ALASKAN WAY VIADUCT AND BATTERY STREET TUNNEL
Seattle
King County
Washington

HAER WA-184
WA-184

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

FIELD RECORDS

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
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HISTORIC AMERICAN ENGINEERING RECORD

ALASKAN WAY VIADUCT AND BATTERY STREET TUNNEL

HAER WA-184

Location: The Alaskan Way Viaduct is a two-level structure of reinforced concrete that runs for approximately two miles between Battery Street and S. Holgate Street on the downtown waterfront of Seattle, King County, Washington. The 2,134 foot-long Battery Street Tunnel connects the north end of the viaduct to State Route (SR) 99 (Aurora Avenue N.).

Construction Dates: 1949-1966

Designers: City of Seattle Engineering Department (Battery Street-Pike Street, Pike Street to S. King Street, Battery Street Tunnel,

Washington Department of Highways Bridge Division (S. King Street to S. Holgate Street)

Owner: Washington State Department of Transportation

Significance: The Alaskan Way Viaduct is significant for its double-deck configuration, the first such bridge built in the state of Washington. The structure encompasses two different designs and crosses over highly complex subsurface conditions, supported throughout its length on pile foundations.

The Battery Street Tunnel was the City of Seattle Engineering Department's first venture into tunnel design. It was designed and built to minimize traffic disruption and reduce risk to neighboring buildings. Its health and safety features were innovative at the time, including a ventilation system actuated by carbon monoxide monitors and a heat-actuated automatic sprinkler system.

The viaduct and the tunnel played an important role in the development of Seattle and the region by providing a direct connection through downtown Seattle and to the industrial areas to the south.

Project Information: Documentation of the Alaska Way Viaduct was undertaken by the Washington State Department of Transportation in 2008 in partial mitigation for planned demolition of the structure because of its seismic instability. Large format photography was produced by Jet Lowe of the National Park Service. The overview history was prepared by Mimi Sheridan, AICP.

INTRODUCTION

Seattle's Alaskan Way Viaduct may evoke the strongest emotions—both positive and negative—of any roadway in the country. Its location along the city's scenic waterfront feeds this debate. In only a few minutes a traveler experiences the best of Seattle's vistas. Coming from the south, on top of the two-level structure, one sees the gradual appearance of the dramatic high-rise skyline. To the left unfolds a close-up view of the busy port with container ships and bright orange cranes. In the distance are the expanse of Puget Sound and the snow-capped Olympic Mountains. To the right are the massive baseball and football stadiums. Closer to the center of the city are the brick buildings of Seattle's birthplace, the Pioneer Square Historic District. Some of the buildings, more than a century old, now stand only a few feet from the viaduct. The nearby railroad yards and the historic piers along the waterfront are a reminder of earlier transportation modes. Before the roadway turns away from the waterfront into the Battery Street Tunnel, it skirts behind the multilevel warren of the Pike Place Market, another vital part of the city's history.

Those who walk along the waterfront, however, have quite a different experience of the viaduct. The traffic noise makes conversation difficult. The viaduct blocks views from neighboring buildings, and makes it more difficult to see them. The large concrete piers and dark barren parking lot beneath the structure are often seen as a barrier between the city and its waterfront—an unpleasant place to cross through.

The Alaskan Way Viaduct was first envisioned in the 1930s to provide an efficient route for traffic traveling through downtown Seattle. The city's hour-glass shape, with its downtown constricted by water and steep hills, made circulation difficult. Engineers seized the opportunity to build along the waterfront, a corridor largely devoted to railroads, shipping and industry. The double-deck configuration allowed six lanes to be built in the space of three. It was the first such highway built in Washington State. A tunnel connected the structure with US 99[1] to the north. The tunnel was dug beneath Battery Street, with minimal disruption to surrounding buildings, and featured innovative ventilation and fire safety systems.

The viaduct was built in three phases between 1949 and 1953, with the tunnel being completed in 1954. Funding was shared by Washington State, the City of Seattle and the U.S. Bureau of Public Roads. Construction was challenging because of the constricted corridor through a developed area and the complex foundation materials, a mix of till, debris and tide flat deposits.[2] The structure originally served primarily as a by-pass through downtown, but in 1961 an off-ramp into the center of the city was built. An on-ramp was added nearby in 1966. Before these were built, the highway to the south of the viaduct was completed, forming a roadway system connecting downtown Seattle and the industrial areas of South Seattle with residential communities in North Seattle and West Seattle.

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[1] The route was designated as a federal highway (US 99) when it opened, but it was later designated as a state route (SR 99).

[2] City of Seattle photographers thoroughly documented the construction process. The photos are available on the city's website (seattle.gov), under the Municipal Archives.

The viaduct was widely applauded as a civic asset and proved to be a popular and effective transportation artery, carrying more than 100,000 vehicles a day. However, within a decade of its completion, calls began for its demolition. Shipping had been containerized and railroad operations had moved largely south of the central waterfront. Piersheds were converted to restaurants and tourist attractions. The produce businesses had moved to less-congested areas and their old buildings were renovated into offices, restaurants and condominiums. The viaduct's noise and massive concrete presence was increasingly seen as a barrier to enjoyment and economic development of the waterfront.

An earthquake in February 2001 caused significant damage to the viaduct, leading the city and state to seriously consider alternatives to replace it. Today, the structure has been shored up and is constantly monitored for further damage, as numerous options, ranging from a waterfront tunnel to various surface solutions, are considered.

BACKGROUND AND HISTORICAL CONTEXT

National Road Development

When planning for the Alaskan Way Viaduct began the concepts of limited access highways and of double-deck roadway structures were both relatively new. People had heard of the German *autobahn*, the first system of limited access highways. East Coast states had built several heavily-landscaped limited-access roads such as Connecticut's Merritt Parkway. The first section of the Pennsylvania Turnpike, a toll road free of cross-traffic, opened in 1940. In California, the Arroyo Seco Parkway (now the Pasadena Freeway) opened in 1938 and San Francisco's Park Presidio Parkway in 1940. However, other California freeways date from the 1950s, the same period as the Alaskan Way Viaduct.

One of the most influential structures for early viaduct planners may have been Chicago's Wacker Drive, a double-deck structure along the Chicago River. It was initially proposed in the City Beautiful-inspired *Plan of Chicago* (1909) by Daniel Burnham and Edward Bennett as a means to reduce traffic congestion. The structure was built in 1926 and was extended and improved several times in later years. The upper level was originally intended for pleasure drivers to enjoy the view, but it soon evolved to serve local traffic in general, with through traffic on the lower deck.

