SOUND TRANSIT

HCT Planning

Sound Transit Phase 2 – South Corridor

LRT Design Report:

– SR 99 and I-5 Alignment Scenarios (S 200th Street to Tacoma Dome Station)

– Tacoma Link Extension to West Tacoma

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FINAL

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1 Foreword

The purpose of this planning effort is to define a *Sound Transit Phase 2* (ST2) light rail transit (LRT) project between S. 200th Street and Tacoma Dome Station via both the I-5 and the SR 99 corridors. Project definitions include a prototypical alignment and representative transit stations. This definition is the primary source of information used to prepare conceptual cost estimates for potential LRT systems serving the South Corridor.

The alignments developed for cost estimating do not presume that a preferred alignment has been selected for the corridor. It is anticipated that this initial effort will be supplemented by additional engineering, alternatives analyses and environmental studies as the project advances.

This design report provides definition for potential Sound Transit ST2 LRT projects in the South Corridor. Under separate reports, similar project definitions and costs have been prepared for potential LRT projects for the North and East Corridors.

Extension of the Link LRT system in the South Corridor fall into two general categories:

1. Extension of Central Link from the planned S. 200th Street Station to Tacoma Dome;

2. Extension of Tacoma Link from its north terminus in downtown Tacoma to Tacoma General Hospital

As part of *Sound Move,* project definition and cost estimates were prepared for a prototypical LRT line between SeaTac Airport and S. 200th Street (see Figure 1 for a map showing the extensions covered in this design report).

For the S. 200th Street/Tacoma Dome Station corridor, two prototypical alignments were developed for LRT extensions. One alignment follows the general SR 99 corridor while the second follows the I-5 corridor. Each corridor was considered in two sections, S. 200th Street to Federal Way Transit Center and Federal Way Transit Center to Tacoma Dome Station. A *blended* approach made up of the I-5 and SR 99 corridors was also considered for the purpose of ST2 financial modeling.

Project definitions included in this design report address prototypical alignments and representative LRT stations. These alignments and stations serve as primary sources of information for conceptual cost estimates of LRT development in the South Corridor.

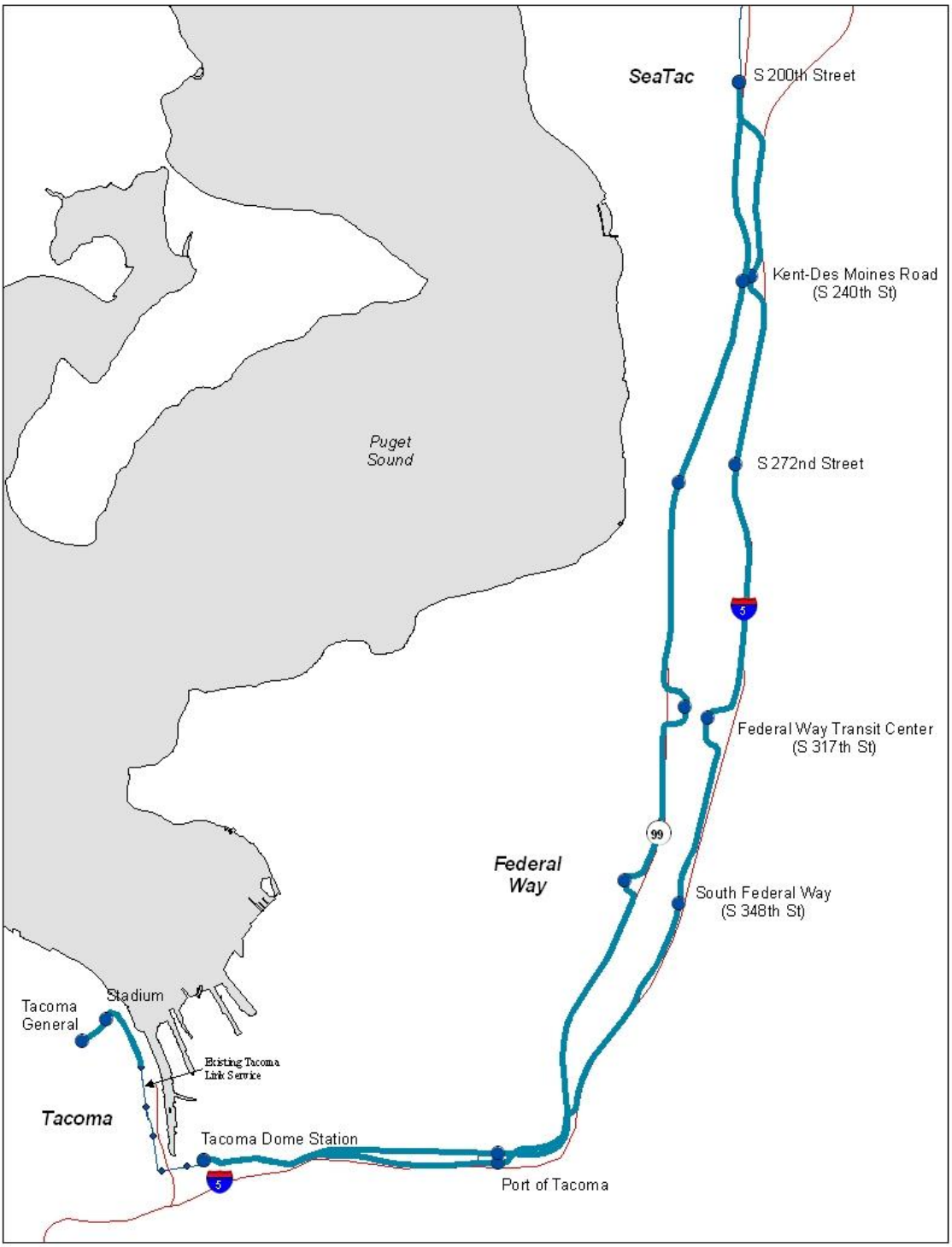
For cost estimating purposes, definitions of potential LRT extensions did not presume a preferred alignment along the affected corridor. As LRT extension projects advance in design and other activities, it is anticipated that the work documented in this report will be supplemented by additional engineering, alternatives analyses, and environmental studies.

This report includes supporting documentation for major design issues, technical assumptions and considerations that were used in estimating costs for potential LRT extensions in the South Corridor. Technical studies and drawings that form the basis of this planning phase are included in Appendix A. Appendix B (provided under separate cover) contains drawings for the I-5 and SR 99 prototypical alignments. Appendix C contains minutes of meetings that took place between Sound Transit and the Washington Department of Transportation (WSDOT). These meetings relate to potential LRT alignments and the relationship with potential future roadway developments in the South Corridor. Appendix D includes sketches relating to LRT alignments in relation to major existing facilities.

Appendix E details the technical work that was carried out on possible LRT crossings of the Puyallup River. Appendix F contains results of a study that considered a section of at-grade LRT alignment between Federal Way and Port of Tacoma. Appendix G details alternative locations that were considered for the Operations and Maintenance Facility for the LRT extensions considered under ST2 and Appendix H (provided under separate cover) contains ROW drawings and cost estimates for potential South Corridor LRT extensions.

Appendix I includes summary descriptions for each potential LRT segment and station that could be constructed in the South Corridor. Estimated costs for the projects follow each description. The information covered in this design report and supporting appendices provide the basis for prototypical cost estimates used in the financial modeling for Sound Transit ST2.

Figure 1: Possible ST2 South Corridor LRT Extensions



2 Summary

Sound Transit's *Long-Range Plan* includes two extensions to existing or future Sound Transit systems in the South Corridor. These include extending light rail from the planned S. 200th Street Station to the Tacoma Dome Station (the extension from Airport Station to S. 200th was identified under *Sound Move)* and extending the existing rail system from the current north terminus of Tacoma Link (Theater District/ S. 9th Street Station) to Tacoma General Hospital.

Under Sound Transit Phase 2 (ST2), further definitions of the South Corridor rail extensions were identified. In the case of the LRT extension from S. 200th to Tacoma Dome Station, two possible prototypical alignments were identified: one following the SR 99 corridor and one following the I-5 corridor. A blended alignment of the two corridors was also considered, this consisted of the SR 99 alignment from S. 200th to Federal Way Transit Center and the I-5 alignment from Federal Way Transit Center Station to Tacoma Dome Station.

In support of the financial analysis portion of the overall ST2 effort, the prototypical LRT extensions were then subdivided into projects each with a unique name, number, and definition. These are discussed in Section 3 of this design report.

2.1 LRT Extension along SR 99 Corridor

A potential extension along the SR 99 corridor includes several segments. For each segment, project scopes and cost estimates were developed for both terminal and non-terminal versions. Terminal versions of a segment will incur higher costs (e.g., provision of tail track) than a non-terminal version. The one exception is *S32A-T5A Link LRT: Extension from Port of Tacoma to Tacoma Dome Station* since the Tacoma Dome Station is assumed to be a terminal station only.

Potential LRT extensions along the SR 99 corridor will include the following component projects.

- Project S28 – Link LRT: Extension from S. 200th Street to Kent-Des Moines Road (S. 240th St) via SR 99;
- Project S29A - Link LRT: Extension from Kent-Des Moines Road (S. 240th St) to S. 272nd Street (Redondo Heights Park-and-Ride) via SR 99;
- Project S30 - Link LRT: Extension from 272nd Street (Redondo Heights Park-and-Ride) to Federal Way Transit Center (S. 317th St) via SR 99;
- Project S31 - Link LRT: Extension from Federal Way Transit Center (S. 317th St) to South Federal Way (S.348th St) via SR 99;
- Project S32 - Link LRT: Extension from South Federal Way (S.348th St) to Port of Tacoma via SR 99;
- Project S32A-T5A - Link LRT: Extension from Port of Tacoma to Tacoma Dome Station via SR 99.

