Discipline Report

Visual Quality

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Magnolia Bridge Replacement

City of Seattle

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Purpose and Need

Purpose

The purpose of this project is to replace the existing Magnolia Bridge structure, approaches, and related arterial connections with facilities that maintain convenient and reliable vehicular and non-motorized access between the Magnolia community and the rest of the City of Seattle. The bridge provides an important link to the Magnolia community in Seattle (see Figure 1 and Figure 2). Since the existing bridge also provides the only public vehicular access to the land between North Bay, also referred to as Terminal 91, Smith Cove Park, Elliott Bay Marina, and U.S. Navy property, the project purpose also includes maintenance of access to these areas.

Need

Structural Deficiencies

The City of Seattle has identified the Magnolia Bridge as an important bridge that should remain standing following a "design" seismic event (an earthquake with a peak ground acceleration of 0.3g that is anticipated to happen every 475 years and may measure 7.5 on the Richter Scale). Even with the repairs completed following the February 2001 earthquake, the existing bridge is susceptible to severe damage and collapse from an earthquake that is less severe than the "design" seismic event.

The original bridge was constructed in 1929 and has been modified, strengthened, and repaired several times. The west end of the bridge was damaged by a landslide in 1997, requiring repair and replacement of existing bridge columns and bracing, the construction of six additional supports, and a retaining wall north of the bridge to stabilize the bluff from further landslides. Repairs after the 2001 earthquake included replacement of column bracing at 27 of the 81 bridge supports. A partial seismic retrofit of the single-span bridge structure over 15th Avenue West was completed in 2001. The other spans were not upgraded.

Inspections of the bridge conclude that the concrete structure is showing signs of deterioration. The concrete is cracking and spalling at many locations, apparently related to corrosion of the reinforcing steel. The bridge requires constant maintenance in order to maintain its load capacity, but there does not appear to be any immediate load capacity problem. The existing foundations have insufficient capacity to handle the lateral load and uplift forces that would be generated by a "design" seismic event. The existing foundations to not extend below the soils that could liquefy during a "design" seismic event. If the soils were to liquefy, the foundations would loose their vertical load carrying ability and the structure would collapse.

System Linkage

There are three roadway connections from the Magnolia community, of over 20,000 residents, to the rest of Seattle. As the southernmost of the three connections, the Magnolia Bridge is the most direct route for much of south and west Magnolia to downtown Seattle and the regional freeway system.

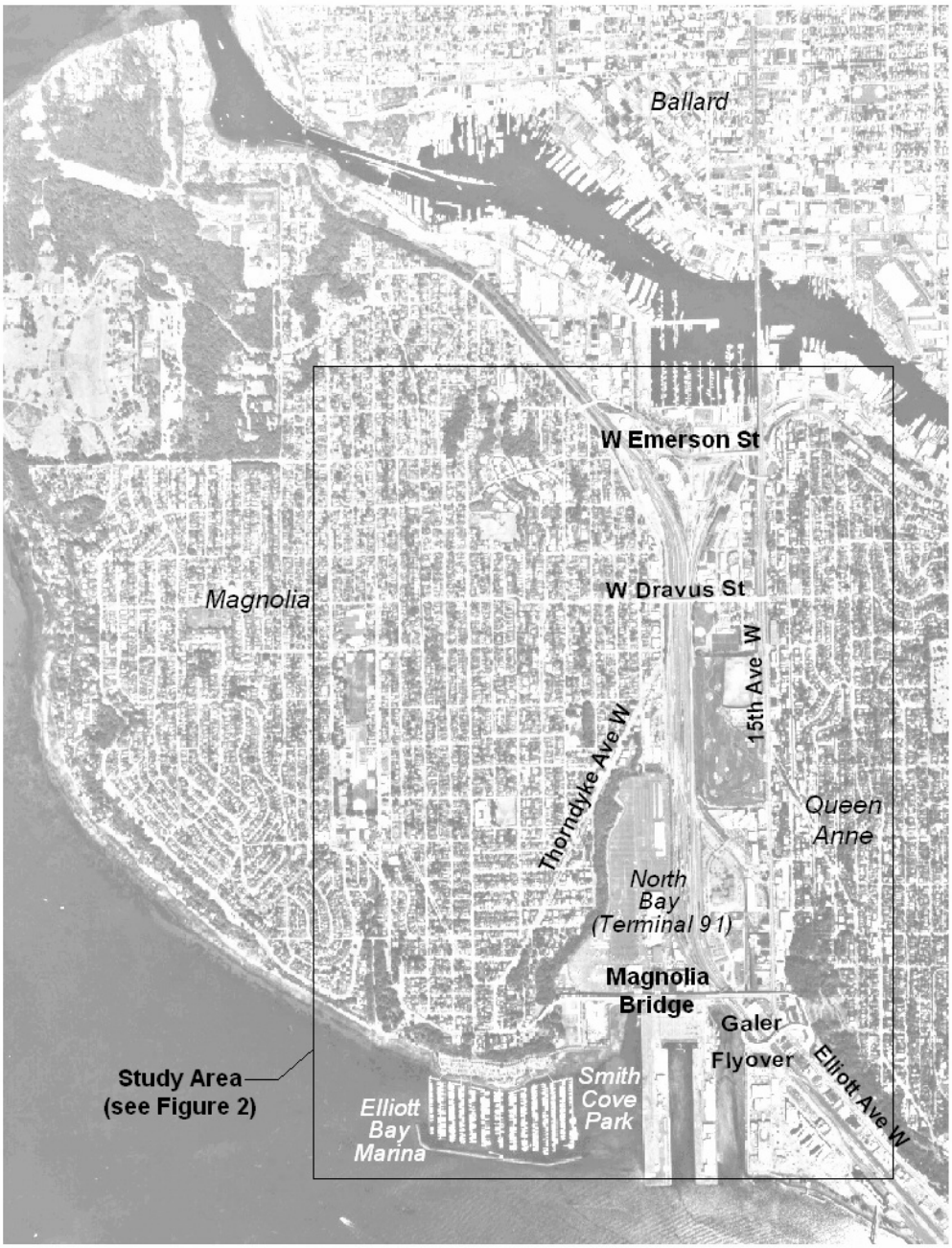


Figure 1
Vicinity Map

In meetings with the public and the Seattle Fire Department, the importance of this route for emergency services has been emphasized. The loss of use of this bridge in 1997 and again in 2001 demonstrated to the City that the remaining two bridges do not provide acceptable operation. During the bridge closure following the February 2001 earthquake, the City addressed community concerns about reduced emergency response time to medical facilities outside of Magnolia by 24-hour stationing of paramedics at Fire Station 41 (2416 34th Avenue West).

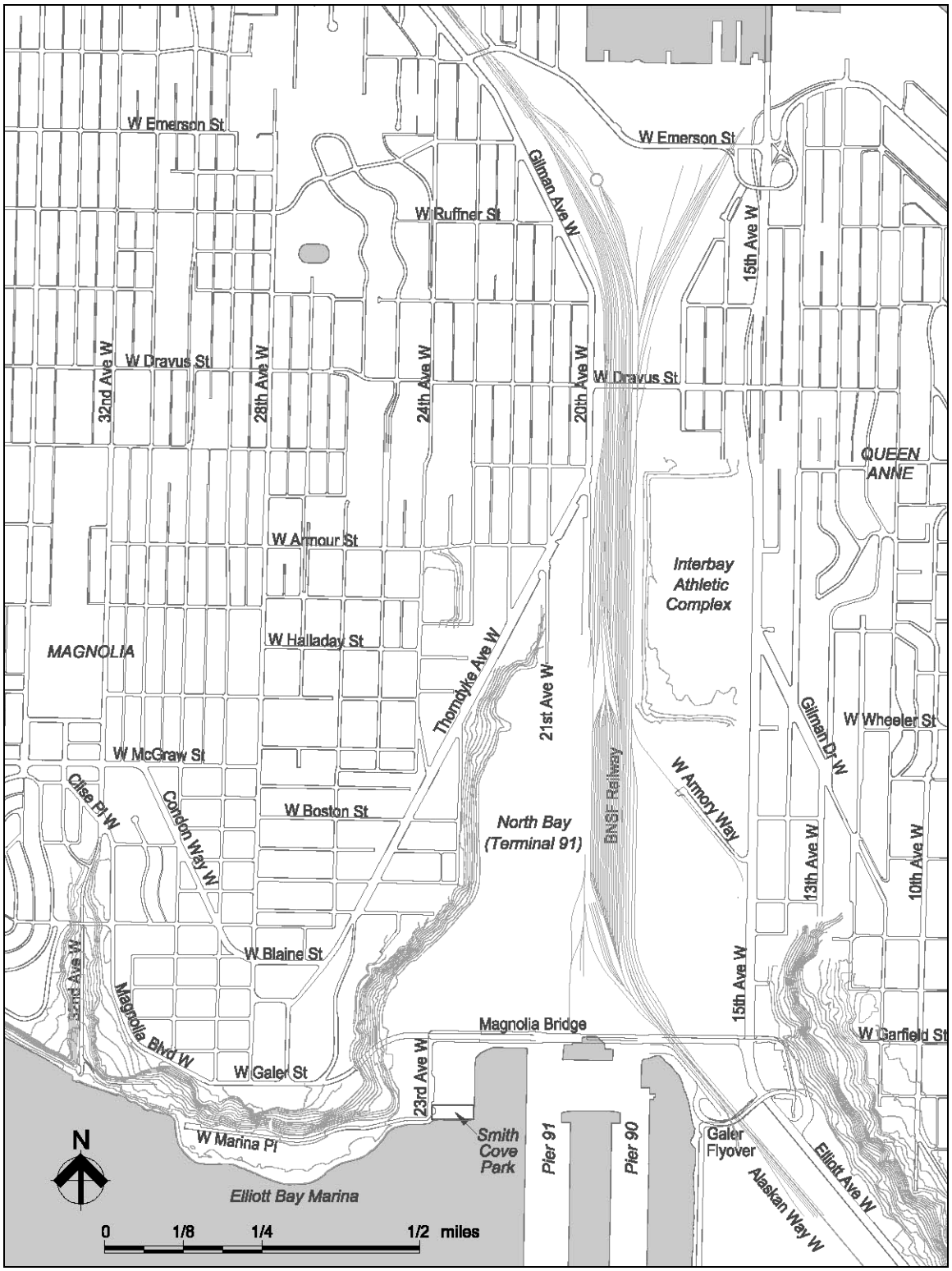


Figure 2
Study Area

Traffic Capacity

The three Magnolia community connections to the 15th Avenue West corridor are adequate for the present volume of traffic. Each of the three connections carries about 30 to 35 percent of the 60,100 daily vehicle trips (2001 counts) in and out of the Magnolia community. Loss of the use of the Magnolia Bridge for several months after the February 2001 earthquake, and in 1997 following the landslide at the west end of the bridge, resulted in lengthy 15 to 30 minute delays and increased trip lengths for many of the users of the Magnolia Bridge. These users were required to use one of the two remaining bridges at West Dravus Street and West Emerson Street. Travel patterns in the Magnolia community changed substantially resulting in negative impacts on local neighborhood streets. The increase of traffic through the West Dravus Street and West Emerson Street connections also resulted in congestion and delay for the regular users of these routes. Losing the use of any one of these three bridges would result in redirected traffic volumes that would overwhelm the capacity of the remaining two bridges.

Modal Interrelationships

The Magnolia Bridge carries three of the four local transit routes serving Magnolia and downtown Seattle destinations. The topography of the east side of Magnolia, East Hill, would make access to the 15th Avenue West corridor via the West Dravus Street bridge a circuitous route for transit. Use of the West Emerson Street connection to 15th Avenue West would add significant distance and travel time for most trips between Magnolia and downtown Seattle.

The Magnolia Bridge has pedestrian facilities connecting the Magnolia neighborhood to Smith Cove Park and Elliott Bay Marina as well as to 15th Avenue West/Elliott Avenue West. These facilities need to be maintained. The Elliott Bay multi-use trail connects Magnolia with downtown Seattle through Myrtle Edwards Park. The trail passes under the Magnolia Bridge along the west side of the BNSF rail yard, but there are no direct connections to the bridge.

Bicycle facilities on the Magnolia Bridge need to be maintained or improved. Even with the steep (about 6.3 percent) grade, bicyclists use the Magnolia Bridge in both directions. There are no bike lanes on the bridge, so bicyclists use the traffic lanes and sidewalks. Once bicyclists cross the bridge, they must either travel with motor vehicles on Elliott Avenue West or find a way back to the Elliott Bay Trail using local east-west streets such as the Galer Flyover.

Transportation Demand

The existing Magnolia Bridge provides automobile access for Port of Seattle North Bay (Terminal 91) to and from the Elliott Avenue West/15th Avenue West. Truck access between Terminal 91 and Elliott Avenue West/15th Avenue West is accommodated via the Galer Flyover. Future planned expansion of the Amgen facility on Alaskan Way West and redevelopment of underutilized portions of North Bay and other areas of Interbay will increase demand for traffic access to the Elliott Avenue West/15th Avenue West corridor. The Port of Seattle has a master planning process underway (July 2003) for its North Bay property (Terminal 91) and the Washington National Guard property east of the BNSF Railway between West Garfield Street and West Armory Way. This area contains 82 acres available for redevelopment. There are also 20 or more acres of private property available for

redevelopment east of the BNSF Railway between West Wheeler Street and West Armory Way. Redevelopment of the North Bay property will include public surface streets with connections to the replacement for the Magnolia Bridge. Forecasts of future (year 2030) traffic demand indicate that the access provided by the Galer Flyover and West Dravus Street would be inadequate. The capacity provided by the existing Magnolia Bridge or its replacement would also be needed.

Legislation

Seattle Ordinance 120957, passed in October 2002, requires the Magnolia Bridge Replacement Study: identify possible additional surface roads from Magnolia to the waterfront (avoiding 15th Avenue West and the railroad tracks); obtain community input on the proposed roads; and identify the cost for such road and include it in the total cost developed in the Magnolia Bridge Replacement Study.

An alignment study process was implemented to help identify the specific bridge replacement alternatives to be studied in the EIS. Twenty-five concepts were developed and screened against the project goals and objectives. This resulted in nine alignment alternatives, identified as A through I, that merited further analysis. These nine went through an extensive public review and comment process as well as project screening criteria and prioritization. Initially, the top four priority alternatives, A, B, D, and H, were identified to be studied in the EIS. Early on, Alternative B was eliminated because it became clear that it violated City shoreline policies and Federal section 4(f) criteria. Upon detailed traffic analysis Alternative H was eliminated because two key intersections were predicted to function at a level of service F and could not be mitigated. The next priority, Alternative C, was then carried forward for analysis in the EIS.

Independent of this project, A new north-south surface street will be constructed on Port of Seattle property connecting 21st Avenue West at the north end of North Bay with 23rd Avenue West near Smith Cove Park. In addition, a southbound ramp will be added to the Galer Flyover to accommodate eastbound to southbound Elliott Avenue West traffic movements. The Galer Flyover ramp has been identified as a needed improvement for expected future development of property west of the railroad tracks. New surface streets through the Port of Seattle property will be located through the Port's master planning process for the North Bay property. The north-south surface street and ramp are assumed to exist in any build alternative, but are not part of this environmental process.