Western Washington

Western Washington's first major roads (actually dirt wagon roads) were developed by the military in the 1850s-60s to improve access to its forts. Later road development occurred primarily under county auspices, meeting local needs by connecting neighboring towns and providing a means for farmers to get their produce to market. Railroads were the preferred method for traveling or shipping longer distances. However, as early as 1899 the benefit of good long-distance highways was recognized. In that year a group of political and business leaders organized the Washington Good Roads Association to lobby for improved highways throughout the state. Their timing was good, as the state's first automobile made its appearance a few months later. Although counties resisted an increased state role in road construction, and the governor objected to the expense, in 1905 the legislature established a State Highway Board and the post of State Highway Commissioner and authorized twelve state highways. Money was appropriated to improve 41 miles of designated roads. However, counties continued to resist state leadership and actual improvements were slow in coming.[3]

With the arrival of the automobile, people could travel casually from town to town for enjoyment and embark easily on pleasure drives. Many people already enjoyed touring on bicycles, and the problems caused by automobiles on rutted, dusty roads encouraged cyclists and "automobilists" to join together in lobbying for improvements. Prosperity and Henry Ford's manufacturing innovations had made automobiles affordable to a growing number of people, and they sought roads to travel on. The Permanent Highway Act of 1911 allowed the state to levy a tax for roads and established standards for construction, which was to be carried out by the counties. Highway construction received a further boost with the approval of federal assistance bills in 1916 and 1921. The emphasis was on rural roads, which had been neglected as cities grew, and on developing a coordinated system of highways to tie the entire country together—a precursor to the post-World War II interstate highway program. In 1926 the State of Washington had a planned system of 17 primary state highways to link together every corner of the state, both rural areas and heavily populated corridors. The first of these, Primary State Highway No. 1 (PSH-1) was the Pacific Highway, extending from Vancouver north to Blaine, through the most populous cities in the state. It was later known as US 99 and later as SR 99.[4]

The Pacific Highway

The Alaskan Way Viaduct and the Battery Street Tunnel were vital and long-delayed components of the Pacific Highway. The original Pacific Highway was part of a national phenomenon of road building that occurred in the teens and Twenties. The Pacific Highway was to be the major route along the West Coast, stretching from the Peace Arch at the Canadian border to the Mexican border. A prescient 1921 article described it as "the broad stretch of pavement, 700 miles in length at present and 1,600 miles when completed …the forerunner of great highways beyond the conception of the next generation that will mark the nation like a great checkerboard with its mass

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[3] Walt Crowley, Kit Oldham and The Historylink Staff. *Moving Washington Timeline: The First Century of the Washington State Department of Transportation, 1905-2005.* Washington State Department of Transportation 2005: 20-23.
[4] Paul Dorpat and Genevieve McCoy, *Building Washington: a History of Washington State Public Works,* Seattle, WA: Washington Chapter American Public Works Association, 1998: 81-85.

of highway arteries running in every direction and over which will flow the traffic of the continent."[5]

In Washington, construction of the Pacific Highway was primarily a county responsibility and was undertaken independently in various locations. By 1923 the route extended 306 miles through nine counties and was nearly completely paved in Warrenite (an asphalt and concrete mixture), brick or concrete.[6] However, through larger cities the streets congested with street cars and pedestrians made the route tortuous for through travelers. To overcome this problem, efforts began to widen the streets and build limited access "speedways." In 1931, Aurora Avenue was widened and paved from Woodland Park north to the city boundary at N. 85th Street.

The last sections to be completed were the most complex and controversial: the stretch through Woodland Park and the bridge over the Lake Washington Ship Canal. In 1928 the state highway commission selected the Aurora Avenue route for a bridge connecting to the northeast side of Queen Anne. This high-level structure would allow ship traffic to pass beneath without requiring a drawspan. Since the state had agreed to pay for the bridge if the city built the approaches, the controversial siting of the highway to the north was a city decision. Nearly two years later, in 1930, the city council approved, after very intense public debate, a straight route through Woodland Park, bisecting the zoo from the rest of the park. Public and media uproar was so great that a referendum was placed on the ballot to overturn the decision. However, it was defeated and planning for the speedway continued.[7] The George Washington Memorial Bridge was dedicated on February 22, 1932, the bicentennial of the first president's birth. To the north and south of the bridge Aurora Avenue became a limited access "speedway" with no traffic lights and a 30-mph speed limit, ending at Denny Way. Traffic on the speedway more than doubled in the seven years after its 1933 opening. Approximately 18,000 to 20,000 vehicles a day used the route initially, rapidly increasing to 25,858 in 1936 and to 38,200 in 1940. This created considerable congestion and a major traffic hazard, with numerous fatalities.[8]

The designated through route from the speedway's terminus at Denny Way was circuitous: south on 7th Avenue to Westlake Avenue, then on Westlake into the center of downtown to 4th Avenue and south to E. Marginal Way S., which eventually joined Pacific Highway S. and continued on to Tacoma. Even while Aurora Avenue was under construction, transportation planners were considering the best way to improve connections through downtown to the industrial area and the remainder of the Pacific Highway to the south. An elevated highway along the waterfront was one of the early options discussed, but the continuing economic depression and the subsequent disruptions of World War II forestalled any further action.

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[5] W. E. Chambers, "The Pacific Highway," *The Argus*, December 17, 1921.
[6] Crowley and Oldham 2005: 35.
[7] "Seattle City Council votes to build Aurora Avenue through Woodland Park," http://historylink.org/essays/output.cfm?file_id=8093.
[8] Seattle Department of Engineering Annual Reports, 1936, 1938, 1940.

EARLY PROJECT PLANNING

Detailed planning for a connection from the north end of the waterfront toward the east began in the early 1930s, when the waterfront was being improved. Until that time, the city's waterfront street, then known as Railroad Avenue, actually consisted of a deteriorated 150-foot-wide timber trestle, developed over time by the railroads to serve the piers. The 1905 completion of the Great Northern Tunnel diverted passenger trains and other through rail traffic, but Railroad Avenue remained largely a milieu of trains, wagons and, increasingly, trucks carrying cargo to and from ships. Passengers typically crossed on overpasses. A *Post-Intelligencer* columnist warned casual visitors away: "No one should travel there, a place for colossal commercialism and not for one little Ford, where freight trains move heavily between boats and commission houses and the last of the horses move with ponderous cargoes."[9] In 1911-1916 construction of a seawall along the western edge stabilized the southern portion, from Washington Street to Madison Street. The extension of the seawall north (from Madison Street to Broad Street) was not completed until 1934. This work provided a foundation that allowed the roadway to be filled and paved, a process that was completed in 1936. Once this dramatic improvement was made, more automobiles and trucks began to use the road, further increasing congestion.[10]

Somewhat earlier, in the mid-1920s, City Traffic Engineer J.W.A. Bollong had recommended to Mayor Bertha Landes an elevated roadway from King Street to Battery Street, with the lower level devoted to freight and pier activities and the upper level for through traffic and parking.[11] This was about the same time as the development of Chicago's Wacker Drive, which used this concept of separated activities. Downtown property owners (the Associated Central Business Properties, Inc.) enthusiastically endorsed this proposal, urging City Engineer Chester Morse to back a double-decked elevated roadway from Yesler Way to Stewart Street, connecting to First Avenue and Battery Street. Their goal was not only to connect to the Pacific Highway but to relieve 1st Avenue of delivery and truck traffic.[12]

By 1933 Bollong was working with waterfront property owners to plan a connection to Elliott Avenue by grading a new roadway between Pike and Stewart streets, behind the Armory that then stood north of the Pike Place Market near Lenora Street.[13] This alternative had actually been proposed in 1926, when Railroad Avenue improvements were being planned, and was approved by the city council in 1929. The connection was to continue on to Wall Street and thus to Aurora Avenue N. The need to continue the route to the south, along the east side of Railroad Avenue (which was 180 feet wide at points) was also discussed, and the concept of an elevated viaduct was proposed soon afterward. One particular interest was to relieve the congestion caused by trucks

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[9] Almira Bailey, *Seattle Post-Intelligencer*, May 27, 1927.
[10] Dorpat and McCoy 1998: 160.
[11] Paul Dorpat, *Seattle Waterfront: An Illustrated History*, Seattle: Seattle City Council, 2006: 209-210.
[12] "Property Owners Urge Upper Deck on Railroad Ave.," *Seattle Times*, March 6, 1927.
[13] J. W. A. Bollong, Traffic Engineer, to H. W. Ross, Superintendent, Department of Streets and Sewers, May 26, 1933.

and refrigerated rail cars serving the commission houses (produce warehouses) along the east side of Railroad Avenue.[14] Property owners and shipping interests, including the railroads, truckers and waterfront businesses, proved very receptive to the idea of the Armory Way bypass.

