinity of Puyallup Avenue and East "D" Street (Station 2 nearby also was proposed for closure). Station 15 was proposed to be moved to the vicinity of Alexander Avenue and SR 509 or 12th Street.[33]

The Buracker study recommended the elimination of 47 commissioned positions, eliminating three engines and the fourth person staffing on most TFD units so constituted, thus potentially eliminating most of the staff improvements made by the service contracts and overtime study previously. The study recommendations were reviewed against a backdrop of continued General Fund financial austerity caused by Eyman sponsored tax initiatives, increasing costs for personnel benefits and the lingering impacts of the Dot Com Crash in the Pacific Northwest, the crash of a speculative bubble in the shares of early internet companies called "Dot Coms."

[31] Ibid., Gary D. Steinhoff to Eileen F. Lewis, "Tideflats Transportation Issues," February 26, 2002.
[32] Patrick J. Sullivan, "Local Governments Hold Breath for I-722 Budget Impacts," PTLeader.com, October 26, 2000, p. 1; Eileen Lewis to Michael Fitzgerald, "I-722 and the Budget," November 21, 2000; Michael Fitzgerald to Judith Shoudy, "Fire I-722 Reduction," November 28, 2000, pp. 1-2. I-722 was later declared unconstitutional. See KOMO News Network, "Judge Declares I-722 Unconstitutional," February 23, 2001.
[33] Caroll Buracker & Associates, Strategic Plan, p. 83.

Although most of the Buracker study recommendations were not subsequently implemented, 10 firefighter/paramedic positions were transferred from the General Fund to the EMS Fund in the 2003–2004 budget.[34] Much more significant TFD reductions were only narrowly averted.[35]

Alexander Avenue Vacation

Following the closure of the Hylebos Bridge, Port staff began discussion with City Public Works staff to repair and reopen the bridge as part of the Port's development plans for the east side of the Blair Waterway. The proximity of Alexander Avenue to the waterway interfered with plans to develop the area for additional container shipping. The Port and the Puyallup Tribe were jointly interested in vacating a portion of Alexander Avenue to enable development adjacent to the waterway to occur. In the event that Alexander Avenue was partially or fully vacated, the Hylebos Bridge was needed to provide a second way off the Hylebos peninsula.

The period 2003–2005 coincided with some major Port projects and an extensive planning effort. In 2003, the Port's expansion plans were helped significantly by Evergreen Line's decision to lease a new 171 acre $210 million terminal and intermodal yard there. Later that year, the Port opened a $40 million 146.5 acre auto storage and warehousing facility with capacity to store and process 20,000 vehicles. Following Evergreen's move to its new terminal, its former space was renovated for additional K Line shipping in 2005. Also that year, the Port completed the renovation of K Line's former space at Terminal 7 for Yang Ming Line. With the added commerce, Port volume increased by more than 20% and the Port processed more than 2 million containers in a single year for the first time.[36]

In response to the Port's petition to vacate 2,737 linear feet of Alexander Avenue and 3,500 linear feet of four other roads adjacent to the area to be developed, TFD objected to the vacation primarily because it would increase response times for Engine 15 and other department units responding into the area. Citing the work of Buracker and Associates, Deputy Chief Gary Steinhoff stated that, "including the previous restriction caused by closure of the Hylebos Bridge, the accumulated restrictions are made significant enough to warrant relocation of the unit and

[34] Ibid., Table 1; Eileen Lewis to Michael Fitzgerald, "Estimated Increase ALS," August 14, 2002; Pat Flynn, "Take Five, Special Edition," August 23, 2002, pp. 1-2; Jesse Colombo, "The Dot-com Bubble," Forbes, August 19, 2012, reprinted in the blog "The Bubble Bubble" (www.thebubblebubble.com), pp. 6-7. To minimize the potentially significant loss of commissioned employees, Buracker argued that TFD should implement BLS transport services in substitution for private sector partners. TFD conducted a six-month experiment with a BLS Aid car to test the consultant recommendation and determined the consultant's recommendation was not financially viable. See Ibid., pp. 405-406; ETeam Staff to Eileen F. Lewis, "Fire BLS Transport Option," October 10, 2002; Tacoma Fire Department, "Basic Life Support Transport Study," [undated PowerPoint].

[35] Kelly Bochenski to David Brame et al, "Summary Programmatic Reductions for Preliminary Budget Document," October 20, 2002; Michael Fitzgerald to Diane Supler, "Estimated 8.5% Reduction," November 13, 2002; Melinda Walter on behalf of Eileen Lewis to Bill Baarsma et al, "Thank You," December 11, 2002.

[36] Kit Oldham, "Port of Tacoma Thumbnail History, Part 3," pp. 4-5.

station."[37] Unfortunately, TFD was unable to identify "any alternate sites capable of restoring both the unit's [Engine 15] Tideflats and Northeast Tacoma response capability."

As mitigation, the Port agreed to assist the City to pay the cost to repair and reopen the Hylebos Bridge. In the interim, the Port agreed to maintain an "emergency access corridor through the vacated right-of-way until the bridge repair was complete."

TFD reluctantly agreed to the use of the interim access corridor as an emergency response and evacuation route into and from the peninsula. Steinhoff indicated such options are "halfway measures" at best. Historically, TFD found such corridors were often "ignored or misused and continuous employee and public training and awareness" was required for them to remain effective.[38]

The project timeline and budget required to repair and reopen the Hylebos Bridge was significantly underestimated by City Public Works staff and eleven years elapsed before the bridge was eventually reopened in May 2012.[39]

Following the Alexander Avenue vacation and while awaiting the bridge reconstruction, Engine 15's effectiveness remained reduced. Never a busy unit, from 2000 through 2003, Engine 15 averaged 439 dispatched emergency responses per year, an average of 1.2 incidents per day. Commands to move up to Station 3 to stand by in Northeast Tacoma to support that area while Engine 3 was in service on an emergency there, made necessary by the bridge closure, became a significant additional part of Engine 15's work load, totaling 196 moves in 2002 and 573 moves in 2003.[40]

Second TriData Study

In 2003, partly as a result of the Port area Tideflats expansion, street vacations and the precarious condition of East 11th Street as a continued thoroughfare, TriData was again engaged by the City to "review the current station and unit locations and support facilities" of TFD, "especially in light of contemplated changes in the Port area."

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[37] Port of Tacoma, Petitioner, "City of Tacoma Petition to Vacate Right of Way," September 30, 2003, pp. a-b; Gary D. Steinhoff to Kyle Crews, "Port of Tacoma Proposed Alexander Vacation," December 10, 2003, pp. 1-2.

[38] Alexander Avenue Interlocal Agreement, September 29, 2004; Paul Rieman, Testimony Before Hearings Examiner Rodney Kerslake, Port of Tacoma's Proposed Alexander Avenue Vacation, February 26, 2004; Steinhoff, op.cit. Compare Steinhoff's predictions of the corridor in his memo to Crews and his testimony before Hearings Examiner Kerslake with the statements and promises of Jeffrey Lincoln, Port of Tacoma, during his testimony before Kerslake. (Taped Hearings, Hearings Examiner File 124.1206). Steinhoff's statements also were generally an accurate prediction of TFD's eventual experience with the Alexander Avenue emergency corridor. This author's subsequent interview of four responsible battalion chiefs revealed that only one thought the corridor was truly functional for TFD's emergency use.

[39] "Hylebos Bridge Reopens Today," Business Examiner, May 21, 2012, p. 1.

[40] Sheila McCoy to Michael Fitzgerald, "E 15 Activity," December 1, 2014.

TriData's analysis confirmed there were already response time problems for units responding into and out of the Tideflats. Looking into the future, the consultant predicted that if the Murray Morgan Bridge and/or the aging 11th Street Viaduct and bridge over the Puyallup River were removed or became inoperable response times would be made significantly worse. Concluding that the western and southwestern portions of the Tideflats were well protected from other units and Engine 15's response zone on the Hylebos peninsula was a relatively low risk, low workload area, the consultants proposed to consolidate the staffs of Stations 6 and 15 into a new station located in the vicinity of SR509 and Port of Tacoma Road.[41]

The TriData Study also called for the refit and renovation of at least one of Tacoma's two fireboats and recommended that one boat be returned to Station 5 on Ruston Way and staffed full-time. In the event the new Port area fire station was constructed and the Murray Morgan Bridge was no longer available, "TFD could move the fireboat to a mooring along the Blair Waterway, closer to the new Port station."[42]

Plans for refit of one of the fireboats was eventually implemented by TFD, as indicated above, and a potential site for the consolidated station was identified by TFD and the Port with $355,000 in initial City capital funding provided for the temporary relocation of Tideflats based units to a Port area fire station. However, funding for permanent construction and relocation was never identified.

Faced with the project funding shortage and the inability to obtain additional capital or operating funding, Fire Chief Ronald Stephens and his staff reviewed plans for the Tideflats. They concluded the current location of Engine 6 at Station 6 was a better current position than the proposed new location in the south central Tideflats because Engine 6 was better able to "serve the western and central Tideflats from the "F" Street location and continue to cross staff the fireboat."[43]

Relocation of Engine 15, Closure of Station 15

By 2005, it also was apparent to TFD planners that the growing volume of emergency incidents in South and East Tacoma was exceeding the capacity of the resident units. Fire staff reported that emergency incidents in Engine 10 and Engine 11's response zones totaled 5,162 and 4,201, respectively, in 2005. Staff reported "the magnitude of the workload not only kept both engines very busy, it dragged units from all over south and central Tacoma into the zones to handle calls when the resident engines were already engaged."

In a written memo in December 2005, Chief Stephens informed City Manager Eric Anderson about the apparent degradation of emergency response in South Tacoma. The Fire Chief proposed to spend $550,000 currently earmarked for infrastructure repair to instead purchase

[41] TriData, Comprehensive Review of the Tacoma Fire Department Facilities and Units, June 2004, pp. iv, 47, Chapter IV.
[42] Ibid., p. 64.
[43] Michael Fitzgerald to Ronald Stephens, "Port Area Fire Station," January 11, 2007.

suitable temporary quarters in East Tacoma for relocated Engine 15 until funding to build permanent facilities could be found.

In a May 3, 2006 memo Chief Stephens thanked the City Manager for approval to proceed with the relocation. In June 2006, TFD purchased a small house at 64th and East McKinley for use as the temporary fire station. The City installed traffic signal control equipment, modified the residence and constructed a garage for the engine in the alley behind the house. The relocated engine crew began operation there in April 2007.[44]

The Great Recession, Closure of Station 6, Reduction of Engines 13 and 15

As the local economy improved in 2006, the City Manager proposed and the City Council approved $3.5 million in Real Estate Excise Tax (REET) based capital funding for TFD "to help address deferred maintenance in the City's fire stations." City funding also was provided to enable TFD to complete a master facilities plan for the department. The maintenance funding, which was initially included in the City's 2007–2008 biennial budget, was intended to be received over a five-year period but was later cancelled due to the onset of the Great Recession and the subsequent shortage of available REET funding. Nearly all of the recommendations included in the Master Facilities Plan have not yet been implemented.[45]

Just prior to the recession in 2007, the Murray Morgan Bridge finally was closed completely by the Washington State Department of Transportation due to structural deficiencies. Following the bridge closure, the City Manager authorized TFD to staff an additional engine (Support Engine 30) out of Station 2, 2701 Tacoma Avenue, to help mitigate the impact of the closure on response times. Staffing of Support 30 continued until August 2009, when it was cut due to the continued impact of the Great Recession. The Bridge remained closed until a major repair and reconstruction project was completed in February 2013, reducing the effectiveness of Engine 6 at Station 6 for the period of the closure.[46]

Officially, the Great Recession is generally considered to have begun in December 2007 although weaknesses in the real estate market and other symptoms of the recession began earlier.

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[44] The proposal to relocate Engine 15 is summarized in Michael Fitzgerald to Jim Duggan, "Station 15 Relocation, "November 14, 2012. See also Michael Fitzgerald to Gary Steinhoff, "Performance Measurement Request," July 11, 2006; Cydney Ketchum to Gary Steinhoff et al, "6415 McKinley Property," June 29, 2006; Tacoma Fire Department Bulletin #07-09, April 5, 2007. TFD reported the cost to purchase, renovate and construct facilities for the relocated unit (including additional traffic signal management) totaled $620,630. See also Jon Lendosky to Allyson Griffith, "Fire 2007-2008 Capital Expenditures," August 14, 2008, p. 2.

[45] Ibid., p. 1; Melinda Walter, (on Behalf of Ronald Stephens) to Eric Anderson, "TFD Facilities Master Plan," January 27,2011, and attachments.

[46] John Gille, "Tacoma's Murray Morgan Bridge Reopening," The News Tribune, February 1, 2013, p. 1; Michael Fitzgerald to Mary Reddin, "Projected Fire General Fund Expenses," February 10, 2008; Tacoma Fire Department Special Order #09-74, "Support 30," July 29, 2009.

By early March 2008, City revenues already had weakened sufficiently that TFD was tasked with offsetting or eliminating an $807,000 budget reduction target by the end of that year. [47]

Although Fire Chief Stephens warned TFD staff that the 2009–2010 biennium would likely be difficult years for the City financially, City Manager Anderson maintained to the City Council that the City could ride out the recession using its reserve funding. The strategy apparently assumed that Tacoma was better able to do so than surrounding jurisdictions and that the recovery from the recession would be similar to previous recent recessions.[48]

The City's adopted 2009–2010 General Fund budget included about $13.9 million in initial reserve funding needed to balance revenues to adopted expenses. However, by the end of the first quarter of 2009 General Fund revenues were about $4 million less than expected while expenses were $734,000 more than projected.[49]

The April 2009 status report resulted in the first quarterly revision to the City's biennial operating budget. For the next four years, quarterly financial updates were followed routinely by budgetary reduction assignments. During 2009 and 2010, TFD cut non-essential non-personnel expenses, deferred capital purchases and lease payments for vehicles and equipment, retained unfilled vacant personnel positions and diverted to non-General Fund funding sources formerly General Fund obligations, including the transfer to the EMS Fund of one former General Fund budgeted management position. By March 2010, City Budget Office staff estimated the value of TFD's 2009–2010 General Fund reductions to total about $4.9 million of the $29.7 million total reduction then identified.[50]

In December 2009, City Manager Anderson acknowledged the City was working through "a recession that is the worst since the Great Depression" and that staff was unable to predict how long the recession would last. Although State and national economists indicated as early as October 2009 the recession was technically ended, impacts at the local level persisted long after

[47] Sam Montana, "What Caused the Great Recession of 2008-2009?" Knoji Consumer Knowledge, September 27, 2010, p. 1; Dale Vaughn to Amy Palmer, "2008 Revenue Offsets and Expense Reductions," March 6, 2008; Peggy Buchanan to Ron Stephens, "Voice Mail to Fitz From Amy," March 24, 2008;
[48] Tacoma Fire Department Bulletin #08-16, August 8, 2008; Michael Fitzgerald to Ron Stephens, "2009-2010 Budget," October 10, 2008; Ron Stephens to Michael Fitzgerald, "2009-2010 Budget," October 10, 2008.
[49] City of Tacoma, "Finance & Economic Status Report," April 28, 2009, p. 4.
[50] City of Tacoma, "General Fund Changes," April 28, 2009, p. 1; Michael Fitzgerald to Ron Stephens, "Additional Personnel Vacancies," August 5, 2009; Ron Stephens to Michael Fitzgerald, "Your Quick Review for Tomorrow's Study Session," November 2, 2009, including p. 2 of attachment; Ron Stephens to Michael Fitzgerald, "Budget Revisions," January 24, 2010; Greg Klump to Michael Fitzgerald, "Changes Told to Council Thru 12/31/09," March 1, 2010, including attachments. The estimated savings of $973,000 from eliminated overtime for Support 30 was in addition to the TFD reductions, reported as part of the reduction to the Non-Departmental area of the General Fund. See Greg Klump to Michael Fitzgerald, "Special Order #09-74: Support 30," March 1, 2010.

the national economy began to revive and officials predicted the recovery would be slow and fragile.[51]

Unfortunately, local impacts of the recession were much longer lasting than officials originally expected. Although the City Manager expressed his confidence in January 2010 that the City still would be able "to bridge the $42.8 million gap in our 2009–2010 [General Fund] budget without layoffs, reduction of services or new taxes," by April it was apparent that City revenues had not yet revived as much as anticipated and first quarter 2010 revenue receipts were about $7.4 million less than expected.[52]

Subsequently, the City of Tacoma continued to supplement General Fund revenues from accumulated reserves while further cutting expenses through the balance of 2010 and into the first half of 2011. Along with other General Government departments, TFD struggled with increased austerity, especially a general requirement to retain unfilled vacant budgeted positions without impacting important City services. The directive was difficult to accomplish for TFD because it continued to staff the same total number of first responding units with 32 fewer actual employees than budgeted by December 2010.[53]

The 2011-2012 General Fund budget approved by the City Council totaled $398.6 million, approximately $42.2 million less than the initially adopted 2009–2010 biennium total. As part of the budget, a general wage freeze was implemented that affected about one half of all General Fund based employees. In addition, 79 vacant City positions were eliminated and another 54 vacant positions were left unfilled. However, City departments were directed to avoid reductions in services. None of the eliminated positions were commissioned positions in the Police or Fire Departments.

Although given an assignment to yield a savings from unfilled positions, TFD also was budgeted and approved to hire a fire recruit class, its first since the onset of the recession, ten employees of which were actually paid from a FEMA Staffing for Adequate Fire and Emergency Response (SAFER) grant. No reserve funds were technically used to balance the General Fund budget, but transfers to reserve funds from the General Fund were reduced for the new budget.[54]

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[51] "Budget Update From City Manager Eric Anderson," City of Tacoma, Take Five, December 11, 2009, p. 1; Eric Swenson, "Washington State Economic & Revenue Outlook," Washington State Economic and Revenue Forecast Council, October 16, 2009, slide 2.

[52] "Fourth Quarter Budget Update From City Manager Eric Anderson," City of Tacoma, Take Five, January 26, 2010, p. 1; City of Tacoma, "Finance & Economic Status Report, 1st Quarter 2010, " April 27, 2010, p. 6.

[53] Michael Fitzgerald to Greg Klump, "May 2010 Gen Gov Vacancies With Fire Revision," May 25, 2010 ; Michael Fitzgerald to Mary Reddin, "Re: Fire Biennium End General Fund Forecast, 2010," June 24, 2010; Michael Fitzgerald to Ronald Stephens, "Fire Payroll and FTE Total, PPE 12/19/10.

[54] City of Tacoma, 2011-2012 Biennial Budget, pp. 1.3; City of Tacoma, "City Council Approves 2011-2012 Biennial Budget," News Release, December 7, 2010; Jim Duggan to Michael Fitzgerald, "Award Notification," February 11,2011; Lewis Kamb, "Tacoma: City's New Budget Hitting Targets, But Officials Remain Cautious," The News Tribune, April 27, 2011.

Through the first quarter of 2011, Robert Biles, the City's Finance Director, indicated the City of Tacoma was essentially "hitting most targets" in its new budget despite the sluggish economy. However, City Manager Anderson conceded the City was "a long way from being out of the woods."

The City continued to draw from reserves to supplement General Fund revenues. An attempt to make a wage freeze Citywide was unsuccessful, adding a $1.5 million cost to the biennial budget. Director Biles proposed to target another 76 positions in addition to those already lost or unfilled to manage revenues to expenses.[55]

The end of the second quarter of 2011 coincided with a performance evaluation of the City Manager by the City Council preparatory to potential extension of his employment contract. The evaluation apparently indicated the Council had lost confidence in the City Manager's planning and financial management during the recession. Council Members also felt they were not kept adequately informed on important issues. Following the evaluation, a majority of the Council elected not to renew the City Manager's contract.[56]

Following the departure of Eric Anderson, Finance Department staff prepared new multi-year projections of City revenue and expenses that reexamined assumptions and excluded continued reliance upon reserves. The work occurred during the third quarter of 2011 while City Budget Office staff continued to report monthly revenues and expenses against the current budget. Those reports appeared to indicate that revenues and expenses were essentially within targets.[57]

As the quarter progressed, it became apparent to Finance staff that the City's predictions for recovery in the final two quarters of 2011 were not being realized. As a result, in early October 2011, Interim City Manager Rey Arellano directed General Fund based departments to prepare reduction plans. In a Saturday meeting in the City Manager's Office in mid-October with Arellano and Biles, senior Fire staff discussed proposals to close four engine companies, eliminating 48 commissioned positions, along with other cuts totaling $11.3 million in recurring savings to the General Fund over a two-year period.[58]

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[55] Ibid.

[56] "Tacoma City Council Terminates City Manager's Employment," PNW Local News, July 13,2011; "Tacoma Fires City Manager Anderson," Puget Sound Business Journal, July 13, 2011.

[57] Laura McPherson to Karen Buchanan et al, "Financial Reports," July 20, 2011; City of Tacoma, "Finance & Economic Status Report, 2nd Quarter, 2011-2012," August 2, 2011; Cindy Cusick to Michael Fitzgerald and Francesca Heard, "General Fund Expenditure Report for September 2011, October 11, 2011. See also Rey Arellano to Department Directors, "Instructions for 2011/2012 Mid Biennium Modification," September 13, 2011, p. 1, that stated "The current revenue projection for the General Fund indicates total revenues for the biennium will come in close to the budgeted amount."

[58] Director Biles' concerns were quoted in a News Tribune article cited in Jim Duggan to Michael Fitzgerald et al, "Today's News Tribune," November 1, 2011; Melinda Walter to Gabriel Engeland and Laura McPherson, "Tacoma Fire Department Budget Reduction Forms," October 24, 2011; Michael Fitzgerald to Mary Reddin, "Assignment to Provide Position Numbers for Personnel Reduction," October 26, 2011. The proposed reduction was increased to 50 commissioned positions when TFD's proposal to return $347,000 in REET funds was not accepted by Finance staff and an alternate recurring reduction was substituted. See Michael Fitzgerald to Ronald Stephens, "Prevention

Later that month, Arellano reported to staff and the City Council that "a combination of falling revenues and unexpected but necessary expenses" during the third quarter would result in a projected gap of $26 million in the General Fund by the end of 2012. He told the Council that the size of the gap would compel the City to reduce services and service levels including the contributions made to external agencies.

The following week, Arellano announced that department directors and unrepresented employees would be taking 9.5% and 4.5% pay cuts, respectively, in 2012, and that resulting pay rates for those employees also were frozen. By November, the projected General Fund funding gap had grown to $31 million. The City announced the availability of one-time retirement incentives of $12,000 for eligible employees in an attempt to reduce the expected number of employees laid off. Fire staff provided position numbers for 79 TFD positions that were potential candidates for elimination.[59]

At the December 6, 2011, City Council meeting, the City Council was formally notified of the proposed reductions planned for TFD. Phase 1 reductions included elimination of four engine companies: Engines 4, 6, 11 and 13 with accompanying personnel cuts in administration and the Prevention, Training and Safety Divisions, totaling 44 positions. A second round of cuts, scheduled to begin in April 2012, would be announced later. Overall, 262.3 General Fund positions were announced for elimination, a cut of about 17.5% with 166.7 FTEs lost through expected layoffs. However, following the early December budget meetings, the City Council directed the Interim City Manager to take a second look at the initial budget reduction proposals, finding additional savings in general maintenance and operations and delaying layoffs of commissioned employees while negotiations with affected unions continued. [60]

Following agreement to defer contracted wage agreements from both Fire commissioned unions for 2012, TFD eventually implemented Phase I budget cuts totaling about $4.47 million that included the elimination of 25.3 General Fund positions. TFD also agreed to about $229,200 in non-personnel related cuts as part of Phase II but further Phase II cuts proved unnecessary due to the Fire Department securing a second SAFER grant. In addition, the Police Department obtained a federal Community Oriented Policing Services (COPS) grant. The multi-year SAFER

Positions," October 27, 2011; Ronald Stephens to Gabriel Engeland and Tanya Robacker, "TFD Budget Reduction Proposal, 11-11 Final," November 4, 2011.

[59] Rey Arellano to Brenda Dean et al, "Budget Message to General Government Employees," October 25, 2011; City of Tacoma, "Finance & Economic Status Report, 3rd Quarter 2011-2012," October 25, 2011; Rey Arellano to All General Government, "Message From the City Manager," October 31, 2011; Celia Holderman on Behalf of Rey Arellano to All General Government, "Budget Message to General Government Employees Re: Retirement Incentives," November 15, 2011; Michael Fitzgerald to Karen Short, "Fire Prevention Positions Identified for Elimination," November 30, 2011.

[60] "Tacoma Fire Department Budget Reductions," [undated]; Ronald W. Stephens to Rey Arellano, "Responses to Questions From December 6, 2011 City Council Meeting," December 14, 2011; Rey Arellano to Marilyn Strickland et al, "Updates for December 6 Budget Workshop Advanced Materials," December 4, 2011; Celia Holderman on Behalf of Rey Arellano, "Budget Message to General Government Employees," December 7, 2011.

and COPS grants, totaling $12.6 million, prevented layoffs of 47 firefighters and 15 police officers.[61]

The SAFER and COPS grant awards occurred coincident with beginning work developing the City's 2013–2014 biennial budget. Intent upon addressing the remaining gap in the 2011–2012 General Fund budget and to eliminate an estimated $60 to $65 million gap for 2013–2014, City Manager T.C. Broadnax and City Budget Office staff initially assigned to TFD an additional two-year General Fund budget reduction target of $13,735,300 along with an EMS Fund reduction target of $3,941,100 as part of a "back to basics" sustainable budget and reprioritization of City services.[62]

However, the projected gaps were prepared without consideration of the awarded federal SAFER grants, totaling about $9.3 million in avoided General Fund expense during the period. Even so, TFD needed to propose $7.3 million in General Fund cuts and $2.9 million in EMS Fund reductions for 2013–2014. The reductions resulted in the elimination of 31.5 FTEs, elimination of staffing for Engine 6 and partial loss of staffing for Engines 13 and 15 and closure of Fire Station 6 in the Tideflats. Staffing was retained to operate two two-person aid cars in substitution for Engines 13 and 15. However, the staffing for Squad 13 was peak-time only, from 0700 hours in the morning until 1900 hours in the evening.[63]

To determine the proposed operational reductions, Fire Chief James Duggan analyzed a number of factors, including: (1) the volume of emergency responses for each of the units; (2) overlapping response capability from other units; (3) the capacity of adjacent units, (4) freeway responses and (5) the overall impact of closure on the entire response system. The Chief's recommendation represented the "combination with the least number of undesirable effects."[64]

The Chief said TFD "made the best of a bad situation," preserving as much emergency response capability as possible and prioritizing life safety over property protection. The closure of

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[61] Michael Fitzgerald to Laura McPherson, "Phase 1 Budget Reduction Proposals Signed and Attached," March 21, 2012, Michael Fitzgerald to Melinda Walter, "Phase I/II," August 6, 2014, p. 2; Jim Duggan to Michael Fitzgerald, "Re: Phase 1 Budget," April 26, 2012; Jim Duggan to All TFD, "SAFER!" June 22, 2012; Lewis Kamb, "Tacoma: Fire Department Wins $7.7 Million Grant Saving 37 Firefighter Jobs and Closing Part of Budget Gap," The News Tribune, June 22, 2012; Halley Griffin, "37 Tacoma Firefighters Safe From Layoffs," KOMO 4 TV, June 21, 2012; Senator Maria Cantwell, "Cantwell, Murray Applaud Grant for Tacoma Police Department," U.S. Senate Press Release, June 26, 2012. The TFD reduction was part of a $19.8 million total General Fund reduction. See Michael Fitzgerald to Jim Duggan, "2011-2012 Budget Bulletin No. 15 – 2011-2012 Revised General Fund Budget," April 5, 2012. The potential TFD layoff was 47 firefighters rather than the 37 reported by the media because the potential grant loss involved the funding for both SAFER grants that supported 47 firefighter positions.