Typical sections and plans of the build and no-build alternatives are located at the end of this section.

No Build Alternative

The No Build Alternative, shown in Figure 3 and Figure 5, would maintain the existing bridge structure in place with the existing connections at the east and west ends. Long term strategies for maintaining the existing structure would be required for the No Build alternative. To keep the existing bridge in service for over ten years, the following would need to be accomplished:

- An in-depth inspection of the bridge would be required to determine needed repairs and a long-term maintenance program.
- Concrete repairs would be required. These repairs could include injection of cracks with epoxy grout, repair of spalled concrete, and replacement of deficient concrete and grout.
- Preservation measures to slow corrosion of the reinforcement would be required. These measures could include a cathodic protection system.
- Any structural elements that lack the capacity to carry a tractor-trailer truck with a 20-ton gross trailer weight would need to be identified, modeled, and strengthened.

Alternative A

Alternative A would replace the existing bridge with a new structure immediately south of the existing bridge as shown in Figure 4 and Figure 6. The alternative would construct a signalized elevated intersection (Alternative A – Intersection) in the bridge's mid-span to provide access to the waterfront and the Port of Seattle North Bay property from both the east and the west. Connections at the east and west ends of the bridge would be similar to the existing bridge.

An optional half-diamond interchange (Figure 7 Alternative A - Ramps) could be constructed in lieu of the elevated intersection to provide access to the waterfront and the Port of Seattle North Bay property to and from the east only.

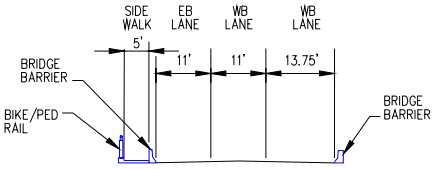
Alternative C

Alternative C would provide 2,200 feet of surface roadway within the Port of Seattle North Bay property between two structures as shown in Figure 4 and Figure 8. The alternative would descend from Magnolia Bluff on a structure running along the toe of the slope. The alignment would reach the surface while still next to the bluff, before turning east to an intersection with the north-south surface street. The alignment would continue east from the intersection, turning south along the west side of the rail yard. The alignment would rise on fill and structure, turning east to cross the railroad tracks and connect to 15th Avenue West.

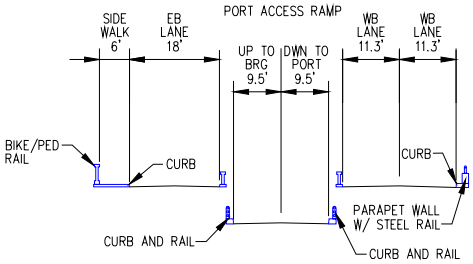
Alternative D

Alternative D would construct a new bridge in the form of a long arc north of the existing bridge, as shown in Figure 4 and Figure 9. Connections at the east and west ends of the bridge would be similar to the existing bridge. This alternative would construct a signalized elevated intersection (Alternative D – Intersection) in the bridge mid-span to provide access to the waterfront and Port of Seattle North Bay property from both the east and the west.

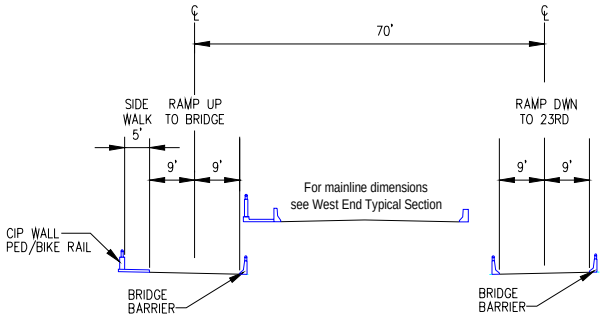
An optional half-diamond interchange (Figure 10 Alternative D - Ramps) could be constructed in lieu of the elevated intersection to provide access to the waterfront and the Port of Seattle North Bay property to and from the east only.



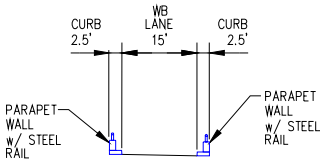
Bridge West End



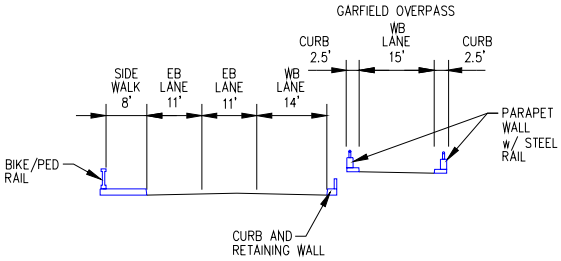
Ramp to Port Access



Ramps to 23rd Avenue West



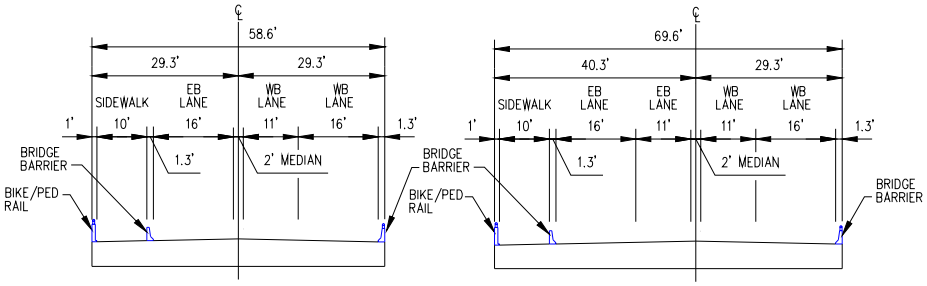
Garfield Overpass



15th Avenue West Connection
Eastbound Off-Ramp
Westbound On-Ramp

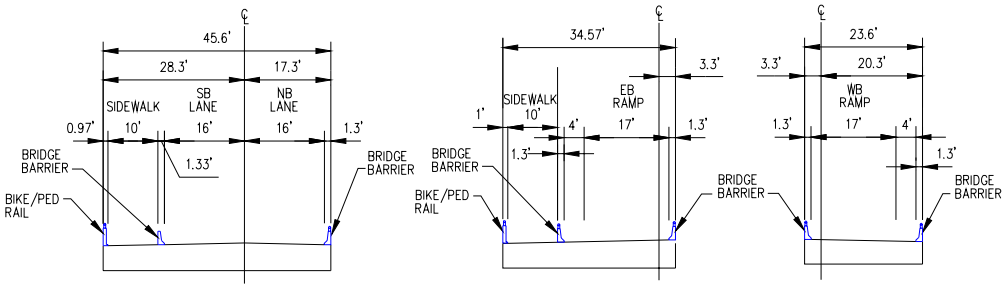
NOTE:
Dimensions are approximate and obtained from construction plans and aerial photographs. The information shown has not been field verified.