An often-quoted account of the viaduct's beginnings is that engineer Ray M. Murray laid out the route on a Shell Oil Company map in 1934, twelve years before viaduct construction began. Murray had been the Department of Highways engineer in charge of the siting, design and construction of the Aurora Avenue Bridge, and probably knew that waterfront options had been in discussion for some time. Much of Murray's original route was followed, although he had identified Wall Street as the location for the tunnel rather than Battery Street, and placed the south end on Fourth Avenue rather than First Avenue.[15]

In 1938 the Seattle Engineering Department published a plan that included a 3000-foot (.57 mile) roadway 54 feet wide that angled down the steep slope from 1st Avenue and Wall Street to Elliott Avenue, near Armory Way, meeting Railroad Avenue at Pike Street. It proposed a 44-foot divided roadway on the east side of Railroad Avenue, noting that an elevated bypass would be built in the future. At the south end it connected to 1st Avenue S. near Railroad Way, with an extension across the rail yard to 4th Avenue S.[16] Planning continued on the $325,000 Armory Way project until early 1940, but the financing was hotly debated from the beginning—the city simply did not have any money to purchase the property. Although very popular with waterfront interests, and approved by the city council in 1940, the final project was opposed by the mayor and the city engineer, who felt that it was not adequate to relieve the congestion on Alaskan Way and that a larger project would soon be needed. The project finally died in 1941 when civic groups successfully sued the city, holding that the proposal to pay property owners over a period of five years would put the city over its legal debt limit.[17]

Before World War II, Alaskan Way carried the highest amount of traffic of any downtown street. The 1940 traffic count showed 24,380 vehicles on Alaskan Way, compared to 21,529 on 4th Avenue and 11,000 to 13,000 on the four parallel streets. Traffic increased dramatically just before the war, as war industries (primarily Boeing and the shipyards) went into heightened operation and workers arrived from all over the country. However, this changed dramatically once the United States declared war in December 1941. Despite the marked increase in population and industrial activity in Seattle during the war, the number of vehicles and miles traveled declined sharply due to gas and tire rationing and the unavailability of new automobiles. In addition, a number of streets on the waterfront and in the Duwamish industrial area were closed either completely or partially for security and industrial use, shifting traffic to other routes. The U. S. Coast Guard

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[14] Report of Special Committee, received December 1, 1939.
[15] P. C. Leonard, "The Inside Story of the Alaskan Way Viaduct and Other Tales," *Washington State Department of Highways News* (May 1953): 4-5.
[16] "Business District By-pass for U. S. Highway No. 99," C. L. Wartelle, City Engineer, March 26, 1938.
[17] Thomas D. Potwin, Jr., "Municipal League Suit to Oppose Armory Way, *Seattle Times*, January 21, 1940.

closed Alaskan Way near the Port of Embarkation (S. Atlantic Street) during evening and night hours for loading of troops and war materials. In 1942-43 traffic throughout downtown decreased nearly a quarter and Alaskan Way traffic decreased by a third, from 23,520 (1942) vehicles per day to 16,000 (1943). However, traffic volume increased almost immediately after the war ended, reaching 40,100 in 1949. Traffic throughout downtown began to increase significantly each year, a trend that the city expected to continue indefinitely.[18]

Further work on a waterfront alternative route essentially halted during the war, but in 1944-45 the city spent considerable time planning how to adapt to post-war conditions, with the anticipated increase in automobile and truck traffic. This planning was part of a nation-wide effort to upgrade highways with improved safety standards and to have a more coordinated federal highway system, funded partially by the Federal Aid Highway Act of 1944.[19] The city set aside money for post-war infrastructure improvements and established a committee to prioritize improvements. Completing the north-south highway to bypass downtown was given the highest priority.

Post-war planning focused on the best methods to address the problem of automobiles throughout the city and to allow people to move around easily from their new homes being built in the suburbs. The preferred option was limited access freeways, a concept that was generally well-received by both experts and the public. In late 1947, four Seattle architects, interviewed by the *Seattle Times*, explained their support for limited access freeways, preferably with extensive landscaping and no adjacent businesses. They also supported banning parking on principal streets to improve traffic flow. They were particularly convinced of the need for a new north-south freeway, one person specifically mentioning a route east of Lake Union. Joshua Vogel, an architect and planner at the University of Washington, emphasized particularly that "We've got to have the Alaskan Way Viaduct. It will be of scenic benefit to tourists, for one thing."[20]

ALASKAN WAY VIADUCT PROJECT PLANNING AND DESIGN

Selecting the Route

Despite the long-term discussion of the need for a route connecting Aurora Avenue to the south, specific planning was delayed until completion of an Origin and Destination Traffic Survey in October 1947. The study was conducted by the Washington Department of Highways, the U. S. Public Roads Administration and the City of Seattle in order to prioritize possible routes through the city. It consisted of thousands of interviews with residents, businesses, bus riders, and drivers of autos, trucks and taxis, to identify where people and how people traveled through the city.

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[18] Seattle Department of Engineering Annual Reports, 1941-1949.
[19] Dorpat and McCoy 1998: 88-89.
[20] Robert Heilman, "Landscaped Freeway Ideal Thoroughfare, City Told," *Seattle Times*, November 14, 1947.

When completed, the study projected that the route with the greatest potential effect on relieving congestion was the long-discussed elevated route on Alaskan Way, connecting beneath Battery Street to Aurora Avenue. The second most effective route was one that crossed the Lake Washington Ship Canal near the University of Washington and ran along 6th Avenue and the west edge of Beacon Hill. The two routes were not seen as alternatives, but as a pair. A refinement of the second route was ultimately chosen for the I-5 freeway, which was completed through Seattle in the 1960s. The report said that:

> The two north-south expressways, the Alaskan Way Viaduct Route and the University-6th Avenue –Beacon Hill Route, will adequately provide for the predominant north-south movement that is now destined for or through the throat of Seattle's hourglass design. By skirting the east and west edges of the business district, these two recommended expressways should well serve the north/southbound traffic with origins or destinations in the downtown area, as well as through traffic.[21]

The choice was made to begin construction of the Alaskan Way route first as it would be less costly. The survey showed a need for more than four lanes, meaning that a two-level three-lane viaduct, totaling six lanes, would be the most efficient way to provide the needed capacity. The two-level structure would also simplify making connections into the business district.

The traffic analysis identified six reasons why Alaskan Way would be the most effective route:

- It would carry a larger volume of traffic when completed (59,000 vehicles per day, compared to 47,000 on Alternative 2).
- It could be constructed in stages, each of which would be a usable facility.
- It could be constructed to its final length for the least cost because the northern section (Aurora Avenue) was already completed.
- It would have the lowest right of way costs, because it could be built mostly on property already owned by the city.
- The location was the most logical for the traffic it is intended to serve, not only because of the origins and destinations of such traffic but because of the location of the existing principal highways to the north and south.
- It would add to instead of subtract from the usable surface area in the most congested part of the city. The viaduct would add 44 percent to the effective width of Alaskan Way while deducting less than 5 percent for the strips to be occupied by support columns.[22]

Another major impetus for the selection of a waterfront route was the continuing need to reduce local congestion on Alaskan Way to facilitate the operations of the Port of Seattle and the adjacent

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[21] Mayor William F. Devin to Seattle Safety Council, June 9, 1948.