[62] Tanya Robacker to Chief Duggan et al, "Budget Efficiency Targets for 2013-2014," June 11, 2012; City of Tacoma, "Back to Basics: Budget Overview, 2013-2014 Biennium;" The City Manager's successful effort to reestablish the City budget upon a more transparent and financially sustainable level is summarized in City of Tacoma Washington, "City Manager Executive Profile," www.cityoftacoma.org

[63] James Duggan, "City of Tacoma 2013-2014 Proposed Biennial Budget Worksession, Tacoma Fire Department," November 6, 2012, pp. 59-62; Michael Fitzgerald to Tadd Wille, "Fire Department Reduction Options, Including Identified Position Numbers," October 11, 2012, with attachments.

[64] Duggan, "Proposed Biennial Budget Worksession," p. 66.

Station 6 probably would not have been possible without the reopening of the refurbished Murray Morgan Bridge. Even after allowance for the grants, the cuts were truly significant and firefighter layoffs again loomed until made unnecessary by announced incentivized retirements of eligible Fire staff and help from revenue generating decisions made by the City Council. Chief Duggan acknowledged "things could have been much worse."[65]

Besides the station closure, the introduction of two two-person squad units in substitution for two former three-person engine companies was controversial. Fire union leaders protested the change to the public, noting the squads provided only labor to fight fires as they lacked a fire pump. Shortly after the engine company was eliminated, a house fire occurred one block away from Station 13. Fortunately the fire, which was caused by faulty electrical wiring, was confined to the room of origin by other responding units.[66]

The 2013–2014 General Fund budget reduction left TFD without an operational station in the Tideflats. This has remained the case even though TFD recognizes the Tideflats has the third highest concentration of high risk structures and the planning zone consistently ranks first in certain high acuity conditions per capita such as cardiac emergencies and trauma. It also hasn't helped that the Tideflats continues to be characterized by limited road access, waterways and at grade rail crossings that limit or impede the transit of emergency vehicles.[67]

Even before Station 6 was closed, TFD identified the addition of a four-person advanced life support engine company as one its proposed improvements for emergency response. Following the 2011–2012 budget reductions, Chief Duggan initiated an exploration of the potential feasibility of modifying the Fire Training Center to provide space and staffing when available for Tideflats emergency response.[68]

The Emergency Response/Intelligent Transportation Systems (ER/ITS) Study sub consultants preliminary draft recommendation to implement a two-person ALS capable squad unit during weekday hours out of the Training Center may provide a comparatively attractive minimum cost unit for timely EMS emergency response within the central Tideflats.[69]

By comparison to 2013–2014, the recently approved City 2015–2016 budget is much improved despite the continued fragile nature of the local economic recovery. Overall, the City budget

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[65] Steve Dunkelberger, "Fire Department Set to Close, Downsize Stations," Tacoma Weekly, November 7, 2012; King Staff, "Tacoma Fire Department Replacing Some Fire Trucks With Pickups," King5.com, December 7, 2012; Deborah Wang, "Proposed Tacoma City Budget Includes Big Layoffs," KUOW News, October 3, 2012; Jim Duggan to Jeffrey Jensen et al, "Budget Adopted," December 5, 2012; Keith Eldridge, "Budget Cuts to Leave 2 Tacoma Fire Stations Without Fire Engines," KOMO News, January 7, 2013.

[66] Eldridge, op.cit.; Tacoma Fire Department: "Electrical Wiring Ignites House Fire on North 25th Street," January 8, 2013, http://tacomafiredepartment.blogspot.com.

[67] Tacoma Fire Department, Standards of Cover, 2009, pp. 38,51.

[68] Ibid., p. 8; Lawhead Architects P.S., "Tacoma Fire Department Fire Training Facility Feasibility Study, Study Document," April 2014.

[69] TriData Division of System Planning Corporation, "Emergency Response Review: Tacoma Tideflats," December 10, 2014, p. 31.

added 110 positions as some City services were restored. TFD lost funding for two additional General Fund positions, one of which was commissioned, but 17 commissioned positions formerly paid from SAFER grant funds were assumed by the General Fund. For 2015, 20 commissioned positions remain funded from SAFER grant funds. TFD's 297.3 General Fund FTEs represent 28.2% of the total budgeted General Fund FTEs. TFD's 2015–2016 General Fund budget of $96,136,996 represents 22.7% of the total budgeted General Fund expenses.[70]

The ER/ITS Study also is occurring against a backdrop of proposed new or expanded petro carbon based projects. In 2014, the Port announced the lease of Port property to Puget Sound Energy for a liquid natural gas storage and trans filling facility and Northwest Innovations Works proposed a methanol storage and exporting facility on another Port parcel. While potentially adding to the demand for fire services, these developments will help restore the economic and tax-generating base of the Blair and Hylebos peninsulas following the closure of two major chlor-alkali plants and a large aluminum smelter, all of which were abandoned or demolished early in the last decade.

Following completion of the second TriData study, TFD used the occasion of the reduced arterial access and reduced risk on the Hylebos peninsula that arose from the closure of Kaiser Aluminum and other manufacturing facilities there to allow the relocation of Engine 15 to South Tacoma. The current increase in risk resulting from the new petro carbon projects may justify the reestablishment of an engine company on the Hylebos peninsula.[71]

Emergency Response/Intelligent Transportation Systems Study, 2014-2015

As indicated above, the ER/ITS Study was developed in response to proposed new projects in the Tideflats, e.g., the petro carbon projects. It also resulted from frustration with a primarily permit driven Tideflats public safety planning process that limited the City's ability to focus on the general or overall effects of development there. The Study builds on the plans developed by the City and Port. For example, the Container Port Element of the City of Tacoma Comprehensive Plan, 2014, developed in collaboration with the Port of Tacoma, contains the following policies:

- Ensure adequate and efficient provision of services through active consultation and coordination amongst multiple agencies and stakeholders;

- Focus on the needs for "efficient access" and "key transportation corridor improvements;"

[70] Kate Martin, "Tacoma's Proposed Two-Year Budget Includes Adding 110 Jobs," The News Tribune, October 7, 2014; Zachariah Bryan, "Pierce County's Recovery Continues, But Rebound Sluggish," Business Examiner, January 2015; Teresa Green to Michael Fitzgerald and Peggy Dundas, "2015-16 Adopted Fire ZLABOR [sic]," February 9, 2015; Tables 1 and 2.

[71] Port of Tacoma, "Puget Sound Energy LNG Facility," portoftacoma.com [undated]; John Gillie, "Tideflats Could Become Site for LNG Plant," The News Tribune, March 7, 2014; Port of Tacoma, "Northwest Innovation Works," portoftacoma.com [undated]; Shari Phiel, Andre Steankowsky, "Northwest Innovation Works Planning Methanol Export Facility in Tacoma," TDN.com, April 24, 2014.

- Partner with existing and future developments to cover necessary costs of services and facilities that support them;

- Future developments pay for the costs of those capital improvements necessary for the proper functioning of the Core Tideflats area.[72]

According to data collected by the American Association of Port Authorities, the ports of Seattle and Tacoma's share of West Coast containerized cargo is declining. With Federal Maritime Commission approval, both ports plan to form a Seaport Alliance with key goals of maximizing their assets, staying competitive and increasing their market share of West Coast cargo. At the time of the ER/ITS Study, quantitative cargo projections for the Seaport Alliance were unavailable but cargo numbers for both ports are expected to increase.[73]

The Port of Tacoma's Land Use & Transportation Plan, developed in consultation with the City of Tacoma in 2014, calls for "addressing transportation congestion on and off the Tideflats , while at the same time identifying transportation improvements that will be necessary to sustain the projected growth at the Port over the next 10 years." That work "will be crucial to the Port's success at enhancing the economic competitiveness of the area."[74]
The Port's Land Use & Transportation Plan also calls for collaboration "with city, State, federal, tribal, and private entities in selecting, prioritizing, and phasing transportation projects."[75]

The Plan's strategies to "work with the City of Tacoma and other emergency responders and stakeholders to develop an Emergency Response Plan for the Port of Tacoma Manufacturing and Industrial Center" and to "develop and implement Intelligent Transportation Systems (ITS) improvements, e.g., real time information on truck and train movements using GPS and video and active traffic management using signals and messaging, to assist with traffic management and emergency response planning and service delivery" were arguably the basis for the timing of the ER/ITS Study.[76]

Another consideration for the City behind the ER/ITS Study is the need to better "ensure that existing and future developments pay for some or all of the costs of capital improvements or new facilities that are deemed necessary, by reason of their respective developments, to reduce existing deficiencies or replace obsolete facilities."[77]

[72] City of Tacoma, City of Tacoma Comprehensive Plan: Container Port Element, 2014, pp. CP3, CP8, CP17.
[73] The assessment is based upon American Association of Port Authorities data included in a PowerPoint presentation about the proposed Seaport Alliance by the Port of Tacoma, January 23, 2015.
[74] Port of Tacoma, Land Use & Transportation Plan, 2014, p.33.
[75] Ibid., p. 40.
[76] Ibid., pp. 29,45.
[77] City of Tacoma, City of Tacoma Comprehensive Plan, Capital Facilities Element, 2014, p. 2.

FIRE TACOMA DEPT.

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April 13, 2015

Mr. Dan Soderlind
City of Tacoma Public Works Department
747 Market Street, Room 520
Tacoma, WA 98402

RE: 5098 11th St Bridge Floor Beam Review
Project No.: A14138.01

Dear Mr. Soderlind:

INTRODUCTION

The 5098 11th bridge structure crosses the Puyallup River near its confluence with Commencement Bay, in Tacoma WA. The structure was built in 1930 as a movable vertical lift bridge, accommodating both vehicle and marine traffic. In 1966 the vertical lift towers were removed, converting the structure from a movable lift to a fixed bridge. For the next forty-eight years the structure remained open, accommodating approximately two-thousand vehicles a day. During those last forty-eight years the paint system had been deteriorating, leaving the structural steel members exposed to the corrosive marine environment. In 2014 it was determined that structural deficiencies caused by corrosion were significant enough to close the bridge to vehicular traffic. Due to numerous non-structural safety concerns along the roadway the recommendation was made to close it to pedestrians as well. The structure remains closed to vehicles and pedestrians.

Since the time of the closure, the City has asked if the structure could be opened to just pedestrian traffic. To answer that question some background that led to the closure is necessary. This structure has significant structural deficiencies from corrosion in most types of primary structural members. A load rating analysis showed that the structure does have some capacity to carry vehicles, but that capacity is very low, nearly half for Washington State legal loads and no capacity for Washington State overload vehicles. These poor load rating results, combined with the known poor condition of many primary structural members, a unknown cause of damage to structural members at pier seven, and several non-structural safety concerns for pedestrians along the roadway, was enough to warrant a closure recommendation, which the City followed in 2014. Any process used to answer the question of whether or not the structure could be opened for pedestrian traffic needs to include a review of those conditions that led to its closure.

This letter report will address two of those conditions in detail, the unknown cause of damage at pier seven and the non-structural safety concerns for pedestrians along the roadway. The remaining conditions will be addressed in the summary and conclusion. (It should be noted that in the proposal of services for this

review, pier seven was mistakenly identified as pier six. The damaged pier and subject of the structural review in this letter report is pier seven.)

SCOPE OF WORK

This letter report will address the damage at pier seven, including web distortion in the steel floor beam, cracking in the reinforced concrete cap, and cracking in the deck concrete in the span adjacent to the pier seven. It will also address non-structural safety concerns in the pedestrian fencing, sidewalk and the deck roadway. The scope of work is as follows:

- Perform a site visit to document the dimensions as needed to analyze the damage at pier seven.
- Determine as best as reasonably possible the probable cause of the damage at pier seven.
- Analyze the floor beam at pier seven to determine what affect the damage has had to its capacity.
- Review the structure for non-structural safety concerns along the roadway.
- Provide a letter report of all findings and a recommendation as to whether or not the structure could safely be re-opened for pedestrian only use, in regards to pier seven. The letter report will also include recommendations for any necessary repairs to pier seven.

This is the letter report of our findings.

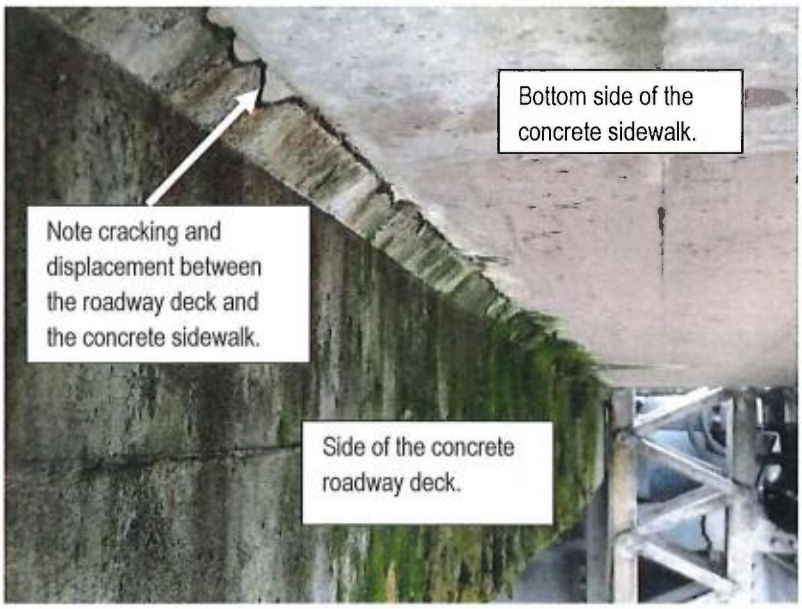
VISUAL INSPECTION

On October 9, 2014, Andrew Packard and Craig Mallow from Sargent Engineers made a site visit to observe the current conditions at pier seven and to observe any pedestrian hazards along the roadway.

During our visit we observed the following:

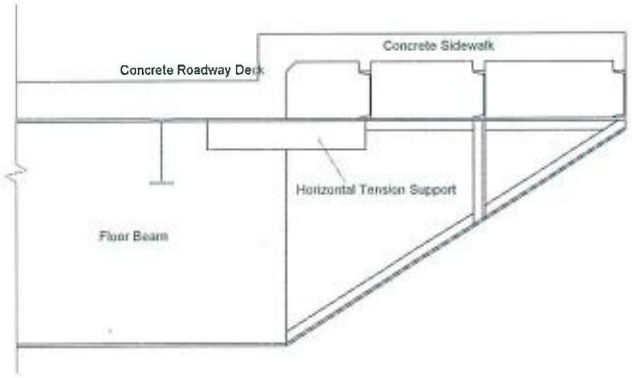
CRACKING IN THE DECK CONCRETE ADJACENT TO PIER SEVEN

Along the upstream side of span six, the concrete sidewalk has broken and slightly rotated away from the concrete roadway deck, along the longitudinal interface between the two. The picture to the right was taken while standing below the concrete sidewalk. Pedestrians walk along the top of the concrete sidewalk, and cars drive along the top of the concrete roadway deck.



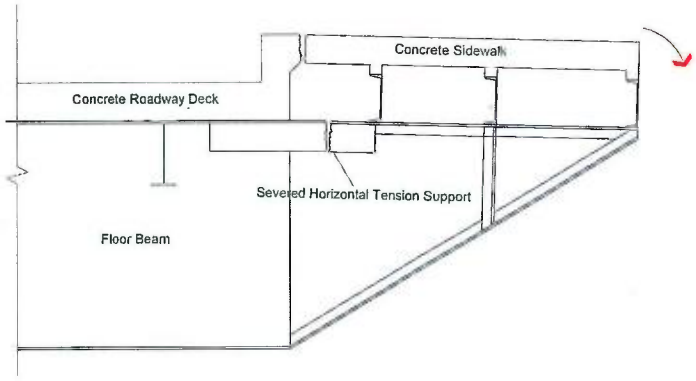
Photograph 1

The simple sketch below is of the cross section of the concrete roadway deck and concrete sidewalk, as well as the triangular structural support system for the sidewalk of that shown in the previous picture.



Sketch 1

The drawing below is again the same cross section but depicts the current condition of one of the main structural members of the sidewalk support system. Note the horizontal member that has severed from and broken away. The amount of rotation in the illustration is exaggerated.



Sketch 2

The severed horizontal connection can no longer hold the top of the support system in place, and the sidewalk has rotated slightly outward and away from the deck. Adjacent similar supports are lending some capacity in its place but are not strong enough to keep the support from rotating. The break in the horizontal member was caused by corrosion, and therefore, not related to what caused the damage at pier seven. It should be noted that this condition will continue to worsen as adjacent supports deteriorate. It should also be noted that there are several additional support members along the sidewalks in this same state. The severed horizontal member can be seen in the picture below.

Photograph 2

FLOOR BEAM AT PIER 7

The vertical web of the floor beam at pier seven has damage in the form of a 1" bow over its height. This type of damage is not typical of what you would see from overstressing the floor beam, but more typical of what you would see from something ramming or banging into it.

Photograph 3: Elevations of floor beam seven.

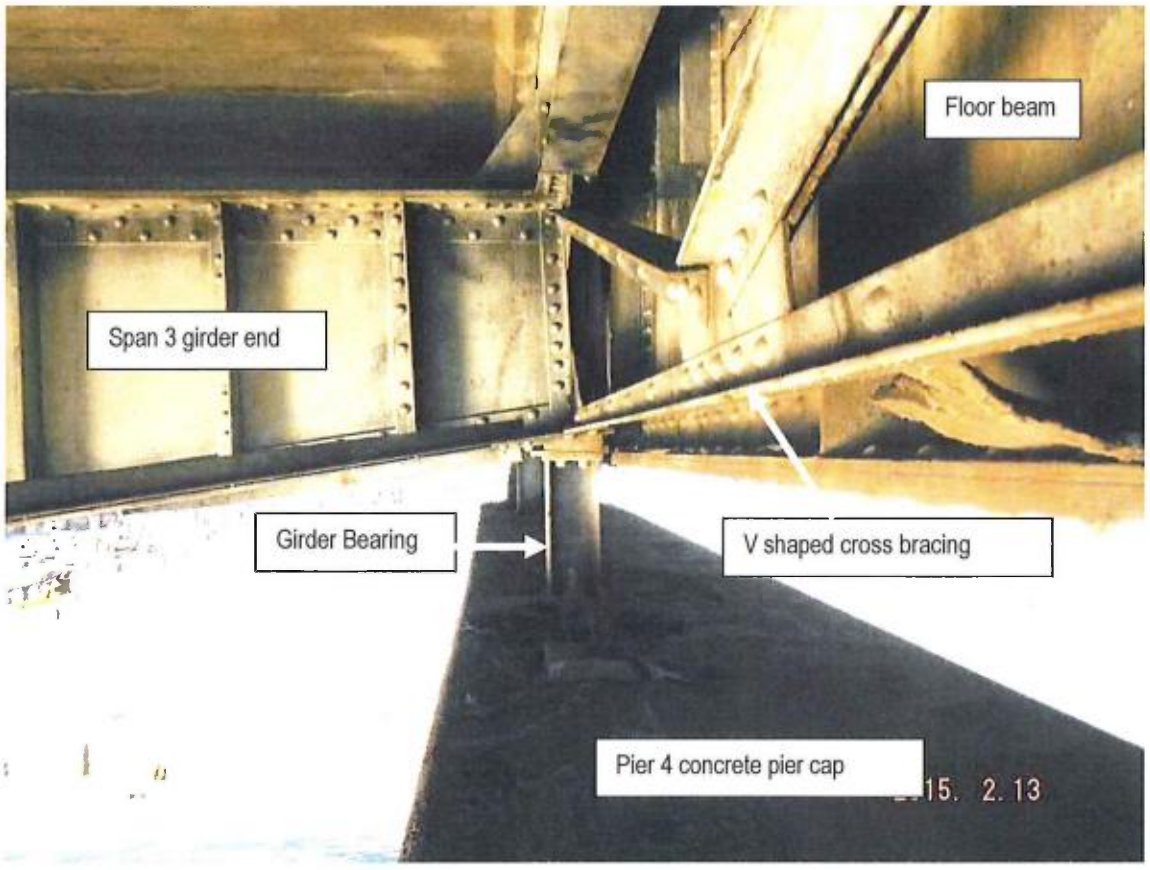
Photograph 4: 1" bowing type deflection damage

Photograph 5: Close-up of deflection damage

To help explain what may have caused the damage to the floor beam at pier seven, a brief comparison of pier four and pier seven, would be helpful

Span three leading up to pier four and span seven leading back to pier seven are sister spans. They are nearly identical in form and function. In being such, their girder end bearing system needs are also nearly identical, and so it would make sense that their girder end bearing systems would be similar. Yet they are not, they are completely different. The bearings at pier four are slender and simple while the bearings at pier seven are massive in comparison and more complex.

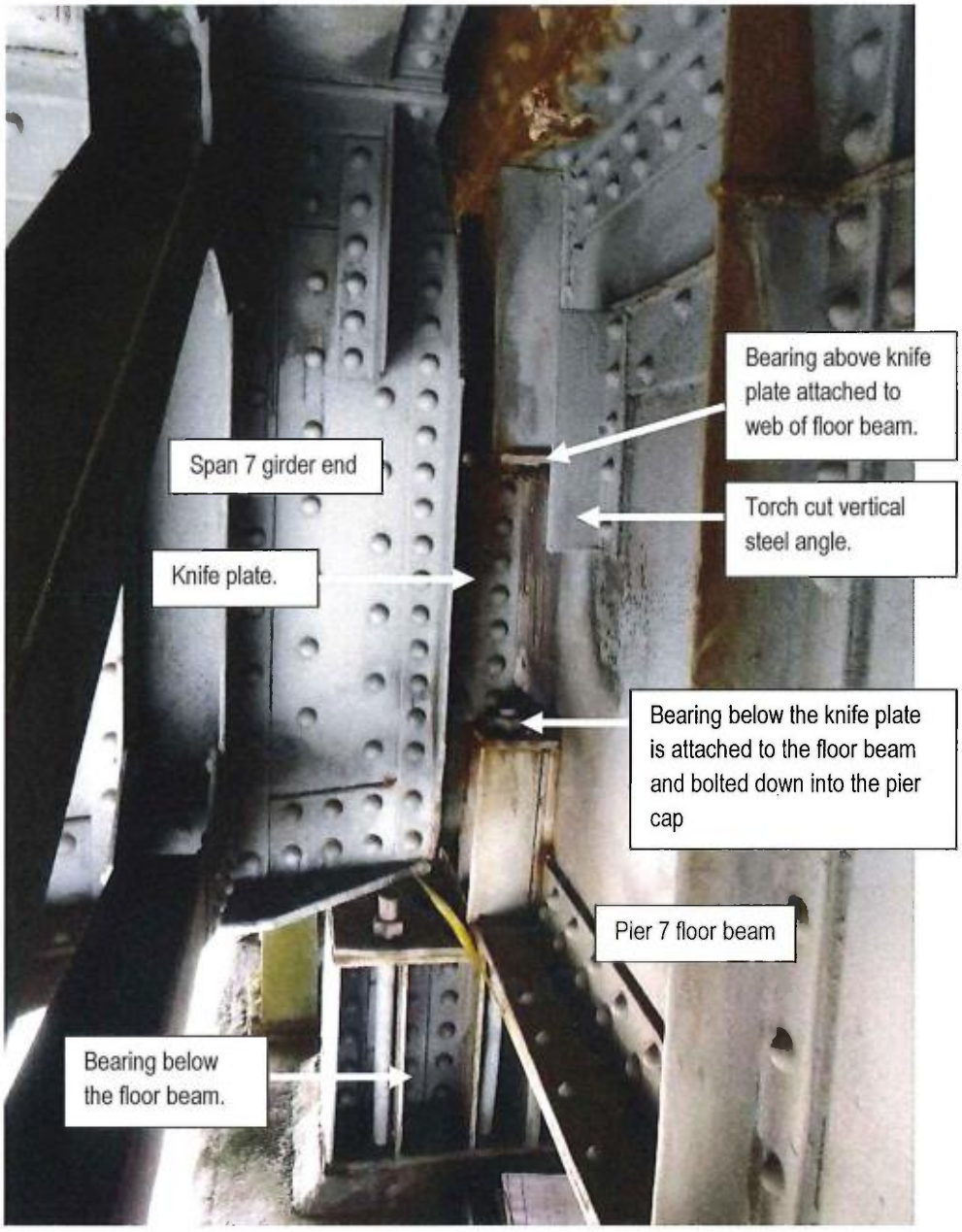
The following comparison photographs illustrate the differences between the two girder end bearing systems. Photograph 6 is of the span three girder end bearing at pier four. The girder end is supported by a simple slender bearing that rests directly on top of the concrete pier cap. There is no connection between the girders or the "V" shaped cross bracing, and the floor beam. This configuration isolates the girder end from the floor beam. This means that any movement in the girder end will transfer directly into the bearing and then into the pier cap, and will not have any effect on the floor beam.



Photograph 6

Photograph 7 is of the span seven girder end bearing system at pier seven. The first thing to note is that the bearing at this pier is much different in appearance than the one at pier four. The girder end is

supported by a bearing that is attached to the floor beam, rather than to the top of the concrete pier cap. A second bearing sits below the floor beam, connecting it to the concrete pier cap. Rather than isolate the girder end from the floor beam, this configuration integrates it with the floor beam. This means that any movement in the girder end will transfer into the floor beam, and could have an effect on it.



Photograph 7

The stout pier seven bearing configuration is not necessary to support vertical downward loads, bearings similar to what are at pier four would easily suffice. This configuration was put in place either to keep the girder ends from moving upwards or to pull them down. The likely scenario is that they are pulling them

down. There has probably been some settlement below pier seven, and since the span seven girders are cantilevered off of the adjacent pier eight, they may not have followed the pier down as it settled. This in turn would cause problems with the deck alignment at the joint between span six and seven above. The bearing system at pier seven was likely modified to pull the girders down in order to re-align the deck.

You can tell the modified support restricts upwards movement by looking at its components. The bearing positioned above the girder end knife plate is solidly attached to the web of the floor beam and the bearing positioned below the girder end knife plate is bolted to the floor beam. The floor beam is then solidly connected to the concrete cap. The girder end knife plate, which is bolted to the end of the girder, fits in between the two bearings and effectively connects the girder end to the cap, restricting it from moving upwards.