Figure 3
Typical Sections – No Build Alternative



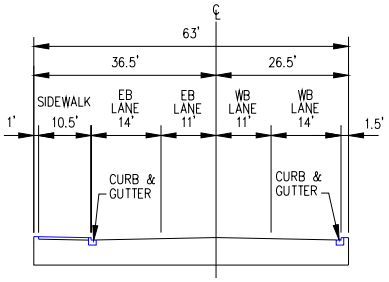
West End East End

Typical Bridge Structure

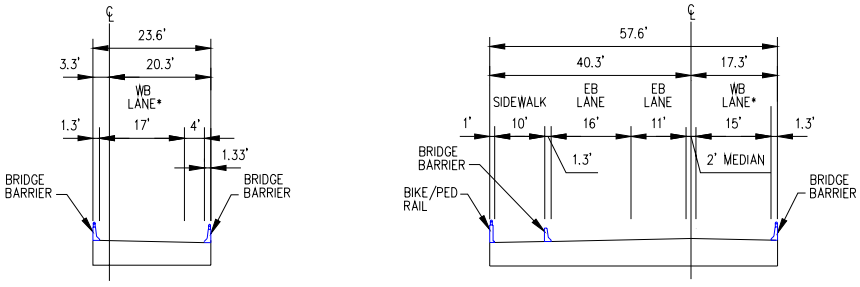


T-Ramp On-Ramp Off-Ramp

Typical A & D Intersection Option Typical A & D Ramp Option



Typical Alternative C Surface Road



Garfield Overpass

* 15' Alternative C
19' Alternative D

15th Avenue West Connection

Eastbound Off-Ramp
Westbound On-Ramp

* 16' Alternative D

Figure 4
Typical Sections – Build Alternatives

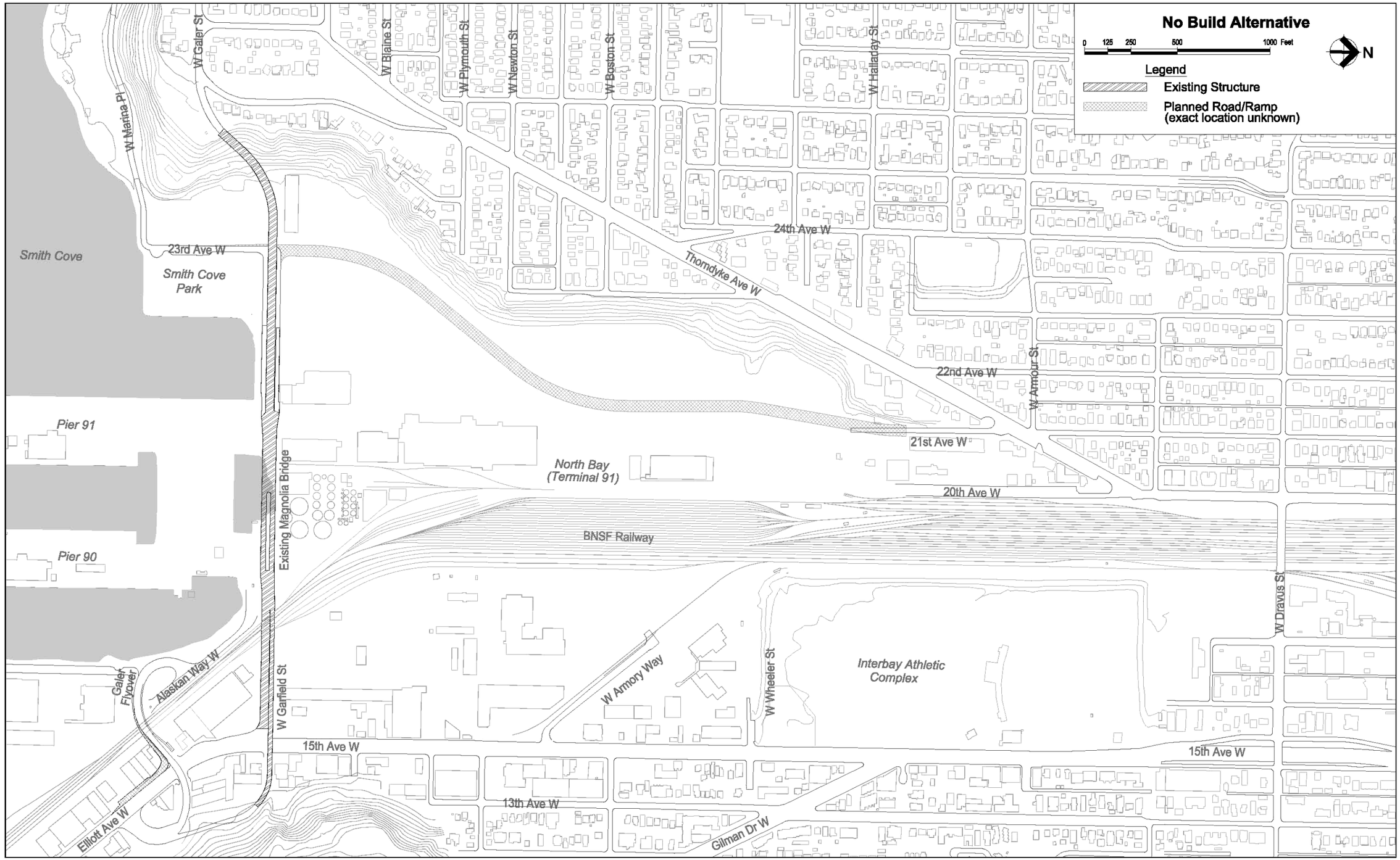


Figure 5 No Build Alternative

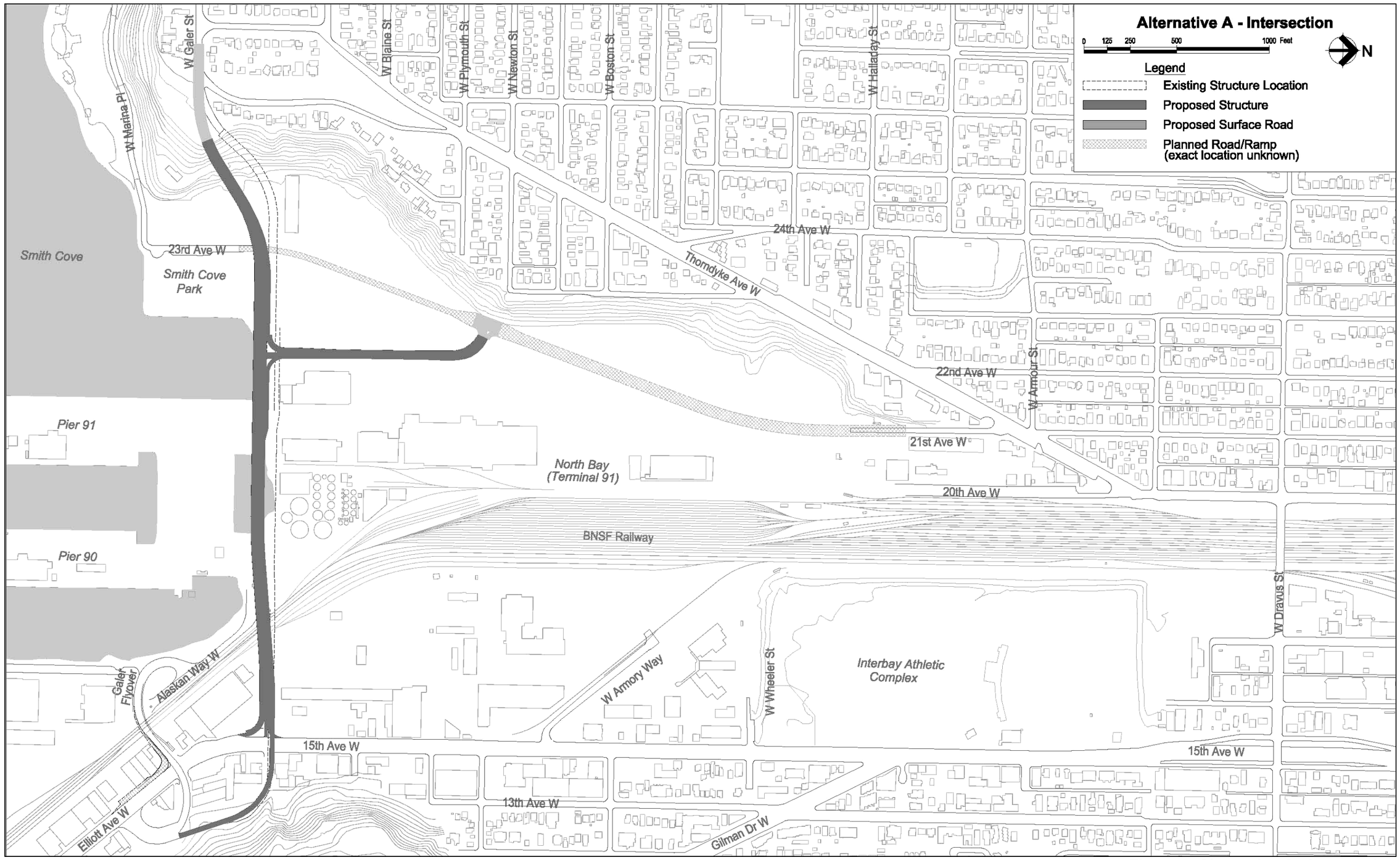


Figure 6 Alternative A - Intersection

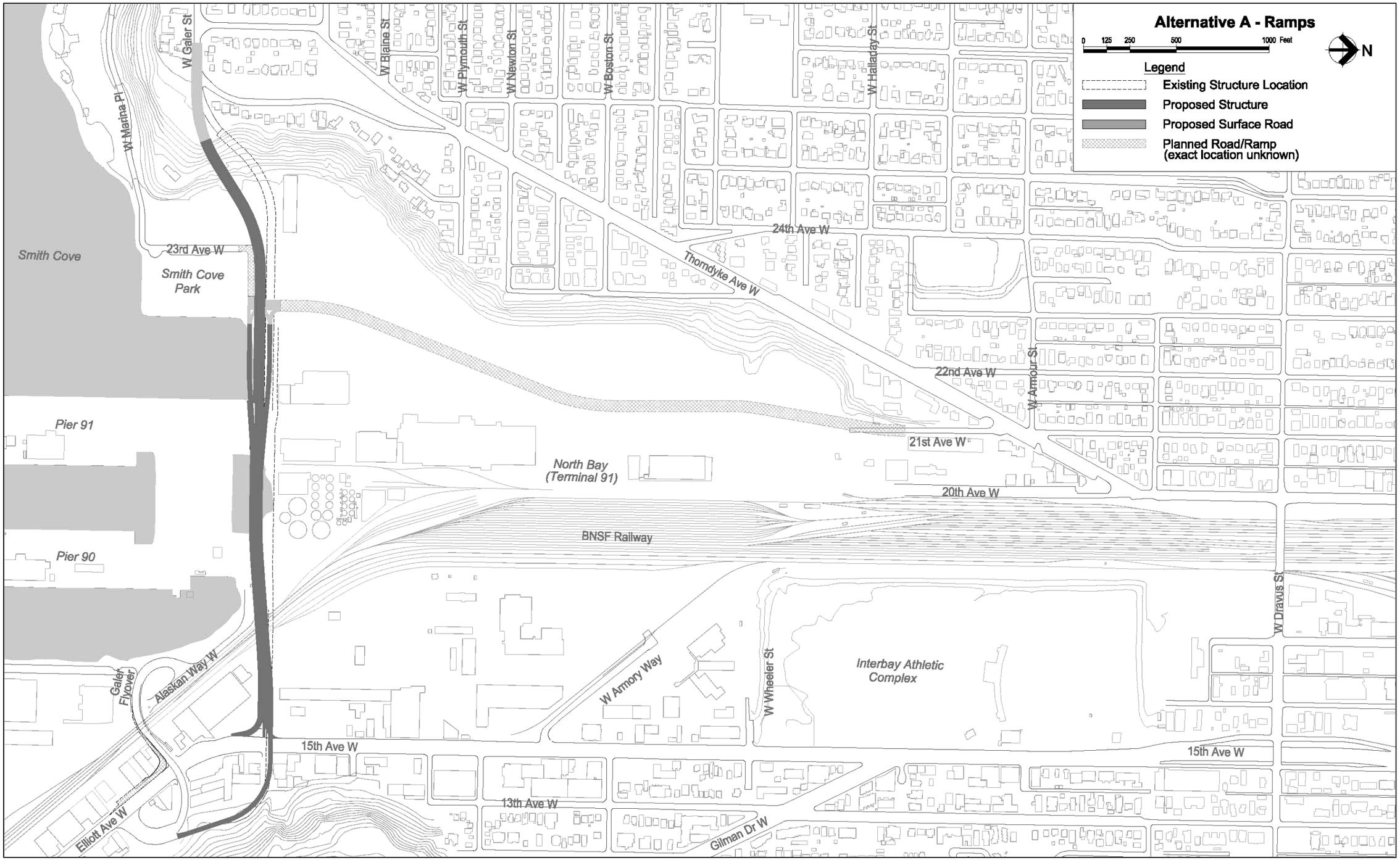


Figure 7 Alternative A - Ramps

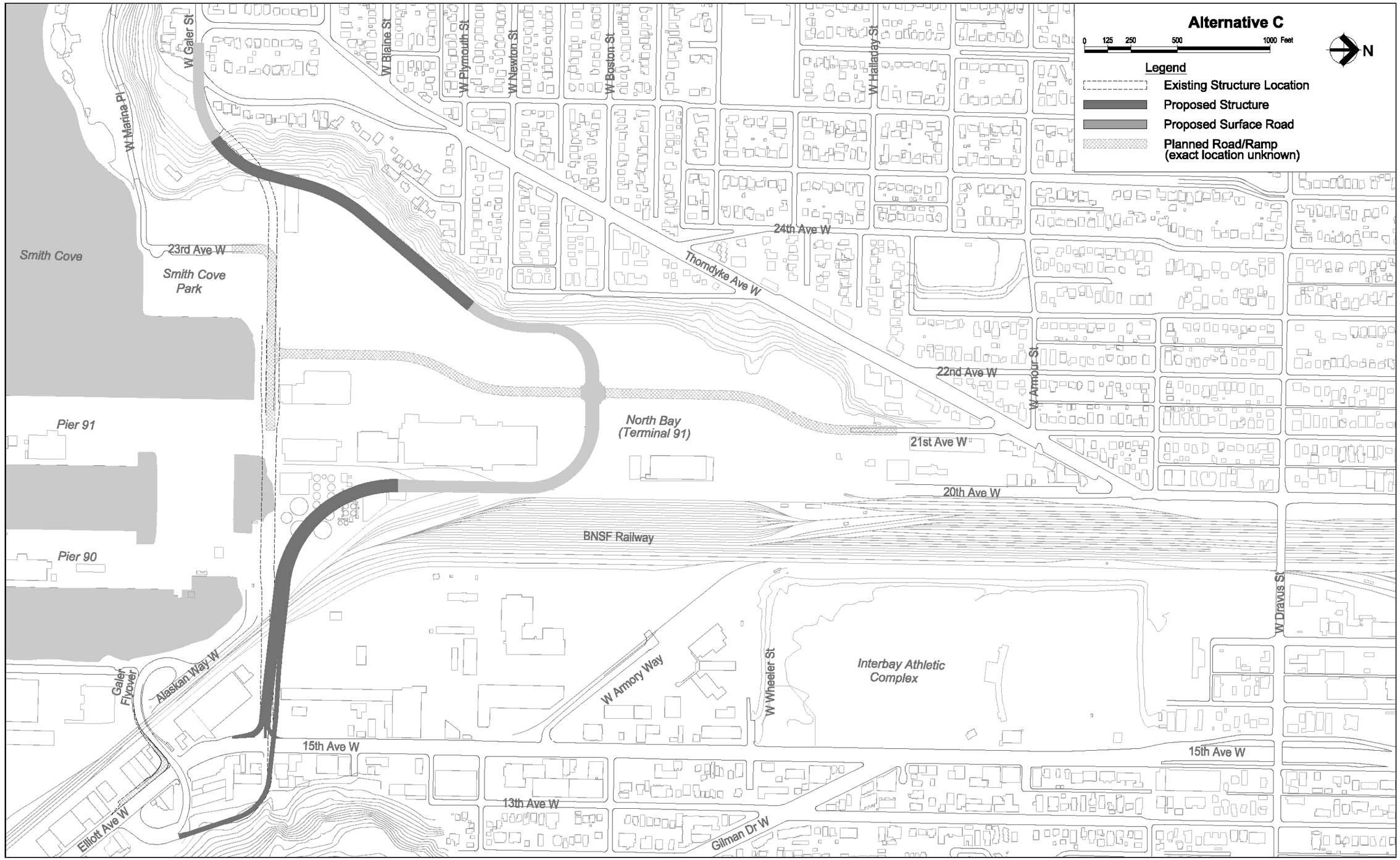


Figure 8 Alternative C

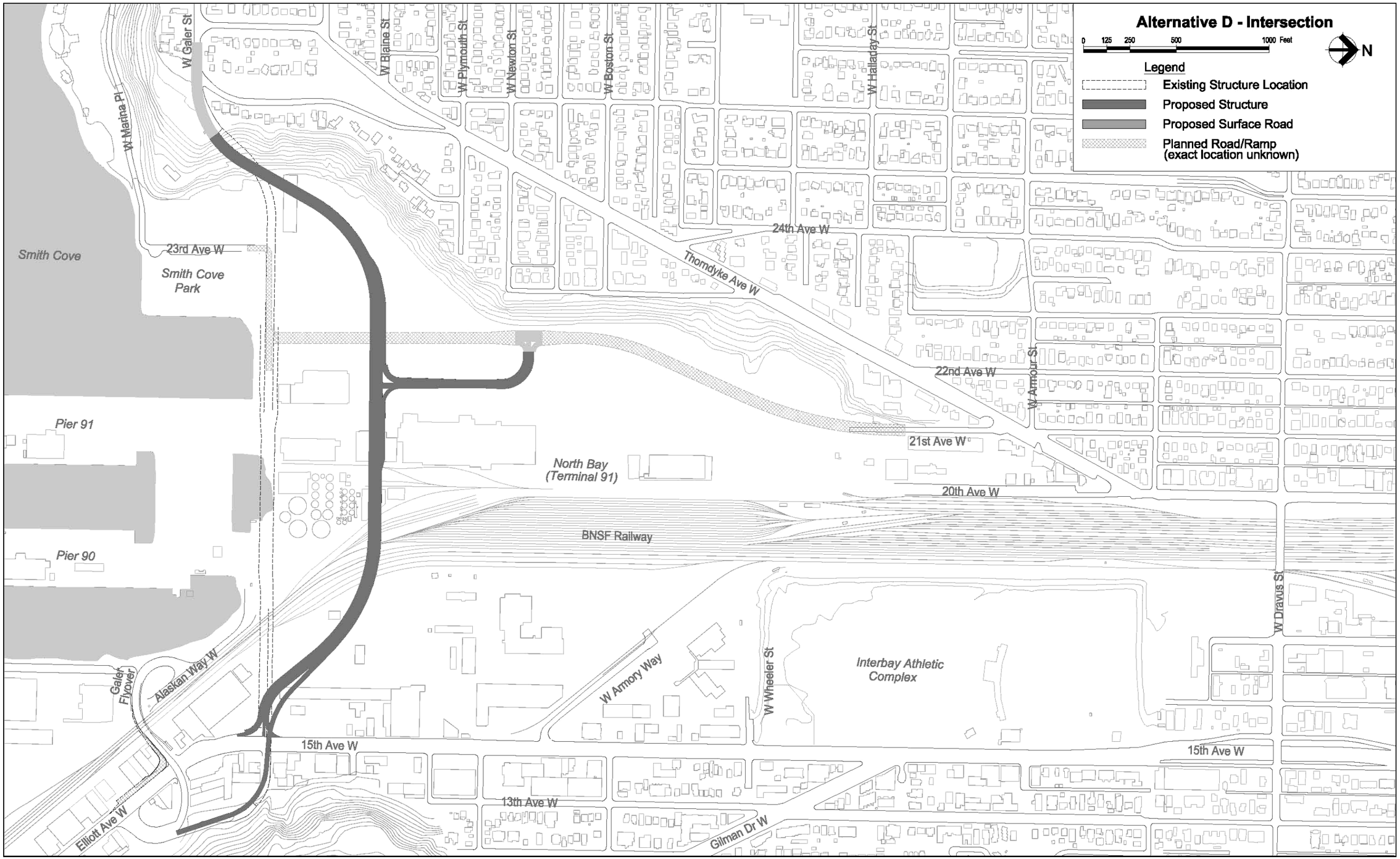


Figure 9 Alternative D - Intersection

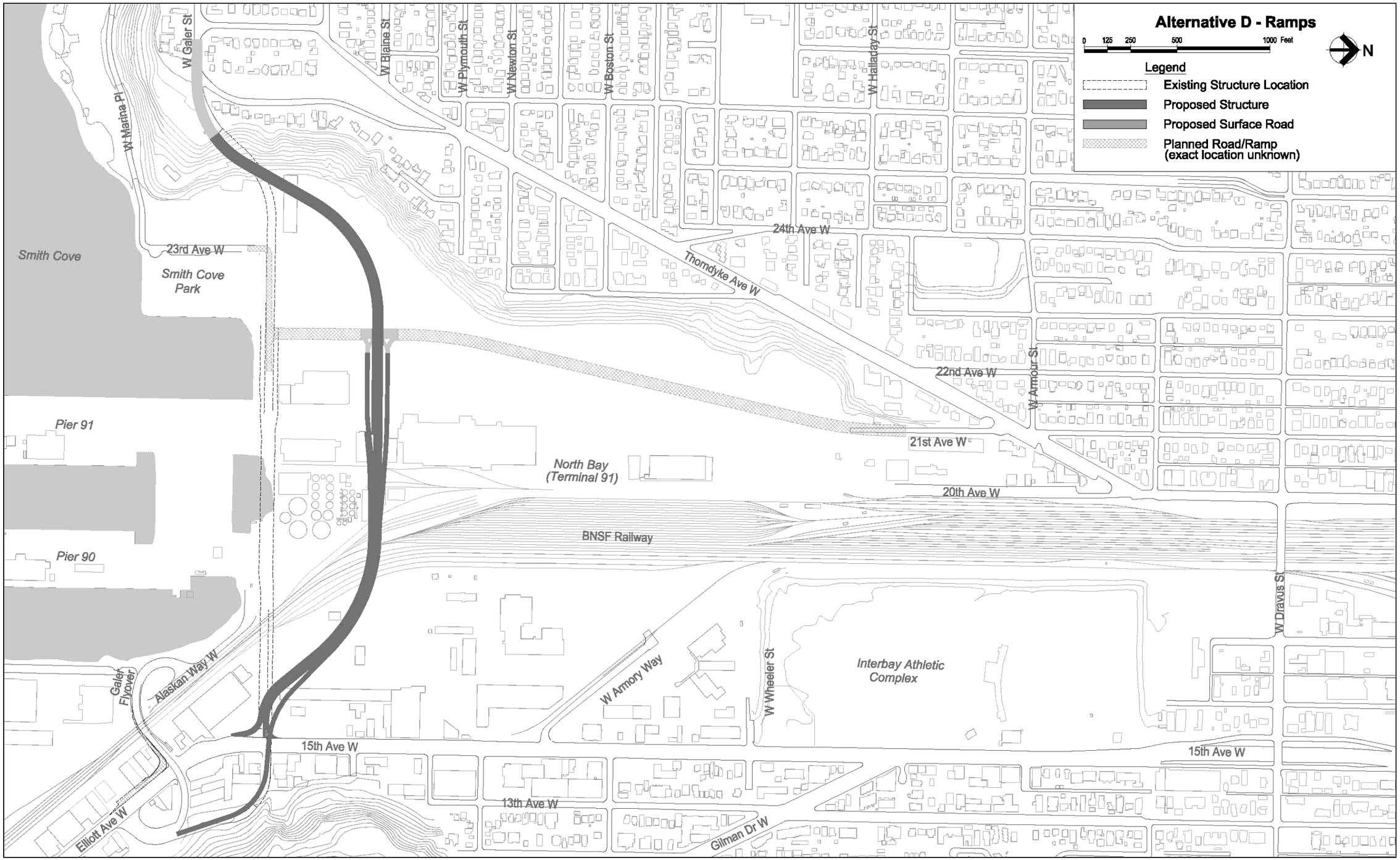


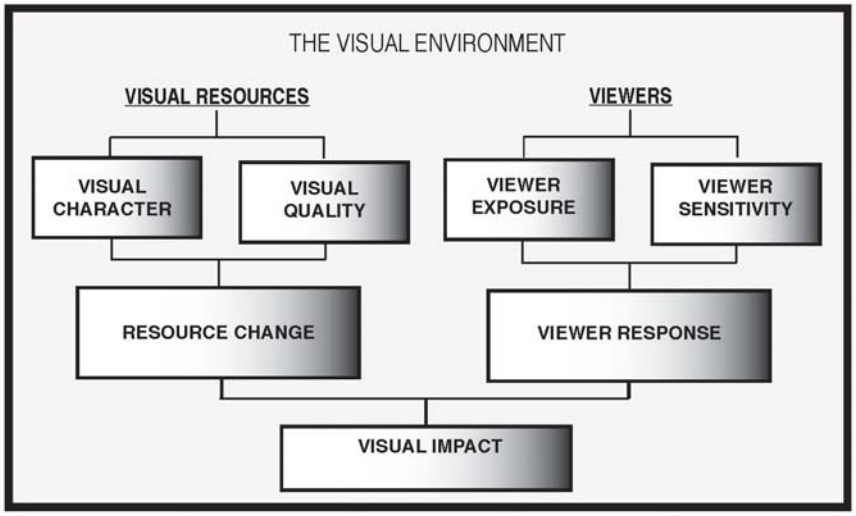
Figure 10 Alternative D - Ramps

The view analysis discipline report has been prepared consistent with the guidelines contained in the WSDOT *Environmental Procedures Manual*. Visual assessments were conducted in general accordance with the United States Department of Transportation (USDOT) Federal Highway Administration (FHWA) *Visual Assessment for Highway Projects* and the City of Seattle SEPA Ordinance 25.05.675.

For purposes of this visual analysis the study area boundaries include West Dravus Street on the north, 8th Avenue West on the east, Elliott Bay on the south (including WSDOT ferry routes), and Thorndyke Avenue West and Magnolia Way West on the west.

The Magnolia Bridge also forms a connection to the Olmsted Legacy boulevard network as identified by the Seattle Department of Parks & Recreation.

The chart shown below graphically describes the visual quality impact assessment process. It shows the assessments of the two components of visual quality - the visual resource and the viewers - coming together to form an overall evaluation of the visual impact of the project alternatives.



Source: FHWA Visual Impact Assessment for Highway Projects

Figure 11
The Visual Environment

Project Area Visual Resources

General land form and view opportunities have been described for the Magnolia, Interbay, and Queen Anne neighborhoods through a field investigation, review of topographic maps, and photographic surveys. More detailed information has been collected and analyzed for the study area, and graphic analysis is shown in Appendix A.

The visual quality and character of the landscape are considered when describing existing visual resources. The assessment of visual character is descriptive and not

evaluative. Descriptions of visual character may include descriptions of patterns, forms, line, color, texture and/or scale. Visual character descriptions from WSDOT's Roadside Classification Plan (WSDOT 1996) have been used to characterize visual environment of the project area and form the background for the evaluation of visual quality.

Objective evaluations of visual quality have been used to minimize the subjective nature of visual perception. Three criteria have been used to perform objective evaluations of visual quality: Vividness, Intactness and Unity. The evaluation has been quantified based on the following formula:

$$\text{Visual Quality} = \frac{\text{Vividness} + \text{Intactness} + \text{Unity}}{3}$$

These criteria, which are independent, are defined as follows per the FHWA visual assessment manual:

- Vividness: The memorability of the visual impression received from landscape elements as they combine to form a distinctive visual pattern. Several elements of the landscape are judged separately to create a combined assessment of vividness. These elements are landform, waterform, vegatation, and the built environment.
- Intactness: The integrity of visual order in the natural and built environment and the extent to which the landscape is free from visual encroachment. The overall development within the view and specific encroachments ("eyesores") are assessed separately and combined into a single assessment.
- Unity: The degree to which the visual resources of the landscape join together to form a coherent harmonious visual pattern. Unity refers to the compositional harmony or inter-compatibility between landscape elements.

The rating scales for these criteria are discussed below.

Vividness Ratings

- High (Value = 7-10): The visual impression received is highly memorable, as contrasting landscape elements combine to form distinctive visual patterns. Strongly defined landforms, waterforms, vegetation or constructions are noted.
- Medium (Value = 4-6): The visual impression is moderately memorable, with some distinctive patterns. Moderately well defined landscape or landforms are present.
- Low (Value =0-3) : The visual impression is of low memorability. Little visual pattern is formed because landscape elements do not combine to form a striking and distinctive pattern.

Intactness Ratings

- High (Value = 7-10): There is a high visual integrity between the natural and built landscape to the extent that the landscape is free from visual encroachment. Natural and built elements blend into the surrounding character and there is little visual discontinuity between natural and built elements. Natural and manmade patterns are not disturbed and they have a clear visual order. Particularly intrusive individual encroachments are noted.

- Medium (Value = 4-6): There is an average visual integrity between the natural and built environment. Some visual encroachment onto the landscape is present and lacks visual order. There is some disruption of the natural and built environments.
- Low (Value = 0-3): There is low visual integrity between the natural and built landscape features. Visual encroachment onto the landscape is very apparent. The pattern of elements is disrupted and the integrity of the natural visual order is lost.

Unity Ratings

- High (Value = 7-10): The visual elements of the landscape join to form a highly coherent, harmonious visual pattern. Natural and built elements blend together
- Medium (Value = 4-6): The visual elements of the landscape join to form a moderately coherent, harmonious visual pattern. Where natural and built elements blend together, the visual order is disrupted
- Low (Value = 0-3): Visual elements do not blend together to form a coherent, harmonious visual pattern. Built elements do not have a visual relationship to natural forms or patterns and visual order is lacking.

Light and Glare

Light and glare conditions for the Magnolia bridge have been considered per the City of Seattle's SEPA Ordinance 25.05.675K. Night-time tours of the project area particularly focused on the identified public lands and recreational resources. Residential and commercial areas were also toured. Locations surveyed included sites both above and below the bridge alignments. Light sources surveyed included roadway lighting and vehicular headlights, and both ambient light levels and direct view of intense light sources (glare) were considered. Based on the description of materials likely to be used for the construction of any bridge replacement (e.g. concrete) glare from reflective surfaces are considered to be minimal and have not been considered.

Shadow

The effect of shadows on all public lands and parks in the project area has been considered and graphic analysis is shown in Appendix B. A survey of public lands and parks in the project area resulted in Smith Cove Park being identified as the primary parcel to be studied for shadow impacts. The Magnolia Greenbelt and the Pier90/91 bicycle trail were also considered. Using topographic maps, engineering drawings of the alignments, and calculations of the sun angles at critical times, cast shadows have been projected onto the terrain. The Seattle SEPA ordinance Section 25.05.675Q requires that shadow analysis be done for times at which the affected parks or other public property are most likely to be used or shadows will have the greatest effect. Thus times selected for analysis were identified as 8:00 a.m., Noon and 4:00 p.m. on the spring and fall equinoxes and winter solstice; and 8:00 a.m., Noon, and 6:00 p.m. on the summer solstice.