[22] Ralph Finke, "Alaskan Way Viaduct: Report on Preliminary Plans." City of Seattle Department of Engineering (June 1948).

warehouses. The east side of Alaskan Way was "commissioners' row," lined with the warehouses that distributed fresh produce, dairy products and other goods throughout the Northwest and Alaska. Shipping along the central waterfront had increased dramatically during the war and after the war shippers faced increased congestion as the growing number of automobiles competed with trucks and trains serving the piers. One suggested option was a belt-line railway operated by the port to transport goods directly to and from ships more efficiently. This idea met with little favor, as most waterfront shippers preferred an elevated highway, despite the fact that maritime leaders had long complained of the city's lack of awareness of the importance of the waterfront.[23] The Port of Seattle also expressed its support for the viaduct, saying that such a roadway would materially relieve congestion, would provide better access to the waterfront for local traffic and would not interfere with its own development plans.[24] The port planned, at that time, to remove all the old piers between Bell and Madison streets and to build a 3,000 foot-long wharf parallel to Alaskan Way, a massive structure that, if it had been constructed, would have itself cut the city off from the waterfront.[25]

The Design Process

The viaduct was designed primarily by the Seattle Engineering Department, with regular review by the state Department of Highways and less frequent review by the federal Public Roads Administration, which provided federal funds for the project. An engineer from Highways, Ray M. Murray, was assigned to work with the city, with his salary paid by the city. Many specific design issues were discussed by representatives from all three agencies meeting together in groups of ten or twenty engineers. This collaborative process did not guarantee quick decisions or agreement, however, partially due to the number of people involved. For example, a city memo generated after a large meeting on July 30, 1947 elicited a lengthy response from Highways, protesting that the stated agreements had not been reached. Indeed, at that point, the city and the state differed considerably on several key design questions.[26]

In August 1947 the city Engineering Department presented its preliminary plan and cost estimates for the first portion of the viaduct project. The proposal was for a six-lane two-deck structure of steel and reinforced concrete extending from Battery Street to S. Dearborn Street/Railroad Way S. The plan included a curved roadway and grade separation at Denny Way and Aurora Avenue, in anticipation of the later construction of a depressed roadway on Battery Street. This early report mentions one area of disagreement, the number of future ramps to downtown; the plan increased the number of turnouts from two to four. The overall project cost was estimated at slightly under $5,000,000. Of this, roughly 80 percent was for construction, 10 percent for purchase of right of

[23] Padraic Burke, *A History of the Port of Seattle*, Seattle: Port of Seattle 1976: 104.
[24] Warren D. Lamport, General Manager, Port of Seattle to C. H. Carlander, Seattle Chamber of Commerce, April 13, 1948.
[25] Dorpat 2006: 236.
[26] D. E. Morris, Department of Highways, to James A. Davis, Department of Highways, August 21, 1947.

way, and five percent each for engineering/administration and contingencies. The cost was to be shared by the three parties involved, with approximately $1,500,000 each coming from the city and the federal aid fund and just under $2,000,000 projected from the State Development Fund.[27] The state's immediate response was that the estimated cost was at least $1,000,000 too low, and a revised estimate of $6,287,398 was provided.[28]

Before construction began (December 1947-May 1948), subsurface explorations were done along the entire route from Battery Street to S. Dearborn Street. The work consisted of test pits, borings, test pile driving, pile test loadings and measurements of ground water elevations and salinity. This information was used to determine what types of piles (treated timber, pre-cast concrete, poured-in-place concrete or steel) would be appropriate for each location and to estimate the difficulty to be expected in pile driving and excavation.[29]

One of the most important design considerations was the preservation of existing facilities and minimizing disruption, particularly for the railroad and trucking activities that were such an important part of the waterfront. The need for parking was also a significant consideration, and providing parking beneath the structure was planned from the beginning.[30] The structure was sited so as to reduce the necessity of moving railroad tracks and to keep sufficient distance from the operating tracks to avoid complications for both the viaduct and the railroad. However, the project did have to pay for some track relocations and property acquisition. Truck operations at adjacent loading docks were taken into account in planning column locations, and the city actually took a truck to Alaskan Way to test turning movements.[31] Ramps near Railroad Way were reconfigured because it was found that the small connector street carried more vehicles (primarily trucks going to the waterfront) during mid-day hours than did First Avenue S., a nearby major arterial.[32]

Minimizing right of way requirements was also a significant design consideration. The vast majority of the project was within the existing Railroad Avenue right of way, with additional property acquired primarily for access ramps, for the approach to the west portal of the Battery Street Tunnel and in the final block connecting to Aurora Avenue at Denny Way. Because of the size of the elevated structure and its proximity to buildings, some damages were paid for infringement of rights of light, air and access.

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[27] C. L. Wartelle, "Proposed Alaskan Way Viaduct: Preliminary Plans and Cost Estimates," Seattle Department of Engineering, August 1947.
[28] Clarence B. Shain, Directory of Highways, to Charles L. Wartelle, City Engineer, October 30, 1947.
[29] Alaskan Way Viaduct Subsurface Explorations, December 1947 to May 1948, City of Seattle Department of Engineering.
[30] Finke, June 1948: 4.
[31] Finke, June 1948: 5.
[32] Finke, June 1948: 7.

The waterfront at this time was seen as an industrial area, and aesthetic impacts were minimized. In 1948 the city engineer stated that:

> The general location of the viaduct has been held as far away from the east property line as economic and physical factors will permit, with a view toward avoiding any interference with the light and air of adjacent property….The structure will not present a solid face, as would a building, but will consist essentially of two bands some 15 feet apart vertically.[33]
>
> Another esthetic factor that has received scan attention is the scenic value of an elevated driveway along the waterfront. The view from the upper deck of the viaduct will be an attraction which may well take a place on a par with some of the other justifiably famous marine drives of the City. I can see no justification whatever in any criticism of the viaduct that is based on esthetic considerations, providing that the architecture of the structure itself is modified as suggested.[34]

Suggested design improvements included using concrete columns, eliminating open crossbeams, reducing the depth of the crossbeams and lengthening the spans.