While this modification fixed the problem with the girders, it inadvertently created a problem for thermal expansion. The girders in spans seven, eight, and nine are continuous. The bearings at piers seven and nine are movable and the bearings at pier eight are fixed. This means that any movement from thermal expansion or contraction in the girders will occur at piers seven and nine. At pier seven, the design of the modification would have allowed for movement of the knife plate between the upper and lower bearings. Unfortunately though, this movement is no longer allowed to occur because the knife plate has become frozen in between the bearings. The knife plate that once almost certainly slid nicely in between the bearings, is now jammed up against the top bearing to the degree that it has bent the upper bearing plate upwards. The plausible cause for this movement is that pier seven settled again after the initial repair. A slight settlement of the pier combined with the upwards force in the girders and the significant corrosion that is present at the bearings, would be enough to freeze the knife plate into the bearing socket.

As a result of the bearing being frozen, when the girder expands it pushes into the floor beam. The force it does this with is great enough to bend the web of the floor beam, and that is the 1" bowing deflection damage that we are seeing, (Photographs 4 and 5), and because the floor beam is anchored into the concrete cap below, it is also the likely cause for the cracking in the concrete cap around the support.

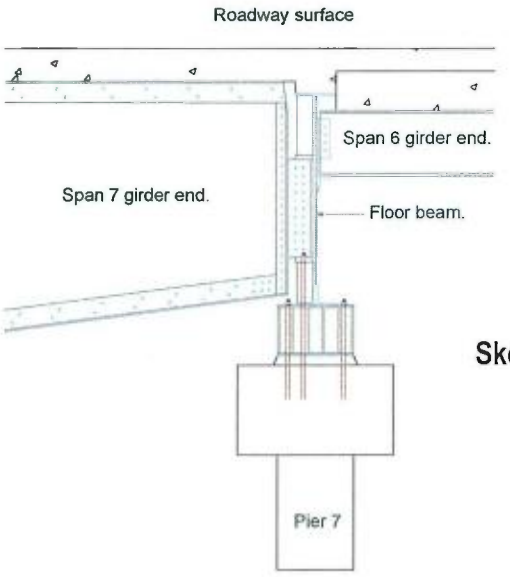
So that is the likely reason for the damage, now the question is, does it significantly affect the capacity of the floor beam to support pedestrian loads? The answer is no and here is why, on the span seven side of the floor beam any girder end loads that would normally transfer into and be supported by the floor beam, are transferring vertically down through the floor beam directly into the supports below and into the pier cap. So essentially the floor beam is not receiving any load from the girder ends. From a structural standpoint, for loads on the span seven side of the floor beam, the damage to the floor beam is inconsequential.

On the span six side of the floor beam however, the girder loads do transfer into the floor beam, as can be seen in the photograph 8.

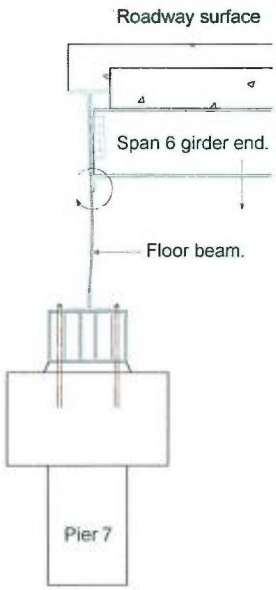
Photograph 8

This floor beam pictured above is actually the floor beam at pier four, but it is a mirror image of the floor beam at pier seven and is an accurate representation of how the girders in span six frame into it. As the picture above illustrates, the girders frame into the floor beam at the top of the web, but unlike the opposite side of the floor beam there are no supports directly below each of the girder ends. In this case the floor beam does support the girders.

Sketch 3 below is a general depiction of how the span six and seven girder ends frame into the floor beam. For clarity, not all extraneous framing is shown. In sketch 4 the span 7 girder end has been removed, leaving only the floor beam and span six girder end visible. The 1" bowing deflection damage in the floor beam web, in the appropriate direction, was also added.



Sketch 3



Sketch 4

The vertical arrow in sketch four indicates the downward force generated by the weight of the girder, the roadway deck, and any load on the roadway deck. The force arrow was placed to show that there is lever type action going into the floor beam. The vertical force arrow cranks a clockwise moment into the floor beam much like a pry bar would. The moment cranked into the floor beam is depicted by the circular arrow. The point to note here is that the vertical force cranks a moment into the floor beam that works to straighten out the bow. If the force arrow were on the other side of the web it would crank a moment into the web that could work to increase the bow. Normal bridge structure loadings will not be high enough to reverse the bow damage, but it is very reasonable to say that because of the direction of the bow in the web that it does not significantly impact the capacity of the floor beam. Further the floor beam has the capacity to support dead loads and pedestrian loads.

NON STRUCTURAL SAFETY CONCERNS

There are several safety concerns along the riding surface of the deck that should be considered.

PEDESTRIAN FENCING

Along the east approach there are several long lengths of pedestrian rail where the cyclone fencing is not connected to the rail posts or deck, and would not support a pedestrian if they fell into it. Along this same rail there are several lengths that have been impacted by vehicles, leaving the railing post connections damaged or in some cases completely severed.

Photograph 9

Photograph 10

PEDESTRIAN SIDEWALK

A large utility penetration through the sidewalk at the east and west end of the structure has unprotected gaps large enough for children to climb into and possibly fall through.

Photograph 11

Due to the corroding sidewalk supports previously discussed, several sidewalk panels have shifted making the walkway surface uneven and bumpy.

Photograph 12

ROADWAY SURFACE

The west approach road way surface is rough and riddled with pot holes caused by spalling roadway concrete. A similar condition exists at the east end, 5098A approach structure. (Structure crossing over the port)

Photograph 13

There are holes in the truss steel grating as well as numerous members with cracks that will soon fall away and become holes. Openings in grating are larger than ADA maximum opening size.

Photograph 14

SUMMARY

In regards to the cracking in the concrete sidewalk near pier seven, the cracking is due to the sidewalks supports failing from corrosion. The corrosion has weakened the supports to the point that it does not have the capacity to fully support the sidewalk and is depending on nearby supports, which are also corroding. It is a bit drastic at this point to say that sections of sidewalk are going to fall off, but they are heading that way. The sidewalk should remain closed indefinitely or until full repairs can be made.

In regards to the web damaged floor beam at pier seven, the floor beam was originally designed to support vehicles and trains, the loads they imparted on it are much larger than what a 90 psf pedestrian loading over the entire deck surface would impart. Additionally, the modification of the bearing system at the pier has increased the strength of the floor beam. Lastly, the degree of bowing deflection damage to its web does not affect its capacity enough to be of concern. Therefore the floor beam is fully capable of supporting pedestrian loads.

In regards to the non-structural safety concerns, the pedestrian railing is in a failed state, there are numerous locations with extensive damage that could not support a pedestrian falling into it. It should remain closed indefinitely or until full repairs can be made. The holes around the utility penetrations into the side walk are large. It would be possible for a child to climb into them and potentially fall through. The two areas around the utility and any other large openings should be closed off until something can be installed to ensure pedestrians cannot access them. With the sidewalks closed, pedestrians will have to use the roadway. The concrete roadway is littered with spalls that are deep enough and rough enough to cause problems for bicycle and foot travel. The steel decking roadway has holes with sharp edges that are large enough to cause significant ant damage to bicycle tires. Further the openings in the steel deck grid are larger than the ADA maximum opening size. Though the deck damage and ADA compliance issue are not as threatening as other deficiencies, they could still result in injuries. The roadway deck should remain closed until ride surface repairs can be made and the opening size can be mitigated.

In regards to the poor load rating results mentioned in the introduction; pedestrian loads are much lighter than vehicular loads and as a result generate smaller forces in the bridge structural members. Because of this smaller loading it is highly likely that the remainder of the structure has sufficient capacity to carry pedestrian traffic. Though as the Engineer of Record for the latest load rating analysis for this structure, KPFF Consulting Engineers would need to be consulted to give the final definitive answer in this regard.

CONCLUSION

The damage to the floor beam at pier seven is not significant. The floor beam is capable of supporting pedestrian loads.

The cracking in the concrete sidewalk caused by corrosion to its steel supports, and the non-structural safety concerns discussed in this report, are significant deficiencies. They are not capable of supporting pedestrian loads and their respective damage should be mitigated prior to giving consideration to opening the bridge to pedestrian traffic.

Lastly, this bridge was originally closed primarily because of significant deterioration from corrosion to most all types of primary structural members. That deterioration is continuing to occur and until mitigated the structure will continue to lose already diminished capacity. So, it should be noted that even if the sidewalk supports and the non-structural items are repaired, and the load rating is reviewed and determined sufficient for pedestrian load, before opening this structure, careful consideration should be given to the risk that remains in the advanced deteriorated state of all affected structural members. It is my opinion that the risk is at a level such that all repairs listed in the routine bridge inspection report for this structure should be completed before re-opening this structure. Until that time it should remain closed to all types of traffic.

Not in the scope of this project but of relevancy is the long east approach structure over the port areas, structure 5098A. It has very similar deterioration levels in its structural members and similar non-structural safety pedestrian safety hazards along its roadway that also should be mitigated prior to any re-opening.

Thank you for this opportunity to assist you with this project, if you should have any questions, please do not hesitate to call.

Respectfully,
Sargent Engineers, Inc.

Andrew Packard, P.E..
Project Engineer

ALP
\\SERVER1\files\14Files\A14138.01 Structure 5098 Tacoma\5098_11thSt_Ped_Doc.docx

Tideflats Area Transportation Study (TATS) Final Report



Prepared for:

Port of Tacoma

Washington State Department of Transportation

Freight Mobility Strategic Investment Board

City of Fife

City of Tacoma

Marine View Ventures (an entity of the Puyallup Tribe of Indians)

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June 2011

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TABLE OF CONTENTS

APPENDICES

Appendix A: Stakeholder Outreach
Appendix B: Background Information
Appendix C: Existing Conditions Technical Memorandum
Appendix D: Existing Traffic, Transportation & Collision Data
Appendix E: Methods & Assumptions for Transportation Analysis Technical Memorandum
Appendix F: Travel Forecasts & Analysis
Appendix G: Evaluation Results
Appendix H: Conceptual Engineering & Cost Estimates
Appendix I: Sequencing of Projects and 2020 Evaluation
Appendix J: Miscellaneous

Note: Due to the large size, appendices are available on a CD.

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

The Tacoma Tideflats, the heart of the area's industrial activity, also serves a diverse set of stakeholders and transportation modes. This convergence provides a unique opportunity for stakeholders to come together to produce a coordinated plan to help enhance the economic competitiveness of the area and increase mobility and accessibility by reducing traffic congestion. The Tideflats Area Transportation Study (TATS) is the result, providing a recommended package of transportation improvements to better serve truck freight traffic in the area.

The study covers the Port of Tacoma, Downtown Tacoma, the City of Fife, as well as portions of unincorporated Pierce County and Puyallup Indian Reservation. The study area contains the region's largest north-south highway, Interstate 5, which often is congested, as well as the port area's high percentage of truck and train traffic. The TATS process included significant agency and stakeholder coordination with those listed, as well as terminal operators, trucking companies and others.

The study identifies multiple improvement projects that will be necessary to sustain growth over the next 20 years. Past traffic modeling indicates a need for at least Phase 1 of SR 167 from its current end in Puyallup to SR 509 at the Port of Tacoma, or the entire area will be highly congested by 2030 regardless of what other projects are completed. This study builds upon that work to identify additional improvements to alleviate current conditions temporarily, then augment the completed SR 167 for further traffic improvement.

EXISTING AND FUTURE CONDITIONS ANALYSIS

The study began by evaluating the existing conditions of the transportation network during the afternoon peak period. This evaluation included all modes of transportation, including passenger vehicles, freight trucks, rail, transit, bicycle and pedestrians. It assessed freeway operations during the peak afternoon period and identified key truck routes between the Port and industrial centers.

Micro-simulation was performed for much of the study area. This detailed analysis provides the basis for the projected operations described in this report as well as the list of Recommended Projects. Additional details may be found in the appendices of this report.

Traffic "hot spots" occur at numerous entry points to the Port, including Portland Avenue, Port of Tacoma Road and 54th Avenue E. During certain points of the day, queues form as trucks wait to enter the Port. In the southern part of the study area, the Meridian Avenue/SR 161 corridor is congested. Southbound I-5 experiences congestion because of a bottleneck between I-705 and SR 16, with queues back to Portland Avenue and onto the I-705 ramps, as well as between 54th Avenue E and Port of Tacoma Road.

Acknowledgements

Following the existing conditions analysis, the project team forecasted traffic growth in 2030 for both passenger cars and freight trucks. The Baseline scenario included only those transportation improvements likely to be implemented by 2030 and/or necessary to prevent severe traffic congestion. These improvements include the Port of Tacoma Road interchange and completing at least Phase 1 of SR 167.

The Baseline assessment showed that future transportation operations will be poor, even with the Port of Tacoma Road Interchange and at least Phase 1 of SR 167 completed, without additional infrastructure investments. The number of intersections in the study operating at unacceptable levels of service increased from six under current conditions to 33 in the Baseline scenario. Although the reconfigured Port of Tacoma Road interchange would operate fairly well, the other main routes to the Port (Portland Avenue, Milwaukee Way and 54th Avenue E) would be severely congested. Operations along Pacific Avenue in downtown Tacoma would also deteriorate substantially.

Improvement Concepts

To lessen expected congestion throughout the study area by 2030, the project team developed improvement concepts, solicited ideas from stakeholders, and consulted various jurisdictions' capital and transportation improvement programs. The result was a list of 85 candidate projects in addition to the Baseline projects already assumed to be in place by 2030.

The project team then conducted a two-step evaluation process to determine which projects would provide the most benefit to the TATS area. The first level screened out projects that did not respond directly to the purpose and need of the study or had some other "fatal flaw." Roughly one-third of the non-Baseline concepts were dismissed at this stage of the evaluation.

The remaining projects warranted more rigorous analysis using the micro-simulation model. The project team tested various combinations of the improvement concepts and presented a preliminary plan to the TATS Advisory Committee. Using the Committee's input, the plan was revised slightly to form the final Recommended Project, consisting of 38 projects.

Recommended Projects

It bears repeating that the Baseline projects are considered essential to avoid traffic system failure by 2030. The Recommended Projects, in addition to the Baseline projects, would result in much better traffic operations. The number of intersections operating unacceptably would drop by 38 percent. The biggest improvements would occur near the Port with decreased delays along the key Port access corridors of Portland Avenue, Milwaukee Way, Port of Tacoma Road and 54th Avenue East. More moderate improvement would be seen in Downtown Tacoma, Fife and the Meridian Avenue/SR 161 corridor.

During the afternoon peak period, the overall vehicle hours of delay would decrease 38 percent over conditions with only the Baseline, and the number of highly congested intersections would be reduced from 33 to 10. Overall greenhouse gas emissions would decrease 2 percent.

Throughout the screening process, the projects were categorized according to the user group they most benefit: Tideflats area, port, industrial, or local access. Several significant projects under each category are highlighted here; the full list and maps showing each project's location are presented in the report.

- Tideflats Area Access
  - Extend Canyon Road from Pioneer Way across the Puyallup River to 70th Avenue E.
  - Rebuild I-5 interchange at 54th Avenue E.
  - Complete the Port of Tacoma Road interchange upgrade at I-5.
- Port Access
  - On Port of Tacoma Road, add a truck lane southbound to I-5 and a truck queuing lane for access to the Port.
  - Construct slip ramps on SR 509 at D Street.
  - At the Milwaukee Way and Marshall Street intersection, add a signal, railroad flashers, and gates with a traffic signal intertie.
  - Extend the A/D rail line east to Taylor Way to remove train blockages of Milwaukee Way and E 11th Street.
- Industrial Access
  - Build overcrossings of I-5 at Frank Albert Road and 62nd Avenue E between 20th Street E and Pacific Highway E.
  - Upgrade intersections along Portland Avenue between SR 509 and I-5.
  - Implement an arterial Intelligent Transportation System to guide travelers to and from industrial sites and coordinate signals.
  - Widen intersections of 54th Avenue E at Pacific Highway E and 20th Street E.
  - Upgrade 12th Street E between 62nd Avenue E and 34th Avenue E.
  - Upgrade 20th Street E between Port of Tacoma Road and 63rd Avenue E.
- Local Access
  - Construct a grade separation at the 54th Avenue E Union Pacific railroad crossing to re-open the street.
  - Make intersection improvements along Pacific Avenue in downtown Tacoma.
  - Widen 20th Street E to three lanes between 70th Avenue E and Freeman Road.

Cost Estimate

The cost of the improvements included in the list of Recommended Projects is $290-335 million, as shown in the breakdown by user group at right. This does not include any baseline projects, which are essential to achieve the LOS benefits of the Recommended Projects.

Baseline projects, (not including additional HOV capacity on I-5 or the SR 167 extension) total $485-540 million. Funding for some baseline projects has already been secured. In total, $196 million has been committed to baseline projects, leaving a need of $579-679 million.

Cost Estimates by User Group

Tideflats Area Access: $140-150M

Port Access: $5-10M

Industrial Access: $110-130M

Local Access: $35-45M

1. INTRODUCTION

The Tideflats Area Transportation Study (TATS) examines the multimodal transportation network within an area including the Port of Tacoma, Downtown Tacoma, the City of Fife, Puyallup Tribal Lands and Pierce County. Complex transportation needs are present within the area due to the diversity of uses.

OVERVIEW

The study began by gathering input from stakeholders. Traffic and other data were collected and analyzed to assess the existing conditions. Future travel demand was projected for not only personal vehicles, but also the trucks which comprise a substantial amount of Tideflats area traffic. Micro-simulation of the roadway network was used to analyze existing and future conditions. This detailed analysis provides the basis for the expected future operations described in this report. Finally, improvement options were evaluated to determine which projects are most likely to alleviate the transportation problems within the study area. Again, micro-simulation was used to assess the benefit of proposed improvements. The culmination of this process is a set of improvement concepts called the Recommended Projects.

PURPOSE & NEED

The purpose of the study is to create a comprehensive plan that will enhance the economic benefits of the Tideflats area, improve the traffic circulation, and reduce congestion. This plan should coordinate between all involved jurisdictions and entities to support existing improvement programs.

GOALS & OBJECTIVES

The goals and objectives for this project are:

- Identify future transportation needs for the growth of freight related truck traffic to and from the Tideflats area
- Increase mobility and accessibility by reducing traffic congestion
- Promote regional economic competitiveness
- Develop and execute a coordinated transportation plan

STAKEHOLDER OUTREACH

A key component of TATS was stakeholder outreach. The project team met individually with stakeholders to ascertain each group's unique needs and opinions. Meetings were conducted with representatives from the Port of Tacoma, City of Tacoma, City of Fife, Washington Department of Transportation, Marine View Ventures (an entity of the Puyallup Tribe), SSA Marine, trucking companies, terminal operators, Union Pacific Railroad, and Tacoma Rail. Detailed interview summaries are included in Appendix A.

Stakeholder interview summaries, Executive Committee meeting minutes and agendas may be found in Appendix A.

In addition to the individual meetings, an Executive Committee was formed. The Committee met periodically throughout the TATS process to review findings of the project team and provide guidance on future steps. The Executive Committee had representatives from the following entities:

- Washington Department of Transportation
- Freight Mobility Strategic Investment Board
- City of Fife
- City of Tacoma
- Marine View Ventures (an entity of the Puyallup Tribe)
- Pierce County
- Port of Tacoma
- SSA Marine

Appendix A includes Executive Committee meeting minutes and agendas. A larger Advisory Committee included additional stakeholders such as Union Pacific Railroad, Burlington Northern Santa Fe, and Premier Transport.

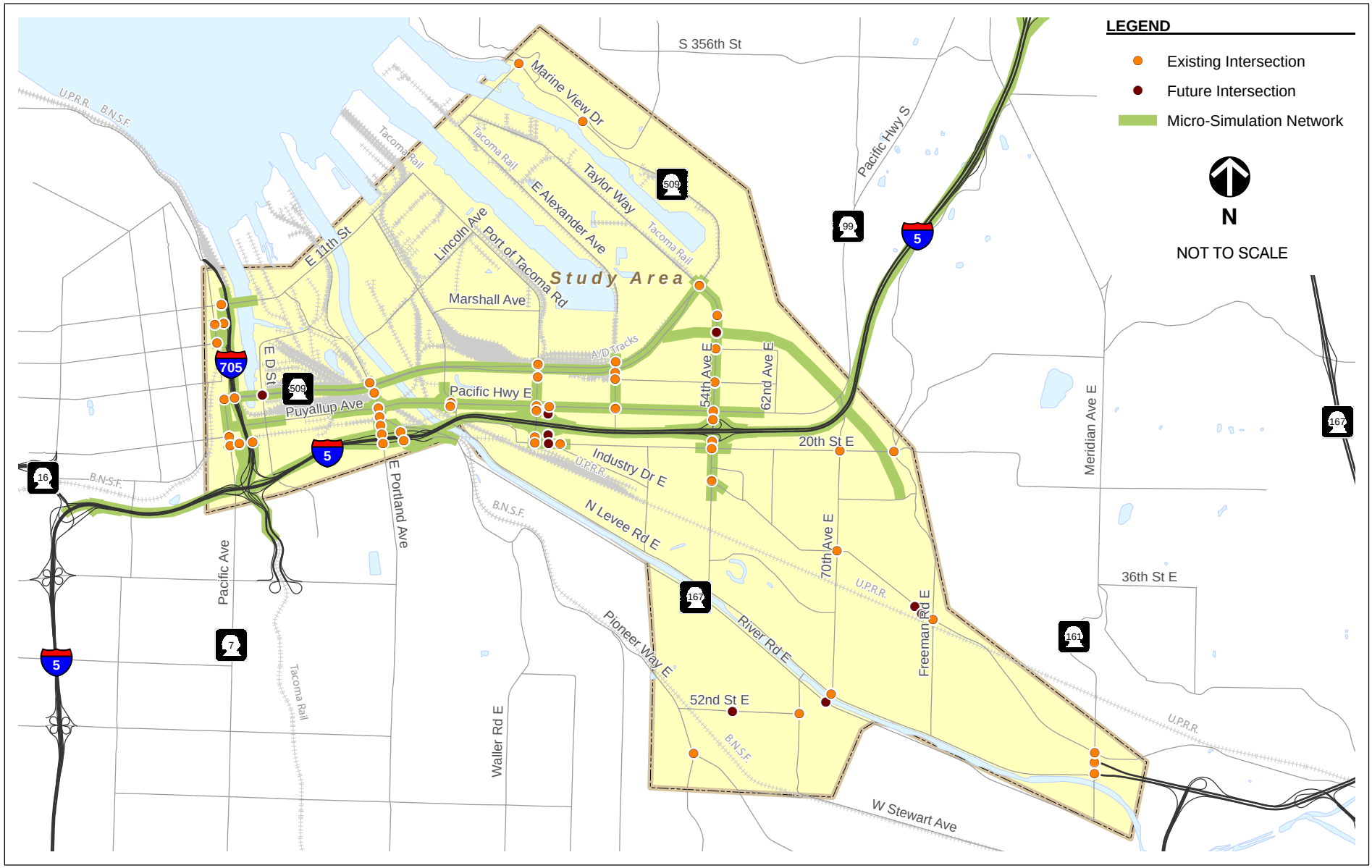
OPERATIONAL CONTEXT

The Port of Tacoma covers 2,400 acres and is used for shipping terminal activity as well as warehousing, distributing, and manufacturing. The Port, the seventh largest in North America, handles more than $36 billion in annual trade and is surrounded by Downtown Tacoma to the west, the City of Fife to the south. The high volume and variety of land uses within the area leads to a complex transportation system with competing needs. This study was undertaken to identify existing problems, forecast future travel needs, and set out a clear plan for future improvements.

STUDY AREA

The study area, shown in Figure 1, includes the Port of Tacoma, Downtown Tacoma, as well as parts of the City of Fife, Puyallup Tribal Lands, and unincorporated Pierce County. Figure 1 also displays the study intersections used for analysis.

Background information including previous transportation studies and planned transportation improvements may be found in Appendix B.



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STUDY AREA AND ANALYSIS LOCATIONS
Tideflats Area Transportation Study
FIGURE 1

2. EXISTING CONDITIONS

The existing conditions within the study area were assessed to provide a complete picture of current transportation operations, opportunities, and constraints. Truck volumes tend to peak in the early morning when the Port opens; however overall traffic volumes are highest during the PM peak period. Therefore, analysis was completed for the PM peak period when the transportation network is most congested. The Existing Conditions Technical Memorandum, which presents the transportation analysis in detail, may be found in Appendix C.

OPPORTUNITIES & CONSTRAINTS

The complex nature of the Tideflats area results in a variety of transportation opportunities and constraints that influence the need for improvements. These issues include bottlenecks with heavy congestion, interaction between rail and roads, bridge conditions, baseline projects that are currently underway or are anticipated to be implemented in the immediate term, and plans for roadway extensions, interchange improvements, and transit routes.

ROADWAY OPERATIONS

Figure 2 displays average daily traffic volumes on roadways within the study area which shows the current distribution of traffic. Intersection operations throughout the study area were analyzed to identify locations that require improvements. Each intersection is assigned a level of service, ranging from A to F, based on the average delay experienced per vehicle. Table 1 displays the criteria for each level of service as well as a brief qualitative description.

Table 1. Levels of Service Criteria for Signalized and Unsignalized Intersections

Level of Service	Delay per Vehicle (seconds)		Description
	Signalized Intersection	Unsignalized Intersection	
A	0-10	0-10	Little or no delay
B	>10-20	>10-15	Short delays
C	>20-35	>15-25	Average delays
D	>35-55	>25-35	Long delays
E	>55-80	>35-50	Very long delays
F	>80	>50	Failure – extreme congestion

Source: Highway Capacity Manual 2000.

Intersection Operations

Figure 3 shows existing traffic "hot spots" within the study area. The Port of Tacoma Road and 54th Avenue E corridors experience congestion, due in large part to the high truck volumes and close spacing of the intersections. These corridors provide critical access to I-5 as well as destinations to the south. Other problematic operations occur along the Portland Avenue corridor between the SR 509 and I-5 interchanges.

The Meridian Avenue/SR 161 corridor between Valley Avenue and River Road experiences congestion. Each

of the five intersections along that stretch of Meridian Avenue show substantial peak hour congestion.