Cost estimates for the each of these projects can be found in Appendix I of this design report.

2.2 LRT Extension along I-5 Corridor

As is the case with the SR 99 corridor, project scopes and cost estimates for the I-5 alignment were developed for both terminal and non-terminal versions. The exception is *S42 – Link LRT: Extension from Port of Tacoma to Tacoma Dome Station* since the Tacoma Dome Station is assumed to be a terminal station only.

Potential LRT extensions along the I-5 corridor will include the following component projects.

- Project S37 – Link LRT: Extension from S. 200th Street to Kent-Des Moines Road (S. 240th St) via I-5;
- Project S38 - Link LRT: Extension from Kent-Des Moines Road (S. 240th St) to S. 272nd Street (Star Lake Park-and-Ride) via I-5;
- Project S39 - Link LRT: Extension from 272nd Street (Star Lake Park-and-Ride) to Federal Way Transit Center (S. 317th St) via I-5;
- Project S40 - Link LRT: Extension from Federal Way Transit Center (S. 317th St) to South Federal Way (S. 348th St) via I-5;
- Project S41 - Link LRT: Extension from South Federal Way (S. 348th St) to Port of Tacoma via I-5;
- Project S42 - Link LRT: Extension from Port of Tacoma to Tacoma Dome Station via I-5.

2.3 Tacoma Link Extension to Tacoma General Hospital

The potential extension of Tacoma Link would consist of a 1.3 mile extension from the existing north terminus at Theater District/S 9th Street Station. Two additional Tacoma Link stations would be provided, at Stadium High School and Tacoma General Hospital. For this segment, scopes and cost estimates were developed for Project *S7B – Link LRT: Extension of Tacoma Link to Tacoma General Hospital with Tacoma Link Technology*.

2.4 Estimated Costs for LRT Extensions

Each of the project descriptions for the HCT segments identified above include cost estimates. These cost estimates are included in Appendix I.

The costs are identified for both alignment scenarios for the potential LRT line between S. 200th and Tacoma Dome Station and for an extension of Tacoma Link to Tacoma General Hospital. The methodology for developing these cost estimates for potential HCT developments is documented in the report, *Cost Estimating Methodology and Documentation* (August 2005).

The cost estimates for potential South Corridor LRT developments are based on two major elements:

1) Conceptual-level project definitions based on ortho-corrected aerial photos (aerial photos have been manipulated to match the Washington State Plan Coordinates, enabling scaleable conceptual engineering drawings to be produced without detail surveys),
2) Unit costs for various project components. The unit costs, expressed in 2006 dollars, are based on information gained from Sound Transit's experience with Link development under *Sound Move*, and are documented in the report *HCT Prototypical Alignment Cost Estimating: Unit Cost Library and Composite Section Costs, May 14, 2007*. These costs were then compared and verified against other LRT projects in the US.

3 Prototypical LRT Alignments in the South Corridor

This section describes segments and stations for potential LRT developments in the South Corridor under ST2. As discussed above under the ST2 program, Sound Transit proposes to extend LRT service between SeaTac (Airport Link Station; opening in 2009) and the existing Tacoma Dome Station via either the SR 99 or I-5 corridors. ST2 also includes a potential Link corridor between the north terminus of Tacoma Link (Theater District/S 9th Street Station) and Tacoma General Hospital.

For the purpose of ST2 financial modeling, a "blended" or hybrid of the SR 99 and I-5 alignments was adopted. As of April 2007, the financial model includes costs for LRT along the SR 99 corridor, from S. 200th Street Station to Federal Way Transit Center Station, and along the I-5 corridor from the Federal Way Transit Center to either the Port of Tacoma or Tacoma Dome (depending on the tax increase scenario assumed).

Further information on potential LRT developments in the South Corridor is described in the following sections. It should be emphasized that, at this stage of project development, representative alignments were used to develop an initial cost estimate. Any final alignments and station locations would be determined through project-level design and environmental review.

3.1 Background for Prototypical LRT Extensions

This section provides background information that was used to define prototypical LRT alignments in the South Corridor. This information includes related planning/engineering/environmental studies, individual project descriptions, and design criteria.

3.1.1 Planning, Engineering, and Environmental Studies

The planning phase for potential LRT extensions in the South Corridor was initiated in November 2005. Initially, this effort included definitions of a prototypical alignment along SR 99 and development of planning level capital cost estimates. In 2006, project definitions and cost estimates were carried out for the alternate I-5 alignment.

The alignment definition and cost estimates were based on ortho-corrected aerial photography, planimetric and topographic mapping carried out in May 2006 for Sound Transit.

For South Corridor LRT projects included in the adopted ST2 Plan, it is anticipated that project-level work will identify and evaluate alternative alignments. This work will include more detailed survey and mapping, utility and geotechnical investigations, planning and technical analyses, engineering studies, public involvement, interagency coordination, and development of detailed cost estimates. Studies also will be performed to identify environmental impacts and to develop appropriate mitigation measures.

Final alignments will be selected only after completion of project-level assessment and environmental review.

3.1.2 Project Definitions

Detailed project descriptions for LRT extensions have been developed for prototypical alignments and transit stations. Items included in the project-specific descriptions include the following:

- Estimated costs broken down by construction, professional services, right-of-way, and contingencies;
- Relationship with other ST2 projects;
- Project Partners;
- Major elements included in the project;
- Key exclusions;
- Evaluation measures; and
- Key Issues & Benefits.

Project descriptions are provided in separate documents published by Sound Transit, including postings to the agency's website. Project descriptions are summarized in Sections 3.2, 3.3, and 3.4.

3.1.3 Design Guidelines

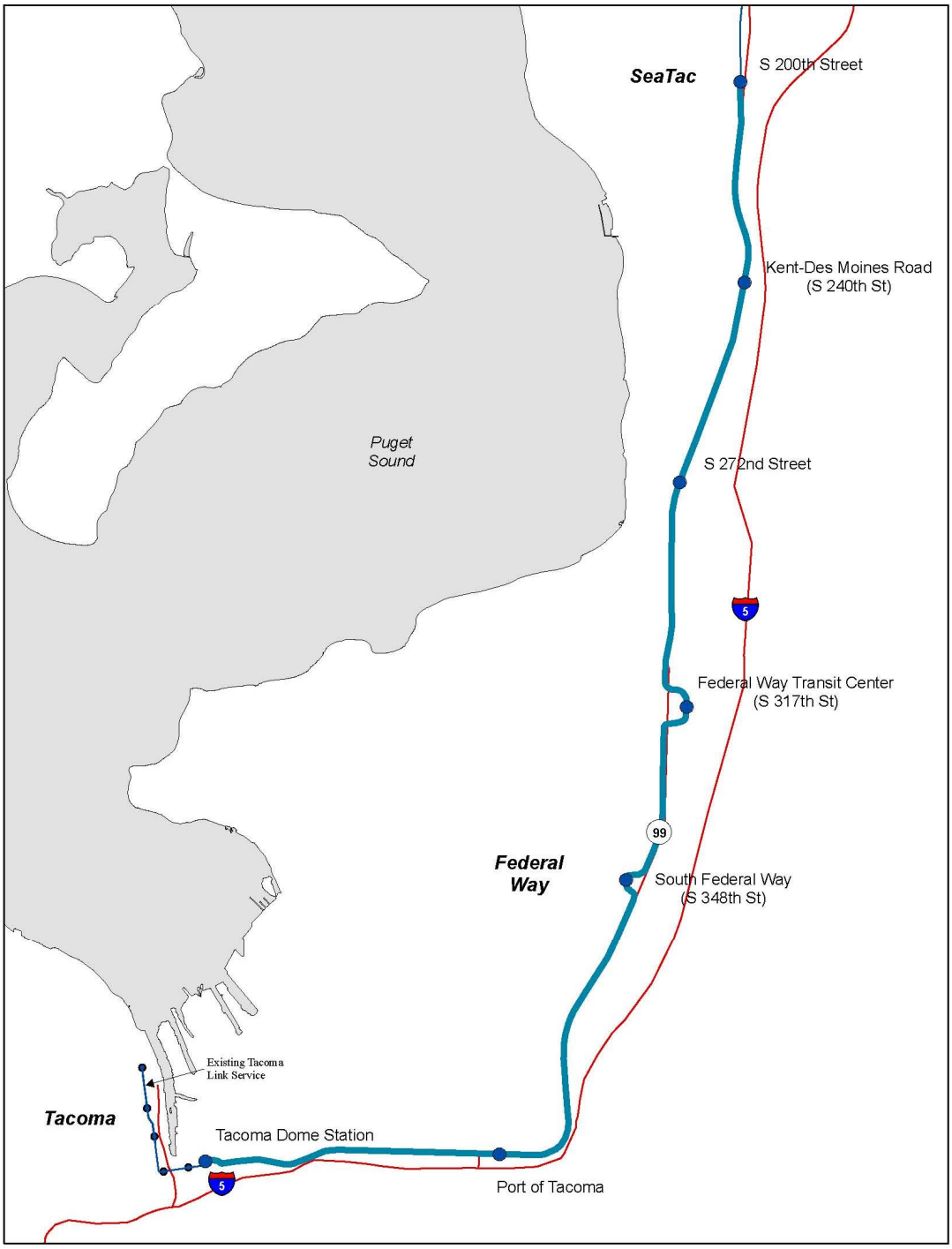
The light rail transit scenarios presented in this section would operate within a dedicated transit right-of-way. The approximately 30 foot-wide guideway accommodates two tracks and it has been assumed that four-car light rail consists would be operated in both directions.

The final alignment would be designed to the current Sound Transit Light Rail Design Criteria. The Sound Transit *Link Light Rail Design Criteria Manual (2001 and 2005)* was used to develop the prototypical alignment and the alignment conforms to current criteria. Deviations from the criteria would be considered during the design phase in order to mitigate impacts and/or reduce right-of-way requirements.