Identifying User Groups

Views of the landscape depend on both what is seen and who is seeing it. Therefore, consideration of the viewers is an important aspect of assessing a project's impacts. This analysis is focused on two user groups: Highway users and viewers from the surrounding communities, parks and roadways. Highway users would have a view from the project. Project neighbors would have a view *of or toward* the proposed project.

The importance of views may be assessed by the numbers of people exposed to the view and of the sensitivity to the particular elements within the view (e.g. important or memorable landscape features, historic elements, etc.)

The perception by viewers of visual elements in the Magnolia Bridge area depends on three factors: The position of the viewer relative to the road, the speed at which the viewer is moving, and the duration of the view.

- Position: The position of the viewer of the project is evaluated for nearness to the project, whether the viewer is on, above or below the project, and the amount of the project that is visible from the viewpoint.
- Speed: Viewer speed affects both views of and from the project. Speed affects the level of detail perceived by the viewer and the length of time the viewer may perceive the view.
- Duration: Duration of view is affected both by the speed of the viewer and the scale of the project element or landscape. A motorist may perceive a project element briefly then become more aware of and remember more of the view as the motorist approaches it. A resident or park visitor looking onto a project element would have a longer duration of view and be more affected by the quality of that view.

The primary groups of viewers of the visual resources in and around the Magnolia Bridge project area include motorists on the bridge itself, pedestrians in the several public parks and trails systems, bicyclists on public trail systems, residents in the adjacent neighborhoods and motorists on the Seattle street network.

An assessment of the importance of each view to the viewer groups has been applied to the quantified visual quality assessment (the vividness/intactness/unity scoring). Views have been given a weighting based on a scale of 1 through 3 based on the following factors:

- High (Value = 3): Greater number of viewers, longer duration of view, view from an exceptional vantage point (e.g. public viewpoint) and/or of notable landscape feature(s)
- Medium (Value = 2): Average number of viewers, moderate duration of view, view from average vantage point and/or of typical landscape features
- Low (Value = 1): Fewer viewers, limited duration of view, view not from poorer than average vantage point and/or of less vivid landscape features.

For example, a very limited view of a highly vivid or memorable landscape may be given equivalent weight to a view of moderately vivid landscape that is seen by large numbers of viewers or for an extended period of time.

Identification of Views

A field study was conducted to identify viewpoints that represent different viewer groups and views in the project location.

All candidate viewpoints in and around the project area were visited, photographed and mapped. Candidate viewpoints included all public parks in the project area, street rights-of-way and points of common public access (e.g. Washington State Ferries). Views from and toward the project were considered.

Twenty-two locations were considered as candidates, with eleven found to offer views that demonstrated the visual characteristics of the bridge alignments. The views from these viewpoints represent views to and from the bridge and represent most of the visual resources likely to be affected by the project.

These viewpoints provide clear views for significant numbers of viewers, provide views of long duration and offer views that were scored to be important to understanding the affects on views from or toward the alternative bridge alignments. They have been studied in detail and are listed in Table 1 below.

Table 1
Magnolia Bridge Location of Viewpoints

View #	Location	Views of Alternatives
1	Galer Flyover, looking NW	Alternatives A, C, D
2	16th Ave W Public Path/Bikeway, looking NW	Alternatives A, C, D
3	W. Dravus Bridge, looking South	Alternatives A, C, D
4	21st Ave W Public Path/Bikeway, looking S	Alternatives A, C, D
5	8th Ave W at W Lee St, looking NW	Alternatives A, C, D
6	Smith Cove Park, looking N	Alternatives A, C, D
7	From Magnolia Bridge, looking SE	Alternatives A, C, D
8	From Magnolia Bridge, looking NW	Alternatives A, C, D
9	From Magnolia Bridge, looking SW	Alternatives A, C, D
10	Bainbridge Island Ferry, looking N	Alternatives A, C, D

Source: S. Johnson, L. Bain field survey, 2003

The visual effect of the alternative alignments on views have been comparatively scored based on the formula for visual quality and weighted for importance in a matrix format

Visual Environment

The existing Magnolia Bridge and the replacement alternatives are located in the valley between Queen Anne Hill on the east and Magnolia Hill on the west in the City of Seattle. They cross the North Bay (Terminal 91) either on elevated structures or surface roads.

The Queen Anne Hill bluff is approximately 300' high as it faces the project area and is primarily residential in character. (Queen Anne Hill is approximately 440' high in all.) A densely wooded greenbelt extends along the southwest portion of the base of the hill, adjacent to Alternatives A and D. A mixture of multi-family and commercial structures line the base of the hill adjacent to Alternative H.

The Magnolia Hill bluff is approximately 150' high as it faces the project area. (Magnolia Hill is approximately 300' high in all.) Magnolia is also primarily residential in character, with a densely wooded greenbelt on its east face, extending the length of the project area.

The North Bay (Terminal 91) district is essentially level, having been filled in a number of separate stages over during the last century. The North Bay area extends from Elliott Bay on the south to the Salmon Bay Waterway on the north, and from the 15th Avenue West/Elliott Avenue West corridor on the east to the Magnolia Hill bluff on the west.

The North Bay area contains a mixture of manufacturing and industrial uses, and includes port and railroad operations as well as Piers 86 through 91. Structures are typically large, single or two story industrial and warehouse structures. The 15th Avenue West/Elliott Avenue West corridor is lined with low commercial structures with some multi-story residential buildings. There is little natural or ornamental landscaping present in the North Bay area.

The roadside character of the project area can be generally characterized as a mixture of urban and semi-urban following the 1996 Washington Department of Transportation Roadway (WSDOT) Character Classification system.

The "urban" definition may be applied to that portion of the project extending from 15th Avenue West to the base of Magnolia Hill (North Bay).

> *An Urban landscape is a predominately built environment. A roadside classified as urban is characterized by elements that mirror the character of adjacent land use. Vegetation is mostly non-native (ornamental) trees, shrubs and groundcover, with remnants of native vegetation.*

The "semi-urban" landscape characterization may be applied to the portion of the Magnolia Bridge alignments that are sited within the Queen Anne or Magnolia greenbelts.