Excessive queues tend to form within the Port at the following locations:

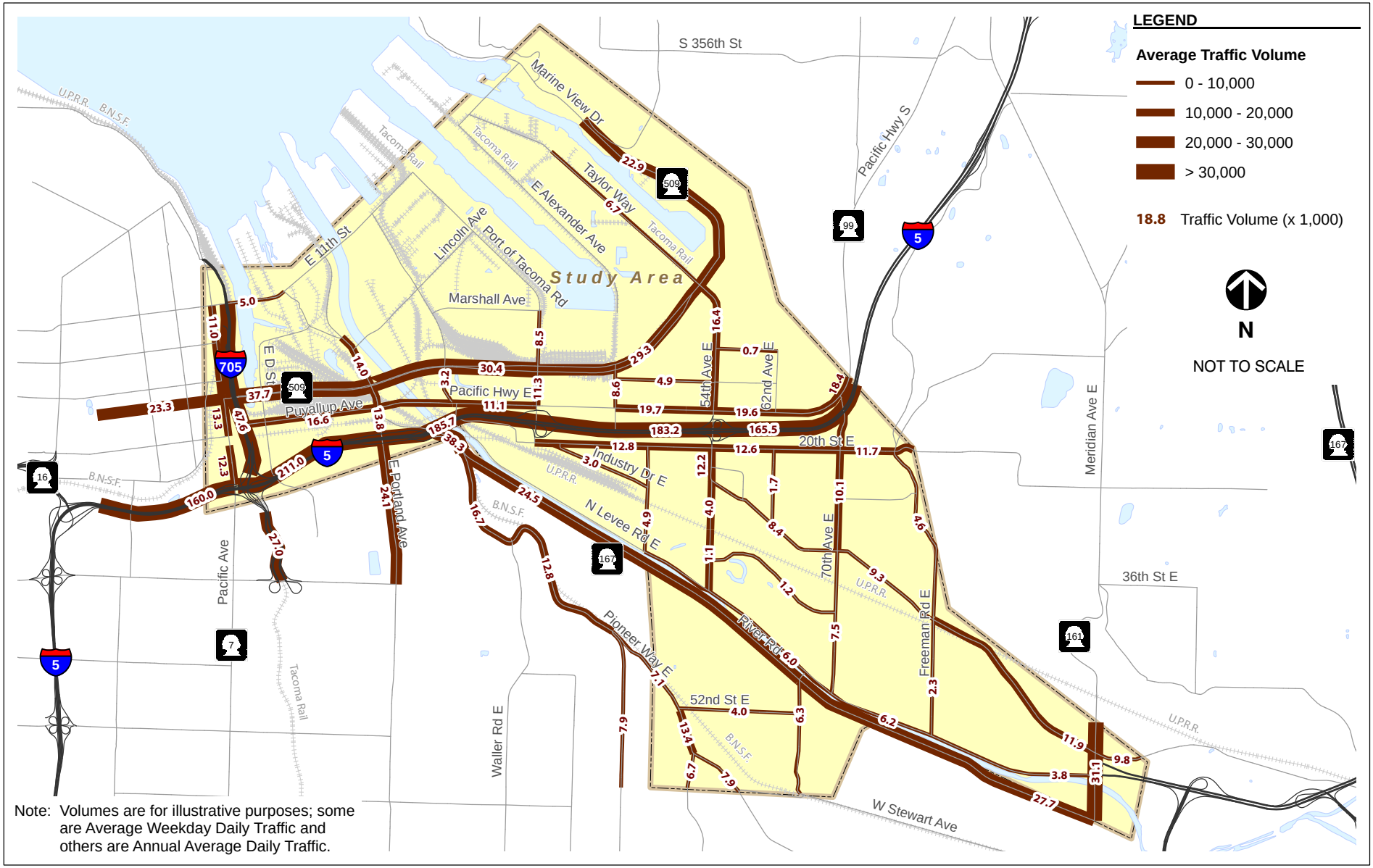
- Westbound E 15th Street and part of East 'D' Street
- Northbound Port of Tacoma Road between Marshall Avenue and E 11th Street
- Eastbound Lincoln Avenue at APM terminal entrance
- Northbound Taylor Way at MacMillan-Piper entrance in the early morning.

Freeway Operations

The study area includes several major freeways that serve both local and regional access. A bottleneck on southbound I-5 between I-705 and SR 16 causes congestion along I-5 as well as queues stretching to Portland Avenue and on the ramps to I-705. Another problematic stretch of southbound I-5 occurs between 54th Avenue E and Port of Tacoma Road where high volumes converge from both the on-ramp and the mainline.

SR 509 currently operates well, and I-705 operates efficiently with the exception of moderate congestion near the 9th Street on-ramp.

Additional information on the existing conditions analysis may be found in Appendices C and D.



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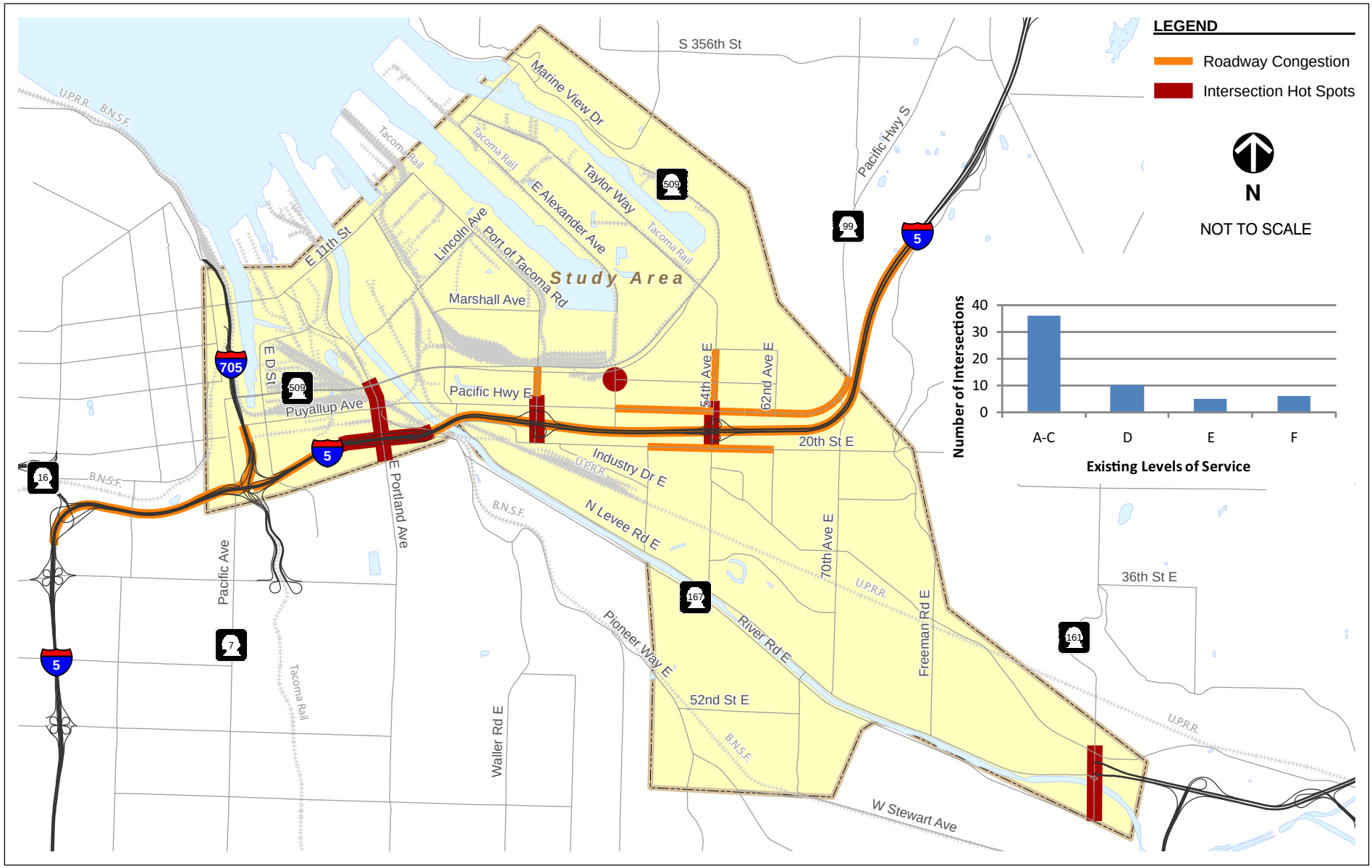
AVERAGE DAILY TRAFFIC VOLUMES
Tideflats Area Transportation Study
FIGURE 2



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EXISTING TRAFFIC "HOT SPOTS"
Tideflats Area Transportation Study
FIGURE 3

FREIGHT CONDITIONS

The presence of the Port creates substantial freight activity (both trucks and rail) with unique operations and a key relationship to the economic vitality of the region.

Trucks

Trucks rely heavily on Portland Avenue, Port of Tacoma Road, and 54th Avenue E to access the shipping terminals within the Port. Much of the truck traffic is traveling between the Port and warehousing and distribution centers located in Kent Valley, Fife/Puyallup/Sumner, Tacoma, Frederickson, Dupont, Lacey/Olympia, and Centralia/Chehalis.

Figure 4 summarizes truck routes within the TATS study area. Most of the principal and minor arterials in the study area are approved truck routes, and are heavily used by Port-related traffic. Truck traffic into and out of the Port of Tacoma is sustained throughout the day with trucks arriving before the terminals open at 8 AM, causing queues within the Tideflats area, mainly within the Port.

Rail

Figure 5 displays the rail facilities and grade crossings located within the study area. Burlington Northern Santa Fe (BNSF) and Union Pacific Railroad (UPRR) are the only long-haul carriers for shipments originating from the Port of Tacoma, with BNSF carrying the larger share. Tacoma Rail serves locally by switching containers from cargo ships to local businesses and assembling the long-haul trains that are pulled by BNSF and UPRR. Figure 5 also shows the location of the major terminals within the Port.

Fourteen of the grade crossings were assessed in terms of level of activity, efficiency of operations, and safety. Crossings that are candidates for grade separation due to the constraints they impose on the transportation network include:

- 70th Avenue E
- 54th Avenue E
- Port of Tacoma Road at Lincoln Avenue
- Port of Tacoma Road southeast of Lincoln Avenue
- Port of Tacoma Road crossing to KPAC
- Milwaukee Way north of Lincoln Avenue
- E 11th Street east of Milwaukee Way
- Taylor Way at former Kaiser site

SAFETY CONDITIONS

Collision data from 2006 to 2008 were analyzed along freeways as well as local corridors to identify locations of concern. Source data are included in Appendix D.

Freeway Collisions

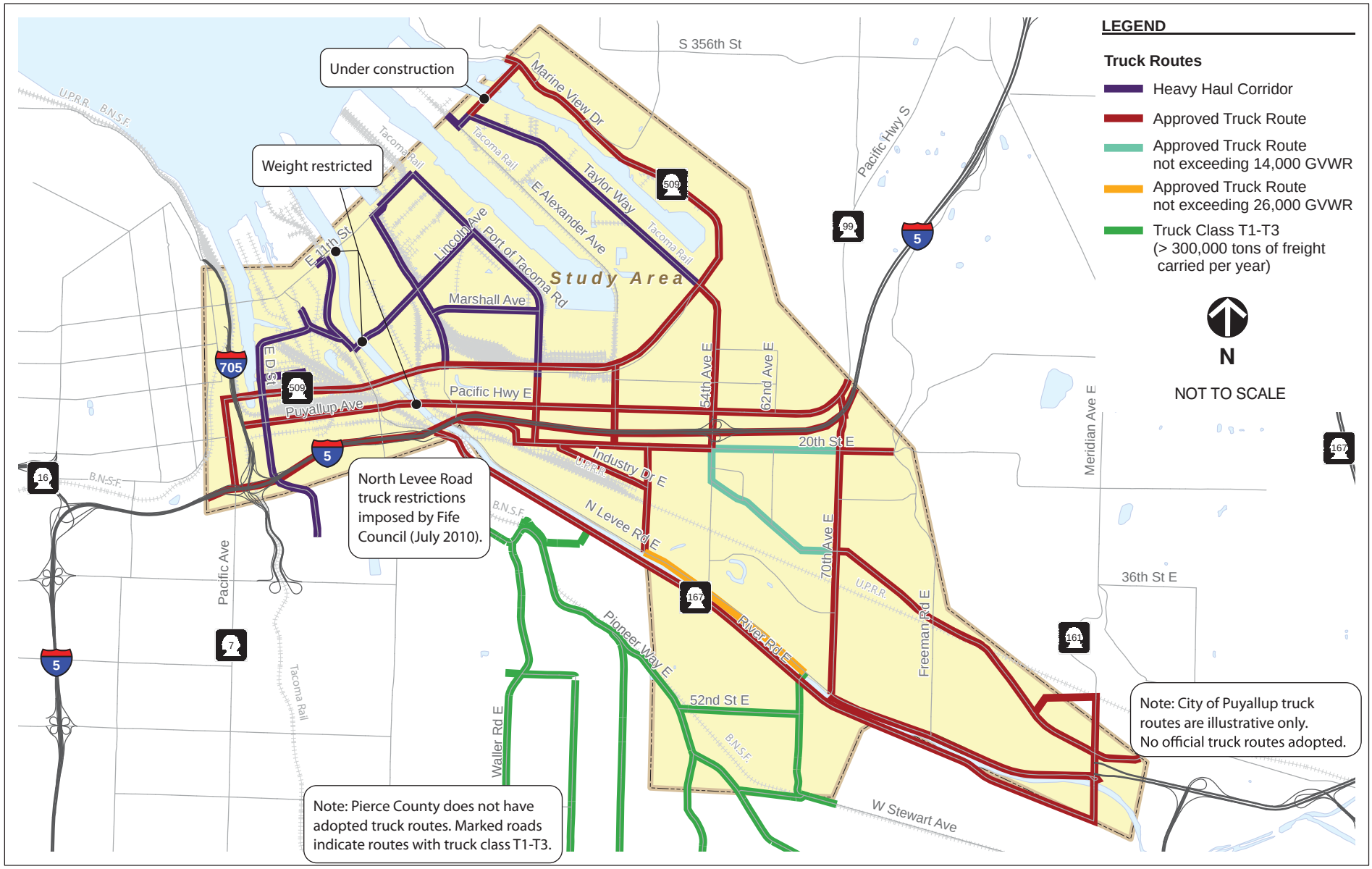
The predominant type of collision on I-5, I-705 and SR 509 were rear end collisions. The majority of collisions on each freeway caused property damage only. Over the three-year study period, multiple fatalities have occurred on I-5, one fatality has occurred on SR 509, and no fatalities have occurred on I-705.

Local Corridors and Intersections

The highest corridor collision rates within the study area occurred on Pacific Highway E between Milwaukee Way and 54th Avenue E and on 54th Avenue E between 4th Street E and Valley Avenue E. High congestion levels contribute to the safety concerns. The highest intersection collision rates occurred along Portland Avenue and Bay Street in the vicinity of the I-5 interchange.

NON-MOTORIZED CONDITIONS

An inventory of pedestrian and bicycle facilities was completed to identify gaps in the network. Due to the industrial nature of much of the study area, non-motorized facilities are limited, creating a challenging environment for pedestrians and bicyclists.



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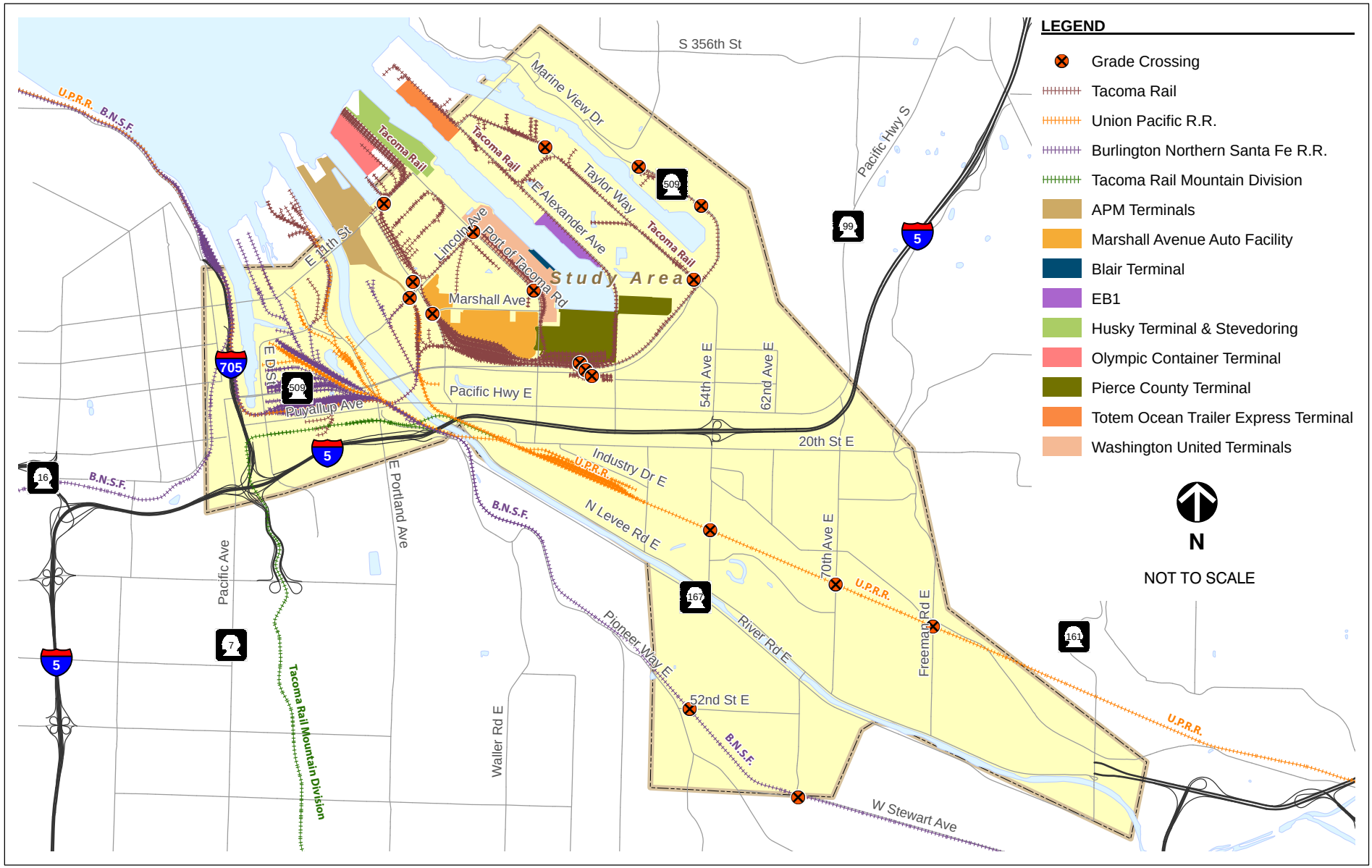
EXISTING TRUCK ROUTES
Tideflats Area Transportation Study
FIGURE 4



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EXISTING RAIL FACILITIES AND GRADE CROSSINGS
Tideflats Area Transportation Study
FIGURE 5

3. FUTURE CONDITIONS

Future transportation network conditions were evaluated for a 2030 horizon year. In addition, a 2020 analysis was done to help formulate the sequencing plan for the projects, which is presented later in this report.

TRAVEL FORECASTS

Traffic volumes were forecast using the Puget Sound Regional Council's (PSRC) regional travel demand model that was modified to include detailed coding of freeway interchanges within the study area.

Truck volumes were forecast using an independent method that accounts for the unique characteristics of the Port of Tacoma. Future growth in Port-related truck traffic was forecast using terminal acreage projections provided by the Port of Tacoma. These were then converted to annual container throughput using factors for the type of terminal and expected operations. Finally, daily and PM peak hour truck trips were estimated from the throughput and assigned to various routes based on expected future terminal location and the 2006 cordon count for the Port. Truck traffic not related to the Port was forecast using a growth rate based on historic traffic count data and future employment projections for the region.

The future year travel demand model incorporates capacity expansion projects that are either currently funded or are considered reasonably likely to be implemented. These Baseline projects are shown in Figure 6 and Table 2. The Baseline scenario assumes that Phase 1 of the SR 167 extension, including tolls, is completed by 2030. This is an essential improvement for the region to ensure the long-term functionality of the transportation system.

Regional and local transportation improvement programs (TIPs), comprehensive plans for a variety of jurisdictions, and other relevant documents were consulted to develop the list of assumed projects. In addition, projects funded by the Sound Transit and WSDOT Gas Tax revenue packages were included.

A more detailed discussion of the methods and assumptions used to develop travel forecasts may be found in Appendix E. The resulting traffic volumes are included in Appendix F.

Additional information on the travel forecasts and analysis of future traffic conditions may be found in Appendices E and F.

Figures 7 and 8 provide an indication of the growth expected in households and employment within the study area between the base year of 2006 and the horizon year of 2030.

- The number of households will grow by 85 percent.
- The number of jobs will grow by 45 percent

This land use growth combined with regional growth will result in major increases in traffic volumes by 2030. Figures 9 and 10 show the volumes crossing screenlines set up through the study area. Screenlines were placed throughout the study area to indicate the number of vehicles that cross the line during the PM peak hour.

A screenline is an imaginary line used to measure the traffic flow between two areas. The number of vehicles that cross the screenline on any of the intersecting roadways is counted to provide the overall traffic volume between the areas of interest.

- PM peak hour truck traffic will increase by 120 percent
- PM peak hour traffic will increase by 35 percent

Overall, the highest growth occurs within Fife, the Port, and approaching downtown Tacoma to and from the east. Between 2006 and 2030, nearly 5,000 more vehicles will travel on I-5. As expected, the highest truck volume growth occurs near the Port, with more moderate increases in outlying areas.

The growth expected by 2030 will put a substantial strain on the already congested roadway network. Truck traffic, much of which is related to the Port, is expected to more than double between 2006 and 2030. These projections highlight the need for infrastructure investment within the study area.

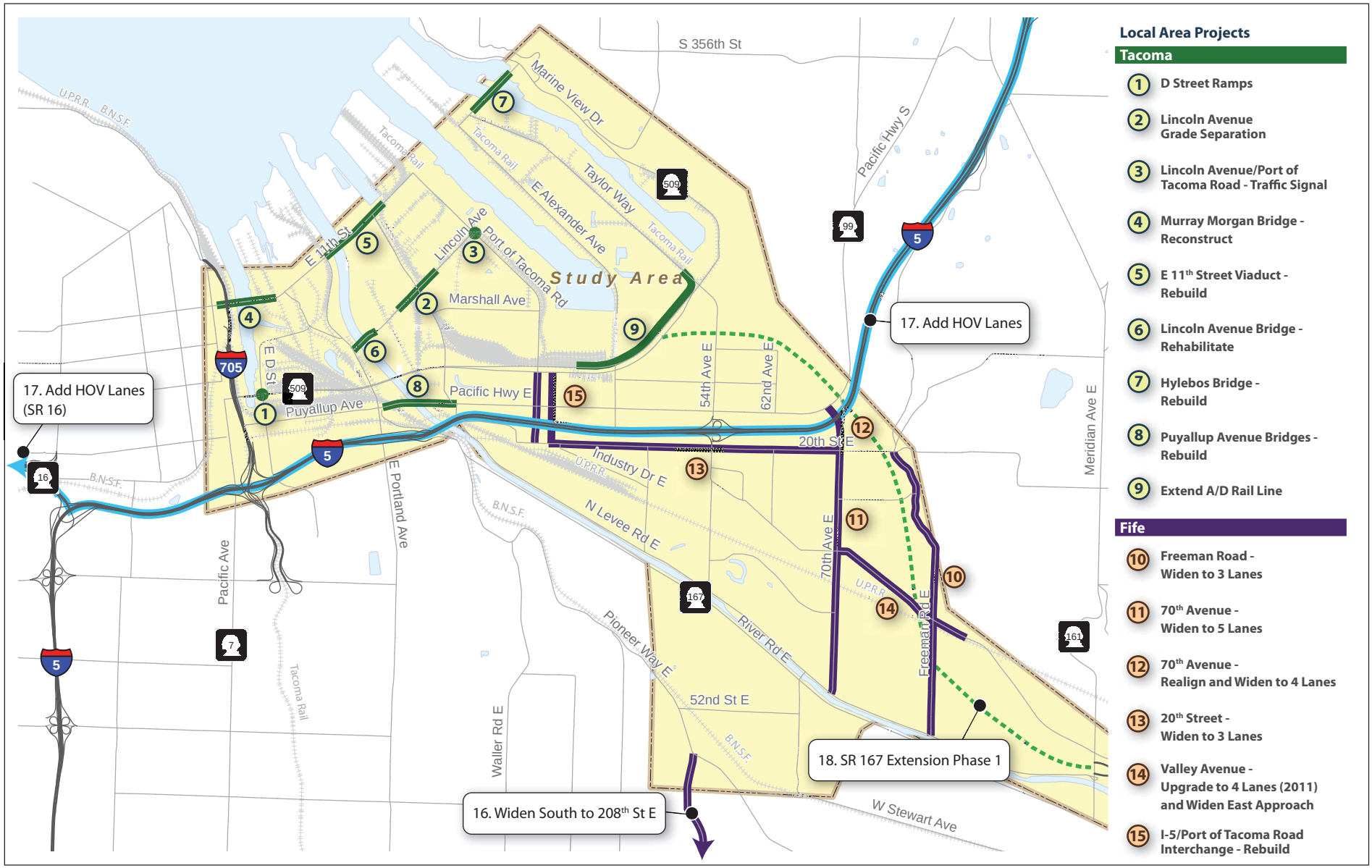
SR 167 Extension and Other Baseline Projects

The baseline projects assumed to be completed by 2030 are presented in Table 2 and shown in Figure 6. Total cost, as well as any committed funding, is also shown.

Although SR 167 is grouped with other baseline projects, its importance outweighs that of the smaller improvements. The SR 167 extension is a fundamental system improvement upon which the TATS operational analysis is based. It is not a requirement of this study, but rather a regional requirement to avoid failure of the transportation system.

However, the holistic impact of the other baseline projects should not be underestimated. None of the Study's project functionality will be realized unless the Baseline is completed.