Early Public Response

In the 1940s-50s transportation planning was accomplished in a less public environment than we see today. There appears to have been relatively little public discussion of the viaduct, which was avidly supported by the major newspapers and the business community. Before work began, Mayor William F. Devin pronounced it "the biggest finest improvement Seattle has put forward in years. It will rank with the Lake Washington floating bridge as a civic asset." [35] Some, however, feared the construction process, if not the finished structure; waterfront shippers favored the new highway, but small business owners along the waterfront feared disruption and lack of access.[36]

The Municipal League expressed concern that the project had received only cursory review by the Seattle Planning Commission in 1944, and that substantive changes had been made since that time. However, the League expressed its own support, saying that the facility would do much to relieve congestion. [37] The City Planning Commission, which was then working on the city's first comprehensive plan, did review the project again in 1948. It praised the proposed route, with no mention of potential negative consequences. It noted how well it supported accepted planning principles by fitting well into the long-range development of traffic routes and by-passing the

[33] Finke, June 1948: 11.
[34] Finke, June 1948: 12.
[35] Doug Willix, "Motorist's Dream: Viaduct Work to begin in 1949," *Seattle Times*, November 28, 1948.
[36] Burke 1976:104.
[37] Floyd Naramore, Municipal League of Seattle, to City Planning Commission, June 9, 1948.

congested central business district while providing access to downtown, the port and industrial and commercial areas to the north and south.[38]

However, the proposed viaduct was not universally popular. Architect Paul Thiry called it "a horrible thing to do to the city" and said it should be in a tunnel if built at all. He said that he had "… never seen an overhead construction in a city that didn't create slum conditions all around it. Most cities are trying to eliminate elevated roadways rather than create new ones."[39] His involvement in this issue led to involvement on later issues, including sitting on the City Planning Commission, heading the local American Institute of Architects planning program and later promoting lidding of the I-5 freeway.[40]

Since the waterfront was industrial, little concern was expressed about pedestrian or recreational uses. However, even as decisions were made to accommodate truck and rail movements, the increasing size of cargo vessels and other technological advances in shipping (notably containerization) were making the central waterfront outdated, causing port activities to move farther south. Some members of the public envisioned these changes. As early as 1947, one resident, George P. Cheney, said "The ugly structure would greatly disfigure the waterfront…It would serve a limited purpose…It will be an eyesore to people of the city and in a few years they will want it removed and a saner plan devised for handling traffic--and no one can tell what changes a few years may bring."[41] A lengthy letter from R. S. Hawsley of the Central Building Company noted that "No matter how good the architectural and engineering features of the project may be, it would always remain an unsightly structure along our very valuable waterfront." He continued "It should not be many years before Seattle wakes up to the desirability and the need of redeveloping its waterfront in a high-grade manner, and when that time comes it will be unfortunate to have a viaduct of the nature proposed encumbering our very valuable waterfront."[42]

VIADUCT CONSTRUCTION

Although Mayor Devin had announced that construction would begin in summer 1948, it was not until late 1949 that the design and funding were finalized, after considerable discussion among the local, state and federal agencies involved. Construction was undertaken in five sections, both to minimize disruption and to secure funding. Each contract is described below, in the order in which it was executed. Later contracts for the downtown ramps and the southern extension are discussed in a later section. The total cost for the initial three sections and the tunnel, including right of way, design and administration was $10,627,006. Approximately half of the funding

[38] J. Lister Holmes, Chairman, City Planning Commission, to William F. Devin, Mayor, June 14, 1948.
[39] *Seattle Times*, November 9, 1947.
[40] Interview with Paul Thiry conducted by Meredith Clausen, September 15-16, 1983 for the Archives of American Art, Smithsonian Institution.
[41] George P. Cheney to Mayor William F. Devin, November 4, 1947.
[42] R. S. Hawley, Central Building Company, to Mayor William F. Devin,, June 8, 1948.

($5,860,625) came from the City of Seattle, with the remainder from the Washington State Motor Vehicle Fund ($2,459,783) and the Federal Public Roads Administration ($2,306,608).[43]

Schedule B (Battery Street to Pike Street, 1949-51)

The first section (Unit No. 1) to be undertaken was one of the most difficult, at the north end of the central waterfront below the Pike Place Market and through Belltown's industrial west slope. The contract was awarded to McRae Brothers on December 28, 1949 and was completed on July 26, 1951 at a cost of $1,192,389.[44]

This section was selected to be done first because it connected to existing streets at both ends and could potentially be used immediately upon completion to reduce the critical Alaskan Way congestion. [45] At the north end access was provided to both 1st and Western avenues, pending completion of the Battery Street Tunnel in a later phase. Therefore, this section is very complex, with two pairs of ramps within a fairly short distance: a northbound off-ramp to Western Avenue, a southbound on-ramp at Elliott Avenue, and a northbound on-ramp and a south-bound off-ramp at Battery Street.

This stretch begins at the west portal of the tunnel, which is on the steep slope below 1st Avenue and Battery Street. The first .4 mile consists of single or separated single-deck structures that go diagonally across the two blocks between Battery and Blanchard streets and 1st and Elliott avenues, carrying north- and southbound traffic. The structure crosses diagonally over Western Avenue at Bell Street, curves across Elliott Avenue at Blanchard Street, and then straightens out to parallel Alaskan Way near Lenora Street. The single-level structure separates into two structures near Virginia Street, curving for more than two blocks to form a two-deck configuration at Pike Street. As it crosses Elliott Avenue it also crosses above the north portal of the Great Northern Railway tunnel, which carries all rail traffic through Seattle.

Going southbound, the off-ramp is at the west tunnel portal, going down Battery Street to Western Avenue. The on-ramp goes from the west side of Elliott Avenue near Blanchard Street to merge into the west side of the viaduct. The northbound off-ramp leaves the east side of the viaduct near Blanchard Street, curving beneath it to merge into Western Avenue near Bell Street. The on-ramp is at the northeast corner of Western Avenue and Bell Street, entering directly into the tunnel.
The northerly 1650 feet is carried by a series of three-span units of continuous reinforced concrete tee-beam spans, each from 30 to 40 feet in length. Pier supports are multiple concrete columns on individual pile-supported footings. At this point four wide-flange steel girder spans, varying in length with a maximum span of about 65 feet, carry a reinforced concrete roadway slab that takes traffic over the railroad tracks. Piers for these spans are transversely braced steel columns

[43] Finke 1952: 53.
[44] Washington State Department of Highways Biennial Report, 1950-1952: 37.
[45] Finke, June 1948: 4.

supported on individual concrete pedestals on pile-supported footings. The viaduct continues to the south with another series of three-span units of continuous reinforced concrete tee-beam spans. The spans rest on multiple concrete columns on individual pile-supported footings, until the structure begins its transition into a double-deck configuration.[46] In section, the structure has 14-foot curb lanes, a 12-foot center lane and an additional 1-1/2 foot curb width, for a total width of 43 feet.

This stretch of roadway required the greatest amount of new right of way of any part of the project. A number of modest buildings were demolished, primarily where the structure crosses over Western and Elliott avenues. Negotiations were undertaken to acquire the dramatic castle-like National Guard armory then located on Western Avenue near Lenora Street north of the public market. The negotiations failed, maybe because the city had a decidedly dim view of the value of the property: "The trend of real estate, of this character and location, is definitely on the down grade….The present building is considered of no value for any commercial use….(but) would cost $40,000 to wreck and remove from the property." Perhaps not surprisingly, the National Guard did not accept the offer and the building remained until the 1960s.[47]

This section is among the tightest along the entire route, with several buildings, including some of Seattle's oldest buildings, located very close to the structure. One notable feature is that the former Empire Laundry Building (now the Bell Lofts condominium) at Bell Street juts into the right of way, with the railing going around the corner of the building. When the problem was discovered, the estimate showed that cutting off the corner of the building would cost nearly $50,000, a prohibitive amount. Both the Department of Highways and the U.S. Public Roads Administration approved this situation, saying that such occurrences, while not desirable, were to be expected in built-up urban settings. [48]

Schedule C (Pike Street to King Street, 1951-52)

Unit No. 2 continued construction to the south of Unit No. 1, from Pike Street to King Street. It began more than a year later, when the previous work was almost finished. This schedule was placed under contract to Morrison-Knudsen Company, Inc. on February 13, 1951 at a contract price of $3,691,400.[49] Although pile-driving got off to a slow start, the work was finished ahead of schedule in August 1952. No ramps were included in the contract, although turnouts were included at the locations of future ramps. It did, however, include replacement of the Marion Street pedestrian overpass to Colman Dock, a vital connection that was used by nearly 5,000 ferry riders a day. It was altered and replaced twelve feet south of its previous location.