3.2 SR 99 LRT Alignment Scenario

This section presents descriptions of segments and stations that make up the possible light rail line using the SR 99 alignment. LRT segments and station locations are shown in Figure 2 below. Under *Sound Move*, project definition and costs for the segment between SeaTac (Airport Station) and S. 200th Street Station were identified by Sound Transit.

Figure 2: Prototypical SR 99 South Corridor Light Rail Alignment



3.2.1 Prototypical Alignment for SR 99 Scenario

The proposed prototypical SR 99 light rail alignment is estimated to be approximately 17.5 miles (S 200th Street to Tacoma Dome Station). For cost estimating purposes, the prototypical alignment was assumed to be aerial.

By definition, the prototypical alignment is intended to approximate the cost for the alignment and guideway that will be developed during detailed design. It does not represent a preferred alignment and no attempt has been made to optimize the alignment at this early stage of design. A summary of the alignment by type of structure and location is presented in Table 1 below.

Table 1: Alignment Summary SR 99 Scenario

Location	Type of Structure Number & Type of Stations	Approximate Length (ft. / mi.)
S. 200th to Kent-Des Moines Station (Project S28)	Aerial 1 elevated	12,300/2.3
Kent-Des Moines to S. 272nd Street Station (Project S29A)	Aerial 1 elevated	13,300/2.5
S. 272nd Street to Federal Way Transit Center (Project S30)	Aerial 1 elevated	14,900/2.8
Federal Way Transit Center to South Federal Way (Project S31)	Aerial 1 elevated	12,700/2.4
South Federal Way to Port of Tacoma (Project S32)	Aerial 1 elevated	22,400/4.2
Port of Tacoma to Tacoma Dome Station (Project S32A-T5A)	Aerial 1 elevated	17,600/3.3

3.2.2 Project Descriptions (Segment and Stations)

The following sections describe major components of a potential light rail line between S. 200th Street and Tacoma Dome Station using an SR 99 prototypical alignment. Line segments and stations are included in the descriptions. Appendix B.1, provided under separate cover, includes the drawing set, *ST2 – South Corridor S. 200th to Kent-Des Moines (S. 249th Street) via SR 99, November 1, 2005; S. 240th Street to Federal Way Transit Center (317th Street) – via SR 99 May 1, 2006 and Federal Way Transit Center (317th Street) to Tacoma – via SR 99, December 18, 2006.*

During future stages of design as layouts of light rail stations are developed, refinement of the passenger drop-off facilities, local bus transfers and pedestrian connectivity infrastructure would be required. Indicative cost allowances have been included as part

of the prototypical capital cost estimate; however, layouts were not developed at this planning stage of design.

S. 200th Street to Kent-Des Moines (S. 240th Street) - Project S28

The prototypical alignment begins south of the planned light rail station at S. 200th Street and 28th Avenue South and would continue south to SR 99 (Pacific Highway). Along SR 99, the alignment would be located along the west side of the street.

Placement of columns on the west side of the SR 99 right-of-way will require modifications to existing sidewalks and realignment of some property accesses, such that adequate sight lines can be achieved. The project will include road widening and traffic signal modifications along SR 99 at four SR 99 intersections, S. 208th St., S. 216th St., S. 220th St., and Kent-Des Moines Road.

In the Kent-Des Moines area, a center platform aerial station with a ground-level plaza would be located near Highline Community College. The Kent-Des Moines Station also will have the following characteristics:

- Park-and-ride capacity of 500 spaces for use by light rail patrons. The park-and-ride garage should include features limiting its use to light rail patrons only;
- 1% capital cost allowance for art as per the Sound Transit policy;
- Passenger drop-off facilities (approximately 20 bays);
- Local bus transfer facilities at the station (approximately 4 bays);
- Elevated pedestrian walkway between the parking garage and the light rail station;
- Vehicular access improvements at the Kent-Des Moines Station, including one new traffic signal and the upgrade of an existing signal.

Other design features assumed in the capital cost estimate include one track crossover in the vicinity of the Kent-Des Moines Station. In the event that the station is a terminus, other characteristics will need to be included (e.g., provision of tail track to accommodate maneuvering and direction change of the 4-car LRT trains).

Kent-Des Moines Road (S. 240th Street) to S. 272nd Street - Project S29A

The prototypical alignment for this segment begins south of the planned Kent-Des Moines Station and would continue south along the west side of SR 99. Immediately south of the Kent-Des Station, lead tracks could be provided from the line to a possible new operations and maintenance base located to the east. A description for this operations and maintenance project is included in Section 3.4 of this report.

As is the case with Project S28, column placement for the aerial guideway on the west side of the SR 99 right-of-way will require modification to the existing sidewalk and realignment of some property accesses. These changes will allow adequate sight lines along the street.

The 272nd Street Station would be provided on SR 99 south of S. 272nd Street to serve the existing Redondo Heights Park-and-Ride facility. The aerial station is assumed to be center platform with ground-level plaza. Other characteristics of this station include:

- New 500 stall parking structure for use by light rail patrons using the S. 272nd Street Station. It is proposed that the new parking structure will be constructed within the existing Redondo Heights Park-and-Ride right-of-way. (The existing surface park-and-ride lot has 697 stalls, which is under utilized since demand, as of 4th Quarter 2006, is at approximately 40 vehicles);
- New pedestrian bridge across SR 99, connecting the S. 272nd Street Station with the parking structure;
- 1% capital cost allowance for art as per the Sound Transit policy;
- Local bus transfer facilities and passenger drop-off facilities are not included since these are currently provided at the Redondo Heights park-and-ride lot station (approximately 20 bays).

Other design features assumed in the capital cost estimate include one track crossover in the vicinity of the S. 272nd Street Station. In the event that the station is a terminus, other characteristics will need to be included (e.g., provision of tail track to accommodate maneuvering and direction change of the 4-car light rail trains).

S. 272nd Street to Federal Way Transit Center (S. 317th Street) - Project S30

The prototypical alignment for this segment begins south of the planned S. 272nd Street Station and would continue south along SR 99. The alignment continues along the west side of the street for most of the segment until crossing over to the east side of SR 99 in the vicinity of S. 317th Street.

This shift would allow the segment to approach the proposed light rail station located along 20th Avenue South near the existing Federal Way Transit Center.

Characteristics of this station include:

- New pedestrian bridge connecting the proposed light rail station with the existing parking structure at the Federal Way Transit Center. This pedestrian bridge was included for the purpose of developing a prototypical capital cost estimate. During further stages of design development, pedestrian connectivity should be investigated further and may be achieved with at-grade street crossings;
- 1% capital cost allowance for art as per the Sound Transit policy;
- No cost allowances for passenger drop-off facilities and local bus transfer facilities at the station (it was assumed that the existing facilities at the Federal Way Transit Center will be used).

Other design features assumed in the cost estimate include one track crossover in the vicinity of the Federal Way Transit Center Station. In the event that the station is a terminus, other characteristics will need to be included. (e.g., provision of tail track to accommodate maneuvering and direction change of the 4-car light rail trains).

Federal Way Transit Center (S. 317th Street) to South Federal Way (S. 348th Street) - Project S31

After leaving the Federal Way Transit Center Station, the aerial alignment would continue southward along the west side of 20th Avenue South and the north side of S. 320th Street before crossing to the west side of SR 99. South of the Federal Way Transit Center Station, from approximately Sta. 1024+50 to Sta. 1026+50 (see Appendix B1, provided under separate cover, for stationing details), existing Bonneville Power Administration high voltage transmission lines cross the proposed light rail alignment.

For the purpose of developing a prototypical capital cost estimate, an allowance has been included for modifications to the high voltage transmission lines. For cost estimating purposes it was assumed that the transmission lines would need to be raised such that the proposed light rail alignment could pass under the transmission lines with the required clearances for the nominal voltage of the lines. This assumption was developed with Sound Transit Link department engineers, and a nominal allowance of $20 million was adopted and considered adequate to cover the range of possible mitigations that maybe needed during the final design.

During the prototypical alignment development, grade separation by lowering the LRT alignment and placing the guideway into a cut and cover structure was also considered. Sketch ST2J-SK004 in Appendix D illustrates a possible vertical alignment from the I-5 corridor (discussed in later sections of this report), a similar alignment was also considered from the SR 99 corridor and similar issues were identified. Due to complexity with the approach to the proposed Federal Way Transit Center Station and the need to grade separate across S. 317th Street, S. 320th Street and S. 322nd Street it was decided that this alignment was too costly and not suitable for the purpose of development of a prototypical alignment and cost estimate.

Further design development is required to investigate potential alignment profile options that would allow the proposed light rail alignment to cost effectively pass across the transmission lines. No discussions have been carried out with Bonneville Power Administration and further investigations are required into what modifications are allowed for these transmissions lines.

The proposed alignment continues along the west side of SR 99 to S. 348th Street**.** The prototypical alignment provides a light rail station in South Federal Way. The light rail station is proposed to the south of the SR 99 and S. 348th Street intersection. This station would serve the immediate, primarily commercial area, and have pedestrian connectivity to the existing South Federal Way park-and-ride lot to the west of SR 99**.**

Other characteristics of the South Federal Way Station include:

- New 500-space parking structure. This is in addition to the 520 spaces at the existing South Federal Way surface park-and-ride lot;

- New pedestrian bridge connecting the South Federal Way station with the new parking structure and pedestrian connective to the existing South Federal Way park-and-ride;
- No cost allowance for passenger drop off facilities or local bus transfer facilities at station (it was assumed that the existing facilities at the South Federal Way park-and-ride lot would be used);
- 1% capital cost allowance for art as per the Sound Transit policy.