Table 2. Baseline Network Assumptions		
Figure 6 ID	**Project Description**	**Funding and Construction Status**
Tideflats Area Access Projects		
15	Port of Tacoma Road Interchange - Reconstruct interchange between SR 509 and I-5. Reconstruct 34th Avenue E and 12th Street E to a 3-lane roadway. Include southbound truck lane on Port of Tacoma Road. (H14)	Partially Funded
16	Canyon Road E from 72nd Street E to Pioneer Way E - Widen roadway to provide additional lane(s). (H15)	Partially Funded
17	I-5 HOV lanes - Extend from SR 18 to SR 16. (H16)	Partially Funded and Under Construction
18	SR 167 extension - Construct 2-lane freeway between SR 509 and SR 161 (tolls assumed). (H17)	Partially Funded
Port Access Projects		
2	Lincoln Avenue grade separation - Construct overpass on Lincoln Avenue between Marc Avenue and Thorne Road. (H2)	Completed June 2011
3	Lincoln Avenue & Port of Tacoma Road - Add traffic signal. (H3)	Unfunded
4	Murray Morgan Bridge - E 11th Street between A Street and D Street. Rehabilitate bridge. (H4)	Partially Funded and Under Construction
5	11th Street Bridge - Renovate to accommodate trucks. (H5)	Unfunded
6	Lincoln Avenue Bridge - Portland Avenue to Marc Avenue. Replace part of the bridge deck, bridge bearings, repair rails and sidewalks, re-paint. (H6)	Fully Funded and Under Construction
7	Hylebos Bridge - Rehabilitate the bridge including a new deck, sidewalk, and guardrails. (H7)	Under Construction
9	Extend A/D rail line east across Alexander Avenue to Taylor Way. The Port is planning to increase arrival/departure train lengths from 8,000 feet to 10,000 feet. (H18)	Unfunded
1	SR 509 slip ramps at D Street - Construct a half diamond interchange at D Street and SR 509. (W7)	Partially Funded
Industrial Access Projects		
8	Puyallup Avenue Bridge - Replace 2 of 5 bridge structures, increasing total lanes to 4. Widen to 6 lanes at approach to Portland Avenue. (H8)	Partially Funded
11	70th Avenue E corridor - 20th Street East to UPRR. Widen existing two-lane arterial to 5 lanes. (H10)	Unfunded
12	70th Avenue E - 20th Street E to Pacific Highway E. – Realign and reconstruct to 4-lane roadway section. (H11)	Unfunded
13	20th Street E - Port of Tacoma Road to 63rd Avenue E. Reconstruct to a 3-lane roadway. (H12)	Unfunded
14	Valley Avenue - Widen existing two-lane arterial to 4 lanes between 70th Avenue E and Freeman Road E. Add fifth lane east of Freeman Road E and restripe the eastbound right-turn lane to through/right-turn. (H13)	Unfunded
Local Access Projects		
10	Freeman Road - 20th Avenue E to N Levee Road. Reconstruct to 3-lane roadway. (H9)	Unfunded
Source: Fehr & Peers, 2011		



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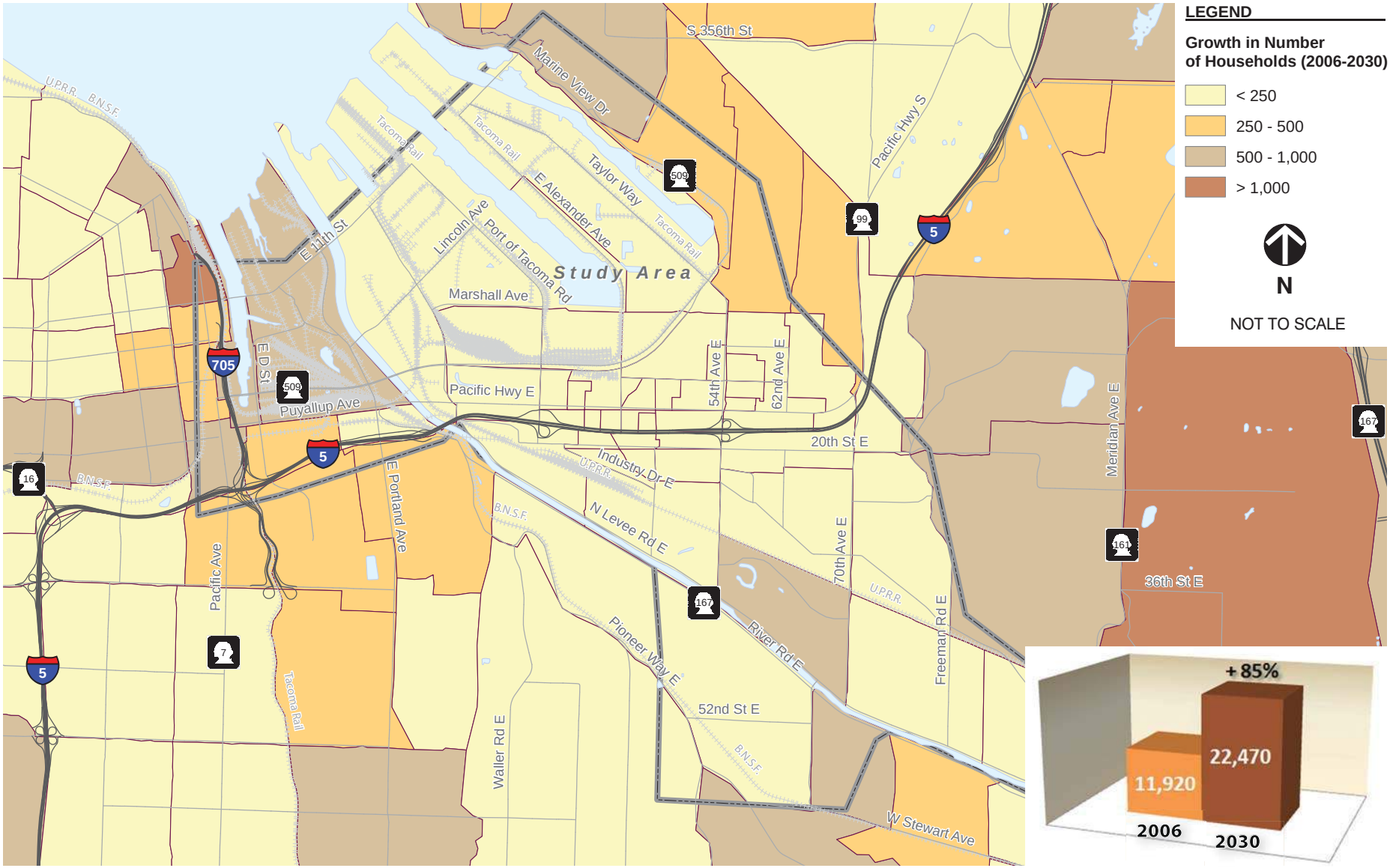
BASELINE NETWORK ASSUMPTIONS
Tideflats Area Transportation Study
FIGURE 6



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HOUSEHOLD GROWTH (2006-2030)
Tideflats Area Transportation Study
FIGURE 7

FEHR PEERS

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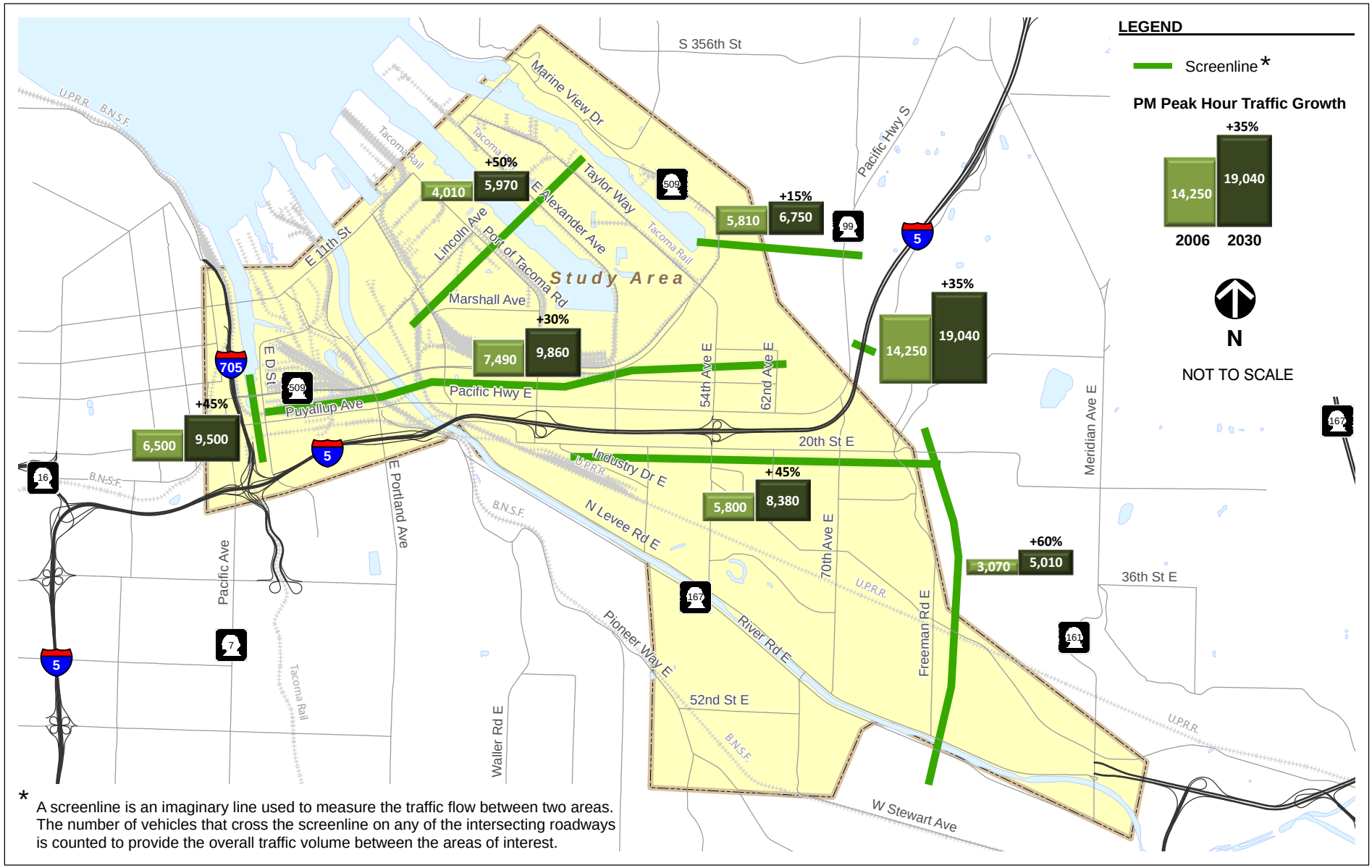
EMPLOYMENT GROWTH (2006-2030)
Tideflats Area Transportation Study
FIGURE 8



* A screenline is an imaginary line used to measure the traffic flow between two areas. The number of vehicles that cross the screenline on any of the intersecting roadways is counted to provide the overall traffic volume between the areas of interest.

FEHR PEERS

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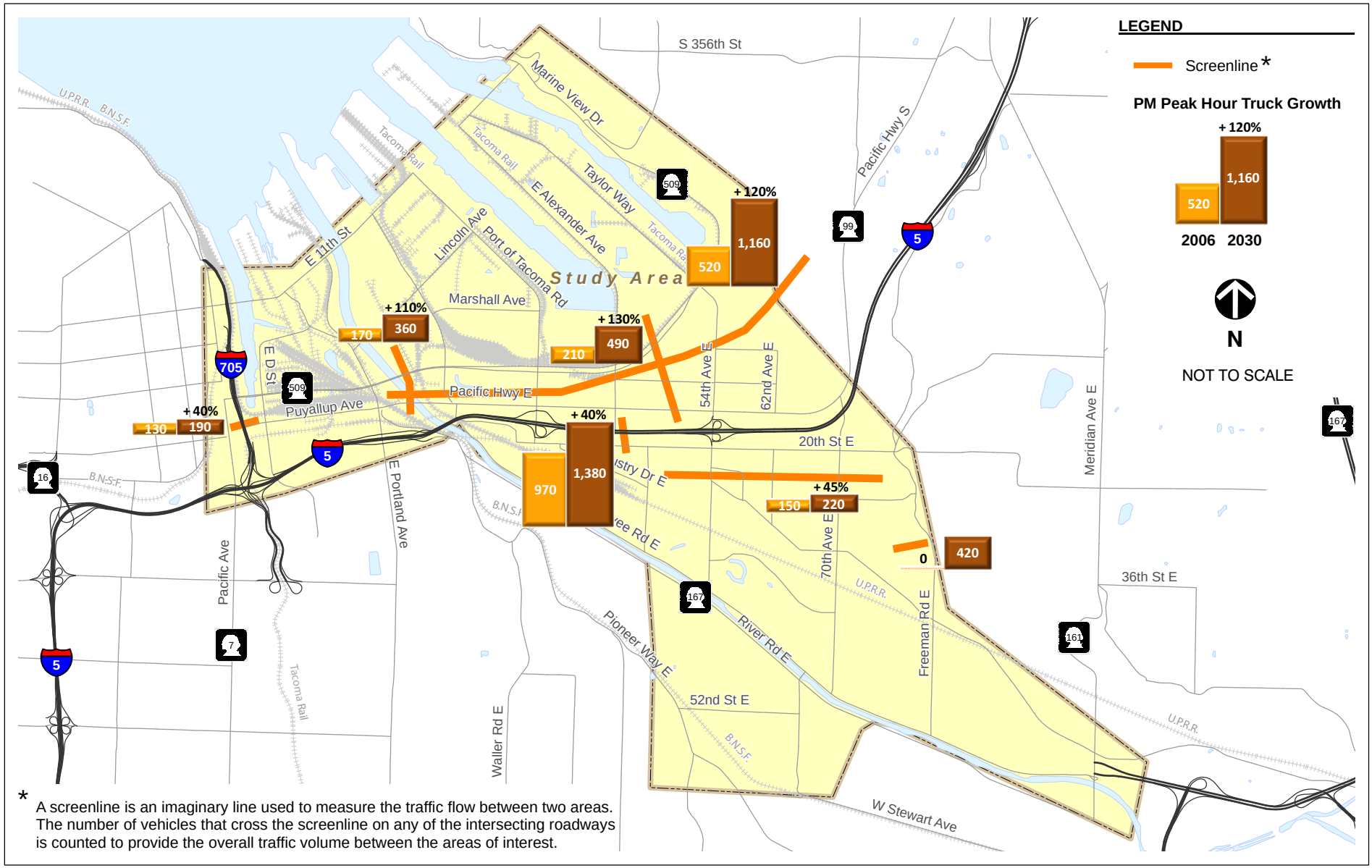
PM PEAK HOUR TRAFFIC GROWTH (2006-2030)
Tideflats Area Transportation Study
FIGURE 9



* A screenline is an imaginary line used to measure the traffic flow between two areas. The number of vehicles that cross the screenline on any of the intersecting roadways is counted to provide the overall traffic volume between the areas of interest.

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PM PEAK HOUR TRUCK GROWTH (2006-2030)
Tideflats Area Transportation Study
FIGURE 10

TRAFFIC OPERATIONS

The 2030 Baseline scenario represents traffic operations within the study area if only the reasonably foreseeable transportation projects are implemented.

As Figure 11 shows, fewer than half of the study intersections currently operating at LOS A through C would continue to do so in 2030. The number of intersections operating at LOS F would increase from six to thirty-three.

Downtown Tacoma

Downtown Tacoma, which currently has good traffic operations, would see half of its study intersections drop to LOS F. Those include Pacific Avenue at S 13th, S 15th, S 21st, and S 24th Streets as well as the I-705 northbound off-ramp at S 26th Street.

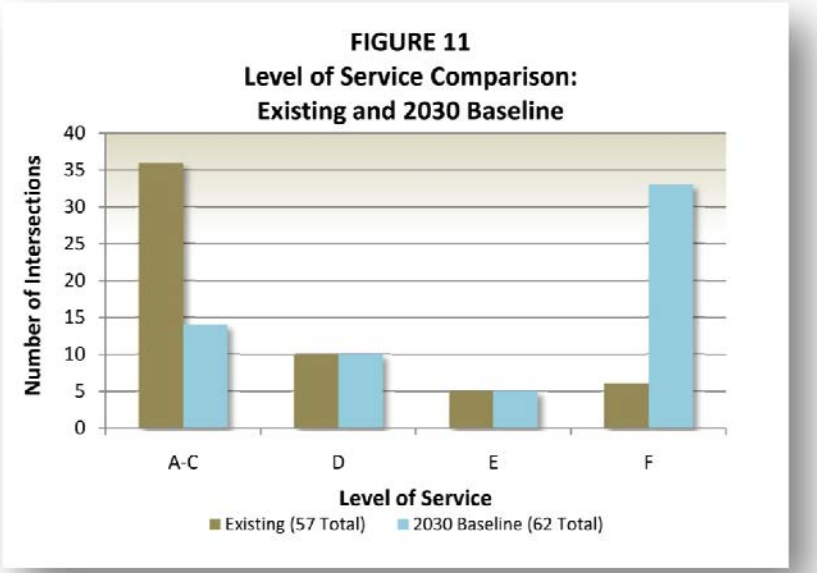
Port of Tacoma

Traffic conditions immediately surrounding the Port would deteriorate substantially by 2030. Every north-south arterial accessing the Port will have poor operations at some point along the corridor. Portland Avenue and 54th Avenue E would be extremely congested.

Along Portland Avenue, every intersection between the SR 509 and I-5 interchanges would operate at LOS F. The two unsignalized intersections at Milwaukee Way and Pacific Highway E would also drop to LOS F by 2030.

Intersections along 54th Avenue E from SR 509 to Valley Avenue would operate at LOS F due to heavy growth in industrial traffic and I-5 congestion. The Port of Tacoma Road corridor would fare better than the other regional access roads due to the planned I-5 interchange reconstruction. The plan for the new interchange would construct a couplet between 12th Street E and 20th Street E with Port of Tacoma Road carrying southbound traffic and an extension of 34th Avenue E carrying northbound traffic.

FIGURE 11
Level of Service Comparison: Existing and 2030 Baseline



Southern Study Area

The intersection of Pioneer Way E and Canyon Road E would drop from LOS C to LOS F by 2030. The Meridian Avenue/SR 161 corridor will be somewhat improved by the construction of Phase 1 of the SR 167 extension. Several intersections along N Levee Road E and Valley Avenue E would also deteriorate to LOS F.

4. ALTERNATIVES DEVELOPMENT & ANALYSIS

The project team developed improvement concepts, solicited ideas from stakeholders, and consulted various jurisdictions' capital and transportation improvement programs. This effort resulted in a list of 85 improvement projects in addition to the 2030 Baseline projects.

EVALUATION CRITERIA

The evaluation of candidate projects was completed in two steps. The first level was a preliminary screening to identify projects that could be dismissed without intensive analysis. The second step was a more rigorous assessment including micro-simulation. See Appendix G for the technical memorandum including the full results of this process.

First Level Screening Criteria

The first level screening criteria is shown in Table 3. The purpose of this step was to ensure that the team selected only projects that directly related to the purpose and need of the study.

Categories considered include transportation system performance, potential to improve safety, physical feasibility, cost, level of public and private support, and consistency with existing plans. Each project was scored on a simple three-tier basis.

Table 3. First Level Screening Criteria

Category	Criteria
Transportation System Performance	• Potential to improve traffic "hot spots" • Potential to improve truck operations
Safety	• Potential to improve high collision locations
Physical Feasibility	• Ability to be constructed; environmental feasibility
Cost	• Range of cost
Partnerships	• Support by public and private sectors
Consistency with Plans	• Addressed in local, regional, state plans

Source: Fehr & Peers, 2011

There was no formal threshold needed to pass the screening process. Rather, the ratings were used as a tool for the project team to weigh the costs and benefits, and make a determination as to whether the project warranted further analysis.

Over a third of the non-Baseline projects were dismissed during this screening process. Following the initial screening round, a handful of new projects were added to the candidate list.

Additional information on the evaluation results may be found in Appendix G.

Second Level Screening Criteria

The second level of evaluation (see Table 4) involved more detailed analysis in terms of traffic operations, cost, and environmental impacts. The candidate projects were incorporated into the micro-simulation model to assess the expected benefits, not only of individual projects, but of the overall package of improvements.

The project team presented an initial package of improvements to the TATS Advisory Committee. The Committee provided input and suggested revisions to the set of projects. The final improvements, consisting of 38 projects, are called the Recommended Projects.

Table 4. Second Level Evaluation Criteria

Category	Criteria
Transportation System Performance	• Vehicle delay (trucks, general traffic) • Travel time
Safety	• Collision prone locations improved
Environment	• Greenhouse gas emissions
Cost Effectiveness	• Cost (capital, operating) • Cost effectiveness (annualized cost/delay saved)
Partnerships	• Support by public and private sectors
Implementation	• Ability to be phased

Source: Fehr & Peers, 2011

User Groups

Throughout the screening and evaluation process, improvement concepts were classified by the user group which would experience the most benefit. Those user groups and the type of travel they represent are summarized in Table 5.

The improvement concepts are grouped according to these categories in the next section containing the final recommendations.

Table 5. User Groups

Category	Criteria
Tideflats Area Access	• To/from Port • To/from Distribution Centers • To/from Industries
Port Access	• Between Port and Local Warehouses • Between Port and Consolidators • Between Port and Rail (Dray)
Industrial Access	• Connect to Tacoma Industry • Connect to Fife Industry
Local Access	• Local traffic circulation • Access to residential properties

Source: Fehr & Peers, 2011

5. FINDINGS & RECOMMENDATIONS

The result of this study is a set of Recommended Projects of transportation improvements in the Tideflats area. This section summarizes the recommended improvement package, the expected performance of the transportation system if the recommended package is implemented, and cost estimates of the improvement projects. Conceptual drawings and cost estimates are included in Appendix H.

RECOMMENDATIONS

The project descriptions and costs of the recommended package of improvements are presented in Table 6. Figures 12 through 15 map the project locations according to the user groups presented in the previous section.

PERFORMANCE SUMMARY

The recommended projects were added to the 2030 baseline transportation network to evaluate its impacts. The following list highlights the main findings of that analysis. All statistics reflect performance during a single PM peak period:

- 92 percent of the PM peak period traffic demand would be served, an increase of 23 percent over that served by the Baseline network.
- 510,000 vehicle miles traveled (VMT), an increase of 15 percent compared to the Baseline network. The increase in VMT is due to the higher volumes able to travel through the roadway network.
- 8,500 vehicle hours of delay, a decrease of 38 percent compared to the Baseline network.
- 257 average seconds of delay per vehicle, a decrease of 46 percent compared to the Baseline network.
- 742,100 pounds of GHG emissions, a decrease of 2 percent compared to the Baseline network.
- 10 of the 63 study intersections operating at LOS F, a decrease of 70 percent compared to the Baseline network.

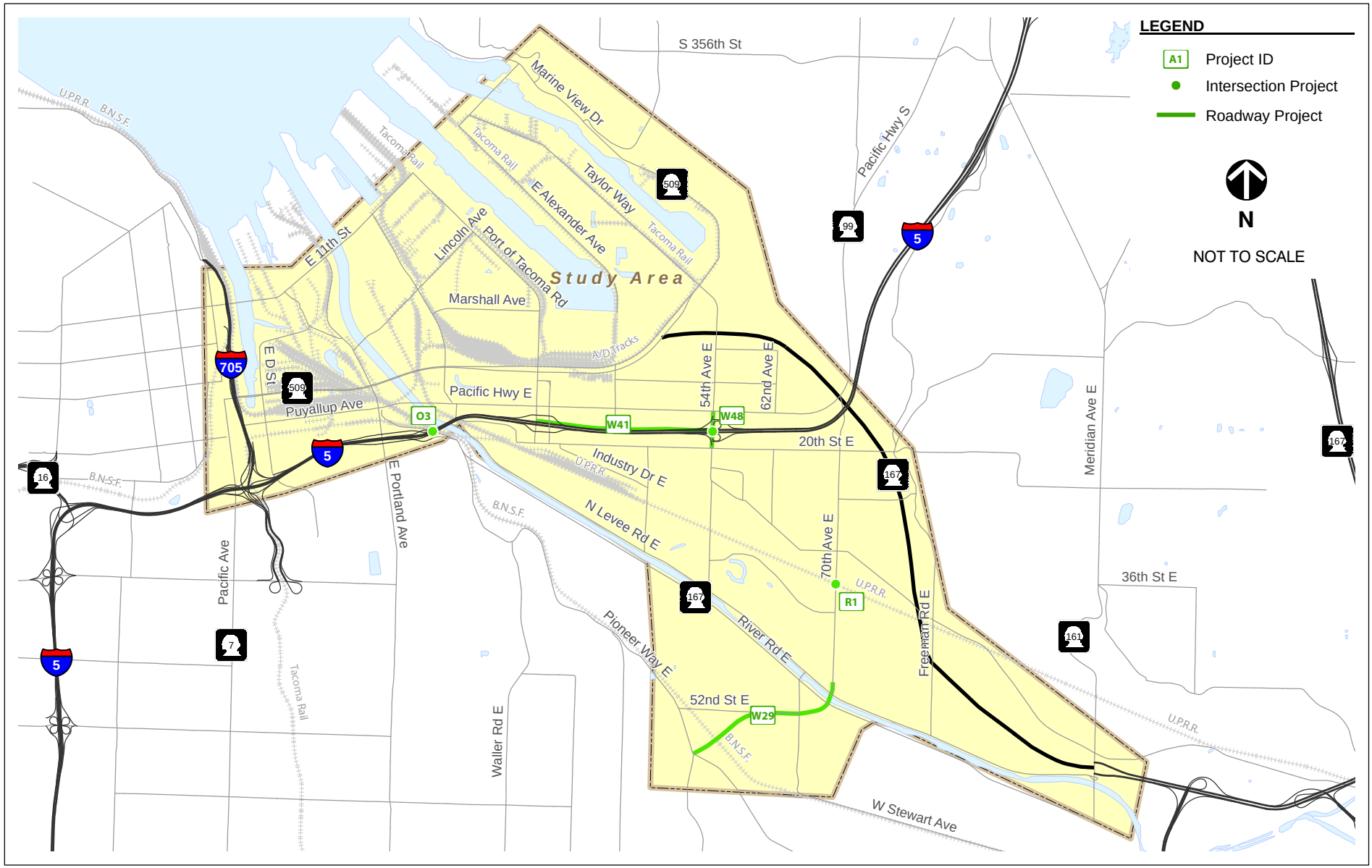
Additional information on conceptual engineering and cost estimates may be found in Appendix H.