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[46] Oscar R. "Bob" George, "Alaskan Way Viaduct and Battery Street Tunnel National Register of Historic Places Registration Form, 2001.
[47] Charles L. Wartelle, City Engineer, to Adjutant General, Washington National Guard, May 20, 1947.
[48] W. A. Bugge, Director of Highways, to R. W. Finke, City Engineer, March 23, 1951
[49] Washington State Department of Highways Biennial Report, 1950-1952, 37.

The structure curves westward between Yesler Way and S. Washington Street to follow the shoreline. An additional lane is provided at Seneca Street (northbound) to allow cars to move to the exit. On the southbound lower deck a similar lane allows vehicles entering at Columbia Street to accelerate. Additional "bulges" at Spring and Union streets were provided for planned ramps that were never built.

Near Pike Street the structure transitions to a double-deck configuration, with southbound lanes on the lower deck and northbound lanes on the upper deck. This structure has a series of continuous three-span units, having spans in the range of 60 to 75 feet, with a unit length of from 170 to 225 feet. Supporting piers are concrete frames, with either square or rectangular columns on each side of the roadway, and deep crossbeams at the top of the columns and below the lower roadway. The primary longitudinal supports for the spans are 7-feet deep by 1 foot 7-1/2 inch wide exterior girders rigidly connected to the pier columns. Three smaller longitudinal beams are equally spaced between the exterior girders: A shallow beam at the center and two deep beams haunched at the pier cross beam at the quarter points between exterior girders. These beams are supported on concrete crossbeams at each pier and by floorbeams located at the third points in each span. This system supports the reinforced concrete roadway slab and traffic above. All pier frame columns are supported on individual footings founded on deep piles. Along the length of the double-deck portion, pier frames have been extended as outriggers where needed to accommodate ramps, roadway transitions or obstacles below. These curved outriggers are among the structure's most distinctive features. [50]

Because this section adjoins a densely developed part of the city, extensive relocation of underground and overhead utilities was required. Holes were provided in the cross girders to carry conduits for Seattle City Light's distribution system as well as for the viaduct's own lighting and telephone systems. Along the central waterfront, construction was eventful, as excavating the footings often hit unrecorded pipes, leading to broken sewers and water pipes or flooded basements for nearby buildings.[51] A number of archaeological finds were also made, which was evidently a surprise to Highways and the contractors. Near Bell Street excavators found evidence of the inlet that once sheltered canoes and small boats before the shoreline was filled. At Pine Street a large block of concrete was uncovered, the foundation for a hydraulic pump used in regrading Denny Hill. Throughout the area old timber structures, lumber mill waste, and small items such as bottles were uncovered.[52]

Because this section of the structure is very close to existing buildings, the city was required to pay many property owners for impairment of access, light, air or outlook (view). The largest of these awards was $13,200 for the O.K. Hotel, a building that still stands beneath the viaduct. Other

[50] George 2001.
[51] Leonard (May 1953): 6.
[52] C. A. Pilon, "The Alaskan Way Viaduct." *Washington State Department of Highways News* (July 1952): 15-16.

well-known buildings for which payments were made include the Our Home Hotel, the Polson Building, Lowman and Hanford and the Lutheran Compass Mission. Several warehouses and railroads received damages because their rail spurs had to be moved. Some cases were heard by juries, with numerous expert witnesses brought in by both sides to testify to the extent of damages suffered. The city paid $144,575 for damages of this type, about thirteen per cent of the total right of way cost for the project.[53]

Schedule D (S. King Street to Railroad Way S., 1951-1953)

The contract for Unit No. 3, the southerly section from S. King Street to Railroad Way S./S. Connecticut Street, was awarded to McRae Brothers on November 21, 1951 at a contract price of $1,063,659.[54] The work was delayed considerably during 1952 because of a nationwide steel strike. When work was finally completed in April 1953 the entire section of the viaduct from Battery Street to Railroad Way/1st Avenue S. was opened to traffic.[55]

While the first three sections of the structure were designed by the City of Seattle Engineering Department, this section was designed by the Bridge Division of the State Department of Highways (George Stevens, Chief Bridge Engineer). Although it continues the double-deck configuration, this section differs slightly from that described above in that it has four or five smaller longitudinal beams between the exterior girders, rather than the three beams used in the city's design.[56]

The two ramps at the south end of this section were particularly important because they served as the southern terminus of the project until the connection to S. Spokane Street was completed in 1960. Both of these ramps underwent considerable design change as planning progressed. The southbound off-ramp was re-designed several in order to minimize impacts to the large Union Pacific Freight Terminal located at the southwest corner. Maintaining truck traffic on Railroad Way S. and S. Dearborn Street was also a concern. As built, the ramp exits the east side of the viaduct, goes above Railroad Way S. and S. Dearborn Street and enters directly onto the west side of 1st Avenue S.. This design largely maintains the utility of the surface, although it does block some access at the northeast corner of the freight facility.

The northbound on-ramp begins at the east edge of 1st Avenue S., south of S. Dearborn Street, and curves over the street and above Railroad Way S. to merge with the upper deck of the viaduct. The original design for the ramp was much longer, beginning a block farther south at the northeast corner of S. Connecticut Street (now S. Royal Brougham Way) and swooping as far east as

[53] W. E. Parker, City Engineer, to W. A. Bugge, Director of Highways, April 15, 1953.
[54] Washington State Department of Highways Biennial Report, 1950-1952: 37.
[55] Bill Lee, "Project Progress." *Washington State Department of Highways News* (September 1952): 8.
[56] George 2001.

Occidental Avenue S., before coming across Railroad Way at Dearborn. In one of the interim designs the ramp began in the center of 1st Avenue S. near S. Dearborn Street, taking a third of the roadway, with traffic diverted around it. The reason for this design, termed a "death trap" by some, is unclear. However the ramp was moved to the right side of the roadway, which required taking part of a building on the corner.

Schedule A (Battery Street Subway, 1952-54)

The Battery Street Tunnel was the vital "missing link" to connect the new waterfront structure with Aurora Avenue (US 99) to the northeast. The construction contract was awarded to Morrison-Knudsen Company, Inc., and Rumsey and Company, with work starting in September 1952. The subway section was 2,134 feet; with the widening of Aurora Avenue to Broad Street, which was included in this contract, the total length for the work was 4201.85 feet. The subway was opened to traffic in a grand ceremony on July 24, 1954, although it was not officially completed until September 20, 1954, at a cost of $2,839,500.[57] The cost was shared almost equally between the city ($1,541,000) and the state ($1,298,571). [58]

The tunnel is 2,134 feet long with two 25-foot roadways separated by a center wall, with two travel lanes in each direction; vertical clearance is 14-1/2 feet. It is built largely within the existing right of way, directly beneath Battery Street, and curving northward at the east end around a major building that was at that time the newly-built printing plant of the *Seattle Post-Intelligencer* on Sixth Avenue. The west portal is in a steep slope on the west side of First Avenue. The east portal is on Aurora Avenue north of Denny Way.