> *The semi-urban landscape is characterized by intermixed built and natural or naturalized elements, with built elements prevailing. A roadside classified as semi-urban is transitional in character. Vegetation is a combination of native and non-native species. Trees and large shrubs are predominant where sufficient right-of-way is available.*

There are several public parks adjacent or overlooking the project area, as well as public pedestrian paths and bikeways. (See Public Lands, Section 4F of this document) The recreational resources considered for the Magnolia Bridge visual quality assessment include:

- Kinnear Park along the southeast face of Queen Anne Hill
- Parsons Gardens and the adjacent 8th Avenue West promenade on the ridge of Queen Anne Hill
- Elliott Bay Park along the Pier 86-88 waterfront
- Terminal 90/91 Pedestrian and Bicycle paths
- Interbay Golf Course and Pea Patch Garden on the north, along 15th Avenue West
- Smith Cove Park on Elliott Bay across from the Pier 91 waterway
- West Galer Street and Magnolia Way West, as part of the Olmsted Legacy boulevard network
- The Magnolia Greenbelt

SEPA Ordinance 25.05.675 and Attachments protects views from parks and other public rights of way to certain major landscape features, including Puget Sound, the Olympic Mountains, the Cascade Mountains, Mount Rainier, and the Seattle Downtown Skyline. The Magnolia Bridge and the alternative replacement alignments offer views of some of these features and are also apparent in views toward certain of these features from public viewpoints.

In particular, the field survey showed that the existing Magnolia Bridge and alternative replacement alignments are visible from the 8th Avenue W. Promenade and from Smith Cove Park and these viewpoints have been considered. Likewise, the existing bridge and the replacement alignments provide views toward the Downtown Skyline, Mount Rainier and Puget Sound, and these views have been considered.

Visual Resources from Viewpoints

Twenty-two viewpoints in and around the project area were visited, photographed and mapped. Candidate viewpoints included all public parks in the project area, street rights-of-way and points of common public access (e.g. Washington State Ferries). Views from and toward the project were considered. Ten of views were selected for analysis of the visual quality

View #	Location
1	Galer Flyover, looking NW
2	16th Ave W Public Path/Bikeway, looking NW
3	W. Dravus Bridge, looking South
4	21st Ave W Public Path/Bikeway, looking S
5	8th Ave W at W Lee St, looking NW
6	Smith Cove Park, looking N
7	From Magnolia Bridge, looking SE
8	From Magnolia Bridge, looking NW
9	From Magnolia Bridge, looking SW
10	Bainbridge Island Ferry, looking N

Figure 12
Viewpoint Locations

Those viewpoints that provided clear views for significant numbers of viewers, provided views of long duration and offered views that were scored to be particularly important have been studied in detail and are mapped in Figure 12 and described below.

Viewpoint 1

Viewpoint 1 represents the view of a motorist or pedestrian on the Galer Flyover, looking northwest toward Magnolia Hill and the existing Magnolia Bridge. The Galer Street Flyover was constructed to allow direct access to the Port of Seattle property in North Bay (Terminal 91) and the businesses in the Pier 86 –89 area. From Viewpoint 1, the Terminal 90/91 structures and the BNSF railroad tracks form the foreground, with the existing Magnolia Bridge in the middle ground, stretching across the view, along with several structures on Pier 90/91 and in the North Bay industrial area. The Magnolia greenbelt is visible as the background. The most vivid elements in this view are the railroad tracks and existing Magnolia Bridge with the greenbelt in the distance, forming a continuous band. The bridge and residential structures encroach on the greenbelt. The industrial area of North Bay is also apparent from this view, along with the pattern of bridge structure. This view is briefly available to drivers and to the very few pedestrians using the Flyover.

Figure 13
Viewpoint 1

Viewpoint 2

Viewpoint 2 represents the view of a pedestrian or bicyclist from the Port of Seattle's Terminal 91 public pedestrian and bike trail just north of West Galer Street on Pier 89. The foreground is formed by ornamental landscaping along the pathway and a portion of the 89/90 waterway. The structure of Pier 90 and the existing bridge forms the middle ground with the Magnolia greenbelt forming the background. The view of the marine activities on Pier 90, which are visible for the full duration of a walk or ride along Pier 89, is the most memorable and intact element of this view. The Magnolia greenbelt is in the background of this view, and is disrupted by existing bridge structure. Viewpoint 2 is available to pedestrians and bicyclists for several hundred yards along the pathway and briefly to drivers on the Pier 90/91 access road.

Figure 14
Viewpoint 2

Viewpoint 3

Viewpoint 3 is the view of a pedestrian or motorist on the West Dravus Street bridge looking south over the BNSF railroad tracks. The tracks form the foreground of the view as they recede into the distance. The view is framed by the landscaping of the Interbay Golf Center on the left and the Magnolia greenbelt on the right. The existing bridge structure is visible in the far background, with the piers of the elevated structure barely visible as the bridge climbs up to the top of Magnolia hill. The hills of West Seattle are visible in the far distance. This view has two memorable and unified visual characteristics. The railroad tracks form a very consistent, memorable pattern. They are seen repeatedly as a motorist drives north and south along the 15th Avenue West corridor. The distant view to the Magnolia greenbelt and West Seattle is also memorable, locating the viewer in the larger Seattle area. This view is briefly available to the substantial number of drivers and to the relatively few pedestrians on the Dravus Street bridge.

Figure 15
Viewpoint 3

Viewpoint 4

Viewpoint 4 shows the perspective of a pedestrian or bicyclist on the Terminal 91 Bikeway at the southern end of 21st Avenue West. The view shows the large undeveloped paved area of the North Bay in the foreground, extending into the distance. On the right, the Magnolia greenbelt forms the edge of the view. The North Bay industrial buildings are visible in the middle distance. The existing bridge structure is visible in the background. Both the industrial area and the greenbelt are intact and vivid visual elements. The contrast between the hard surfaced industrial area and the natural landscape of the greenbelt is the most memorable aspect of this view. This view is available to pedestrians and bicyclists for several hundred yards as they use the trail.

Figure 16
Viewpoint 4

Viewpoint 5

Viewpoint 5 is taken from the pedestrian promenade along 8th Avenue at W Lee Street. This view is representative of several views available from Queen Anne Hill, and has been selected as the clearest view from a highly dramatic and well-known viewpoint. The pedestrian walkway extends for several blocks, providing a long exposure to the view. The foreground of this view is formed by the roofscapes of residences below the viewer's eye. Although the dwellings are of many different architectural styles, these roofs form a consistent pattern. The Magnolia greenbelt is clearly visible in the distance above a narrow strip of the North Bay industrial development. The existing bridge structure can be seen encroaching on the greenbelt. From various points along the promenade, Puget Sound and the distant Olympic Mountains are visible on clear days. The landforms of Magnolia Hill and the setting of the city within Puget Sound are highly memorable from this view. The structure of the bridge against the greenbelt is of a distinctly different scale than other built elements visible from this view. This view is from a popular viewpoint and is available to pedestrians and drivers along the 8th Avenue promenade for an extended period of time. It is also available to a relatively large number of Queen Anne residents.

Views from 8th Avenue W. Promenade to the downtown skyline, Elliott Bay and Mount Rainier are protected per Seattle SEPA Ordinance 25.05.675P.

Figure 17
Viewpoint 5

Viewpoint 6

Viewpoint 6 is taken from the West Marina Place roadway, near 23rd Avenue West and adjacent to Smith Cove Park. It represents the view of a pedestrian at the park, an Elliott Bay Marina visitor or a bicyclist using the Terminal 91 Bikeway. The foreground shows undeveloped property belonging to the US Navy with the structure of the existing bridge climbing up to Magnolia Hill in the middle ground. In the distance, the form of the northwest slope of Queen Anne Hill is visible through the bridge structure. A small section of the Magnolia Greenbelt is visible on the left of the picture. The distinct separation of the bridge structure from the landscape is the most vivid and memorable aspect of this view, particularly with the transparency of the structural supports to the views of the hills in the distance. This view is available relatively briefly to drivers departing from the Elliott Bay Marina complex and to park users leaving Smith Cove Park.

Views from Smith Cove Park to the downtown skyline, Elliott Bay and Mount Rainier are protected per Seattle SEPA Ordinance 25.05.675P.

Figure 18
Viewpoint 6

Viewpoint 7

Viewpoint 7 represents the view of a motorist from the existing Magnolia Bridge near its connection to West Galer Street at the top of Magnolia Hill. The view provides a changing, dramatic view across the Pier 90/91 piers to Elliott Bay and the Downtown Seattle skyline. On clear days, Mount Rainier would be visible in the distance. The greenbelt of Queen Anne is visible on the left. This view forms a highly vivid, highly memorable image of an urban waterfront and of the Seattle and regional landforms. With the integration of marine activities, water, hills and urban development, this view forms a relatively unified and intact urban view. This view is available to all east-bound travelers on the Magnolia Bridge. Due to the speed of travel, however, exposure to this view is relatively brief. (Pedestrians are relatively rare at this location due to the length of the bridge and poor connections from the bridge structure. Bicyclists are occasional bridge users, but the bridge is not part of a bicycle path network due to safety concerns. (Seattle Department of Transportation).

Views to the downtown skyline, Elliott Bay and Mount Rainier are protected from certain identified public viewpoints and parks. Currently the Magnolia Bridge is not identified as one of those viewpoints.

Figure 19
Viewpoint 7

Viewpoint 8

Viewpoint 8 represents the view of a motorist from the existing Magnolia Bridge near its connection to West Galer Street at the top of Magnolia Hill. The roadway and the shoulder of the Magnolia greenbelt form the foreground. The elevated structure of the bridge is visible in the middle ground along with the paved surfaces and warehouse structures in the North Bay industrial area. The west slope of Queen Anne hill is visible in the distance, across the North Bay industrial area. This view is taken from the point that the bridge connects to the West Galer Street boulevard, directly behind the viewer, and is the point of a major shift from a naturalistic park and residential landscape to a highly urban visual character. The view shows a consistent pattern of development with larger commercial structures in the bottom land giving way to mid-sized apartment buildings on hillside and finally a smaller scaled residential development on the hilltop. Memorability derives from the dramatic topographic change and road curvature. Compared to the view to the southeast available to motorists at Viewpoint 7, this viewpoint is of lesser memorability. Duration of the view and accessibility to pedestrians and bicyclists is limited, as described for Viewpoint 7.

Figure 20
Viewpoint 8

Viewpoint 9

Viewpoint 9 represents the view of a motorist, pedestrian or bicylist from the existing Magnolia Bridge, looking southwest over Pier 90/91 toward Elliott Bay Marina, Puget Sound and the distant mountains. The Magnolia greenbelt appears on the right, with the encroachment of the existing bridge structure and roadway. The view is available for most of the length of the bridge but, due to the speed of travel, exposure to this view is of moderate duration. Accessibility to pedestrians and bicyclists is limited, as described for Viewpoint 7.

Views to the downtown skyline, Elliott Bay and Mount Rainier are protected from certain identified public viewpoints and parks. Currently the Magnolia Bridge is not identified as one of those viewpoints.

Figure 21
Viewpoint 9

Viewpoint 10

Viewpoint 10 is the view looking north from the Washington State Ferry run to Bainbridge Island in Elliott Bay. The water of Elliott Bay forms the foreground, with the shoreline approximately a mile away. The landforms of Queen Anne on the left and Magnolia Hill on the right are evident as is the industrial and maritime activity at Piers 90 and 91. The existing bridge roadway and structure can be seen climbing up to Magnolia Hill. The landform of the Ballard community in north Seattle is visible in the far distance. The view shows the clear contrast between the urban landscape of the North Bay area and the semi-urban hillsides of Queen Anne and Magnolia. Each area forms a coherent and intact visual element. Viewed together they have a low level of visual unity. Viewers are exposed to this view for many minutes on each ferry run.

Figure 22
Viewpoint 10

Light and Glare

The topography, natural and built environment surrounding the existing Magnolia Bridge and the project area for the alternative bridge replacement alignments provides several locations from which light and glare from the bridge may be visible. In particular,

- Roadway lighting viewed from above the bridge alignments
- Roadway lighting viewed from below the bridge alignments, and
- Vehicular headlights viewed from above the bridge alignments

have been identified as potential sources of light and glare. These potential sources of light and glare may be visible from the surrounding residential communities, typically located above the bridge alignment on Magnolia and Queen Anne hills, from businesses, typically located below the bridge alignment in the North Bay area and in the Elliott Avenue West/15th Avenue West corridor, and from public lands such as Smith Cove Park, the Magnolia Greenbelt and 8th Avenue West promenade.

Viewpoint 5

From Viewpoint 5 and similar viewpoints on Queen Anne Hill (such as West Blaine Street at 9th Avenue West) the Magnolia Bridge and the North Bay area is between 2000' distant at the eastern end and 5000' distant at the western end where the roadway ramps up to Magnolia bluff. Throughout the Northbay area, safety, street and vehicular lights are visible as are the lights of the residences on Magnolia. The vehicular lights on the Magnolia Bridge make up part of this pattern of lights. The roadway lights on the bridge are largely screened from this vantage point. The lights on fishing vessels, with their high levels of light can form distinct points of glare that inhibit night viewing.

Viewpoint 6

From Viewpoint 6 and from the adjacent Smith Cove Park, there are relatively few light sources other than the streetlights along West Marina Place. The parkland, the waters of Elliott Bay and the greenbelt on the slope of the Magnolia Bluff are quite dark. The most dramatic lighting is the Seattle downtown skyline approximately 120 degrees to the right of Viewpoint 6. The roadway lights on the Magnolia Bridge are clearly visible as light sources, but have no apparent effect on the ground. Glare from fishing boat work lights may also be visible from this location.

Viewpoint 8/Magnolia Greenbelt

The area around Viewpoint 8, including the Magnolia greenbelt and a group of approximately ten residences along Magnolia Place West, offers views across the North Bay area to the Queen Anne hillside. Due to distance, similar to those of Viewpoint 5, most visible light sources are seen as part of the pattern of development but do not, typically, form individual points of glare. Glare from fishing boat work lights may also be visible from this location.

Viewpoint 9

From Viewpoint 9, vehicular headlights may cause glare for occupants of vehicles in the opposite travel lane due to the curvature of the roadway.

Studies

A field study was performed by Johnson Architecture & Planning and Weinstein Architects Urban Planners to isolate the viewpoints most relevant to the purposes of this analysis.

Computer generated models of each proposed alignment superimposed on photographs from all viewpoints were used to evaluate the impact to visual quality.

Data Sources

Bridge alignments, roadway dimensions and elevations from KPFF Consulting Engineers

Topographic elevations and distances from City of Seattle Engineering Department maps

Overview

In order to assess the effect of each alternative bridge alignment, a digital model of each alignment has been inserted into each photograph taken from the selected viewpoints (See Affected Environment section). The resulting composite images are shown in Appendix A. The assessments of both visual and light/glare impacts were made based on those composite images.

Visual Quality

Each viewpoint has been analyzed for visual quality assessing the vividness, intactness and unity for each alternative as described in the Methodology Section above. The visual characteristics of the alternative alignments have been scored in a visual quality matrix on a scale of 1 though 10. Each view has been weighted for relative importance (number of viewers, duration of view, etc.) on a scale of 1 to 3. The scoring for the alternative alignments is shown in Tables 3, 4 and 5 respectively.

The A alignment variations (Alignments A6-Ramp and A7-Intersection) and the D alignment variations (Alignments D9-Ramp and D10-Intersection) have been modeled and analyzed as single alternatives Alignments A and D. The distinction between the ramp and intersection variations of these alternative alignments relates to the road connection between the bridge structure and the North Bay area. There is little perceptible difference between the affect these alignment variations have on the visual resources of the project area, and they have been scored together as Alignment A (A6 and A7) and Alignment D (D9 and D10) for the purposes of visual quality assessment.