Table 6. Recommended Projects		
ID	**Project Description**	**Cost (in thousands of 2010 dollars[1])**
Tideflats Area Access Projects		
O3	I-5 - Add variable message signs for access to port.	2,100
R1	70th Avenue E/UPRR Railroad - Build railroad grade separation.	25,000
W29	Canyon Road Extension - Extend Pioneer Way across Puyallup River to 70th Avenue E.	58,200
W41	I-5 from 54th Avenue E to Port of Tacoma Road - Add collector-distributor/auxiliary lanes.	7,300
W48	54th Ave Interchange with I-5 - Rebuild interchange.	53,400
Port Access Projects		
I1	SR 509, Taylor Way & 54th Avenue E - Add a right turn lane on northbound 54th Avenue E; double left turn lanes on both directions of SR 509.	4,800
I16	Milwaukee Way/Marshall Street (East 4th Street) intersection - Add signal, RR flashers and gates with a traffic signal intertie.	1,000
O7	Port of Tacoma Road - Address truck queuing by making the outside northbound lane a truck queue lane and converting the inside southbound lane to reversible operations.	240
W37	Alexander Avenue/SR 509 intersection - Add a free-flow right turn lane on the northbound approach.	2,300
Industrial Access Projects		
I2	54th Avenue E/Pacific Highway E intersection - Reconstruct intersection and add turn lanes. Add southbound through lane from 12th Street E to Pacific Highway E.	See W48
I5	St. Paul Avenue/ E 11th Street intersection - Construct signal or roundabout.	2,800
I7	St. Paul Avenue/ Portland Avenue intersection - Construct signal.	500
I10	20th Street E/Industry Drive intersection - Add signal.	500
I15	Portland Avenue/Puyallup Avenue intersection - Widen intersection with additional left turn/through lanes.	5,900
I18	Reconstruct curb returns for trucks at various locations within study area.	500
I19	S 26th Street/I-705 northbound off-ramp intersection - Add signal.	500
I20	Portland Avenue on and off ramps at SR 509 - Add traffic signals and modify channelization.	1000
I21	54th Avenue E/4th Street - Add signal.	500
I22	54th Avenue E/12th Street E intersection - Create an eight-phase signal operation with protected left turns.	60
I27	54th Avenue E/20th Street E intersection - Widen approach legs and rechannelize.	See W48
I28	Portland Avenue/25th and 26th Streets - Add traffic signals. Coordinate along Portland Avenue corridor.	820
M5	Pavement overlay program - Improve pavement conditions throughout study area.	3,000

Table 6. Recommended Projects

ID	Project Description	Cost (in thousands of 2010 dollars[1])
O1	SR 99 - Interconnect signals.	100
W1	Frank Albert Road Overcrossing - Build new bridge over I-5 from 20th Street E to Pacific Highway E; new signals at Pacific Highway E and 20th Street E.	24,300
W13	Levee Road - Reconstruct Frank Albert Road to Freeman Road. Add signals at two intersections.	31,200
W30	62nd Avenue E overpass - Extend 62nd Avenue E over I-5 from Pacific Highway E to 20th Street E; new traffic signals at Pacific Highway E and 20th Street E.	26,300
W54	54th Avenue E - Access Management- Pacific Highway E to SR 509.	See W48
W55	Arterial ITS Program - Signal Coordination; traveler Information to/from industrial sites.	2,000
W56	12th Street E- Extend new street from Alexander Avenue E to 34th Avenue E.	18,400
W57	12th Street E - Widen to 3 lanes from 62nd Ave E to Alexander Avenue E; extend new street from Alexander Avenue E to 34th Avenue E.	See W56
W58	62nd Avenue E - Pacific Highway E to 12th Street E - Widen to 3 lanes.	See W30
W59	Frank Albert Road- Pacific Highway E to 12th Street E - Widen to 3 lanes.	See W1
Local Access Projects		
I4	East D Street/Puyallup Avenue intersection - Change signal phasing. Add left turn pocket to southbound approach.	50
I23	Pacific Avenue/13th Street intersection - Restripe the eastbound right turn lane as a shared through/right-turn lane.	60
I24	Pacific Avenue/Tacoma Way/26th Street intersection - Restripe the eastbound right-turn lane as a shared through/right-turn lane.	60
P1	Puyallup Avenue - Add bike lane from Portland Avenue across Puyallup River.	See H8
R2	54th Avenue E at UPRR rail crossing - Construct a grade separation structure to re-open the street.	35,800
W31	20th Street E - Reconstruct from 70th Avenue E to Freeman Road to a 3-lane section.	3,900
	Total	312,690

[1]Some cost estimates were provided by older studies, and are therefore not shown in 2010 dollars.
Source: Fehr & Peers, 2011



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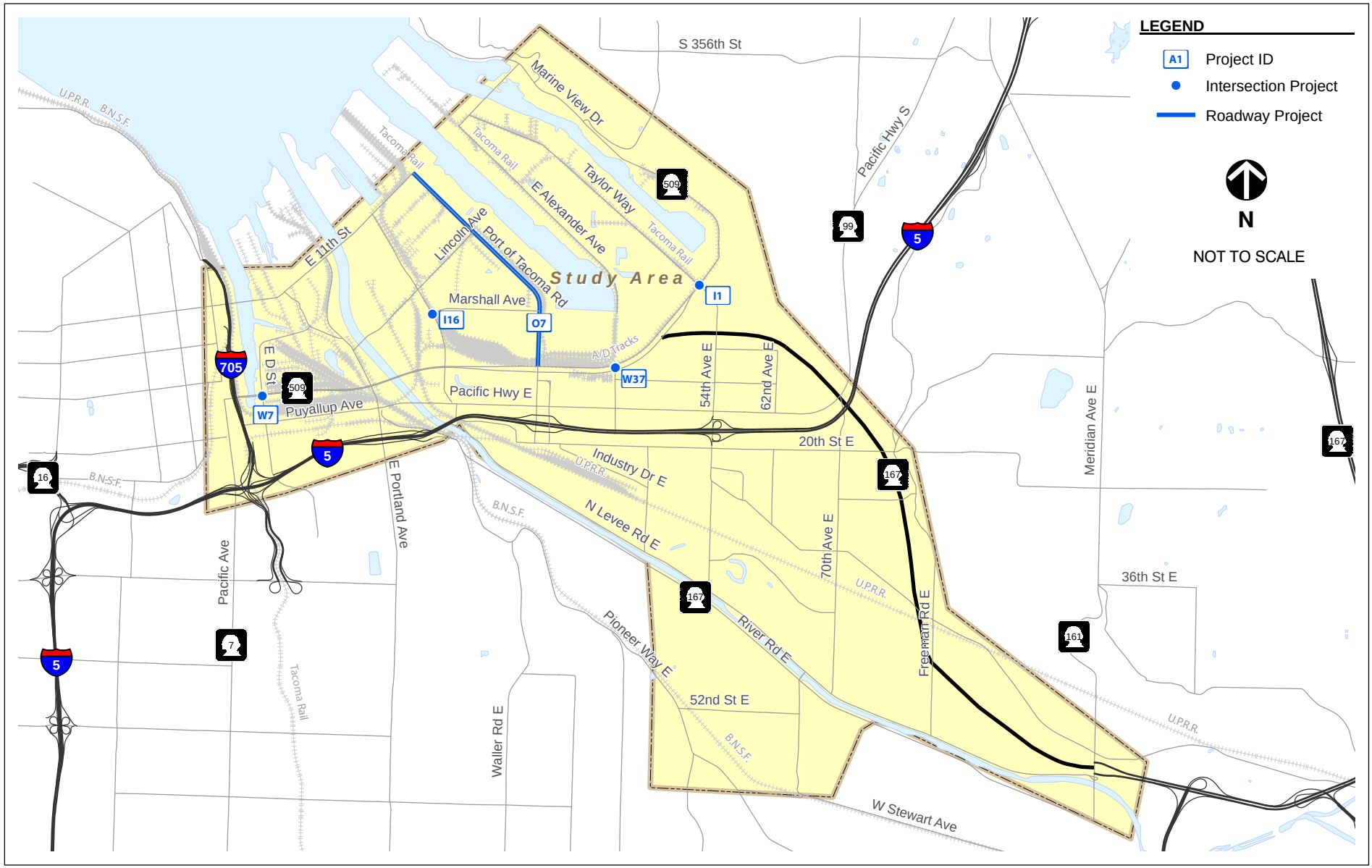
RECOMMENDED PROJECTS - TIDEFLATS AREA ACCESS
Tideflats Area Transportation Study
FIGURE 12



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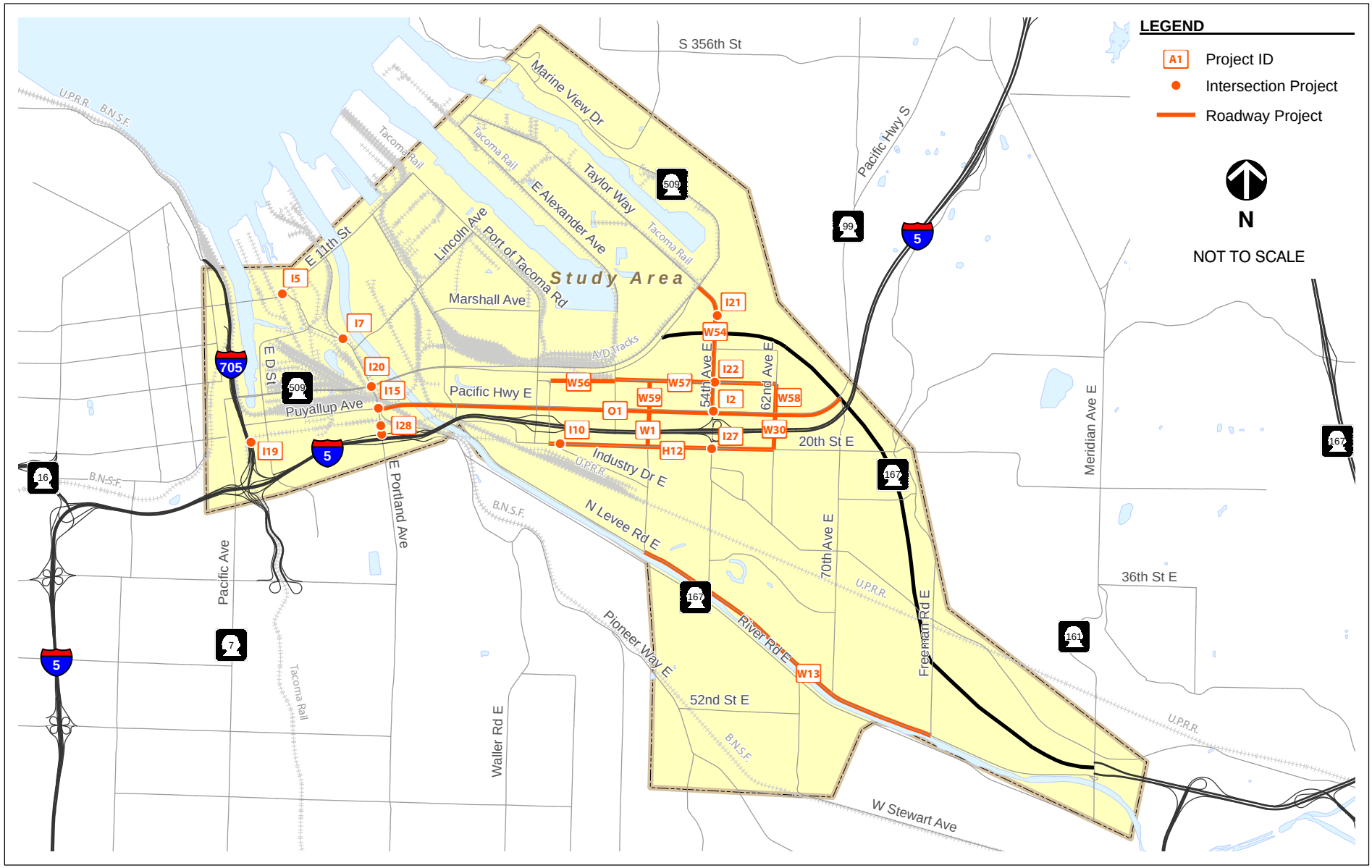
RECOMMENDED PROJECTS - PORT ACCESS

Tideflats Area Transportation Study

FIGURE 13



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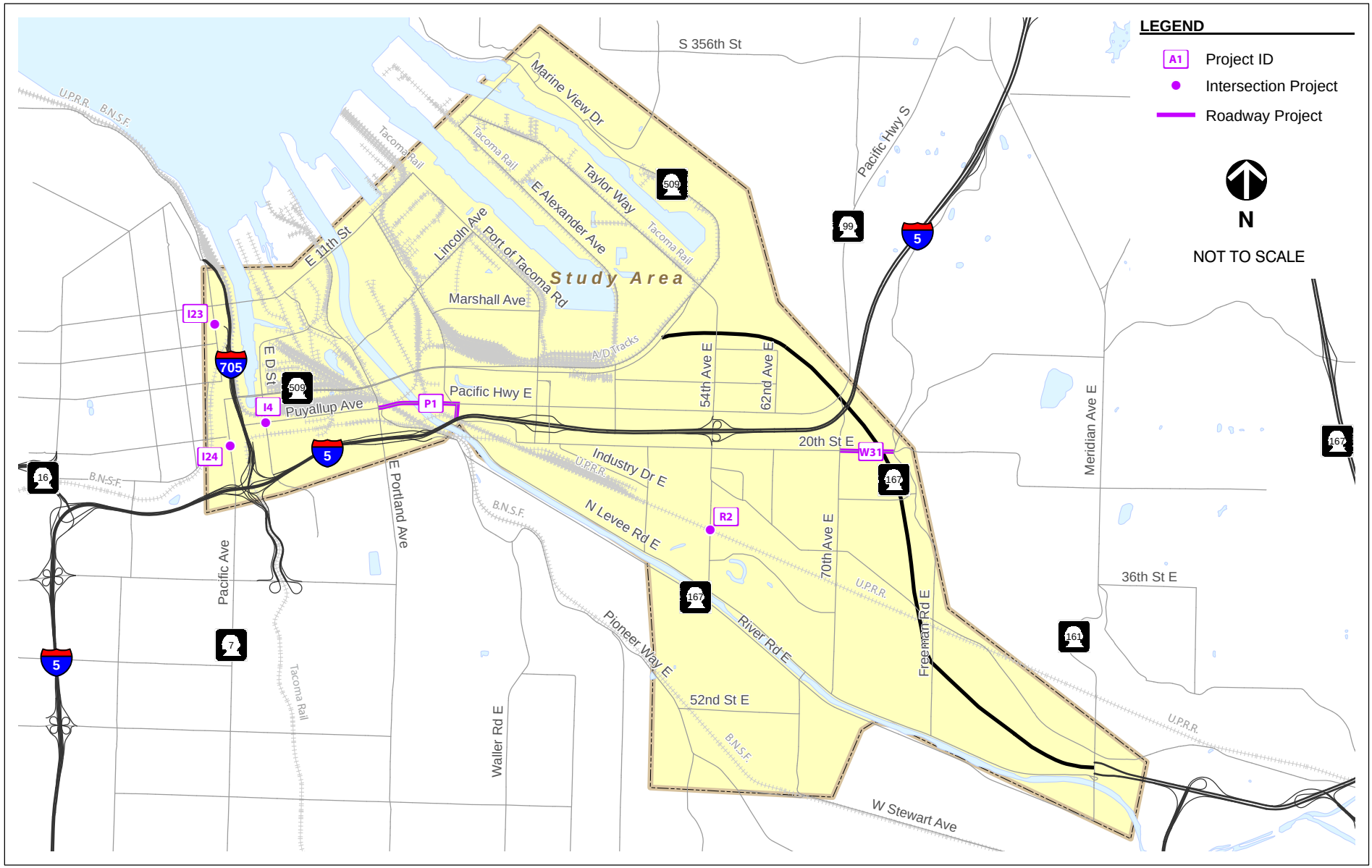
RECOMMENDED PROJECTS - INDUSTRIAL ACCESS
Tideflats Area Transportation Study
FIGURE 14



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RECOMMENDED PROJECTS - LOCAL ACCESS
Tideflats Area Transportation Study
FIGURE 15

TRANSPORTATION ANALYSIS

The Recommended Projects would improve the transportation network performance compared with the Baseline scenario. As Figure 16 shows, the Recommended Projects would result in double the number of LOS A through D intersections when compared to the 2030 Baseline scenario. The number of LOS F intersections would drop from 33 LOS F intersections expected in the Baseline condition to 10 under the Recommended Projects.

It is important to note that these projected improvements are contingent upon the completion of the Baseline projects. The Recommended Projects alone would not achieve these results.

Downtown Tacoma

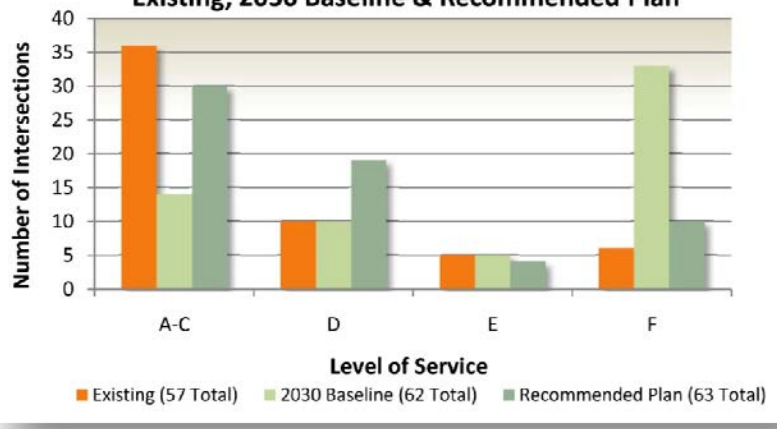
In Downtown Tacoma, operations would improve moderately compared to the 2030 Baseline scenario. However, four intersections would remain at LOS F: Pacific Avenue at S 15th, S 21st, and S 24th Streets and the I-705 northbound off-ramp at S 26th Street.

Port of Tacoma

The Recommended Projects would lead to better conditions near the Port than would be expected under the 2030 Baseline. The Portland Avenue corridor would have only one LOS F intersection between the SR 509 and I-5 interchanges. Although that intersection, at Puyallup Avenue, would be LOS F, the projected delay is still less than was forecast in the Baseline scenario.

The two unsignalized intersections at Milwaukee Way and Pacific Highway E would operate at LOS F as was the case under Baseline conditions, but the expected delay would decrease.

FIGURE 16
Level of Service Comparison:
Existing, 2030 Baseline & Recommended Plan



The conditions on the 54th Avenue E corridor from SR 509 to Valley Avenue E would improve substantially if the Recommended Projects were implemented. With the exception of 54th Avenue E at 12th Street E, all intersections along the corridor would improve from LOS F conditions. The intersection of Marine View Drive and E 11th Street would operate at LOS B rather than LOS F as under the Baseline. All intersections along Port of Tacoma Road would operate at LOS D or better if the Recommended Projects are implemented.

Overall, the area around the Port would operate far better under the Recommended Projects than under the Baseline conditions.

Southern Study Area

The intersection of Pioneer Way E and Canyon Road E would improve from LOS F to LOS E under the Recommended Projects. The Meridian Avenue/SR 161 corridor would operate slightly better, with shorter delays, although LOS would remain about the same as the 2030 Baseline.

COST ESTIMATES

The overall cost of the recommended improvements included in the preferred package is $290-335 million. This total does not include baseline projects, which are essential to avoid failure of the transportation system by 2030. Costs are broken down to indicate the proportion of money being proposed for Tideflats area, industrial, port, and local access:

- Tideflats area access: $140-150 million
- Port access: $5-10 million
- Industrial access: $110-130 million
- Local access: $35-45 million

Baseline projects, (not including additional HOV capacity on I-5 or the SR 167 extension) total $485-540 million. Funding for some baseline projects has already been secured. In total, $196 million has been committed to baseline projects, leaving a need of $579-684 million.

FUNDING SOURCES

The amount of annual funds needed to implement the TATS plan is consistent with the levels of expenditures that have been made within the TATS area over the past ten years. The high level of agency coordination and joint funding commitments has led to the successful implementation of several high-profile projects in the TATS area.

Funding for these projects has come from a variety of sources, including the following:

- City and County transportation funds
- Port of Tacoma funds
- Private company funds
- State grants, primarily through the Freight Mobility Strategic Investment Board (FMSIB) and the Transportation Improvement Board (TIB)
- WSDOT funding authorizations
- Federal grants, as part of ongoing Transportation Reauthorization programs and recently as part of the ARRA ("stimulus plan") program

While many of these funding sources will continue to provide support for the TATS projects, additional funding sources will need to be explored. For example, the SR 167 extension is a state and regional priority. Partial funding for that project is expected to include

tolls, which could be extended to other regional facilities within the TATS area.

Operations and maintenance of the TATS projects will also be a priority. In particular, pavement and bridge maintenance is key to preserving the integrity of the TATS transportation network. Heavy truck loads place additional maintenance burden on the roadway facilities. Funding opportunities for maintenance could include a Transportation Benefit District and other local funding options under consideration within the State legislature.

6. PROJECT SEQUENCING

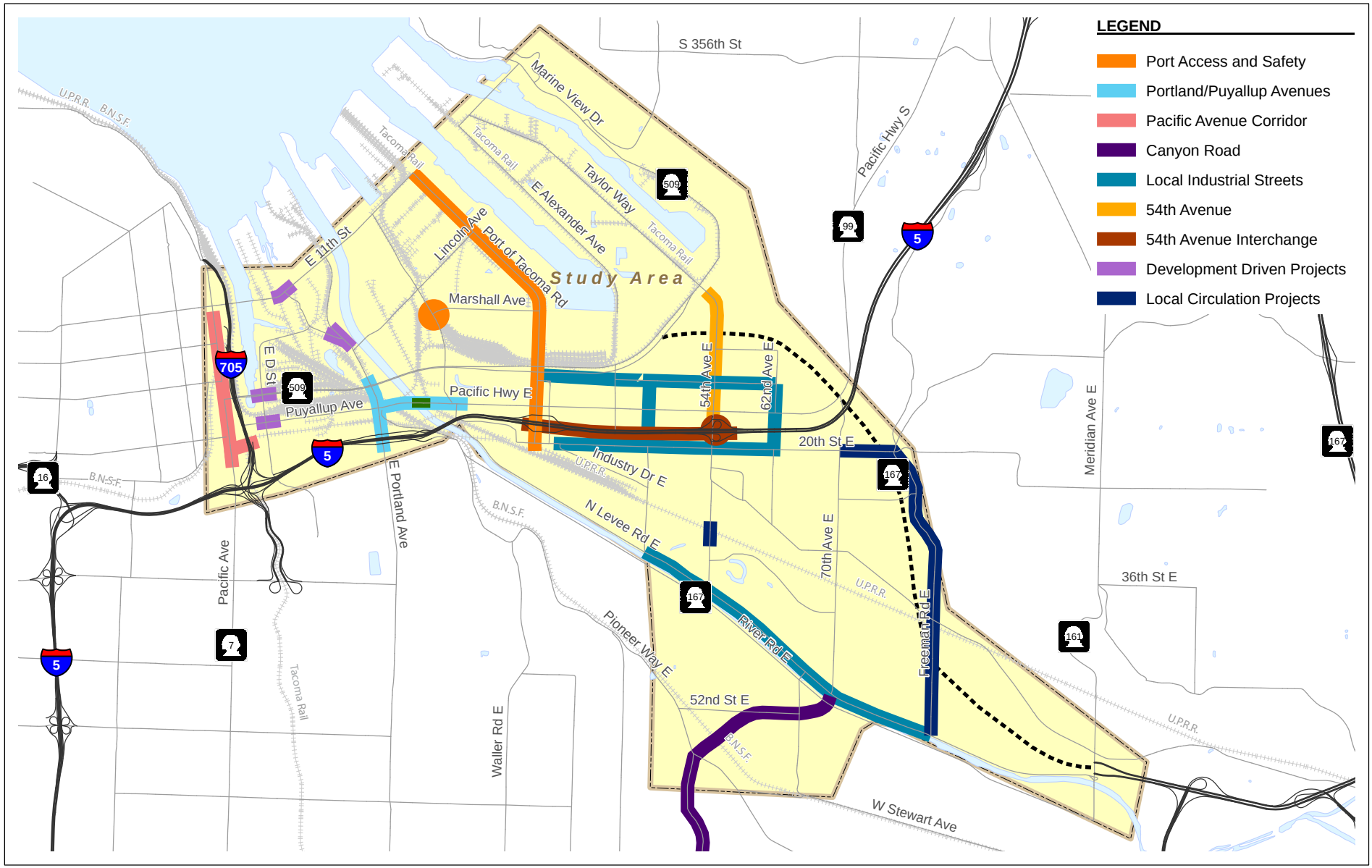
The recommended projects benefit the entire TATS system holistically. Recommendations from TATS are based on objective system analysis and provide a pool of candidate projects from which individual agencies, or agency partnerships can advocate for in local, regional, state and federal prioritization and/or funding processes.

To assist in this process, the Executive Committee requested suggestions for implementation sequencing of the recommended projects over the next 20 years. The sequencing does not imply priorities per se, since some high priority projects may take several years to implement. The suggested sequencing was developed by creating logical groupings of projects that could be implemented as packages. Most of these groupings are geographically based, but some are based on functionality (e.g. development-driven projects). Refer to the technical memorandum in Appendix I for more details regarding project sequencing.

The following list and Figure 17 present the suggested sequencing. Note that SR 167 is an essential regional roadway connection and is assumed to be implemented during the next 20 years. Likewise, the other baseline projects must be completed to realize the benefits of the Recommended Projects.

- Improvements to Portland and Puyallup Avenues will improve the bottleneck that currently hinders access to I-5. This package of improvement requires the completion of the Port access bridges' reconstruction.
- The Pacific Avenue corridor focuses on travel within Downtown Tacoma and could take place sooner.
- The Canyon Road/70th Avenue E railroad crossing and bridge over the Puyallup River would complete access to the southern study area and tie into the completed 70th Avenue E corridor.
- Local industrial street improvements such as Frank Albert Road, 62nd Avenue E, 12th Street E, 20th Street E, and N Levee Road E would reduce the congestion on 54th Avenue E and Pacific Highway E by providing alternate routes.
- Corridor improvements along 54th Avenue E (multiple projects) are independent of any interchange redesign so they could take place sooner.
- The I-5/54th Avenue E interchange reconstruction can be accomplished independently.

Appendix I provides more details on the projects included within each sequencing group and performance results.



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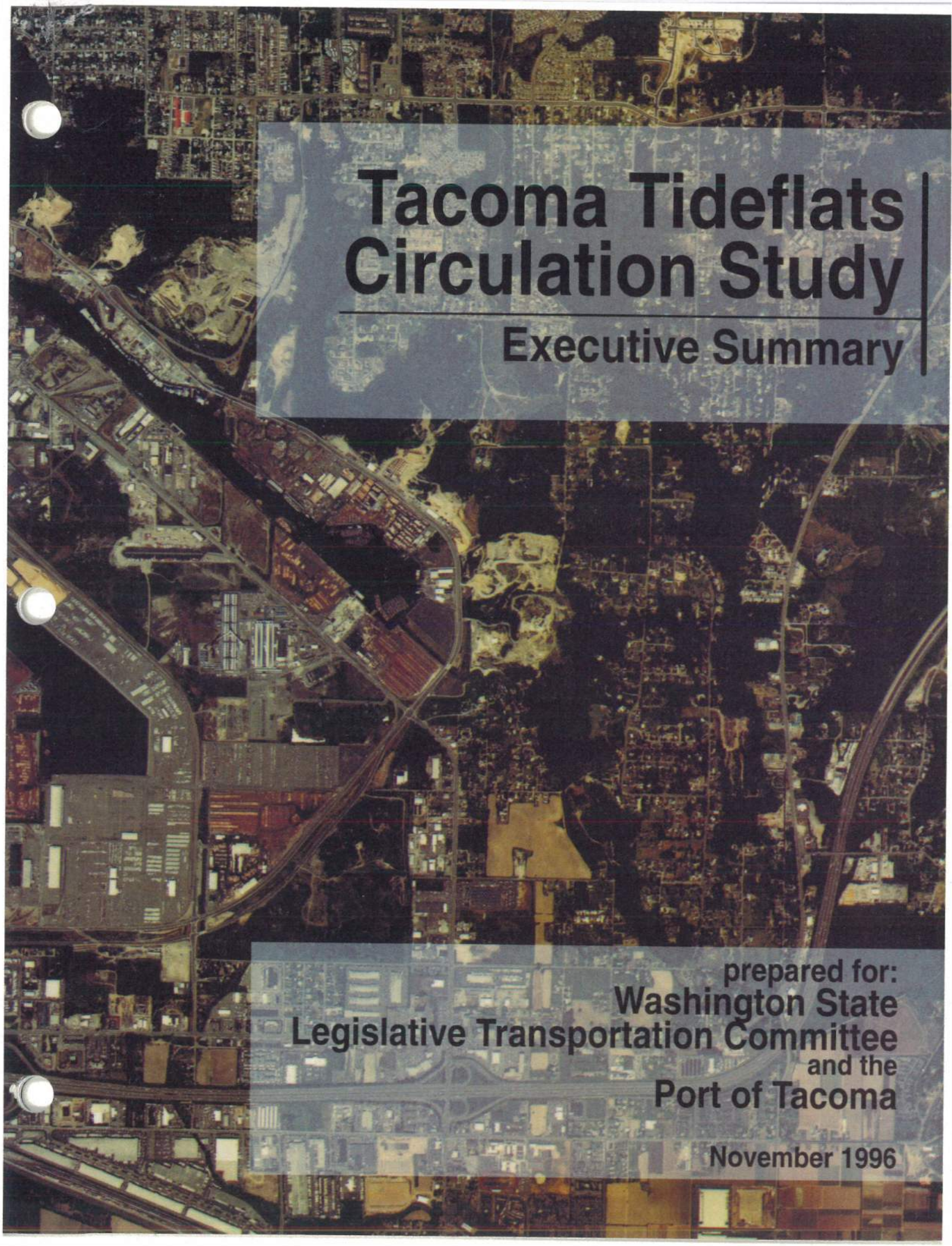
PROJECT DEFINITION AREAS - Tideflats Area Transportation Study

FIGURE 17

SEQUENCING RATIONALE

The sequencing suggestions listed above reflect the following rationale and realities:

- Baseline projects are being implemented as funding permits during the next few years, as described in section 3.Portland Avenue (tied to the Puyallup Avenue Bridge) is a key industrial corridor whose upgrading could be tied to the completion of the I-5 HOV lane project.
- The Canyon Road extension would complete the regional corridor connections to the south and provide a substantial freight mobility benefit for truck access between the TATS area, south Pierce County, and the Frederickson industrial area.
- Local agencies can improve the local industrial streets between Port of Tacoma Road and 62nd Avenue E. These projects will provide alternative routes for local traffic and freight truck movements, reducing the impacts on the very congested Pacific Highway E and 54th Avenue E corridors. The Levee Road upgrade will allow trucks to resume using that route to access Frank Albert Road, which has an existing overcrossing of the UPRR.
- There are upgrades that can take place along 54th Avenue prior to rebuilding the I-5 interchange. These include access management and widening at the intersections of 54th Avenue E/Pacific Highway E and 54th Avenue E/20th Street E.
- Independent of the SR 167 extension, the remaining major TATS State Route/Interstate improvement would be rebuilding the 54th Avenue E/I-5 interchange.
- Several other TATS projects can be implemented independently or contingent upon development plans. These include:
  - Pacific Avenue intersections in Downtown Tacoma
  - Intersection upgrades on the Thea Foss Waterway
- TATS partners will assure that sequencing of key projects includes clear public information identifying alternate routes and considers the least possible negative impact on commercial movements.