Further design development is required to establish the layout of the proposed station and Park-and-Ride expansion, determine the need for passenger drop off and local bus transfer facilities. Vehicles and pedestrian access requirements to the station and the Park-and-Ride from either SR 99 or S. 348th Street need to be further developed during later stages of design. Indicative cost allowances have been included as part of the prototypical capital cost estimate however layouts were not developed at this planning stage of design.

Other design features assumed in the cost estimate include one track crossover in the vicinity of the South Federal Way Station. In the event that the station is a terminus, other characteristics will need to be included (e.g., provision of tail track to accommodate maneuvering and direction change of the 4-car light rail trains).

South Federal Way (S. 348th Street) to Port of Tacoma (54th Street) - Project S32

After leaving the South Federal Way Station, the representative alignment is assumed to transition to the center of SR 99 and continue south for approximately 2.5 miles. It would then transition to the east side of SR 99, north of the proposed I-5 interchange with SR 167.

The aerial alignment weaves through the proposed SR 167 interchange structures and there is a section of at-grade guideway necessary to pass under the SR 167 structures. On the western side of the proposed SR 167 interchange the prototypical alignment transitions back to an aerial guideway located on the southern side of SR 99. A light rail station (Port of Tacoma Station) is proposed in the vicinity of the SR 99 and 54th Avenue East intersection.

The design of the guideway in this area (near the SR 99/I-5 and proposed SR 167) will require close coordination with WSDOT. As indicated above WSDOT is examining a potential extension of SR 167 to SR 509 and the related ramp connections to I-5. These extensions will affect the potential light rail alignment. The conceptual-level layout for a light rail alignment between South Federal Way and Port of Tacoma Stations recognized potential constraints and opportunities relating to design features of a future I-5 / SR 167 interchange. The layout of the proposed SR 167 interchange has been recognized in developing the prototypical light rail alignment (see Appendix A.3). The LRT alignment drawings are included in Appendix B.1, which is provided under separate cover.

As discussed above, a new Port of Tacoma Station would be provided in the vicinity of SR 99 and 54th Avenue East intersection. This station would serve the nearby employment and commercial areas. Key features of this station include:

- New 500-stall parking garage;
- New pedestrian bridge connecting the Port of Tacoma Station with the new parking structure;
- 1% capital cost allowance for art as per the Sound Transit policy;
- No cost allowance for passenger drop-off facilities or local bus transfer facilities at station.

Other design features assumed in the cost estimate include one track crossover in the vicinity of the Port of Tacoma Station. In the event that the station is a terminus, other characteristics will need to be included. (e.g., provision of tail track to accommodate maneuvering and direction change of 4-car light rail trains).

In addition to the aerial prototypical LRT alignment development in this area, an at-grade scenario was also investigated as part of the planning level work. This investigation is documented in Appendix E. This scenario was not adopted for the purpose of developing a prototypical capital cost estimate. Potential issues relating to a surface alignment included required right-of-way to allow double-track LRT operations on Pacific Highway.

Port of Tacoma (54th Street) to Tacoma Dome Station - Project S32A-T5A

West of the proposed Port of Tacoma Station, the representative alignment transitions to the center of SR 99 for approximately 1.8 miles. The alignment then shifts towards I-5 (to the south of SR 99).

The alignment would cross the Puyallup River on a new bridge to be located parallel to the existing Tacoma Rail bridge. Appendix F further details the issues associated with a light rail crossing of the Puyallup River.

After reaching the west side of the Puyallup River, the aerial alignment for LRT follows the existing Sounder alignment (Commuter Rail) and then the 25th Street alignment. The prototypical light rail alignment terminates on the south side of the existing Tacoma Dome Park-and-Ride structure at a proposed Tacoma Dome Station.

A new Tacoma Dome LRT Station would be provided southeast of the existing Tacoma Dome Park-and-Ride garages. This station would serve the nearby employment and commercial areas, the existing Tacoma Link and Sounder stations and nearby park-and-ride garages (total capacity of approximately 2,400 stalls). A new pedestrian bridge would connect the Tacoma Dome Station with the easternmost parking garage.

Other design features assumed in the cost estimate include:

- 1% capital cost allowance for art as per the Sound Transit policy;

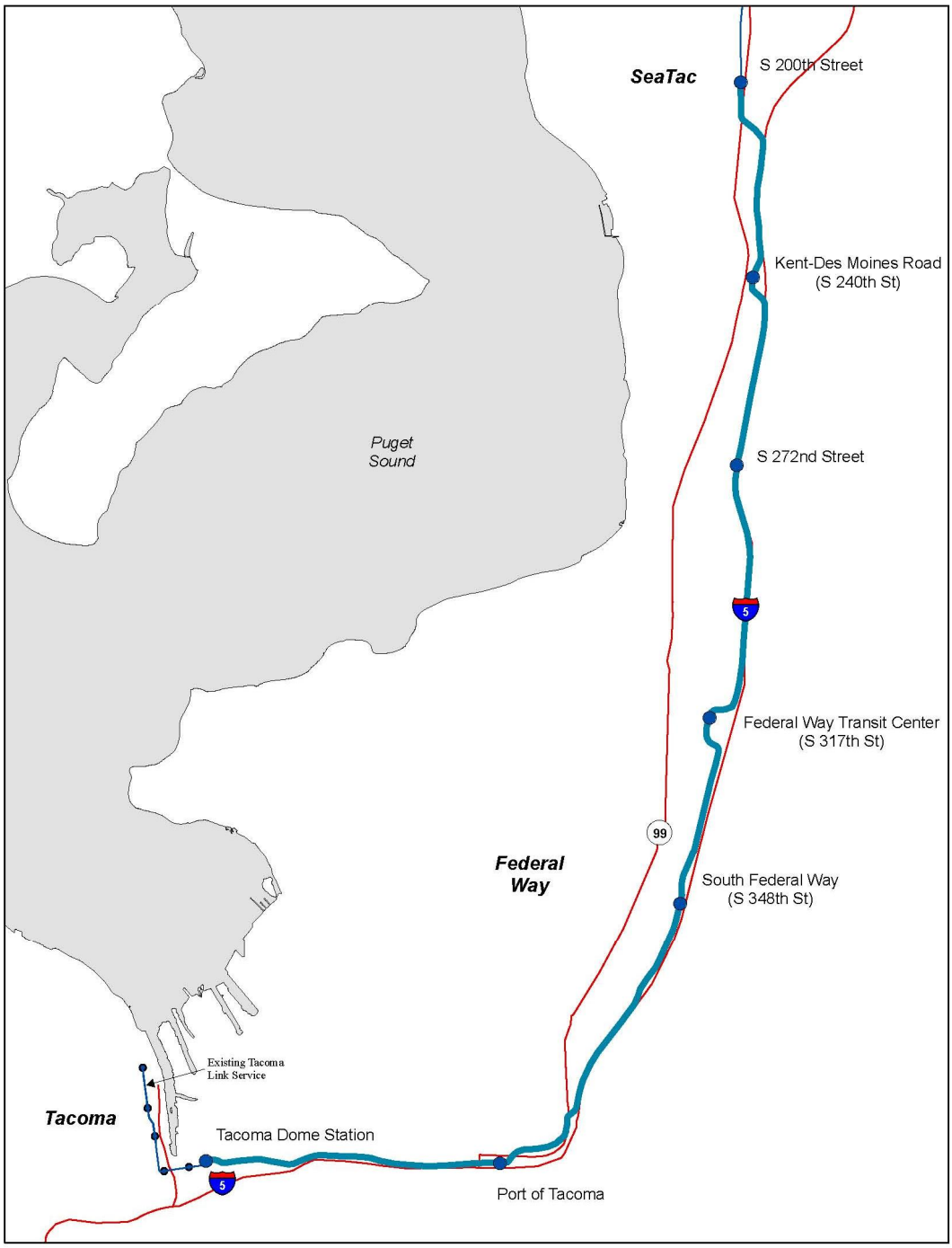
- One track crossover - west of the Tacoma Dome Station;
- One tail track in the vicinity of the Tacoma Dome Station with a pocket track in between. The pocket track would be long enough to accommodate a 4-car LRT train.

Cost allowances have been included as part of the prototypical capital cost estimate However, layouts of the station and investigations into passenger facilities were not developed for this planning stage of design.

3.3 I-5 LRT Alignment Scenario

This section presents descriptions of segments and stations for a light rail line following the I-5 corridor. The light rail segments and station locations are shown in Figure 3.

Figure 3: Prototypical I-5 South Corridor Light Rail Alignment



3.3.1 Prototypical Alignment for I-5 Scenario

The length of the proposed I-5 alignment is approximately 17.4 miles (S. 200th Street to Tacoma Dome Station). The proposed prototypical alignment includes approximately 11.2 miles of aerial guideway, 4.9 miles of retained cut or fill, and 1.3 miles of at-grade/exclusive right-of-way guideway.

The prototypical alignment was developed for capital cost estimating purposes. These estimates provided a basis for costs involving a possible guideway alignment that would be developed during detailed design. The prototypical alignment does not necessarily represent a preferred alignment and no attempt has been made to optimize the alignment at this early stage of design.

A summary of the alignment by location and type of structure and is presented in Table 2 below.