Planning of the tunnel was a long process, with a number of significant changes and roadblocks. The facility was referred to as a "depressed roadway" or, later, "subway," not a tunnel. Early (1947) plans show a 66-foot wide depressed section with a 54-foot wide divided roadway. It would have been 14.5 feet deep and left open between the streets and alleys, with decorative railings along each street and alley. The sidewalks were to have been cantilevered from the walls of the depressed roadway. However, by early 1949 it was determined that the increased condemnation costs for street access would outweigh the cost of the decking, and that an enclosed tunnel would be better for the area.

The tunnel was designed by the Seattle Engineering Department, their first effort at tunnel design. City Engineer R. W. Finke described the tunnel and its innovative features in an article in a December 1952 article in *Civil Engineering* magazine.

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[57] Washington State Department of Highways Biennial Report, 1954-1956: 32.
[58] Myra Phelps, *Public Works in Seattle: A Narrative History of the Engineering Department 1875-1975*, Seattle: Kingsport Press, 1978: 125.

> Construction will be by open cut, with the surface roadway being replaced as a ceiling for the subway. Steel H-piles on three foot, nine inch centers will be driven along each side wall of the subway and capped with a reinforced concrete beam arranged to act as a wale and as a seat for the deck beams. These beams are precast reinforced concrete members placed transversely on 16-foot centers and they act initially as struts between the outside lines of steel H-piles and later as the beams carrying the deck slab. These precast beams are also supported at the center wall by steel piling. Where necessary, precast concrete liner plates placed between the steel piling, as the excavation is made, will protect adjacent property and foundations against subsidence.[59]

The tunnel was lined with concrete rather than the ceramic tile that was used on later tunnels. This gives it a darker appearance than the other tunnels.

Notable and innovative features of the tunnel included:

- An automatic ventilation system that sampled and recorded carbon monoxide levels;
- A dry-pipe automatic sprinkler system controlled by heat-responsive automatic valves;
- Fire extinguishers, hose connections and escape doors placed at 325 foot intervals; and,
- Emergency telephones connected to the Seattle Police Department.

The ventilation system, always a challenging and expensive part of tunnel design, has a continuous exhaust vent visible along the entire center line of Battery Street. The 36 air intake fans (each 33 inches in diameter) at 45 foot intervals along each side of the tunnel can produce a complete air change every two minutes. The carbon monoxide monitors automatically turn on the fans if allowable concentrations are exceeded. If toxic gases were to continue to build up, illuminated signs (saying “Subway Closed” and “Detour”) at each entrance would notify motorists of the tunnel closure, diverting them to surface streets, and the police would be notified through an automatic alarm system. Lighting in the tunnel was with fluorescent luminaires with mercury vapor lights, controlled by photoelectric cells, at the portals. A control chamber near the center of the tunnel contains carbon monoxide monitoring equipment and a control panel for the ventilation and fire safety systems.[60] The control center was originally manually operated but has since been automated.

The innovative ventilation system design was controversial, because the U.S. Bureau of Public Roads insisted that the proposed plan was not feasible and that similar tunnels elsewhere had demonstrated that forced draft ventilation was essential, regardless of cost. The increased cost was estimated at $1,000,000. The city maintained that the continuous open vent running the entire tunnel length with large fans to improve air circulation would be sufficient. One of the federal agency’s objections was that the vent openings would be blocked by snow and that melting snow

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[59] Ralph Finke, “Tunnel and Viaduct to Ease Seattle’s Traffic Troubles.” *Civil Engineering* (December 1952): 51.
[60] Finke 1952.

and rain would flood the tunnel. They proposed that the surface vents in the center of Battery Street be surrounded with 10-inch curbs—an obvious traffic hazard that was immediately rejected by both the city and the state.

This controversy delayed the project for two years as the city went to great lengths to prove its point. The initial ventilation proposal, in early 1949, had only an open vent with no fans, but the 72 fans (36 on each side) were added to the plan in September 1949. Tests in July 1951 showed that carbon monoxide from vehicles on the surface was very unlikely to be a danger, as the Bureau of Public Roads had feared. These data and the plans were reviewed by the U.S. Bureau of Mines, which gave its unqualified approval.[61] In April 1952 City Engineer Ralph Finke went to New York City to consult with an engineering firm with expertise in ventilation and to inspect similar tunnels in the New York vicinity. The firm agreed that the plan was sound, but the city increased the size of the fans on their recommendation. All agreed that the city's proposed approach would be effective. Despite these efforts, the U.S. Bureau of Public Roads did not approve the ventilation system. The city then proposed, and the Department of Highways agreed, that the tunnel's cost be shared by the city and the state, with no federal funding. [62]

The automatic deluge sprinkler system was believed to be the first such system installed in a vehicular tunnel, as fog systems were generally considered adequate for the purpose. Although the Bureau of Public Roads suggested eliminating the fire sprinkler system to save money, the city insisted on following the sprinkler recommendation made by the Seattle Fire Department, the U.S. Bureau of Mines and the National Board of Fire Underwriters. The recommendation may have been instigated by a severe fire that occurred in New York's Holland Tunnel on May 13, 1949. Despite extensive fire safety measures (short of a sprinkler system), the fire caused significant damage. [63]

Approximately 100,000 cubic yards of soil was removed for the tunnel. About 40,000 yards were used as fill along Westlake Avenue N. on Lake Union. The remainder was given to the Great Northern Railway Company to be used as fill along the northern part of the waterfront near Pier 89.[64] Not surprisingly, tunnel construction caused considerable disruption downtown, with lengthy street closures—1st Avenue was closed for 16 weeks and 2nd Avenue for 10 weeks. Sections about a block long were excavated at a time. Once a section was excavated and the piles driven, precast concrete beams were installed to support the surface streets, with the cross street being paved as soon as possible. However, between the cross streets, the cut was left open for a longer period until excavation was complete and no further use of gasoline-powered equipment was needed. This saved on ventilation costs and improved worker safety

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[61] R.W. Finke, City Engineer, to Streets and Sewers Committee, Settle City Council, March 13, 1952.
[62] Phelps 123-125.
[63] J. K. Wooley, Washington Surveying and Rating Bureau, to R. W. Finke, December 27, 1951.
[64] R. W. Finke, City Engineer, to I. E. Clary, Great Northern Railway Company, March 4, 1952.

Since work was done primarily in the open, construction was particularly difficult during long rainy periods. The *Seattle Times* described workers as "gophermen slugging soggily through a primordial sort of ooze … a greasy, slippery, soaking quagmire of puddled gumbo " Bricks from the old Central School at 7th Avenue and Madison Street were laid down to provide a base for digging machinery and a foundation for the roadway.[65]

A primary focus of construction was to minimize harm to neighboring buildings, and the project appears to have been largely successful in achieving this goal, with some exceptions. At 4th Avenue and Battery Street, the cornice on the Concord-Lexington apartments was damaged and had to be replaced. On a recently-completed building at 2333 3rd Avenue, then the offices of White & Bollard, a prominent real estate company, the wide overhanging cornice had to be removed and replaced, with the company and the city sharing the cost.[66] An award of $5,000 for loss of access was made for the property at the southwest corner of 4th Avenue, where the emergency exit structure was built. The small building (5 by 15 feet, 9 feet high), which also provides direct access to the control chamber, was apparently not included in the initial plans.[67] Evidently the greatest problem occurred with the building at the southeast corner of 1st Avenue and Battery Street (then the Paramount Pictures film exchange, now the Catholic Seamen's Club). The owner would not allow tunnel construction to occur beneath the corner of the building. After evaluating various options (including changing the alignment, moving the building and altering the building), the city purchased the building so that the tunnel could curve through the basement; the building was sold after construction was completed.[68]

Schedule E (Lighting, 1952)

The lighting and signage for the entire project were done under a single contract to Northwest Engineering Electric Company on August 26, 1952 at a cost of $148,534. The upper deck was outfitted with mercury vapor street lights placed every 120 feet. The lighting standards were typical of those being used elsewhere in the city at the time, a steel pole topped with a decorative finial with an arm supporting a cobra head fixture. The lower deck had fluorescent luminaires attached to the underside of the upper deck every 60 feet. Emergency telephones were installed at 1,000 foot intervals along each deck. Lighting proved to be considerably more costly than originally anticipated, since early estimates were based on ordinary mercury vapor street lights rather than fluorescent lights. This was the largest installation of this type of fluorescent luminaire in the country, and the first use of the fixtures in the Pacific Northwest.