Tacoma Tideflats Circulation Study

Executive Summary

prepared for:
Washington State
Legislative Transportation Committee
and the
Port of Tacoma

November 1996

tW

ACKNOWLEDGMENTS

STUDY SPONSOR

Washington State Legislative Transportation Committee
Representative Karen Schmidt, Chairperson

LOCAL PARTICIPANTS

Port of Tacoma
County of Pierce
City of Tacoma
City of Fife
Tacoma Municipal Belt Line Railway

Technical Steering Committee

Steering Committee members provided guidance, technical support, and timely decisions throughout the study process.

Chairperson: Paul Chilcote, Port of Tacoma
Project Manager: Fred Thompson, Parametrix

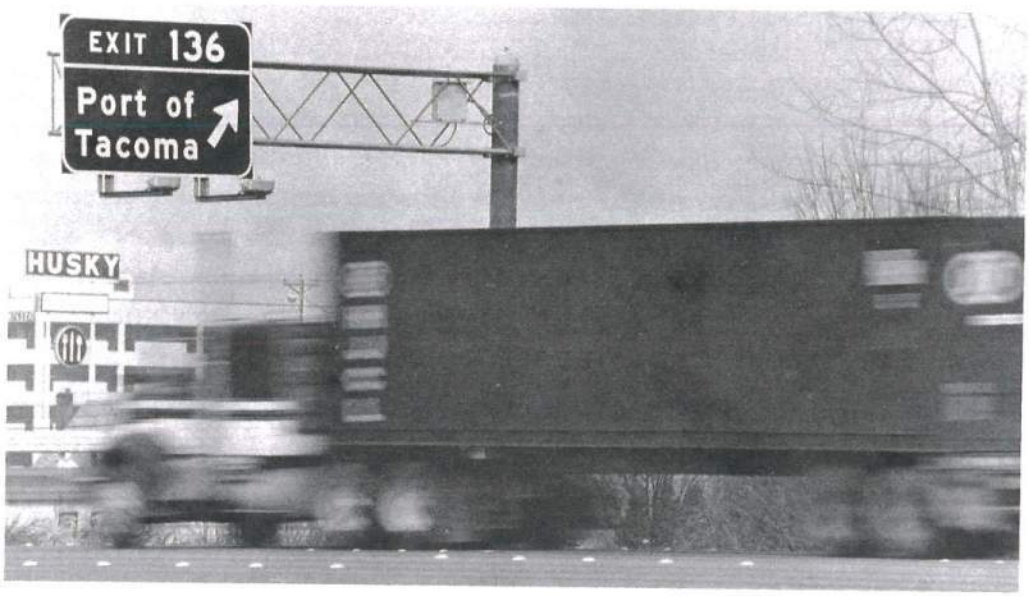
Members of Technical Steering Committee:

Tom Ballard, Pierce County
Paul Chilcote, Port of Tacoma (Chair)
Dennis Dean, Tacoma Municipal Belt Line Railway
Jeff Doyle, Washington State Legislative Transportation Committee Staff
Dave Hildebrant, Washington State Department of Transportation
Mart Kask, City of Fife (Kask Consulting)
Jeff Lincoln, Port of Tacoma
Howard Schesser, City of Fife
Al Tebaldi, City of Tacoma
Fred Thompson, Parametrix (Project Manager)

PORT OF TACOMA

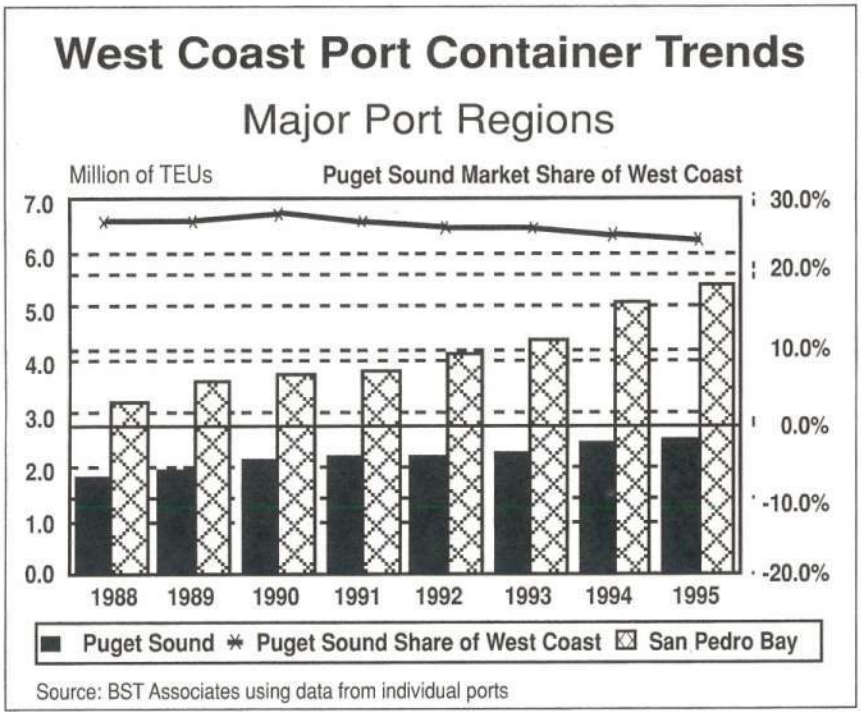
TIDEFLATS CIRCULATION STUDY

EXECUTIVE SUMMARY



STUDY PURPOSE

Rapid growth at the Port of Tacoma, increasing rail and roadway congestion within the Tacoma Tideflats and changes in the flow of cross-Tideflats vehicular traffic are impacting the Port and the surrounding area. Recognizing these challenges and cognizant of intensifying competition from California ports, the Washington State Legislative Transportation Committee commissioned the Port of Tacoma Tideflats Circulation Study. The study identifies existing and potential transportation conflicts resulting from the growth of both rail and roadway traffic and recommends capital improvements aimed at continuing economic growth.



WHY THIS STUDY IS NEEDED

Rail and roadway infrastructure capacity in the Port of Tacoma area is being outpaced by growth in containerized cargo and other freight traffic. This is a critical issue for both the Tacoma area and Washington state because:

- ***Puget Sound's share of the West Coast container shipping market has slipped by 3.6 percent during the past five years.***
- ***This loss of market share has amounted to at least 235,200 container units, two million tons, $8.5 billion in total trade and $2.2 billion in export sales.***
- ***Container shipping produces high-paying, family-wage jobs that averaged $41,000 per job in 1995.***

The Port of Tacoma's containerized cargo traffic, in particular, is growing at a rate that is outpacing the capacities of rail and roadway infrastructure. In 1995, more than 1.1 million TEUs (containers in 20-foot-equivalent units) transited the Port's shipping terminals. It is forecast that this container shipping volume will more than double by 2010.

In addition, a major change in cross-Tideflats vehicular traffic is resulting from the January 1997 completion of the SR 509 expressway around the Port's inland perimeter and the subsequent removal of the Blair Waterway drawbridge on East 11th Street.

Both the Port's growth and this change in vehicular traffic flow require the development of a comprehensive, long-term strategy to improve the rail and roadway network within and near the Tacoma Tideflats.

THE STUDY'S KEY FINDING

This study's most significant finding is that to achieve continued economic growth in trans-Pacific trade in the Puget Sound region, major investments in surface transportation must be made on the Tacoma Tideflats as well as throughout the State of Washington. ***This report recommends six rail improvement alternatives and seven roadway improvement alternatives totaling $299.3 million. However, five steps recommended for immediate action are estimated at $57 million.*** Without continued and increased investment in the state's transportation infrastructure, the Puget Sound international cargo gateway will continue to lose market share and economic growth to other West Coast ports.

PUGET SOUND'S LOSS OF MARKET SHARE

In order to compete with Southern California ports, it is imperative that Puget Sound ports improve the efficiency of their inland connections. Efficient landside access to marine terminals is now the most important need for Puget Sound ports.

Containerized cargo trade through Tacoma and Seattle increased from less than one million TEUs in 1984 to 2.5 million TEUs in 1995 — but the Puget Sound gateway has lost market share since 1990. From 1990 to 1995, Puget Sound's share of the West Coast container shipping market slipped by 3.6 percent to 24 percent. Most of that share was lost to the faster-growing ports of Long Beach and Los Angeles. This occurred even though Southern California has severe freeway congestion.

Southern California's huge population and its rail connections to the nation's growing southern-tier markets are key reasons for that gateway's gain in market share. Continued market share growth there is possible, particularly after the Alameda Corridor project of improved port rail and roadway access is eventually completed.

CONTAINER SHIPPING'S ECONOMIC IMPACT

Washington state as well as the ports of Tacoma and Seattle are adversely affected when container market share is lost. In 1995, container operations generated $487 million in direct income and $533 million in additional income due to respending throughout Washington state.

A loss of one percent in West Coast container shipping market share means a loss of 65,300 TEUs transiting Puget Sound ports. This loss represents 560,000 metric tons of product valued at $2.4 billion. Since 1990, Puget Sound's market share loss has amounted to at least 235,200 TEUs, two million tons, $8.5 billion in

Consequences of Lost Market Share

For Each % Lost Share of West Coast International Container Trade

	Share Shift (%)	TEUs (1,000s)	MTons (1,000s)	Value ($Billions)	Exports ($Billions)
	-1.0	-65.3	-560.0	-2.4	-0.6
	-2.0	-130.7	-1,121.0	-4.7	-1.2
	-3.0	-196.0	-1,661.0	-7.1	-1.8
*	-3.6	-235.2	-2,017.0	-8.5	-2.2
	-4.0	-261.3	-2,242.0	-9.5	-2.5
	-5.0	-326.7	-2,802.0	-11.9	-3.1
	-6.0	-392.0	-3,362.0	-14.2	-3.7

Source: BST Associates

*Actual Loss Since 1990

total trade and $2.2 billion in export sales.

Total personal income generated by container shipping surpassed a billion dollars in 1995. ***Container shipping produces high-paying, family-wage jobs. The average earnings per job amounted to $41,000 in 1995.*** This was 58 percent above the average Washington state job.

In 1995, Washington state producers and manufacturers exported $4.1 billion of goods by container through the ports of Tacoma and Seattle. It is conservatively estimated that 24,300 direct jobs with a payroll of $616 million resulted from export sales by these companies. Altogether, Washington state firms that export containers via Puget Sound generated 65,869 direct, indirect and induced jobs.

ANOTHER REASON PORT ACCESS IS CRITICAL

The success of Washington state exporters in part depends on efficient access to Puget Sound ports. If access to the ports and the mainline rail corridor is not improved, the costs of engaging in international trade will increase and negatively impact Washington state shippers.

The trans-Pacific container trade via Puget Sound ports is primarily driven by imports from Asia. Imports are mainly high-value consumer goods and industrial products that are about five times more valuable on a per-ton basis than exports. As a result, the profits earned by ocean carriers are mostly derived from imports rather than exports.

Containerized cargo transportation has been developed to serve imports as a fronthaul and exports as a backhaul. This means that export cargoes have access to a much larger transportation system and much lower freight rates than would exist if the system were designed solely to serve the export base. ***It is estimated that Washington exporters save $150 to $500 per container because of these advantageous backhaul rates.***

Of particular importance to the economic welfare of Washington state is that most containerized exports from Puget Sound are manufactured or grown in the Pacific Northwest. The availability of containers and frequency of steamship line and railroad schedules resulting from the high volume of high-value imports enhances Washington state and Pacific Northwest shippers' access to international trade. Without this transportation system, many of these exporters — especially those engaged in shipping low-value products — would not be able to sell their products overseas.

Up to 75 percent of the Port's containerized imports are transported inland by rail

Most containerized exports from Puget Sound are manufactured or grown in the Pacific Northwest

HOW PORT OF TACOMA CARGO MOVES

Both the rail and truck modes are major movers of containerized cargo flowing through the Port of Tacoma. ***Up to 75 percent of the Port's containerized imports are transported by rail to destinations in the Midwest and East.***

The Burlington Northern Santa Fe and the Union Pacific railroads both carry containerized and other cargoes shipped to and from the Port. The Tacoma Municipal Belt Line Railway switches cars between the mainlines and the largest of the Port's two intermodal rail yards as well as other Port and industrial rail users on the Tideflats. The BNSF and UP have direct access to the Port's other intermodal rail facility.

Trucks transport most of the Port's containerized export cargoes and containerized domestic freight being shipped to Alaska and Hawaii. ***Truck access routes to most of the Tideflats area must traverse at-grade rail crossings.***

PORT OF TACOMA TRANSPORTATION SUMMIT

As part of the Port of Tacoma's transportation planning process, a Port of Tacoma TransPORTation Summit was held August 22 and 23, 1996. In conceiving the event, the Port Commission's objective was to facilitate development of a master plan that would ensure cargo moves to, through and beyond the Port more rapidly, efficiently and cost effectively than at any other West Coast port.

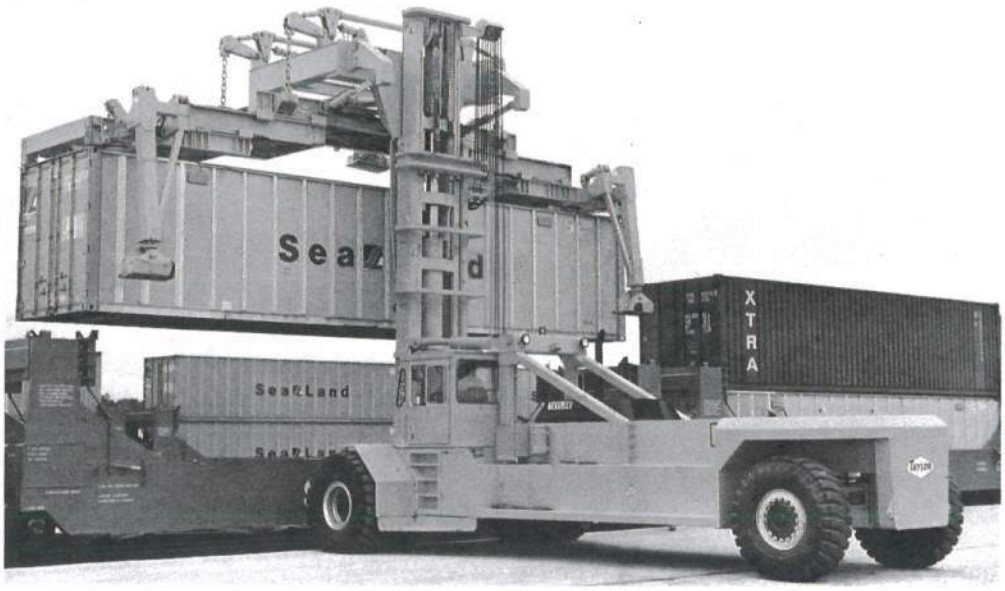
Participating in the summit were about 170 community leaders, Port staffers, shippers, manufacturers, railroaders, concerned citizens and professionals in the areas of public policy, logistics, planning and transportation. Results of the summit with its broad base of participation were incorporated into the Port of Tacoma Tideflats Circulation Study that identifies rail and roadway congestion and recommends capital improvements and a schedule for their phased implementation.

PORT RAIL ACCESS CONGESTION

The Tacoma Tideflats rail system is constrained by a lack of adequate intermodal staging tracks and long departure tracks to support the working yards. During the past 10 years, the Belt Line has been unable to increase its yard capacity to accommodate the increased staging requirements of the Port's rapidly growing intermodal rail services.

Today, the Belt Line's switching operations are experiencing significant delays during peak periods due to the lack of staging tracks. The Belt

Line will begin constructing five new intermodal staging tracks in 1997 at its existing yard on the Tideflats. This expansion will provide much-needed staging capacity for the North Intermodal Yard, the largest of the Port's two such facilities.



Rail system is constrained by a lack of adequate intermodal staging tracks and long departure tracks to support working yards such as this facility

The Port's other container rail facility, the South Intermodal Yard, also faces problems resulting from a lack of staging capacity and a need for longer departure tracks. New staging tracks and additional working tracks are planned for this yard.

Significant capacity problems similar to those in the Belt Line yard also are being experienced by the UP's Fife yard and the BNSF's Tacoma yard. In addition, both railroads face traffic flow problems at the Bullfrog Junction mainlines entrance to the Tideflats area. BNSF movements in Tacoma are further constrained by a 10-mile-per-hour speed limit due to a tight, 10-degree curve on the double-track mainline around the end of Thea Foss Waterway.

Further, both rail and roadway access to the Port is restricted now and in the future by at-grade crossing conflicts. With the removal of the Blair Waterway drawbridge on East 11th Street and construction of a new West Blair intermodal terminal, these crossing conflict points will shift drastically in the near future.

The two most critical crossing conflicts facing the Port of Tacoma within the next five years are:

- ***Port of Tacoma Road just north of SR 509.***
- ***Lincoln Avenue at Milwaukee Way.***

Projected delays for trucks and other vehicles range from two to 25 minutes. The crossings are predicted to handle 10 to 20 trains per day. Severe congestion on Port of Tacoma Road, SR 99 and I-5 are predicted as a result of the Port of Tacoma Road at-grade crossings conflict.

TRAIN TRAFFIC FORECAST

The need for rail access improvements is dramatized by increases in intermodal train traffic projected for the Port. By 2000, 78 weekly arrivals/departures of intermodal trains are anticipated — an 18 percent increase in train starts over the 1996 volume.

In 2005 when the second phase of the Port's West Blair Terminal is completed and the planned East Blair intermodal terminal is on line, 89 weekly train arrivals/departures of intermodal trains are forecast. This is an increase of 33 percent, compared with 1996. By 2015, total intermodal train counts are expected to reach 126 per week, an increase of 89 percent over 1996.

PORT ROADWAY ACCESS CONGESTION

Already operating at volumes well above design capacity are the major intersections at Port of Tacoma Road and Pacific Highway, Port of Tacoma Road and Interstate 5 southbound ramps, and 54th Avenue East and Pacific Highway. All other major intersections operate at near-design capacities.

The congestion at the Port of Tacoma Road and 54th Avenue East intersections with Pacific Highway is compounded by I-5 interchange ramp locations. The close proximity of the interchange ramps with intersections and the high peak-hour traffic volumes result in traffic backups that severely restrict traffic along these major access routes to the Port.

This problem is further exacerbated by the high volume of trucks that use the interchanges to access the Port area. Trucks account for 30 to 40 percent of the daily traffic on Port of Tacoma Road, for example.

ROADWAY TRAFFIC FORECAST

As with rail access, the need for improved roadway access to the Port is obvious because of projected increases in vehicular volumes. Total traffic generated within the Tacoma Tideflats area is forecast to increase from a 1996 daily total of 63,300 auto and truck trips to 105,400 daily trips in 2020. This represents a growth rate of about 2.1 percent per year.

Forty-seven percent of Port-related truck trips are estimated to be to/from the north or northeast. These trips connect with the industrial/distribution areas of Seattle, Auburn, Kent and Renton as well as I-90 (via SR 18) and I-5 to other locations in Washington, Canada or the Pacific Northwest.

Slightly less than 40 percent of the truck container trips are oriented to I-5 south. These trips connect with industrial/distribution facilities in south Tacoma, Olympia and the Portland area.

The remaining container truck trips are estimated to have connections with Puyallup, SR 410 and SR 512 to the east and southeast.

In addition to growing traffic volume in the Tideflats area, the City of Tacoma's redevelopment plans along Thea Foss Waterway could generate a 12-fold increase in traffic in that vicinity — from 4,000 trips in 1996 to more than 48,000 trips in 2020.

Port of Tacoma Road intersection with Pacific Highway, adjacent to Interstate 5, is already operating at volumes well above design capacity

Tacoma Tideflats Rail and Roa

Alternative 6: West Blair Terminal Grade Separation

Provides Grade Separation Over Loop Track at North End of New West Blair Terminal

Alternative B: West Blair Intermodal Terminal and Loop

Provides Loop Track to Allow Bi-Directional Moves to Terminal

Alternative E: South Intermodal Yard Expansion

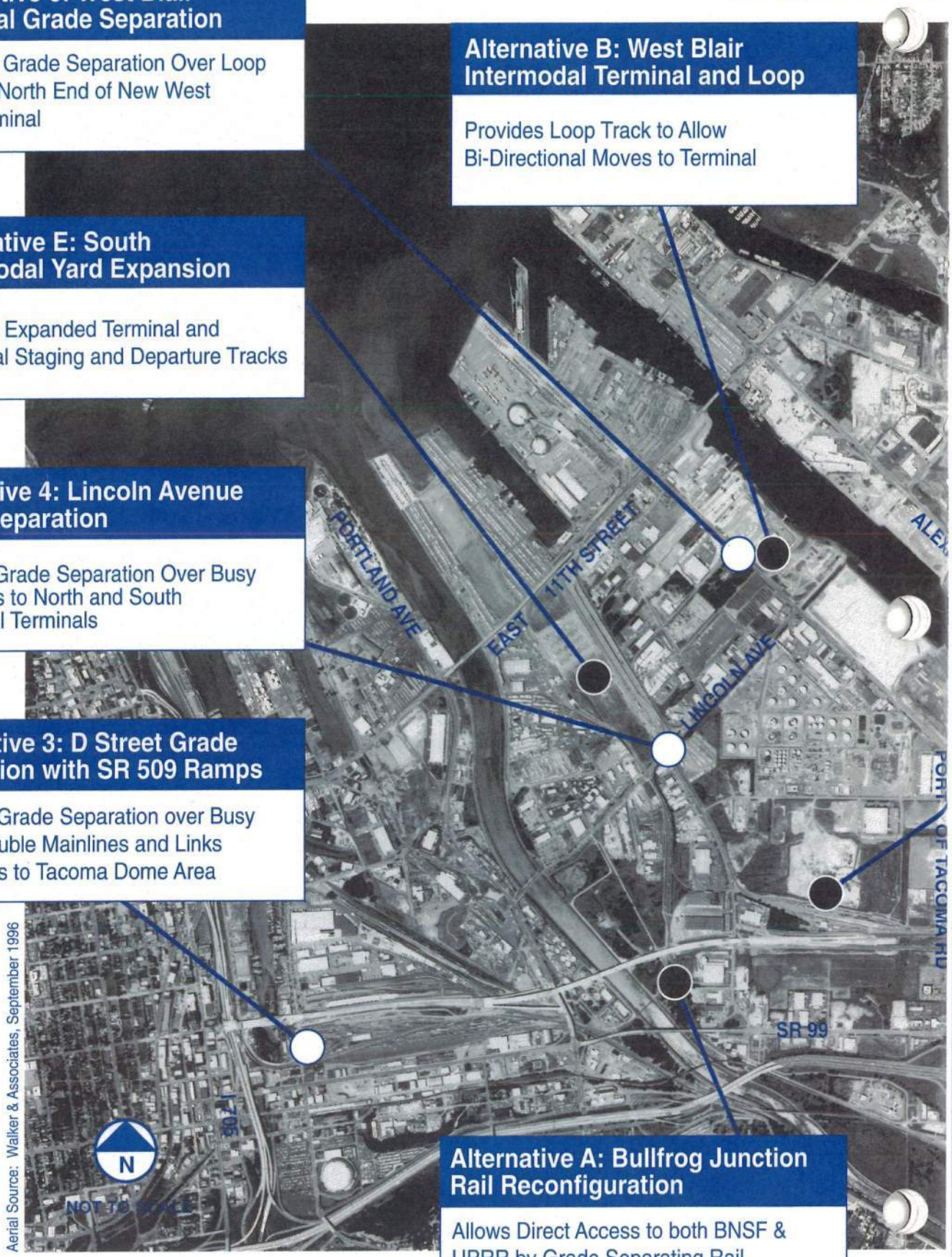
Provides Expanded Terminal and Additional Staging and Departure Tracks

Alternative 4: Lincoln Avenue Grade Separation

Provides Grade Separation Over Busy Rail Leads to North and South Intermodal Terminals

Alternative 3: D Street Grade Separation with SR 509 Ramps

Provides Grade Separation over Busy BNSF Double Mainlines and Links Thea Foss to Tacoma Dome Area