Table 2: Alignment Summary I-5 Scenario

Location	Type of Structure Number & Type of Stations	Approximate Length (ft. / mi.)
S. 200th to Kent-Des Moines Station (Project S37)	Aerial	12,600/2.4
	1 elevated	
Ken-Des Moines to S. 272nd Street Station (Project S38)	Aerial	3,100/0.6
	Retained Cut or Fill	9,100/1.7
	1 elevated	
S. 272nd Street to Federal Way Transit Center (Project S39)	Aerial	7,500/1.4
	Retained Cut or Fill	9,800/1.9
	1 elevated	
Federal Way Transit Center to South Federal Way (Project S40)	Aerial	8,100/1.5
	At Grade/Exclusive ROW	2,000/0.4
	Retained Cut or Fill	1,200/0.2
	1 elevated	
South Federal Way to Port of Tacoma (Project S41)	Aerial	13,900/2.6
	At Grade/Exclusive ROW	1,600/0.3
	Retained Cut or Fill	5,100/0.9
	1 elevated	
Port of Tacoma to Tacoma Dome Station (Project S42)	Aerial	14,400/2.7
	At Grade/Exclusive ROW	3,000/0.6
	Retained Cut or Fill	850/0.2
	1 elevated	

3.3.2 Project Descriptions for the I-5 Scenario (Segment and Stations)

The following sections describe major components for a potential prototypical light rail alignment between S. 200th Street and Tacoma Dome Station following the I-5 corridor. Line segments and stations are included in the descriptions.

Appendix B.2, provided under separate cover, includes the drawing sets, *S. 200th Street to Federal Way Transit Center (317th Street) – via I-5*, (October 27, 2006) and *ST2 – South Corridor Federal Way Transit Center (S 317th St) to Tacoma: HCT Prototypical Alignment – I-5* (September 22, 2006).

During future stages of design, as layouts of light rail stations are developed, refinement of the passenger drop off facilities, local bus transfers, and pedestrian connectivity infrastructure is required. Cost allowances have been included as part of the prototypical capital cost estimate; however, layouts were not developed at this planning stage of design.

S. 200th Street to Kent-Des Moines (S. 240th Street) - Project S37

The prototypical alignment begins south of the planned LRT station at S. 200th Street and 28th Avenue South. After leaving the station, the alignment would continue south along 28th Avenue until S. 206th Street. At S. 206th Street and SR 99, the alignment will veer to the southeast along the proposed SR 509 extension.

The LRT alignment would be situated on the east side of the SR 509 extension as it approaches I-5. Before reaching I-5, the light rail alignment would crossover SR 509 so that it would be located west of the new collector-distributor road paralleling I-5.

Large water storage tanks are located on the west side of the LRT alignment at approximately Sta. 54+00 to Sta. 59+00 (see Appendix B.2, provided under separate cover, for stationing location details). It has been assumed that the prototypical alignment can pass between the water tanks and the proposed widened western outer edge of the I-5. Appendix D contains Sketch ST2H-SK003 which illustrates the clearances assumed for the prototypical LRT alignment in this area.

As the line proceeds south along the west side of I-5, the prototypical alignment is a mix of aerial and at-grade guideway within an exclusive right-of-way. The alignment in this area follows the I-5 corridor takes into consideration WSDOT's layout for the future collector-distributor road.

At approximate Sta. 80+00 to Sta. 82+50 (see Appendix B2, provided under separate cover, for stationing location details) the prototypical alignment passes between an existing Puget Sound Energy Substation and the proposed WSDOT I-5 collector – distributor road. Sketch ST2H-SK004 contained in Appendix D illustrates the alignment in this area.

To the south of the substation the at-grade alignment passes under existing Puget Sound Energy high voltage transmission lines at approximate Sta. 83+00. Further design

development is required to investigate potential alignment profile options that would allow the proposed light rail alignment to cost effectively pass across the transmission lines. Discussions have not yet been carried out with Puget Sound Energy at this stage of planning. Further investigations are required as to what alignment mitigations or possible modifications that may be required for these transmissions lines.

The light rail alignment continues south transitioning back to aerial guideway and crossing Kent-Des Moines Road. South of Kent-Des Moines Road the alignment follows 30th Avenue South. A center platform aerial station has been assumed on the west side of 30th Avenue South. The light rail station located east of Highline Community College will be connected to the campus via a pedestrian bridge spanning SR 99. Other features of the Kent-Des Moines Station include the following:

- Park-and-ride capacity of 500 spaces for use by light rail patrons. The park-and-ride garage should include features limiting its use to light rail patrons only;
- Elevated pedestrian walkway between the parking garage and station;
- 1% capital cost allowance for art as per the Sound Transit policy;
- Passenger drop off facilities at the station (approximately 20 bays);
- Local bus transfer facilities at the station (approximately 4 bays);
- Vehicular access improvements at the Kent-Des Moines Station, including a new traffic signal and the upgrade of an existing signal.

Kent-Des Moines Road (S. 240th Street) Station to S. 272nd Street - Project S38

From the proposed Kent-Des Moines station on 30th Avenue South, the alignment shifts to the southeast and gradually transitions to surface guideway. As the prototypical alignment approaches I-5, it will have a north-south orientation. In this general area, lead tracks would be provided from the line to a possible new operations and maintenance base located to the east. This base would accommodate additional light rail vehicles required for extension of the system. A description and related cost estimates for this project are included in Section 3.4 of this design report.

The alignment would continue at-grade along the east side of the existing Midway Landfill. Due to the expected settlement characteristics of this landfill, a cost allowance for special structures to support the at-grade guideway has been assumed. Repairs to the upper membrane of the landfill may be required following installation of this structure. General discussions were held with the design team members involved in the capping of the Midway Landfill and some documentation of the landfill's characteristics was provided. Further design development is required to determine the necessary mitigations necessary for any LRT guideway to be constructed on the edge of the Midway Landfill.

South of the landfill, the prototypical alignment would transition to aerial guideway and continue on the west side of I-5 to S. 272nd Street. At S. 272nd Street a station would be provided between I-5 and the southbound off-ramp. The LRT station would be located east of the existing Star Lake park-and-ride lot and will be connected to this lot via a pedestrian bridge. The layout of the proposed WSDOT single point interchange (see Appendix A.6) was considered with the orientation of the station, however further details

on this WSDOT project will be required during design development of the LRT alignment and station location.

Other features at the S. 272nd Street Station include the following:

- Park-and-ride structure of 500 spaces for use by light rail patrons;
- Elevated pedestrian walkway between the parking garage and the station, above the interchange off-ramp;
- 1% capital cost allowance for art as per the Sound Transit policy;
- Passenger drop off facilities at the station (approximately 20 bays);
- Local bus transfer facilities at station (approximately 4 bays).

Other design features assumed in the cost estimate include one track crossover in the vicinity of the S. 272nd Street Station. In the event that the station is a terminus, other characteristics will need to be included (e.g., provision of tail track to accommodate maneuvering and direction change of the 4-car light rail trains).

S. 272nd Street to Federal Way Transit Center (S. 317th Street) - Project S39

After leaving the elevated S. 272nd Street Station, the prototypical alignment would continue south along the west side of I-5. South of Military Road the topographic features allow the alignment to transition to an at-grade guideway.

The line would remain mostly at-grade until just north of the S. 317th Street direct access ramp (see Appendix A.7 for HOV direct access details). The alignment transitions to aerial guideway to pass over the roundabout for the direct access ramp to I-5 and veers southwest to follow the south side of S. 317th Street. As the alignment approaches 23rd Avenue South, it turns south and follows the east side of 23rd Avenue South.

A light rail station would be located south east of the existing Federal Way Transit Center on the east side of 23rd Avenue South. Features at the prototypical Federal Way Transit Center LRT station include the following:

- New pedestrian bridge connecting the proposed light rail station with the existing parking structure at the Federal Way Transit Center. This pedestrian bridge was included for the purpose of developing a prototypical capital cost estimate, during further stages of design development pedestrian connectivity should be investigated further and may be achieved with at-grade street crossings;
- 1% capital cost allowance for art as per the Sound Transit policy;
- No capital cost allowance included for park-and-ride facility (assumed that the existing Federal Way Transit Center parking will be used);
- Capital cost allowances for passenger drop off facilities at the station (approximately 20 bays);
- Capital cost allowances for local bus transfer facilities at the station (approximately 4 bays).

Other design features assumed in the cost estimate include one track crossover in the vicinity of the Federal Way Transit Center Station. In the event that the station is a terminus, other characteristics will need to be included (e.g., provision of tail track to accommodate maneuvering and direction change of the 4-car light rail trains).

Federal Way Transit Center (S. 317th Street) to South Federal Way (S.348th Street) - Project S40

The prototypical alignment for this segment begins south of the planned light rail station at the Federal Way Transit Center. After leaving the elevated station, the alignment continues south along the east side of 23rd Avenue S. After crossing 322nd Avenue S., the alignment shifts to the southeast over the existing surface park-and-ride lot.

South of the Federal Way Transit Center Station, existing Bonneville Power Administration high voltage transmission lines cross the proposed light rail alignment. For the purpose of developing a prototypical capital cost estimates, an allowance was included for modifications to the transmission lines. For cost estimating purposes it was assumed that the transmission lines would need to be raised such that the proposed aerial LRT alignment could pass under the transmission lines with the required clearances according to the voltage of the lines.

This assumption was developed with Sound Transit Link Department engineers, and a nominal allowance of $20 million was adopted and considered adequate to cover the range of possible mitigations that may be considered during final design. During the prototypical alignment development, grade separation by lowering the LRT alignment and placing the guideway into a cut and cover structure was also considered. Sketch ST2J-SK004 in Appendix D illustrates a possible vertical alignment from the I-5 corridor.

Due to complexity with the approach to the proposed Federal Way Transit Center Station and the need to grade separate across S. 317th Street, S. 320th Street and S. 322nd Street it was decided that this alignment was too costly and not suitable for the purpose of development of a prototypical alignment and cost estimate.

Further design development is required to investigate potential alignment profile options that would allow the proposed light rail alignment to cost effectively pass across the transmission lines. Also, discussions have not yet been carried out with Bonneville Power Administration and further investigations are required as to what modifications would be allowed for any modifications to these transmissions lines. Appendix D also contains site photos of the existing high voltage transmission lines.

As the LRT alignment approaches I-5, it shifts parallel to the southbound lanes. At this point, the alignment transitions to at-grade in retained cut or fill. North of S. 333rd Street in Federal Way, the guideway transitions back to an aerial alignment due to the topographic features in this area and the need to cross existing roadways.