Light and Glare

For light and glare, a comparative assessment was conducted from vantage points from both above and below the roadway for each alignment. In particular, views from the 8th Avenue West Promenade (View 5 from the visual quality assessment) from Smith Cove Park/West Marina Drive (View 6) and from the Magnolia Greenbelt (near View 8) were considered for all alternatives. In addition, the view from Thorndyke Avenue West at West Halladay Street was considered for the north segment of Alternative H. Consideration has been given to the effect of vehicular headlights seen from above the roadway and for roadway lighting seen from above and below the roadway.

Each alternative alignment was analyzed for their relative or comparative change from the existing bridge for the three primary potential sources of light and glare:

- Roadway lighting viewed from above the bridge alignments
- Roadway lighting viewed from below the bridge alignments, and
- Vehicular headlights viewed from above the bridge alignments

As with the view assessments, the two variations of the A alignment (with ramps or with intersection) are essentially similar as are the two variations of the D alignment. Therefore these alignment variations are discussed together.

Shadow

The effect of the shadows created by each alignment has been studied by computer modeling. These are shown in Appendix B. In particular, the public lands and parks in the project area were analyzed for times of day that the use of those recreational areas is most likely to be affected by shadows. The effect of the shadows created by Queen Anne Hill and Magnolia Hill were also included in the analysis.

Environmental Consequences

The combined environmental consequences of each alternative replacement alignment on visual quality, light and glare and shadow have been assessed in a matrix using the existing conditions as a baseline for comparison.

No Build Alternative

The potential visual quality impacts the No-build Alternative are summarized in Table 2. The visual quality and importance factor scoring for each viewpoint is used as a baseline for the comparative assessment of Alignments A, C and D.

Table 2
Visual Quality Assessment Matrix – No Build Alternative

Magnolia Bridge Visual Assessment Scoring

	Viewpoints										
No Build Alternative	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Score**
Vividness											
Landform	4	3	7	7	10	5	10	8	7	6	
Waterform	0	1	1	0	9	0	9	0	9	7	
Vegetation	2	2	5	6	6	4	4	6	7	6	
Constructed	2	2	8	6	7	3	9	7	7	5	
Average	2.0	2.0	5.3	4.8	8.0	3.0	8.0	5.3	7.5	6.0	
Intactness											
Development	1	1	2	2	6	5	7	4	7	4	
Encroachment	1	1	4	4	4	3	4	3	8	4	
Average	1.0	1.0	3.0	3.0	5.0	4.0	5.5	3.5	7.5	4.0	
Unity	1	1	7	5	6	3	8	4	8	5	
Sum	4.0	4.0	15.3	12.8	19.0	10.0	21.5	12.8	23.0	15.0	
Importance	2	2	2	1	3	2	3	3	3	1	
Total Visual Quality	8.0	8.0	30.5	12.8	57.0	20.0	64.5	38.3	69.0	15.0	323

Source: S. Johnson, L. Bain, 2003

Views to Structure

The No Build Alternative would retain the existing bridge structure in its present location. No change from the existing visual characteristics or affect on visual resources would occur.

Views from the Structure

No change from the existing visual characteristics or affect on visual resources would occur.

Light and Glare Impacts

The existing light and glare conditions would continue.

Headlights from vehicles traveling west on the upward slope to Magnolia hills would continue to be visible from the Magnolia Greenbelt and from approximately ten residences along Magnolia Way West. These westbound lights are seen relatively briefly but from relatively close by (200' to 400'). Vehicles traveling east leaving Magnolia hill from the 8th Avenue West promenade on Queen Anne hill would be seen from a distance of approximately 4000' and for the duration of the travel across the bridge. Viewed from the east, lights are angled downward or seen from well above the roadway.

Roadway lighting would continue to be visible from the businesses below the bridge alignment and from such public areas as Smith Cove Park. Most of the roadway lighting, where it is unscreened laterally, would continue to be visible from the Magnolia greenbelt. Most of the roadway lighting is currently screened to limit views of the direct light source above the horizontal. Therefore, roadway lighting seen from Queen Anne hill is limited to reflected light from the bridge roadbed.

Shadow Impacts

The existing shadow patterns would continue.

Shadows from the existing elevated roadway and support columns continuously shadow the property lying beneath and to the north of the roadway. Shadows would continue to be cast on the portion of the Magnolia Greenbelt immediately below and to the north of the alignment. The large number of support columns and lateral braces make a relatively large contribution to the cast shadow, particularly for times with low sun angles.

In the summer months, when the sun rises and sets to the north of due east and west, shadows would continue to be cast to the south of the bridge, after the sun rises above Queen Anne Hill or before it sets below Magnolia Hill. In particular, shadows would continue to be cast on the northern portion of Smith Cove Park in the early morning summer hours.

Alternative A

The visual impacts of Alternative A are summarized in Table 3, below and shown in Appendix A of this report. Alignment A is approximately 30% wider and the same overall length when compared to the existing bridge, and this increase in the apparent bulk and scale is judged to have somewhat increased impacts on views of the structure. Alternative A is judged to have similar views from the bridge structure of the surrounding visual environment and similar light and glare impacts as existing conditions. Views that will likely have perceptible change from the existing condition are described in the narrative below. For Alignment A, the views from Viewpoints 3 and 10 are considered to have minimal differences from the existing condition. These views are shown in Appendix A, but not discussed below.

Table 3
Visual Quality Assessment Matrix – Alternative A

Magnolia Bridge Visual Assessment Scoring

A Alignments	Viewpoints										
	1	2	3	4	5	6	7	8	9	10	Score
Vividness											
Landform	4	3	7	7	9	5	10	7	7	6	
Waterform	0	1	1	0	9	0	9	0	9	7	
Vegetation	2	2	5	6	4	4	4	5	7	6	
Constructed	2	2	8	6	6	2	9	6	7	5	
Average	2.0	2.0	5.3	4.8	7.0	2.8	8.0	4.5	7.5	6.0	
Intactness											
Development	1	1	2	2	5	5	7	3	7	4	
Encroachment	1	1	4	4	3	2	4	2	8	4	
Average	1.0	1.0	3.0	3.0	4.0	3.5	5.5	2.5	7.5	4.0	
Unity	1	1	7	5	5	3	8	4	8	5	
Sum	4.0	4.0	15.3	12.8	16.0	9.3	21.5	11.0	23.0	15.0	
Importance	2	2	2	1	3	2	3	3	3	1	
Total Visual Quality	8.0	8.0	30.5	12.8	48.0	18.5	64.5	33.0	69.0	15.0	307

Source: S. Johnson, L. Bain, 2003

Views to the Structure

Viewpoints 1, 2, 4, 6

It is likely there would be reduced supporting structure for the elevated portion of the bridge with contemporary engineering and design. There may be some change in the transparency of the bridge when seen from below and consequent effect on the view from locations such as Viewpoints 1, 2, 4 and 6.

Viewpoints 5, 6

The increased width of the bridge roadway (from 45' to approximately 60') will have an increased visual presence from several viewpoints. From Viewpoint 5 (from above the bridge at 8th Avenue W.) the increased roadway width will be more perceptible as an interruption of the Magnolia greenbelt. From Viewpoint 6 (from below the bridge at W. Marina Place) the width of the structure overhead would have a greater visual presence, and overall the likely reduction of support structure would increase transparency at ground level.

Views from the Structure

Viewpoints 7,9

There would be little change for most of the views from the structure (Viewpoints 7 and 9) of the surrounding land and water with either of the Alternative A alignments, assuming equivalent or greater transparency of guardrails. The provision of a pedestrian and bicycle path on the bridge structure would likely increase the number of non-vehicular users and thus the relative importance of these views.

Viewpoint 8

The increased roadway width (from 45' to approximately 60') would reduce the visual effect of the topographic changes at Viewpoint 8 (from the bridge roadway at Magnolia bluff) making it less vivid and memorable than the existing bridge.

Light and Glare Impacts

Alignment A is substantially similar to the existing bridge alignment and light and glare impacts are expected to be similar as well.

Vehicular headlights would continue to be visible from the residences on Magnolia Hill and from a distance from Queen Anne Hill. The approach to Magnolia is somewhat further to the south, and the sight lines to the vehicular headlights may reduce glare.

The view of the roadway from Queen Anne Hill would be substantially the same as the existing alignment.

The roadway lighting visible from below at West Marina Place and Smith Cove Park may be more apparent as the alignment is further south and more directly overhead.

Shadow Impacts

Alignment A is substantially similar to the existing bridge alignment and shadow impacts are expected to be similar as well, except that the reduced amount of supporting columns and elimination of the lateral braces will likewise reduce the amount of shadow at low sun angles.

Shadows from the Alignment A elevated roadway would continuously shadow the property lying beneath and to the north of the roadway. Shadows would be cast on the portion of the Magnolia Greenbelt immediately below and to the north of Alignment A. The support columns will contribute to the cast shadows at times with low sun angles.

In the summer months, when the sun rises and sets to the north of due east and west, shadows would be cast to the south of the bridge, after the sun rises above Queen Anne Hill or before it sets below Magnolia Hill. In particular, shadows would be cast on the northern portion of Smith Cove Park in the early morning summer hours.

Alternative C

The visual impacts of Alternative C are summarized in Table 4 below and are shown in Appendix A of this report. The elevated portions of Alternative C are approximately 30% wider and 10% longer than the existing structure. Overall, the combination of the two segments of Alignment C, when compared to the existing bridge, is judged to have somewhat increased impacts on views of the structure, reduced views from the bridge structure and increased light and glare impacts (due to the overall length of the alignment including the east and west structures and the surface segment). Views that will likely have perceptible change from the existing condition are described in the narrative below. For Alignment C, the view from Viewpoint10 is considered to have minimal differences from the existing condition. This view is shown in Appendix A, but not discussed below.

Table 4
Visual Quality Assessment Matrix – Alternative C

Magnolia Bridge Visual Assessment Scoring

	Viewpoints										
C Alignment	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Score**
Vividness											
Landform	4	4	7	8	8	7	10	7	4	6	
Waterform	0	1	1	0	9	0	9	0	0	7	
Vegetation	2	2	5	6	4	6	4	5	0	6	
Constructed	4	3	8	7	7	5	9	5	5	5	
Average	2.5	2.5	5.3	5.3	7.0	4.5	8.0	4.3	2.3	6.0	
Intactness											
Development	1	1	2	2	6	5	7	4	5	4	
Encroachment	3	2	4	5	5	5	4	3	1	4	
Average	2.0	1.5	3.0	3.5	5.5	5.0	5.5	3.5	3.0	4.0	
Unity	2	3	7	5	6	5	8	5	4	5	
Sum	6.5	7.0	15.3	13.8	18.5	14.5	21.5	12.8	9.3	15.0	
Importance	2	2	2	1	3	2	3	3	3	1	
Total Visual Quality	13.0	14.0	30.5	13.8	55.5	29.0	64.5	38.3	27.8	15.0	301

Source: S. Johnson, L. Bain, 2003

Views to the Structure

Viewpoints 1 & 2

Alternative C moves the bridge alignment north away from the water and onto the surface behind existing development on North Bay. As a result there would be a reduced visibility of the bridge from Viewpoint 1 and Viewpoint 2. The long diagonal of the bridge across the face of will be readily visible.

Viewpoint 3

The western segment of Alignment C would ramp down to a surface road on the Interbay property. The surface section would not interfere with views from Viewpoint 3 across to the distant hills. The structured ramp for the west portion Alignment C would be visible in the distance, and would be slightly more visible than the existing condition or Alignments A and D.

Viewpoint 4

The western segment of Alignment C would ramp down to a surface road on the Interbay property. This surface section would not interfere with views from Viewpoint 3 across to the distant hills. The structured ramp for the west portion Alignment C would be more visible than the existing condition or Alignments A and D.

Viewpoint 5

Alternative C creates a long ramp diagonally across the face of the Magnolia greenbelt. The length of the bridge structure would be more visible than the existing condition or a Alignment A, and somewhat more visible against the greenbelt than Alignment D as the roadway would be seen largely in profile against the hillside.

Viewpoint 6

The realignment of the western segment of the Alignment C bridge structure to the north results in a reduced view of the bridge overhead from Smith Cove Park and Marina Drive W.

Views from the Structure

Viewpoints 7

In Alternative C, the western portion of the roadway, as it leaves Magnolia Hill, is turns rapidly to the northeast. This turn would have the effect of shortening the duration of the views from the bridge from Viewpoint 7. In the scoring of this viewpoint the increase in duration off-set the effect of the increased roadway width.

Viewpoints 8

In Alternative C, the western portion of the roadway, as it leaves Magnolia Hill, is turns to the northeast and angles down the face of the greenbelt. This turn would have the effect of lengthening the duration of the views from the bridge from Viewpoint 8. In the scoring of this viewpoint the increase in duration off-set the effect of the increased roadway width.

Viewpoint 9

The elimination of the elevated roadway in the middle of the project area (North Bay/Terminal 91) would eliminate views currently available from the Magnolia Bridge. In particular, Viewpoint 9, a vivid view of Puget Sound, the Olympic Peninsula and the West Seattle hill would be lost.

Light and Glare Impacts

The western segment of Alignment C runs nearly parallel to the Magnolia Bluff and is similar to Alignment D and the perceived glare from headlights as seen from the Magnolia greenbelt should similar to or less than Alignment D and less than the existing condition or Alignment A.

The view from Queen Anne Hill of light or glare from Alignment C would likely be somewhat less than Alignment D, and less than Alignment A or the existing condition.

The roadway lighting visible from below at West Marina Place and Smith Cove Park should be less apparent than the existing bridge or Alignment A as Alignment C is further north and not so directly overhead.

There will be an increase in the perception of light and headlight glare when viewed from Viewpoint 4.

Shadow Impacts

The elevated portion of Alignment C is in two sections. The eastern portion passes over private commercial, public right of way, railroad and port properties. The western elevated portion passes over the Magnolia Greenbelt and Port properties. The cumulative length of the elevated portions of Alignment C are Alignment A or the existing bridge, and therefore cast a somewhat greater area of shadow. The reduced amount of supporting columns and elimination of the lateral braces will

likewise reduce the amount of shadow at low sun angles as compared to the existing structure

Shadows from the Alignment C elevated roadway would continuously shadow the property lying beneath and to the north of the roadway. Shadows would be cast on the portion of the Magnolia Greenbelt immediately below and to the north of the structure. Alignment C, as it leaves Magnolia Hill, runs essentially parallel to the Magnolia Greenbelt, therefore Alignment C will shadow more of the Greenbelt than Alignment A or D or the existing structure. The support column will contribute to the cast shadows at times with low sun angles.

In the summer months, when the sun rises and sets to the north of due east and west, shadows would be cast to the south of the bridge, after the sun rises above Queen Anne Hill or before it sets below Magnolia Hill. Because Alignment D turns to the north as it leaves Magnolia Hill, shadows on the northern portion of Smith Cove Park in the early morning summer hours would be reduced in comparison to Alignment A or the existing bridge.