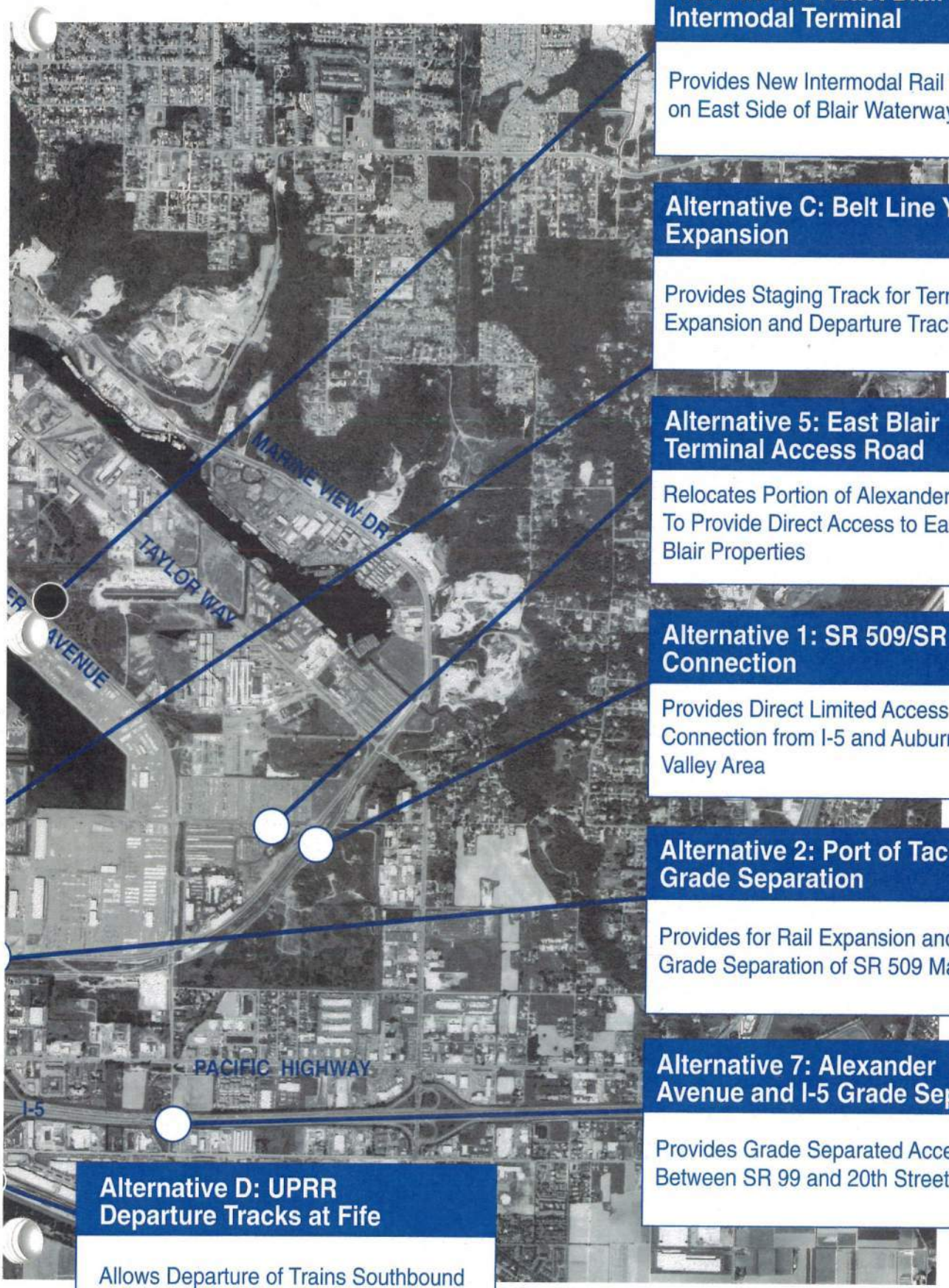


Aerial Source: Walker & Associates, September 1996

Alternative A: Bullfrog Junction Rail Reconfiguration

Allows Direct Access to both BNSF & UPRR by Grade Separating Rail Crossing Movements

Circulation Study Alternatives



Alternative F: East Blair Intermodal Terminal

Provides New Intermodal Rail Terminal on East Side of Blair Waterway

Alternative C: Belt Line Yard Expansion

Provides Staging Track for Terminal Expansion and Departure Tracks

Alternative 5: East Blair Terminal Access Road

Relocates Portion of Alexander Avenue To Provide Direct Access to East Blair Properties

Alternative 1: SR 509/SR 167 Connection

Provides Direct Limited Access Connection from I-5 and Auburn/Kent Valley Area

Alternative 2: Port of Tacoma Grade Separation

Provides for Rail Expansion and Grade Separation of SR 509 Main Lanes

Alternative 7: Alexander Avenue and I-5 Grade Separation

Provides Grade Separated Access Between SR 99 and 20th Street in Fife

Alternative D: UPRR Departure Tracks at Fife

Allows Departure of Trains Southbound without Blocking UPRR Mainline

○ **ROADWAY ALTERNATIVES**

● **RAILROAD ALTERNATIVES**

PROJECT ALTERNATIVES

In selecting highest-priority rail and roadway alternatives, the HDR study team evaluated five major areas of traffic conflict that need to be resolved:

1. ***Truck access to and from I-5, I-705, SR 509 and SR 167.***
2. ***Rail and truck grade crossings in the Tideflats area.***
3. ***Potential arterial reroutings east of the Puyallup River.***
4. ***Truck and rail access to Blair Waterway marine terminals.***
5. ***Rail access for the BNSF and UP.***

Most of these alternative projects complemented major transportation improvement themes developed during the Port of Tacoma TransPORTation Summit. These themes are:

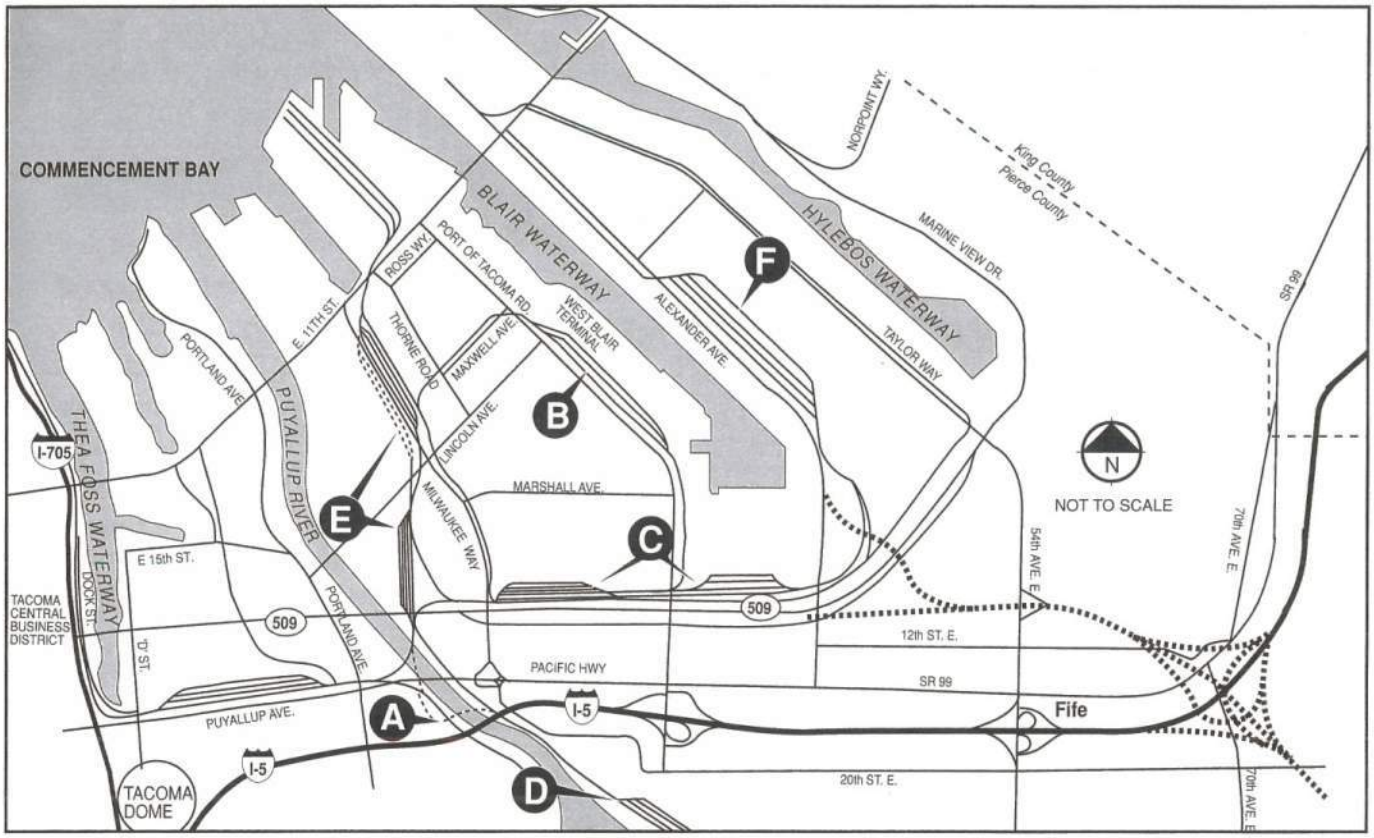
• Rail infrastructure improvements in the Tacoma Tideflats and Fife area should solve congestion problems at Bullfrog Junction, provide for several 9,000- to 10,000-foot arrival and departure tracks at the Union Pacific's Fife yard and provide for sharing of infrastructure by mainline railroads.

• Improvements to roadways to and within the Tideflats area should include providing grade separations at all major rail and highway crossings, completing the SR 167 freeway between Puyallup and the Port of Tacoma and widening SR 18 between the Auburn area and Interstate 90.

Extensive study was conducted concerning projects proposed by the HDR study team and participants at the transportation summit. For example, the study team examined the summit's proposal for a Fife Intermodal Yard jointly operated by the UP and BNSF in lieu of using Port-owned land on the Tideflats for this purpose. Given today's environmental and economic climate, the Fife Intermodal Yard concept was found to be not feasible. This facility would be located near a growing residential area, encompass a wetlands habitat requiring costly mitigation, involve tribal land issues, require a joint operating agreement between two competing railroads, and necessitate costly double tracking of the UP as well as a new connection to the BNSF at Auburn. The Fife Intermodal Yard concept has merit and should be reviewed periodically as environmental and economic conditions warrant.

Other issues raised at the transportation summit and addressed by the study team included opposition to a proposed Tideflats loop track along Alexander. After a thorough analysis, the study team decided to drop the proposed loop track because it was felt this project will not be needed before 2015. But the proposed project merits consideration beyond the study period as rail traffic continues to grow.

Following an extensive study of alternative projects and present and projected rail and roadway traffic, the HDR study team selected the following alternatives that it feels will provide the most relief from Port access congestion.



SELECTED RAIL ALTERNATIVES

A. Bullfrog Junction Rail Reconfiguration — projected cost, $19.7 million. This would facilitate direct access to mainlines for both the BNSF and UP by grade separating opposing rail movements of the two railroads to and from the Tideflats. The project includes construction of a 1,400-foot rail overpass and reconstruction of the BNSF trestle over the Puyallup River.

B. West Blair Terminal and Loop — projected cost, $11.8 million. Planned for this future terminal are five loading tracks and new lead tracks connecting the terminal to the South Intermodal Yard. The loading tracks would be each capable of accommodating 14 cars of 305-foot length. The Loop will not be needed until West Blair Intermodal Terminal is operating at full capacity.

C. Belt Line Yard Expansion -- projected cost, $41.3 million. This would enable the Belt Line to build more trains and store and sort more rail cars for the Port and other Tideflats rail users. The project includes nine new intermodal storage/staging tracks each capable of accommodating nine 305-foot cars, space for the future addition of seven more intermodal tracks each capable of handling nine 305-foot cars, extension of 10 existing Belt Line yard tracks to Alexander Avenue, and construction of four loading tracks each with a capacity for seven 305-foot cars at the Port's future reconfigured Pierce County Terminal.

D. UPRR Departure Tracks at Fife — projected cost, $5.3 million. This would allow trains to depart without tying up the UP main track at the UP Fife yard. The project includes construction of two 9,000-foot siding tracks and closure of 54th Avenue East at this location.

E. South Intermodal Yard Expansion -- projected cost, $22.6 million. This would provide

a new intermodal yard on the south side of the present facility and enable the yard to more efficiently stage trains. The project includes installing six loading tracks, each capable of accommodating seven 305-foot cars, as well as adequate staging and running tracks.

F. East Blair Intermodal Terminal -- projected cost, $4.3 million. This would provide five new loading tracks each with a capacity for nine 305-foot cars.

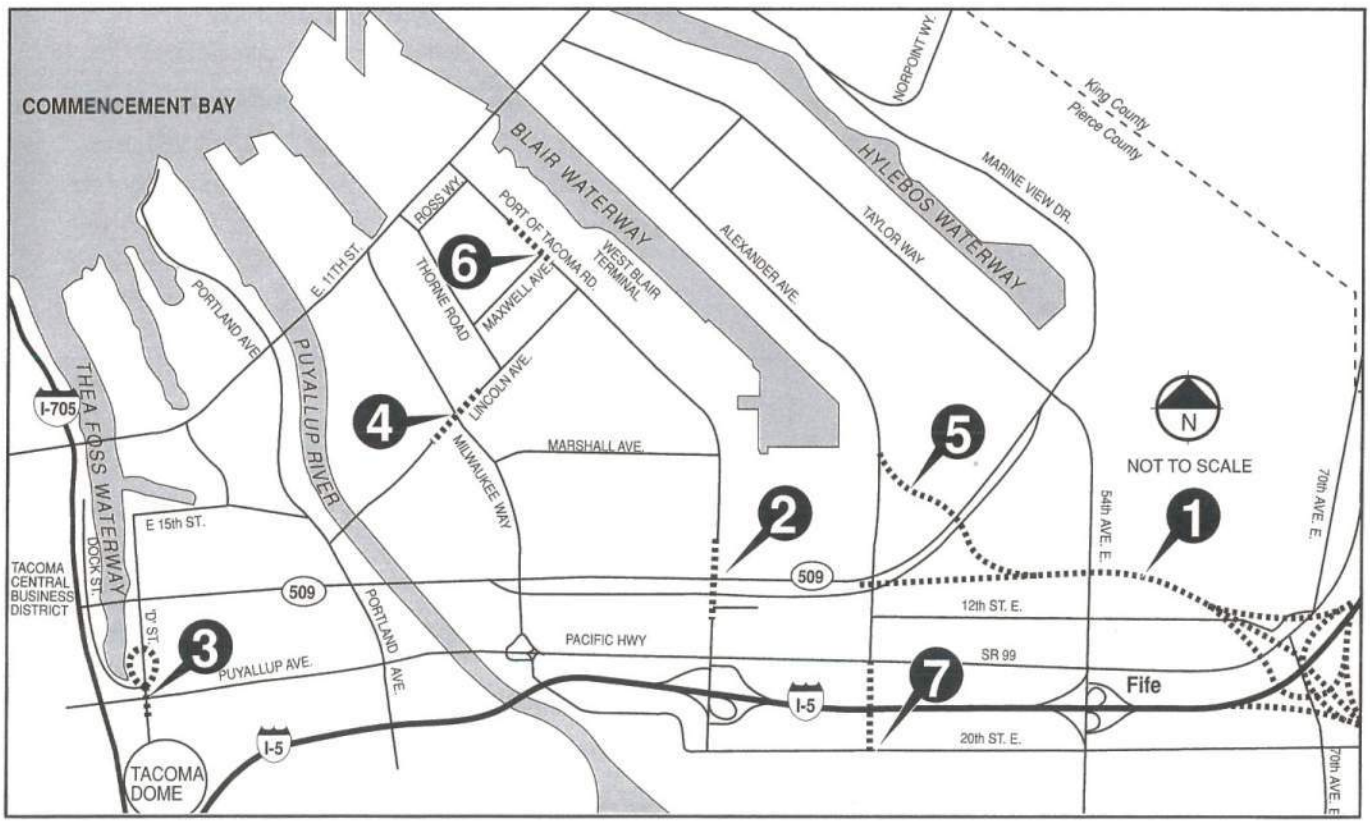
These six selected rail improvements are projected to cost a total of $105 million.

SELECTED ROAD ALTERNATIVES

1. SR 509/SR 167 Connection — projected cost, $126.8 million. This would provide a direct, high-speed connection to the Port and downtown Tacoma from I-5 and the proposed extension of the SR 167 freeway from Puyallup to Fife. The four-mile project includes a three-level interchange with I-5 and a two-level connection at SR 509 and SR 167.

2. Port of Tacoma Road Grade Separation -- projected cost, $22.2 million. Routing Port of Tacoma Road over SR 509 would provide an uninterrupted, high-speed traffic flow on SR 509 and set aside roadway-free space for the proposed expansion of the Belt Line rail yard.

3. D Street Grade Separation with SR 509 Ramps — projected cost, $16.4 million. This would provide safe, unrestricted traffic flow over the busy BNSF double-mainline tracks, alternative access to and from I-5 via SR 509, and a flatter curve for more efficient rail service and another roadway.



4. Lincoln Avenue Grade Separation — projected cost, $8.4 million. This would provide safe, unrestricted traffic flow over proposed railroad tracks for expansion of the South Intermodal Yard. To accommodate this expansion, the northern portion of Milwaukee Way would be closed and this missing link would be replaced by extending Thorne Road from Lincoln to Marshall avenues.

5. East Blair Terminal Access Road — projected cost, $2.2 million. A two-lane roadway would provide access to the future East Blair Terminal from the SR 167 off-ramp to SR 509. This alignment would be desirable in conjunction with the proposed closure of Alexander Avenue to accommodate the proposed Belt Line yard expansion.

6. West Blair Terminal Grade Separation — projected cost, $11.0 million. This project at Lincoln would provide safe, unrestricted traffic flow over the proposed railroad tracks that would serve this future terminal. This alternative will not be needed until West Blair Intermodal Terminal is operating at full capacity.

7. Alexander Avenue & I-5 Grade Separation -- projected cost, $7.3 million. This would provide a safe, unrestricted traffic flow over I-5 and provide a new four-lane access to the Port from both 20th Street East and Pacific Highway. The project would relieve Port access congestion, particularly at the I-5/54th Avenue East (Fife exit) interchange.

These seven selected roadway improvements are projected to cost a total of $194.3 million.

CONCEPTUAL PHASING PLAN

A conceptual phasing plan for the selected rail and roadway improvements was developed and tested utilizing traffic flow simulation models. Also influencing the conceptual phasing plan are such factors as current traffic congestion, projected growth in traffic volumes and the timing of three new Port marine container terminals coming on line. For this phasing plan, it is anticipated that all three new terminals planned by the Port will be constructed by 2010.

Conceptual phasing plan for rail improvements:

Phase 1 (2000)

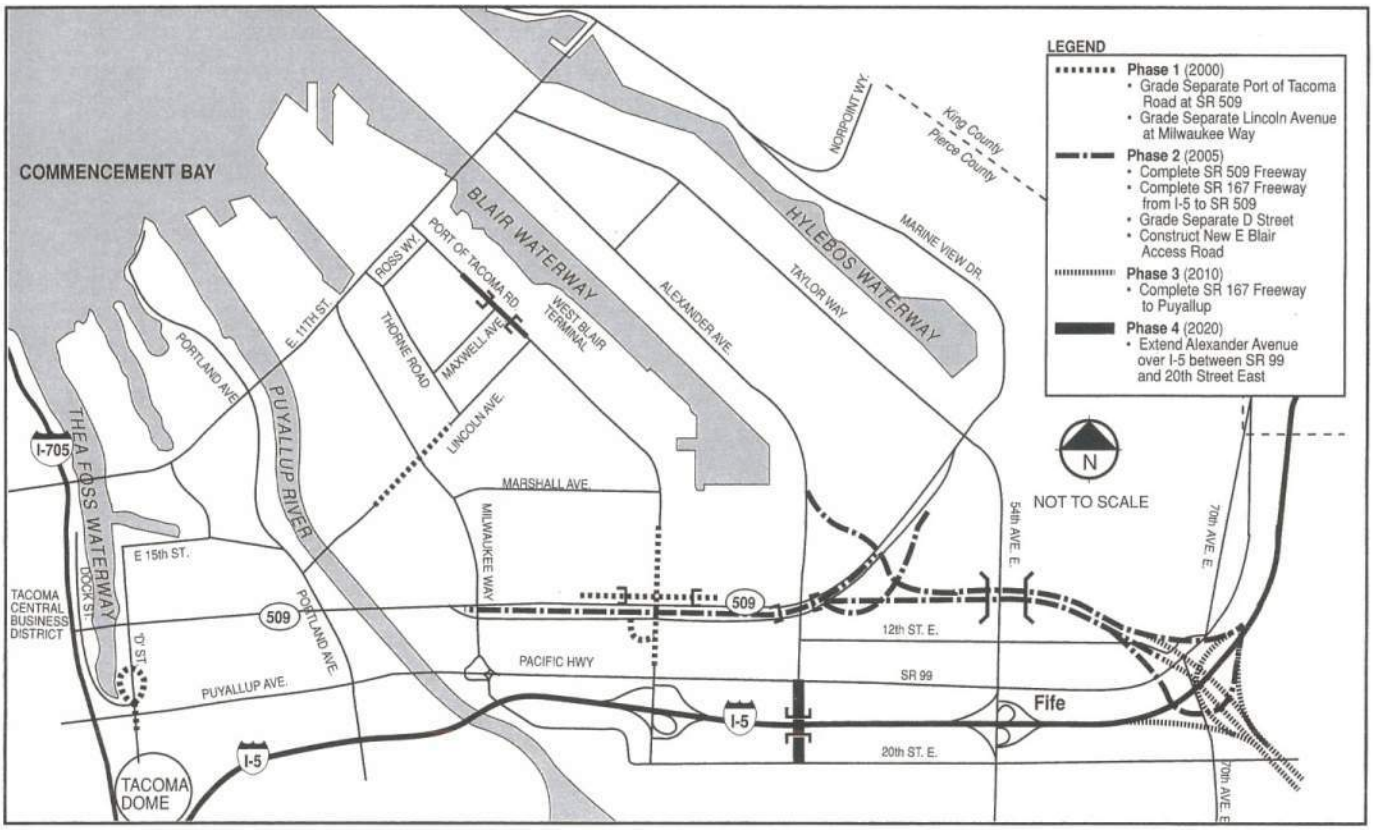
- Construct five (9-car length) intermodal support tracks at Belt Line yard for North Intermodal Yard (to be completed in 1997).
- Construct new West Blair Terminal with four (7-car length) single ended tracks.
- Construct intermodal staging tracks at Belt Line yard for West Blair Terminal.
- Construct two 9,000-foot departure tracks at Union Pacific's Fife yard.
- Construct new north wye at Bullfrog Junction to Burlington Northern Santa Fe mainline; reconfigure Bullfrog Junction.
- Construct one departure track at Belt Line yard.
- Complete intermodal staging tracks for North Intermodal Yard.

Phase 2 (2005)

- Construct new East Blair Terminal with four (9-car length) double ended tracks.
- Expand South Intermodal Yard by adding four (7-car length) double ended tracks.
- Expand West Blair Terminal to four (14-car length) double ended tracks.
- Construct South Intermodal Yard staging and departure tracks.
- Construct track connecting Maxwell Avenue lead to West Blair Terminal.
- Construct UP flyover bridge to BNSF mainline Number 1.
- Construct additional classification and receiving yard tracks at Belt Line yard.
- Construct one additional departure track at Belt Line yard.

Phase 3 (2010)

- Complete Belt Line yard expansion.



Conceptual phasing plan for roadway improvements

Phase 1 (2000)

- Design, prepare EIS and acquire right-of-way for SR 167 freeway between I-5 and SR 509.
- Grade separate Port of Tacoma Road at SR 509 over railroad tracks.
- Grade separate Lincoln Avenue at Milwaukee Way.
- Design, prepare EIS and acquire right-of-way for D Street at Dock Street over railroad tracks.

Phase 2 (2005)

- Complete SR 509 freeway between Milwaukee Way and SR 167 east of Alexander Avenue.
- Construct SR 167 freeway between I-5 and SR 509, including interchanges at SR 509, 54th Avenue East and I-5.
- Grade separate Alexander at SR 509 for rail access.
- Close Alexander between SR 509 and Lincoln Avenue.
- Construct new road from SR 509/SR 167 interchange to serve East Blair properties.
- Grade separate D Street at Dock Street over railroad tracks.

Phase 3 (2010)

- Construct SR 167 freeway between I-5 and Valley Avenue East, including completion of I-5/SR 167 interchange.
- Construct D Street interchange with SR 509.
- Extend SR 167 freeway south between Valley Avenue East and City of Puyallup.
- Grade separate Port of Tacoma Road over railroad tracks at north end of West Blair

Terminal; close Maxwell Avenue west of Port of Tacoma Road.

Phase 4 (2020)

- Extend Alexander over I-5 between SR 99 and 20th Street East.
- Close 11th between Port of Tacoma Road and Portland Avenue.

Operators of autos and trucks will derive substantial economic benefits from a number of these improvements because decreases in congestion will significantly reduce travel times. Producing the greatest transportation savings are Phases 1 and 2 projects that include grade separations at the high-volume Port of Tacoma Road and Lincoln Avenue rail crossings and construction of the SR 167 and SR 509 freeway between Milwaukee Way and I-5.

It is projected that the completion of Phase 2 projects by 2005 will generate yearly transportation savings of $27.2 million. ***Implementing all four phases of projects by 2020 will annually save $42 million in roadway and rail transportation costs.***

RECOMMENDED IMMEDIATE ACTIONS

The Port of Tacoma Tideflats Circulation Study examines transportation options for the Port of Tacoma now and 20 years into the future.

Projects identified as priorities will be presented as a phased implementation strategy by the Legislative Transportation Committee and the Port to the Washington State Legislature for consideration in future funding cycles.

Grade separation and other projects identified by the HDR study team, the Port and the state as priorities are aimed at ultimately resolving the Port's landside congestion problems and preparing the Port's rail and roadway access infrastructure for efficient operations well into the 21st century.

Recommended for immediate action are these critical transportation infrastructure needs:

1. (A) Provide funding for completion of the SR 167 Tier 2 EIS and added access report for connecting SR 167 to I-5. Projected cost, $2 million

1. (B) Design and acquire right-of-way for SR 167 freeway between I-5 and SR 509. Projected cost, $22.4 million.

2. Provide preliminary engineering funds for the Bullfrog Junction rail configuration. Projected cost, $500,000. (Half of this amount would be provided by local public/private funding sources.)

3. Provide preliminary engineering and EIS funds for the D Street grade separation. Projected cost, $1.5 million.

4. Provide construction funds for the Port of Tacoma Road grade separation. Projected cost, $22.2 million.

5. Provide construction funds for grade separation of Lincoln Avenue over railroad tracks at Milwaukee Way. Projected cost, $8.4 million.

Immediately implementing these actions will address the most urgent transportation issues on the Tacoma Tideflats and will provide much-needed momentum for addressing problems identified in the Port of Tacoma Tideflats Circulation Study.

CONSULTANT STUDY TEAM

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Travel Demand Forecast and Analysis: The Transpo Group
Rail Simulation Modeling: Vickerman - Zachary - Miller (TransSystems Corp.)
Rail Operations: MainLine Management
Rail/Truck Modal Splits: Heffron Transportation

Container Economic Impact: BST Associates, under the direction of Paul Sorensen

Executive Summary: Bruce Johnson Communications

Special Thanks to: Tacoma Municipal Belt Line Railway for providing assistance of Ron Ernst, Strategy Associates, Inc.