Since WSDOT's proposed *Triangle* project will reconfigure the existing I-5/S. 348th Street interchange, it has been assumed that the LRT guideway will cross above the proposed interchange ramps, including S. 348th Street. Discussions between Sound Transit and WSDOT have taken place (see Appendix C for meeting minutes June 7, 2006) and the layout of the proposed Triangle project has been recognized in developing the prototypical light rail alignment. The Triangle Project alignment is shown in drawings included in Appendix A.2

South of S. 348th Street, the proposed South Federal Way Station would be located between the existing Home Depot property and the west side of I-5. It is proposed that the station will be connected via a pedestrian bridge to a new park-and-ride garage located west of the station within existing commercial property.

Other features at the South Federal Way Station include the following:

- Park-and-ride structure for 500 spaces for use by light rail patrons and 250 replacement parking spaces for Home Depot;
- 1% capital cost allowance for art as per the Sound Transit policy;
- Cost allowances for passenger drop off facilities at the station (approximately 20 bays);
- Cost allowances for local bus transfer facilities at the station (approximately 4 bays);
- Revised access roads for passengers access the proposed Park-and-Ride and Station facilities.

Further design development is required to establish the layout of the proposed station and Park-and-Ride facility, to determine the need for passenger drop-off and local bus transfer facilities. Vehicle and pedestrian access requirements to the station and the park-and-ride garage from S. 352nd Street or I-5 need to be further developed during later stages of design. Cost allowances have been included as part of the prototypical capital cost estimate; however, layouts were not developed at this planning stage of design.

Other design features assumed in the cost estimate include one track crossover in the vicinity of the South Federal Way Station. If the station is a terminus, other characteristics will need to be included (e.g., provision of tail track to accommodate maneuvering and direction change of the 4-car light rail trains).

South Federal Way (S. 348th Street) to Port of Tacoma (54th Street) - Project S41

The prototypical alignment continues south of the proposed light rail station at South Federal Way along the west side of I-5. The guideway passes over the proposed WSDOT Triangle Project off-ramp connection to SR 161 and then continues south. South of S. 375th Street, the proposed alignment transitions to an at-grade alignment for approximately one mile. North of Porter Way, the proposed alignment then transitions back to an aerial guideway due to the existing topography and the need to clear roadways.

The aerial alignment weaves through the proposed WSDOT SR 167 interchange structures. Also, there is a section of at-grade guideway necessary to pass under potential future SR 167 structures. On the western side of the proposed SR 167 interchange, the prototypical alignment transitions back to an aerial guideway located on the north side of I-5.

The design of the guideway near the SR 99/I-5 and proposed SR 167 will require close coordination with WSDOT. Sound Transit and WSDOT met on 24 July for initial discussion (see Appendix C for meeting minutes). As indicated above, WSDOT is examining a potential extension of SR 167 to SR 509 and associated ramp connections to I-5. These extensions will affect the potential light rail alignment.

The conceptual-level layout for a light rail alignment between South Federal Way and Port of Tacoma Stations recognized potential constraints and opportunities relating to design features of a future I-5 / SR 167 interchange. The layout of the proposed SR 167 interchange has been recognized in the development of the prototypical LRT alignment. Appendix A.3 details the proposed WSDOT project layout at the time of this report.

A light rail station (Port of Tacoma) is proposed on the east side of the I-5/ 54th Avenue East interchange. This station would serve the nearby employment and commercial areas. Key features of this station include:

- New 500-stall parking garage;
- 1% capital cost allowance for art as per the Sound Transit policy;
- New pedestrian bridge connecting the Port of Tacoma Station with the new parking structure;
- Cost allowance for passenger drop-off facilities at station (approximately 20 bays); and
- Cost allowance for local bus transfer facilities at station (approximately 4 bays).

Other design features assumed in the cost estimate include one track crossover in the vicinity of the Port of Tacoma Station. In the event that the station is a terminus, other characteristics will need to be included (e.g., provision of tail track to accommodate maneuvering and direction change of the 4-car light rail trains).

Port of Tacoma (54th Street) to Tacoma Dome Station - Project S42

Following the proposed Port of Tacoma Station the prototypical aerial alignment continues west along the north side of I-5 right-of-way. South of 54th Avenue East, the guideway type transitions between at-grade and aerial guideway on the north side of I-5. The layout of the proposed WSDOT HOV program has been recognized in the development of the prototypical LRT alignment in this area. Appendix A.4 details the proposed WSDOT project layout at the time of this report.

To cross the Puyallup River, a new separate bridge parallel to the existing I-5 bridge location has been assumed for cost estimating purposes. Further work on location and design features of this new bridge would have to be closely coordinated with WSDOT

design for a potential new I-5 river crossing. Appendix E contains further detail the issues associated with a light rail crossing of the Puyallup River.

After crossing the Puyallup River, the light rail alignment would be located on the north side of existing Tacoma Rail/Sounder commuter rail tracks. It then follows East 25th Street until reaching its terminus at the existing Tacoma Dome Station.

A new Tacoma Dome LRT Station would be provided southeast of the existing Tacoma Dome Park-and-Ride garages. This light rail station would serve nearby employment and commercial areas, the existing Tacoma Link and Sounder stations as well as the adjacent parking garages (total current capacity of approximately 2,400 stalls). A new pedestrian bridge would connect the new Tacoma Dome LRT station with the easternmost parking garage.

Other design features assumed in the cost estimate include:

- 1% capital cost allowance for art as per the Sound Transit policy;
- One track crossover - east of the Tacoma Dome Station;
- One tail track in the vicinity of the Tacoma Dome Station with a pocket track in between. The track would be long enough to accommodate 4-car trains.

Allowances have been included as part of the prototypical capital cost estimates. However, layouts of the station and investigations into passenger facilities were not developed for this planning stage of design.

3.4 Operations and Maintenance Facility

This section describes a prototypical operations and maintenance facility to support potential light rail extensions in the South Corridor. This facility, in terms of size and location, would be the same for either the SR 99 or I-5 light rail alignments.

A preferred site for the future maintenance facility has not yet been adopted and further engineering is required before this can be determined. However, for the development of the prototypical alignment Sketch ST2J-SK023 in Appendix D provides a possible prototypical layout for the operations and maintenance facility. This layout was assumed for the purpose of developing a representative capital cost estimate. The assumed base location is on the west side of I-5, south of S. 240th Street (adjacent to the highway) and north of the Midway Landfill. To establish a prototypical cost estimate, a large commercial property ROW impact was assumed.

Other site locations along the South Corridor were considered for a potential LRT maintenance and operations base. However, several constraints such as topography and space needs presented major challenges for locating a base that would support the fleet size necessary for LRT service to Pierce County. Appendix G contains further information on possible operations and maintenance base locations that were considered during this stage of design.

For potential light rail extensions from Airport Station to S. 200th and Kent-Des Moines Stations, sufficient storage and maintenance capacity will be available at Sound Transit's Forest Street operations and maintenance base. However, a new base would be needed to accommodate additional light rail vehicles required for LRT extensions south of Kent-Des Moines Road Station.

3.4.1 Lead Tracks to the Operations and Maintenance Base

For the purpose of developing the prototypical capital cost estimate, it was assumed that a new light rail operations and maintenance facility would be provided immediately south of the Kent-Des Moines Station (for either the SR 99 or I-5 alignment options) between I-5 and SR 99. Lead tracks would be provided from either main line option to the new base.

For an SR 99 alignment, a wye-shaped junction has been assumed for cost estimating purposes. This junction will allow access to the base from the north or south. For the I-5 alignment, the lead track would be provided from the mainline to the operations and maintenance base. Compared to the SR 99 alignment, the extent of lead track for the I-5 alignment scenario will be less, as the mainline would be located closer to the maintenance facility and at the same elevation.

3.4.2 Base Capacity

The maintenance and operations facility capacity would be sufficient to accommodate the future light rail extension to Tacoma. Also, storage and servicing capacity would be provided to support potential light rail extensions in the North Corridor beyond Northgate. The base layout and other design features have assumed accommodation of a 104-vehicle light rail fleet. This capacity is based on preliminary estimates by Sound Transit staff for the number of vehicles required to support potential LRT extensions in the South and North Corridors. With completion of the Draft ST2 Plan, a more detailed estimate of required maintenance and operations base capacity will be identified.

With the goal of servicing and storing a fleet of 104-fleet vehicles, the prototypical cost estimate of the facility was based on the design that was developed for Sound Transit's Forest Street operations and maintenance base. Several maintenance facility layouts were developed based on possible variations in the required numbers of LRT vehicles. However, for the purpose of developing a capital cost estimate, it was decided that the layout for the existing Forest Street base would be used as a basis. Further design development of the possible maintenance base in the South Corridor will be necessary for the final site chosen and for the light rail system needs.

3.4.3 Major Activities for the Operations and Maintenance Facility

As stated above, for planning level cost estimating purposes, it was assumed that the South Corridor maintenance base would have the same functions as the existing Forest Street facility. However, all functions of the existing Forest Street base may not need to be duplicated and further design development is required to determine required maintenance needs at this new base.

The following are construction elements that were used to develop both the unit quantity relationships (square foot of buildings to overall site size, etc.) as well as the composite unit cost (for example, cost per square foot of building). This information was used to identify cost estimates for the proposed heavy maintenance facility on the South Corridor.