Alternative D

The visual impacts of Alternative D are summarized in Table 5, below and shown in Appendix A of this report. Alignment D is 30% wider and 10% longer than the existing structure. Overall, due to the shift of the alignment northward, Alignment D, when compared to the existing bridge, is judged to have somewhat reduced impacts on views of the structure, similar views from the bridge structure and reduced light and glare impacts compared to the existing condition. For Alignment D, the views from Viewpoints 3, 4, 7 and 10 are considered to have minimal differences from the existing condition. These views are shown in Appendix A, but not discussed below.

Table 5
Visual Quality Assessment Matrix – Alternative D

Magnolia Bridge Visual Assessment Scoring

	Viewpoints										
D Alignments	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Score**
Vividness											
Landform	4	4	7	7	9	7	10	7	7	6	
Waterform	0	1	1	0	9	0	9	0	7	7	
Vegetation	2	2	5	6	5	5	4	5	7	6	
Constructed	4	4	8	6	7	4	9	6	7	5	
Average	2.5	2.8	5.3	4.8	7.5	4.0	8.0	4.5	7.0	6.0	
Intactness											
Development	1	1	2	2	6	6	7	4	7	4	
Encroachment	3	3	4	4	4	4	4	3	8	4	
Average	2.0	2.0	3.0	3.0	5.0	5.0	5.5	3.5	7.5	4.0	
Unity	2	2	7	5	6	4	8	5	8	5	
Sum	6.5	6.8	15.3	12.8	18.5	13.0	21.5	13.0	22.5	15.0	
Importance	2	2	2	1	3	2	3	3	3	1	
Total Visual Quality	13.0	13.5	30.5	12.8	55.5	26.0	64.5	39.0	67.5	15.0	337

Source: S. Johnson, L. Bain, 2003

Views to Structure

Viewpoints 1, 2, 6

Alternative D moves the bridge alignment north away from the water, and as a result moves the bridge further from certain viewpoints such as Viewpoint 1 and Viewpoint 2. This should produce a reduced sense of presence of the structure as a visual element in the landscape at those locations. There is a similar, but lesser, reduction of the presence of the overhead bridge structure from Viewpoint 6.

Viewpoints 1, 5

Alternative D creates a longer ramp diagonally across the face of the Magnolia greenbelt. While the additional length of the bridge structure will be visible from Viewpoint 1 and Viewpoint 5, the roadway will be seen largely in profile against the hillside. The view studies show a reduced visibility of the bridge roadway and structure and encroachment on the Magnolia greenbelt landform from those viewpoints.

Views from Structure

Viewpoint 8

In Alternative D, the western portion of the roadway, as it leaves Magnolia Hill, is angled more to the northeast. This angle, combined with the location of the roadway further to the north, would have the effect of lengthening the duration of the views from the bridge from Viewpoint 8. In the scoring of this viewpoint the increase in duration off-set the effect of the increased roadway width.

Viewpoint 9

The Alternative D alignments are further from the Elliott Bay shoreline. This relocation would have the effect of reducing the vividness of views of the land and water from Viewpoint 9.

Light and Glare Impacts

Alignment D is more than 500’ to the north of the existing bridge alignment and angles almost parallel to the Magnolia bluff as it rises to West Galer Street. Although vehicular headlights would continue to be visible from the Magnolia Green belt and from the residences on Magnolia Way West, the perceived glare from headlights should be less than the existing condition or Alignment A.

The view of the roadway from Queen Anne Hill would be substantially the same as the existing alignment, although, due to the angle of the road as it leaves Magnolia hill, the perception of vehicular headlights may be reduced.

The roadway lighting visible from below at West Marina Place and Smith Cove Park should be less apparent than the existing bridge or Alignment A as the alignment is further north and not so directly overhead.

Shadow Impacts

Alignment D is somewhat longer than Alignment A or the existing bridge, and therefore cast a somewhat greater area of shadow. The reduced amount of

supporting columns and elimination of the lateral braces will likewise reduce the amount of shadow at low sun angles as compared to the existing structure.

Shadows from the Alignment D elevated roadway would continuously shadow the property lying beneath and to the north of the roadway. Shadows would be cast on the portion of the Magnolia Greenbelt immediately below and to the north of the structure. Alignment D, as it leaves Magnolia Hill, is somewhat more parallel to the Magnolia Greenbelt than either Alignment A or the existing bridge, therefore Alignment D will shadow more of the Greenbelt. The support column will contribute to the cast shadows at times with low sun angles.

In the summer months, when the sun rises and sets to the north of due east and west, shadows would be cast to the south of the bridge, after the sun rises above Queen Anne Hill or before it sets below Magnolia Hill. Because Alignment D turns to the north as it leaves Magnolia Hill, shadows on the northern portion of Smith Cove Park in the early morning summer hours would be reduced in comparison to Alignment A or the existing bridge.

Summary of Impacts

Summary of View Impacts To and From the Structure

The analysis of view impacts includes both views toward and from the structures. The analysis demonstrates that for views toward the structure, impacts will be somewhat increased for Alignment A (primarily due to the increased width of the proposed roadway) and somewhat reduced for Alignments C and D, particularly from Smith Cove Park (Viewpoint 6), in comparison to the No-Build Alternative.

For views from the structure, Alignment A and Alignment D will be similar to the No Build Alternative. Because Alignment C drops to the surface through the Interbay area there will be loss of some views from the structure (e.g Viewpoint 9) for this alignment.

Summary of Light and Glare Impacts

Light and glare impacts for Alignment A will be similar to the No Build Alternative (the existing condition). There will be a somewhat reduced perception of vehicle headlights from the Magnolia and Queen Anne (Viewpoint 5) residential neighborhoods for Alignments C and D. Because Alignment C is longer than either Alignment A or D, there will be more street lighting associated with Alignment C.

Summary of Shadow Impacts

Shadow impacts have been assessed primarily for their effect on public recreation areas in the project area. All alignments, including the No Build Alternative are predominantly to the north of the major public recreation area (Smith Cove Park) and therefore shadow impacts are not an important factor in the mid-day period. The No Build Alternative and Alignment A have the greatest morning shadow impacts on the park area than Alignment C or D. Alignment C will have a greater impact on the existing Terminal 90/91 bicycle/pedestrian trail than the other alignments.

Environmental Consequences Matrix Scoring

The environmental consequences matrix for visual quality summarizes the comparative impacts of the four categories of impacts discussed above (i.e. Views to the Structure, Views from the structure, Light and Glare and Shadows). The comparison of the alternative Alignments A, C and D to the No Build Alternative are summarized in Table 6, Environmental Consequences Matrix shown below. The scoring shown in the matrix is comparative, assessing visual impacts as being greater or lesser than the existing condition. A score of 5 is used as a median value with greater impacts given a higher number (6 to 10) and lesser comparative impacts given a lower number (4 to 0). As shown on the matrix, the No Build Alternative has a par value of 20 for the four categories of visual impact. Alignment A has s slightly higher score at 21, while Alignment C and D have somewhat reduced overall impacts with scores of 19 and 17 respectively.

Table 6
Environmental Consequences Matrix

Alternative	Views to the structure	Scoring*	Views from the structure	Scoring*	Light & Glare	Scoring*	Shadow	Scoring*	Totals
No Build Alternative	No change	5	No change	5	No change	5	No change	5	20
Alignment A	Some increased impacts	6	Similar	5	Similar	5	Similar	5	21
Alignment C	Some decreased impacts	4	Loss of some views	7	Some reduction	4	Some reduction	4	19
Alignment D	Some decreased impacts	4	Similar	5	Some reduction	4	Some reduction	4	17

Note:* Scoring based on comparative evaluation against the No-build option as a baseline scored as 5, with increased impacts given higher numbers and reduced impacts given lower numbers. Higher totals indicate a greater cumulative impact when compared to the no-build alternative.

Source: S. Johnson, L. Bain

No Build Alternative

View Mitigation

No mitigation of existing conditions would be provided

Light and Glare Mitigation

No mitigation of existing conditions would be provided

Shadow Mitigation

No mitigation of existing conditions would be provided

Alternative A

View Mitigation

For views of the structure, impacts associated with the increased width or apparent mass of the structure (e.g. from Viewpoint 6) may be somewhat mitigated by painting portions of the structure a neutral color. Mitigation of affected areas of the greenbelt should include replanting and reforestation of the project area.

For views from the structure, the proposed railing system will have similar or somewhat improved effect as the existing railings on views from vehicles. For pedestrians and bicyclists, view opportunities will be similar as well. Improved viewing opportunities from the bridge (Viewpoints 7, 8, 9) might be provided by creating one or more seating/viewing areas out of the flow of the bikeway/walkway on the south side of the bridge.

Light and Glare Mitigation

In general, all roadway lighting should be shielded so that there is no visible light source above the horizontal.

For views of the bridge from Magnolia greenbelt area, roadway lighting impacts may be mitigated by providing lateral shielding. Headlight glare may be mitigated by appropriate planting, although potential view blockage from the greenbelt area may be a consideration. Headlight glare across the roadway from oncoming vehicles at curved sections of roadway may be mitigated by median barriers.

Shadow Mitigation

The roadway for Alignment A is wider than the existing structure and therefore will cast larger shadows. Shadow effects may be mitigated to a certain extent by minimizing the number and size of structural support elements (consistent with structural stability and efficiency). Shadow effects under the lower sections of the structure can also be mitigated by the provision of artificial lighting at critical locations, particularly where pedestrian and or vehicular traffic may be affected. Using smooth formwork to produce a reflective surface, painting the structure and

using a bridge section that is tapered toward its edges can also reduce shadow effects.

Alternative C

View Mitigation

The western segment of Alternative C is more visible than the existing bridge as seen against the Magnolia Bluff. The perception of this segment may be reduced by neutral colored paint and landscaping. Mitigation of affected areas of the Magnolia and Queen Anne greenbelts should include replanting and reforestation of the project area.

For views from the bridge, the loss of views from the central portion of Alignment C may be somewhat mitigated for pedestrians by providing viewing areas along the pedestrian/bicycle lane, as described in Alternative A.

Light and Glare Mitigation

In general, all roadway lighting should be shielded so that there is no visible light source above the horizontal, including lighting provided for the surface road segment of Alignment C.

Much of the roadway for Alignment C is aimed away from residential neighborhoods, reducing the effect of headlight glare. For views of the bridge from Magnolia greenbelt area, roadway lighting impacts may be mitigated by providing increased lateral shielding of light fixtures. Headlight glare across the roadway from oncoming vehicles at curved sections of roadway may be mitigated by median barriers.

Street trees may be planted along the surface portions of Alignment C.

Shadow Mitigation

The roadway for Alignment C is wider than the existing structure therefore will cast larger shadows from its elevated sections. Where the elevated sections approach the surface (e.g. along the Magnolia Bluff) there may be some areas that are effectively permanently in shadow. Shadow effects may be mitigated to a certain extent by minimizing the number and size of structural support elements (consistent with structural stability and efficiency). Shadow effects under the lower sections of the structure can also be mitigated by the provision of artificial lighting at critical locations, particularly where pedestrian and or vehicular traffic may be affected. Using smooth formwork to produce a reflective surface, painting the structure and using a bridge section that is tapered toward its edges can also reduce shadow effects.

Alternative D

View Mitigation

For views of the bridge, Alternative D is judged to have slightly less overall impact than the existing bridge. Mitigation of affected areas of the Magnolia and Queen Anne greenbelts should include replanting and reforestation of the project area.

For views from the bridge, the proposed railing design would have similar or improved effect on the views. Viewing areas along the pedestrian/bicycle lane may be effective in improving view opportunities, as described in Alternative A.

Light and Glare Mitigation

In general, all roadway lighting should be shielded so that there is no visible light source above the horizontal.

For views of the bridge from Magnolia greenbelt area, roadway lighting and vehicular lighting impacts would likely be lower than the existing condition, lateral shielding may still be appropriate in specific locations. Headlight glare as seen from the roadway may be mitigated by appropriate planting, although potential view blockage from the greenbelt area may be a consideration. Headlight glare across the roadway from oncoming vehicles at curved sections of roadway may be mitigated by median barriers.

Shadow Mitigation

The roadway for Alignment D is wider than the existing structure and therefore will cast larger shadows. Shadow effects may be mitigated to a certain extent by minimizing the number and size of structural support elements (consistent with structural stability and efficiency). Shadow effects under the lower sections of the structure can also be mitigated by the provision of artificial lighting at critical locations, particularly where pedestrian and or vehicular traffic may be affected. Using smooth formwork to produce a reflective surface, painting the structure and using a bridge section that is tapered toward its edges can also reduce shadow effects.

No Build Alternative

Construction Impacts

No change from the existing visual characteristics or affect on visual resources would occur.

Construction Mitigation

No mitigation of existing conditions would be provided.

Alternative A

Construction Impacts

There would be some removal of existing trees and vegetation where the new structure connects to W. Galer Street to provide for construction activities and the wider roadway. The increased width of the roadway and work area would be approximately 60'.

Construction Mitigation

Required clearing of vegetation may be mitigated by limiting the duration from the start of clearing to replanting/reforestation by careful scheduling and by promptly replanting with relatively mature plant stock.

Alternative C

Construction Impacts

There would be removal of vegetation in a zone approximately 80' wide where the new structure is constructed within the Magnolia greenbelt and ramps down to the Terminal 90/91 property. There will also be some structures removed or altered in the Terminal 90/91 area.

Construction Mitigation

Clearing of vegetation may be mitigated by limiting the duration from the start of clearing to replanting/reforestation and by careful scheduling and by replanting with relatively mature plant stock.

Alternative D

Construction Impacts

There would be removal of vegetation in a zone approximately 80' wide where the new structure is constructed within the Magnolia greenbelt and connects to West Galer Street.

Construction Mitigation

Clearing of vegetation may be mitigated by limiting the duration from the start of clearing to replanting/reforestation by careful scheduling and by prompt replanting with relatively mature plant stock.

Affected Environment

The existing Magnolia Bridge and the bridge replacement alternatives are located in the valley between Queen Anne Hill on the east and Magnolia Hill on the west in the City of Seattle. The bridge replacement alternatives all would cross the North Bay industrial area (Terminal 90/91) either on elevated structures or surface roads.

The Magnolia Bridge, as it sits between the residential communities on Magnolia and Queen Anne hills and crosses the flat North Bay industrial area, offers dramatic views of Elliott Bay, Downtown Seattle, and the surrounding hills, mountains and waters of the region. These views are an important part of a well-traveled commuter route and scenic drive.

Views of the bridge structure from both above and below are available from many vantage points, including views from a number of public parks and open spaces, from residences on Queen Anne and Magnolia hillsides and from businesses in North Bay and the 15th Avenue West Elliott Avenue West corridor.

While the distance and height from which the bridge is seen from many areas tends to reduce the perception of light and glare from the bridge, there are several locations, including public parks and some residential areas where vehicular and roadway lighting are visible from relatively close by.

Environmental Consequences

Operational Impacts

The environmental consequences for visual quality (i.e. Views to the Structure, Views from the structure, Light and Glare and Shadows) of the alternative alignments, as compared to the No Build Alternative are summarized in Table 7, Environmental Consequences Matrix and described below. The scoring shown in the matrix is comparative, assessing visual impacts as being greater or lesser than the existing condition. A score of 5 is used as a median value with greater impacts given a higher number (6 to 10) and lesser comparative impacts given a lower number (4 to 0). The No Build Alternative has a cumulative score of 20.