Maintenance and Storage Facility Buildings

- Light Rail Vehicle Wash Facility
- Maintenance of Electrical Facilities Building
- Maintenance of Way Building
- Prefabricated Supervisors Office Building
- Prefabricated Entry Station Building
- Steel Carport
- Prefabricated Inspector's Office / Toilet Building
- Prefabricated Utility Closet
- Mezzanine Storage System
- Service and Cleaning Area

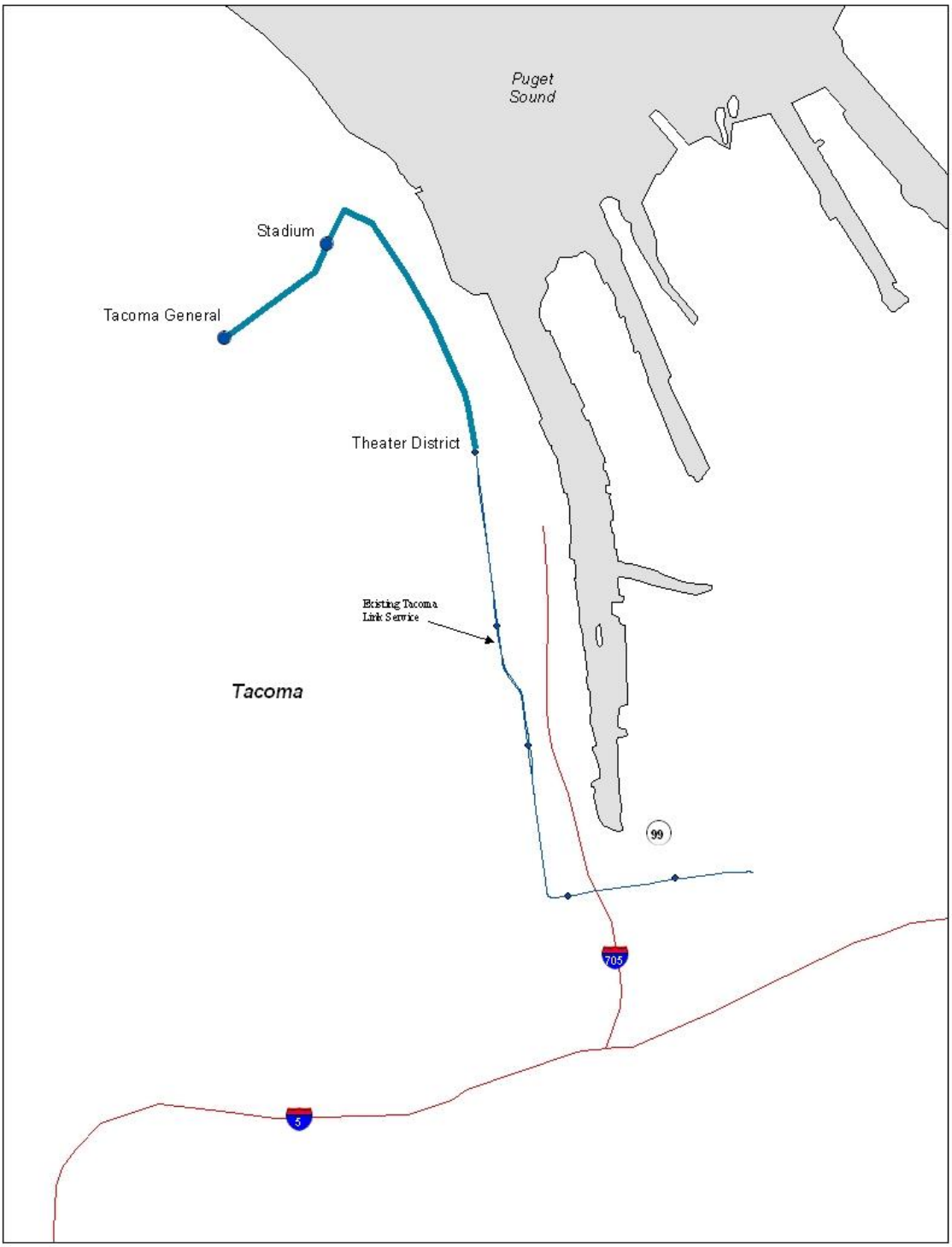
Maintenance and Storage Facility Equipment - Heavy Allowance

- Underfloor Wheel Profiling System
- Jib Cranes
- Rail Yard Shuttle
- Turntables – 60,000 lbs
- Monorail Cranes System
- Compressed Air Equipment
- Vehicle Lifts
- Truck Lift with Turntable
- Truck Repair Lift
- Bridge Crane – 10 Ton MOE
- Bridge Crane – 2 Ton MOW
- Dock Lifts
- LRV Washer System
- Sand Distribution Equipment
- Industrial Waste System
- Parking Control Equipment
- Spray Paint Booth
- Portable Rail Car Lifts
- Turntables – 16,000 lbs.

3.5 Tacoma Link Extension to Tacoma General Hospital

This section presents descriptions of segments and stations for a Streetcar Tacoma Link extension to Tacoma General Hospital. The extension would be from the existing Tacoma Link Station at Commerce and S. 9th Streets to Tacoma General Hospital. The segments and stations are shown in Figure 4.

Figure 4: Tacoma Link Extension to Tacoma General Hospital



3.5.1 Prototypical Alignment for Tacoma Link Extension to Tacoma General Hospital

For the extension to Tacoma General Hospital, the prototypical alignment would include new at-grade, semi-exclusive guideway located on existing streets. This prototypical extension is approximately 1.3 miles (from the existing 9th Street/Theater District Station to Tacoma General Hospital). Two new Tacoma Link Stations are included in the extension; at Stadium High School and Tacoma General Hospital.

The prototypical alignment, by definition, is intended to approximate the cost for the alignment and guideway that will be developed during detailed design. It does not necessarily represent a preferred alignment and no attempt has been made to optimize the alignment at this early stage of design.

A summary of the alignment by location and type of structure and is presented in Table 3 below.

Table 3: Alignment Summary: Tacoma Link Extension to Tacoma General Hospital

Location	Type of Structure Number & Type of Stations	Approximate Length (ft. / mi.)
9th Street/Theater District Station/Stadium HS/Tacoma General Hospital	At-Grade Structure/Semi-Exclusive 2 at-grade	6,600/1.3

3.5.2 Project Descriptions for Tacoma Link Extension to Tacoma General Hospital (Project S7B)

The following sections describe a potential extension of Tacoma Link between the current north terminus at Theater District/S 9th Street and Tacoma General Hospital. Line segments and stations are included in the descriptions.

Track Extension and Stations

The potential Tacoma Link extension would involve semi-exclusive, at-grade operations. General traffic will not be mixed with LRT vehicles (Tacoma Link technology); however, crossing by general traffic of the rail line would be permitted at street crossings. The prototypical alignment begins at the existing Link station located at S. 9th and Commerce Streets.

The extension will include 1.3 miles of double track and two new rail stations. Stadium High School Station would serve the nearby high school and commercial areas. The General Hospital Station would serve Tacoma General, Mary Bridge Children's Hospital, and nearby commercial and residential areas.

Existing on-street parking would be eliminated to accommodate light rail tracks in the center median as well as two general-purpose travel lanes on either side. Exclusive left turn lanes at some signalized intersections would also be eliminated.

The technology for this extension would be similar to existing Tacoma Link vehicles. As is the case with Tacoma Link vehicles, the cars for the extension would operate as single units. Consistent with existing segments of Tacoma Link, the line and station will be designed to accommodate two-car trains in the future.

Appendix B.3, provided under separate cover, includes the drawing set, *ST2 HCT Planning/South Corridor HCT Prototypical Alignment and Station Locations – West Tacoma Link Extension. (November 1, 2005).*

3.5.3 Additional Vehicles and Maintenance/Operations Base Needs

To support the potential extension of Tacoma Link to Tacoma General Hospital, two additional vehicles would be required. These vehicles would be similar to existing Tacoma Link cars.

The two additional vehicles would be stored at the existing Tacoma Link maintenance and operations base located in Tacoma on 25th Street and McKinley Avenue. A previous assessment of a potential Tacoma Link extension indicated that two additional vehicles can be serviced and stored at the existing Tacoma Link maintenance facility[1]. The report also noted that since the facility's existing shop has space for three vehicles, it would be necessary to store two additional cars in the existing yard. Cost estimates for the extension to Tacoma General Hospital include allowances for modifying the existing maintenance and operations base to permit storage of two additional vehicles.

3.6 Alternative Approaches to LRT Extensions in Pierce County

In addition to the potential LRT alignments described in Section 3.4 and 3.5, other scenarios were examined. These scenarios included extensions of LRT from downtown Tacoma to South King County or west from the current terminus at 9th Street/Theater District. The LRT extension from downtown Tacoma to South King County (Federal Way Transit Center Station) would require a new operations and maintenance base. For costing purposes, the base would be located near the site of the proposed Port of Tacoma LRT station.

There are various constraints relating to a potential LRT extension from downtown Tacoma to South King County. One major constraint is that it would result in a service gap between Federal Way and SeaTac.

[1] *Tacoma Extension Feasibility Study*; prepared for Puyallup Tribe of Indians by Sound Transit (March 2004)

4 Basis of Project Definition

This section describes the basis for the project definitions of potential light rail extensions in the South Corridor. The section also identifies major work elements that will be required as design develops in the future.

4.1 Civil Engineering

4.1.1 Base Mapping

All base mapping, photography, topographic, and right-of-way information used to develop the prototypical alignment was based on aerial photography and mapping carried out in May 2006. Where feasible, supplemental information on planned/proposed projects within the corridors was considered. Examples included descriptions by WSDOT of project limits for potential new or expanded roadways.

Preliminary aerial photography and mapping limits were identified for a potential LRT extension between S. 200th Street Station and Tacoma Dome Station; for both the SR 99 and I-5 corridors. A digital terrain model (DTM) was developed based on the photogrammetry-based definition.

4.1.2 Utilities

Utility studies were not prepared for initial definition of prototypical alignments. Also, no utility surveys, test pits, or pot holes were prepared as part of the utility investigations for the prototypical alignment. These activities will be required during future design phases.