Alignment A, when compared to the existing bridge, is judged to have somewhat increased impacts on views of the structure due to increased structure width and proximity to Smith Cove Park, similar views of the region from the bridge structure and similar light and glare impacts. The cumulative score for Alternative A is 21

Alignment C, when compared to the existing bridge, is judged to have somewhat reduced impacts on views of the structure, due to the diagonal alignment across the Magnolia greenbelt and its increased distance from Smith Cove Park. There are lost views from the bridge structure. There are somewhat reduced light and glare and shadow impacts, also due to the diagonal alignment across the Magnolia greenbelt. The cumulative score for Alternative C is 19

Alignment D, when compared to the existing bridge, is judged to have somewhat reduced impacts on views of the structure, due to the diagonal alignment across the

Magnolia greenbelt and its increased distance from Smith Cove Park, similar views from the bridge structure and reduced light and glare impacts, also due to the diagonal alignment across the Magnolia greenbelt. The cumulative score for Alternative D is 17.

Construction Impacts

Construction impacts on views would be limited to the clearing of greenbelt areas for the alternative alignments and the associated work zone of approximately 10' on each side.

Alignment H, because of the additional north segment, will have increased impacts compared to the other alternatives.

Secondary and Cumulative Impacts

No secondary or cumulative impacts have been identified.

Table 7
Environmental Consequences Matrix

Alternative	Views to the structure	Scoring*	Views from the structure	Scoring*	Light & Glare	Scoring*	Shadow	Scoring*	Totals
No Build Alternative	No change	5	No change	5	No change	5	No change	5	20
Alignment A	Some increased impacts	6	Similar	5	Similar	5	Similar	5	21
Alignment C	Some decreased impacts	4	Loss of some views	7	Some reduction	4	Some reduction	4	19
Alignment D	Some decreased impacts	4	Similar	5	Some reduction	4	Some reduction	4	17

Note:* Scoring based on comparative evaluation against the No-build option as a baseline scored as 5, with increased impacts given higher numbers and reduced impacts given lower numbers. Higher totals indicate a greater cumulative impact when compared to the no-build alternative.

Source: S. Johnson, L. Bain

Mitigation Measures

Operational Mitigation

Consider the use neutral paint colors to reduce the effect of bulk of the structure when seen from below.

Consider including viewpoints along the pedestrian walkway.

Provide planting of mature vegetation to reforest greenbelt areas and to screen vehicular lights.

Provide shielding for all lights, to minimize direct views of light sources.

Provide lateral shield of roadway lights at particular locations where viewers may be below the light source.

Construction Mitigation

Reduce duration of construction work in greenbelt areas.

Schedule prompt replanting of cleared areas.

References

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City of Seattle Engineering Department. 1983. Stereophotogrammetric Mapping.

City of Seattle Department of Planning & Development, "Seattle Views"An Inventory of 86 Public Views Protected Under SEPA (SMC 25.05.675), May 2002

Appendix A – View Analysis Figures

The assessments of each alternative bridge alignment discussed in the Impacts section were based on a digital model of each alignment that had been inserted into the photograph taken from the selected viewpoints (see Affected Environment section). The resulting composite images are shown in the following pages.

Alignment A seen from Viewpoint 1

Alignment C seen from Viewpoint 1

Alignment D seen from Viewpoint 1

Alignment A seen from Viewpoint 2

Alignment C seen from Viewpoint 2

Alignment D seen from Viewpoint 2

Alignment A seen from Viewpoint 3

Alignment C seen from Viewpoint 3

Alignment D seen from Viewpoint 3

Alignment A seen from Viewpoint 4

Alignment C seen from Viewpoint 4

Alignment D seen from Viewpoint 4

Alignment A seen from Viewpoint 5

Alignment C seen from Viewpoint 5

Alignment D seen from Viewpoint 5

Alignment A seen from Viewpoint 6

Alignment C seen from Viewpoint 6

Alignment D seen from Viewpoint 6

Alignment A seen from Viewpoint 7

Alignment C seen from Viewpoint 7

Alignment D seen from Viewpoint 7

Alignment A seen from Viewpoint 8

Alignment C seen from Viewpoint 8

Alignment D seen from Viewpoint 8

Alignment A seen from Viewpoint 10

Alignment C seen from Viewpoint 10

Alignment D seen from Viewpoint 10

Appendix B – Shadow Analysis Figures

The shadow analysis of each alternative bridge alignment discussed in the Impacts section is shown by illustration in the following appendix. These images were generated by overlaying computer models of the bridge alignments over computer-generated terrain models with sunlight projections based on time-of-day and time-of-year.

Alignment A seen at Equinox
8 a.m. PST

Alignment A seen at Equinox
noon PST

Alignment A seen at Equinox
4 p.m. PST

Alignment A seen at Summer Solstice
8 a.m. PDT

Alignment A seen at Summer Solstice
noon PDT

Alignment A seen at Summer Solstice
6 p.m. PDT

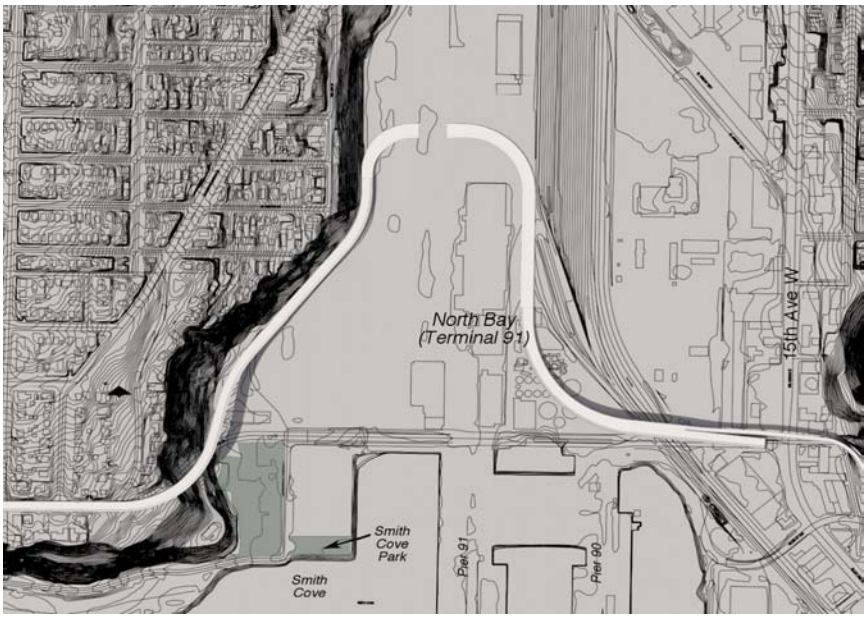
Alignment A seen at Winter Solstice
8 a.m. PST

Alignment A seen at Winter Solstice
noon PST

Alignment A seen at Winter Solstice
4 p.m. PST

**Alignment C seen at Equinox
8 a.m. PST**

**Alignment C seen at Equinox
noon PST**



**Alignment C seen at Equinox
4 p.m. PST**

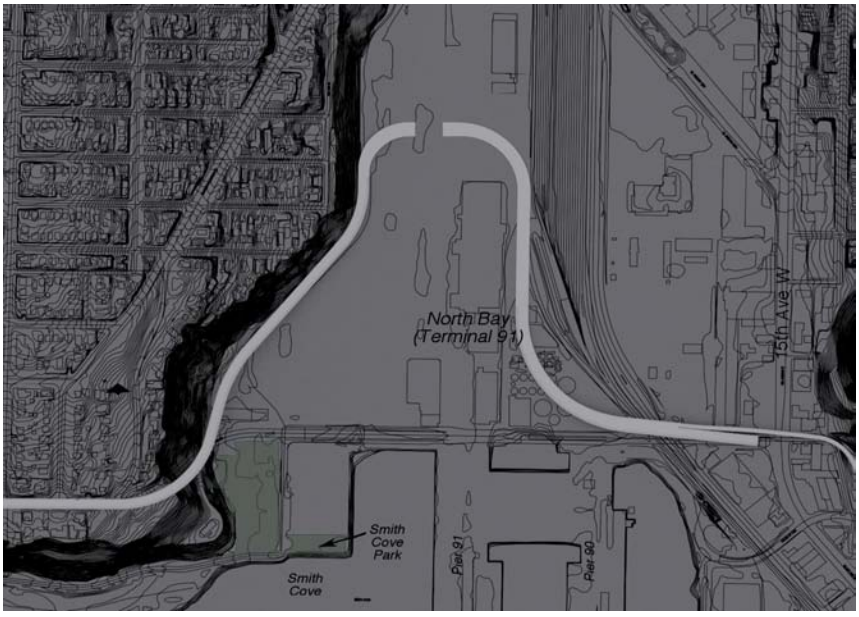
Alignment C seen at Summer Solstice
8 a.m. PDT

Alignment C seen at Summer Solstice
noon PDT

Alignment C seen at Summer Solstice
6 p.m. PDT

Alignment C seen at Winter Solstice
8 a.m. PST

Alignment C seen at Winter Solstice
noon PST

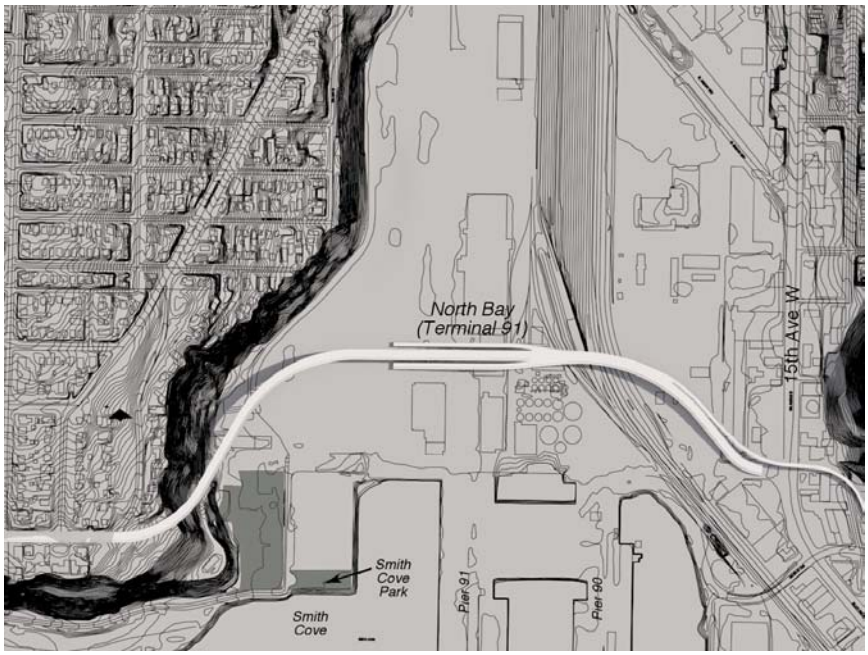


Alignment C seen at Winter Solstice
4 p.m. PST

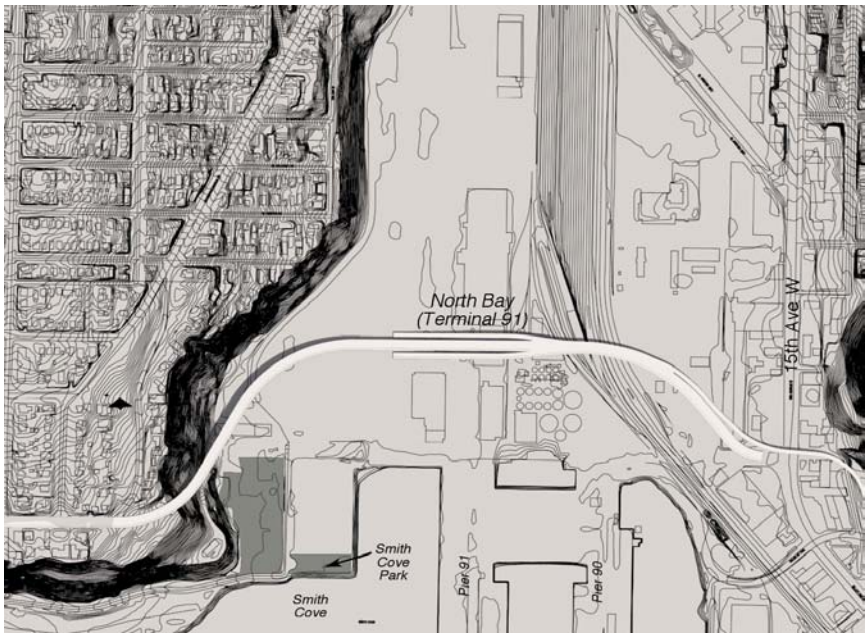
Alignment D seen at Equinox
8 a.m. PST

Alignment D seen at Equinox
noon PST

Alignment D seen at Equinox
4 p.m. PST



Alignment D seen at Summer Solstice
8 a.m. PDT

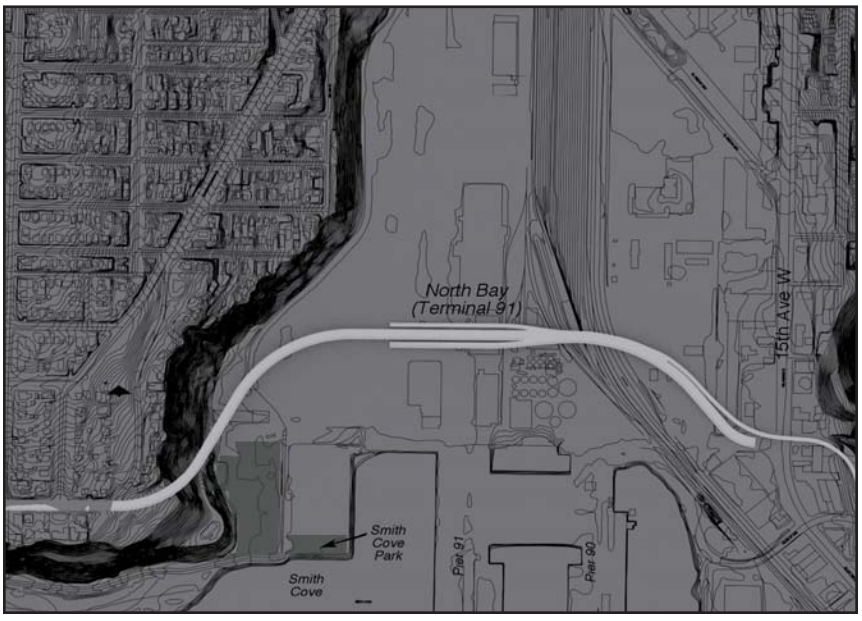


Alignment D seen at Summer Solstice
noon PDT

Alignment D seen at Summer Solstice
6 p.m. PDT

Alignment D seen at Winter Solstice
8 a.m. PST

Alignment D seen at Winter Solstice
noon PST



Alignment D seen at Winter Solstice
4 p.m. PST