Other anticipated utility work will include protecting and relocating typical existing utilities that would be impacted by construction. Except for high tension power lines, existing aerial utilities impacted by HCT construction would be placed underground as required by municipal code.

4.2 Right of-Way Issues

Anticipated property impacts from potential LRT extensions in the South Corridor were identified as part of cost estimates for the prototypical alignment. Potential right-of-way impacts and cost estimates were developed using 2005 parcel maps, property reports, appraised land and appraised improvement information available from King and Pierce County GIS Center information sources. Sound Transit Real Estate staff provided estimates of property valuations for the parcels impacted by potential LRT extensions.

Property valuations are assumed to be either “partial acquisitions” or “full acquisitions” of impacted parcels. Subsequent design will confirm the extent of any right-of-way requirements, including temporary and permanent easements necessary for construction and operation of light rail extensions in the South Corridor. The following sections further describe major right-of-way issues for potential light rail extensions in the South Corridor.

Details of the ROW assumptions for each LRT segment and stations considered are included in Appendix H which is provided under separate cover. This appendix also includes ROW drawings and cost estimates.

4.2.1 SR 509 Extension

For potential light rail extensions along I-5, the prototypical layout includes (but not exclusive) use of WSDOT right-of-way for the SR 509 project. This project would extend SR 509 south of Sea-Tac Airport to I-5. Partial use of WSDOT right-of-way is also anticipated along the collector-distributor road on the west side of I-5 where acquisition of private properties will be necessary.

It has been assumed that the majority of the properties along the proposed SR 509 project will be purchased by WSDOT and that LRT will be constructed after this occurs. Sound Transit will still need to purchase some remnants of parcels from WSDOT and some full properties from private owners in this area.

4.2.2 SR 99 Alignment

The prototypical light rail alignment along SR 99 was assumed to use existing public right-of-way as much as practical. However, some partial takes of private property will be anticipated as a result of possible modifications to existing sidewalks and driveways.

For cost estimating purposes, allowances have been included for possible visual impacts on commercial properties due to the location of aerial guideway.

4.2.3 Maintenance and Operations Base

Substantial right-of-way would be required for a maintenance and operations base supporting the potential light rail extensions. For cost estimating purposes, it has been assumed that commercial property located south of the Kent-Des Moines Station between SR 99 and I-5 will be required. This is indicative only and was assumed to capture a representative right-of-way cost for the project.

4.2.4 Potential New SR 167/I-5 Interchange

A potential light rail extension between South Federal Way and Port of Tacoma will include segments located in the area of a proposed I-5/SR 167 interchange. It has been assumed that the majority of properties in this area will be purchased by WSDOT and that LRT will be constructed after these purchases occur. Sound Transit will still need to purchase some remnants of parcels from WSDOT and some full properties from private owners in this area.

4.2.5 Construction Staging Areas

Construction of the HCT guideway will occur in constrained areas and developed urban centers. For cost estimating purposes, indicative construction staging areas were identified for the representative alignment using existing parcel information. However, the final location and the extent of areas will be determined during later stages of design on the final alignment.

Areas assumed for construction staging are approximately two acres of contiguous properties at each station location. If distances between stations are greater then 1.5 miles, an additional one acre (approximately) was assumed adjacent to the alignment. The construction staging areas assumed were identified on the right-of-way drawing sets contained in Appendix H which is provided under separate cover.

4.3 Structural

Several types of structures have been identified for potential LRT extensions along the South Corridor. These include aerial, retained cut or fill, and surface. The following sections further describe these structure types.

4.3.1 Aerial Guideway

The aerial guideway is assumed to be a combination of girder arrangements and bent configurations including single track simple span girders, double track continuous cross-over girders, and three-track continuous cross-over girders. It is anticipated that the aerial guideway will generally be constructed using pre-cast concrete structures, although some of the girders will be cast-in-place concrete due to irregular geometry.

The prototypical alignment assumes the foundations to be large diameter drilled shafts. In the absence of geotechnical data, a shaft diameter of 10 foot and depth of 100 feet was used in preparing cost estimates. The size and depth of the shafts will be developed during follow-up design. These details will be based on geotechnical investigation and analyses.

4.3.2 Retained Cut/Fill

The prototypical alignment includes several segments that will include either retained cut or retained fill structures. These structures will be located on a potential I-5 alignment and would mostly occur on the west side of I-5 between S. 200th and South Federal Way. Additional opportunities for retained cut/retained fill segments are limited due to topographic features and the need to cross existing roadways.

A number of earth retaining systems could be constructed, including cantilever retaining walls, structural earth or mechanically stabilized embankments, boat sections or U-sections, tie back walls, tangent pile walls, braced walls, gravity walls, soldier pile and lagging walls, and combinations of these. Each of these systems is cost effective in certain applications. For the purpose of estimating, drilled shaft structural walls were generally assumed.

4.3.3 Semi-Exclusive Surface

For the potential Tacoma Link extension to Tacoma General Hospital, the alignment would be on semi-exclusive surface streets. Along the transitway, rail cars would operate on exclusive right-of-way; however, general purpose traffic could cross the tracks at several intersections. The street arrangement assumed would be similar to the guideway for the Central Link Project located along Martin Luther King Junior Way South in Seattle.

4.4 Geotechnical

No geotechnical information was collected as part of this concept engineering phase.

5 Environmental Considerations

Potential environmental impacts of the HCT system will be identified during subsequent environmental studies. Appropriate mitigation measures will also be defined to address these impacts.

A partial list of anticipated environmental issues identified during development of the prototypical LRT alignments includes:

- For a prototypical alignment along SR 99, some support columns will be located on public school property.
- Also along a potential SR 99 alignment, support columns will be located near Todd Beamer High School.
- For a potential LRT alignment along I-5 north of Kent-Des Moines Road, there may be a need to remove existing multi-family housing.
- Along a potential I-5 alignment environmental considerations will apply to locating tracks on the existing Midway Landfill.

6 Third Party Coordination

In defining the potential light rail extensions, meetings were held with WSDOT staff. These meetings addressed highway projects located along potential light rail extension alignments. Appendix C contains minutes for these meetings. The following further describe these coordination efforts.

6.1 SR 509 Extension

On May 31, 2006 a meeting was held with WSDOT personnel who are involved with design of the SR 509 extension/collector-distributor road on I-5. Key issues discussed at the meeting included:

- Need to maintain commitment to communities to provide buffers between roadway and residential areas; 5 to 15 foot buffer.
- Potential approaches to alignment of the LRT extension in the vicinity of existing water tanks; between South 211th Street to South 220th Street.
- Potential interference between light rail foundations and the proposed WSDOT wall tiebacks.
- Roadway and light rail alignment near existing substation.
- Light rail alignment on Midway Landfill and potential remediation efforts.

6.2 Triangle Project

A meeting held was on June 7, 2006 with WSDOT personnel who are involved with design of a new connection between I-5, SR 18, and SR 161 (Enchanted Parkway). Key issues discussed at the meeting included:

- There will likely be additional general purpose lanes and shoulders on I-5 in the area of the Triangle Project.

- Two branches of the Hylebos Creek pass through the WSDOT project; based on WSDOT meetings with regulatory agencies, there is no year-round water in the secondary branch of the creek in the vicinity of a potential future light rail station (southwest quadrant of I-5 and S. 348th Street).
- Alignment locations for light rail will need to keep in mind the new Todd Beamer High School located in South Federal Way.
- WSDOT and Sound Transit reviewed potential alignment modifications that could avoid Todd Beamer High School, proposed new off-ramps, and an existing wetland.
- WSDOT to provide electronic files showing footprint of the Triangle Project, including channelization and right-of-way details.

6.3 I-5 HOV Lanes in Tacoma

A meeting was held on November 6, 2006 with WSDOT staff involved with design of HOV lanes on I-5 in the vicinity of Tacoma. The project is examining a potential new I-5 crossing of the Puyallup River.

- New I-5 bridges could be located south of the existing structure, to be built as a two phase project, a single phase of construction being preferred.
- No modification of the Port of Tacoma Road/ I-5 interchange is included in the project.

7 Systems

The following describe major system-level components for potential light rail extensions.

7.1 Communications

Station systems are anticipated to include closed circuit television (CCTV), emergency telephones, public address system, access control and security system, emergency management panel; variable message signs (VMS), Supervisory Control and Data Acquisition (SCADA), and tunnel radio distribution systems. Station systems also include power supply, ticket vending machine (TVM) and public telephone, power and communications raceways.

Except for a potential Tacoma Link extension to Tacoma General Hospital, centralized command and control for light rail service will continue to be provided at Union Station in Seattle. This service will be provided for Central Link and potential future extensions along the North, East, and South Corridors. For a potential Tacoma Link extension to Tacoma General Hospital, command and control would be provided at the existing operations and maintenance base in Tacoma.

7.2 Signals

Transit signal systems include insulating joints, wayside signals, signal bungalows and/or equipment cases and/or signal rooms, duct-banks and signals equipment and foundations. Non-transit signal systems are anticipated to include municipal traffic and pedestrian signal system, including foundations for traffic signals modified by the prototypical alignment.

7.3 Electrical Systems

Electrical systems include lighting luminaires, poles, controls and branch circuits, mechanical equipment branch circuits, power distribution system and utility services for tunnels, stations, ancillary rooms, and station plaza areas.

Mechanical systems include controls and requirements for SCADA control and monitoring. Other electrical systems include luminaires/poles and design electrical circuits and services for municipal roadway and pedestrian way lighting impacted by LRT construction.

7.4 Traction Power

Power requirements include traction power substations (TPSS), feeders and control equipment, duct bank and vault systems along with the associated site grading, fencing and drainage. The traction power system will be an overhead contact system (OCS) with pole foundations along at-grade and aerial segments. Stray current control and cathodes protection details will be included as required.