The contract also included furnishing and installing illuminated directional signs and two sign bridges, one at each end of the tunnel, to warn of tunnel closures. The unique sign bridges,

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[65] *Seattle Times*, December 17, 1953.
[66] Hugh H. Benton, Jr., White & Bollard, to Mr. Robertson, City Engineering Department, December 15, 1952.
[67] A.C. Van Soelen, Corporation Counsel, to Seattle City Council, March 14, 1955.
[68] R. W. Finke, City Engineer, to W. A. Bugge, Director of Highways, February 20, 1950.

constructed of steel with distinctive curved edges and a pattern of graduated holes, were designed in 1952 by the Seattle Engineering Department for this project and were cast locally by Pacific Car and Foundry. The bridges are fifty feet wide, spanning the north- or south-bound lanes with a clearance of 18 feet 10 inches. One is located just north of the tunnel and one is to the south, near the Pike Place market. In addition to traffic signage, they originally had illuminated signs saying "Subway Closed—Detour," which would light automatically if carbon monoxide limits were exceeded. The sign bridges are still in use, but with modern warning signs and light fixtures.

Viaduct Extensions

Extending the viaduct to S. Holgate Street, where Alaskan Way ran into E. Marginal Way S., was contemplated from the beginning, but was delayed because of financing. The ultimate objective was to connect US 99 to S. Spokane Street, the major route into the large neighborhood of West Seattle. Following the opening of the tunnel in 1954, efforts turned toward completing the project. At that time, the viaduct ended with a stub at Railroad Way S./S. Dearborn Street. Southbound traffic had to exit onto 1st Avenue S. to continue on to the industrial area and the continuation of US 99. Northbound traffic traveled on 1st Avenue S. to Railroad Way S. for the first opportunity to enter the viaduct to make the connection through the tunnel and on to Aurora Avenue N.

For the final phases, the initial layouts were prepared by the Seattle Engineering Department, as on the previous sections, but the final designs were prepared by the State Highways Bridge Division. The first contract was a small one, completing the .2 mile section just south of Railroad Way. The contract was awarded to Rumsey and Company on October 5, 1955, at a cost of $728,000. This work was completed on November 15, 1956. The contract for the final stretch, to S. Holgate Street, was awarded to the joint venture of Morrison-Knudsen Company and Rumsey and Company on June 20, 1956 at a cost of $2,827,000.

In this section the two-level viaduct curves to the west to follow the shoreline. At S. Massachusetts Street it begins to transition to a side-by-side roadway, descending to grade near S. Holgate Street. There are no ramps, but north of S. Atlantic Street a turn-out (protected by a "temporary" wood railing and a concrete barrier) was installed for a future ramp to a highway connecting to the east to the Lake Washington Floating Bridge (now I-90). Even at that time it was envisioned that the upcoming construction of the Seattle Freeway (I-5) might obviate the need for this connection to the floating bridge, which is what occurred.[69]

The design, property acquisition and construction of this section were particularly challenging because of the proximity of five railroads whose tracks and warehouses adjoined the planned roadway: the Great Northern Railway Company; the Union Pacific Railroad Company; the Chicago, Milwaukee, St. Paul and Pacific Railroad Company; the Northern Pacific Railroad

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[69] R. W. Finke, City Engineer, to W. A. Bugge, Director of Highways, November 28, 1952.

Company; and the Oregon and Washington Railroad and Navigation Company. To build a six-lane surface roadway it was necessary to move a railyard with five tracks on E. Marginal Way S. between S. Holgate and S. Hanford streets. The city had paid the railroads for half of the cost of relocating tracks ($182,000) during the earlier parts of the project, but saw that as a poor precedent and sought to minimize its costs in future relocations.[70] After extensive negotiations, the city and the railroads agreed to the yard to a vacated street and a strip of unused Seattle City Light property (formerly the Seattle-Tacoma Interurban right of way).[71]

Later contracts improved the roadway from S. Holgate Street to S. Dakota Street, south of the Spokane Street Viaduct. Again, the railroad tracks were a major obstacle; the railroads and the Port of Seattle expressed a preference for maintaining the roadway on structure for the entire length to S. Spokane Street, but this was financially infeasible. As built, the highway is one the surface s from S. Holgate Street to S. Hanford Street, where it is again on structure to cross over connecting streets and important railroad tracks. At S. Dakota Street, the roadway descends to join an existing six-lane surface roadway extending to the 1st Avenue S. bridge over the Duwamish River.

The greatest controversy involving the viaduct extension was the opening of the roadway. The new Spokane Street Viaduct was under construction but was not due to be completed until after the Alaskan Way route. Due to a steel shortage, the opening of the northbound ramp from Spokane Street was further delayed until January 1960, several months later than planned. Industrial and shipping interests lobbied for delaying the opening until the south-end connection was completed, while other people complained about keeping an important facility closed. The city and the state decided to open the viaduct extension as soon as possible. Work was completed on August 26, 1959 and opened soon after on September 3. The grand opening celebration featured the governor, the mayor, the director of highways, the Seafair queen, the Fort Lewis band and a parade of horseless carriages.[72] As predicted, considerable congestion occurred on 1st Avenue S. as motorists struggled to get onto the new roadway.[73]

Downtown Ramps

Although the city often spoke of the viaduct as being primarily a by-pass to relieve congestion downtown and on Alaskan Way, the record shows that it was clearly intended that access to downtown would be provided when the entire route, connecting to Spokane street, was completed. Turnouts with acceleration/deceleration lanes had been built into the structure to accommodate ramps when funding became available. The four proposed ramps were to be at Seneca, Spring, Columbia and Union streets. It appears that these streets may have been selected

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[70] R.R Hubbard, City Engineer, to A. C. Van Soelen, Corporation Counsel, December 11, 1952
[71] W. E. Parker, City Engineer, to E. R. Hoffman, Superintendent of Lighting, April 7, 1953.
[72] "Viaduct Extension Opened Officially," *Seattle Times*, September 3, 1959: 1.
[73] R. W. Finke, City Engineer, to Seattle City Council, March 13, 1951.

for topographical reasons to minimize the grade of the ramps, rather than for improved traffic circulation.[74]

By 1959 traffic congestion and the demand for improved access to downtown led the City Engineering Department and the City Council to have serious discussions about constructing the downtown ramps. The desirability of the ramps was not an issue, but the number , location and funding sources were of great concern. The ramps would greatly improve bus service to the rapidly growing neighborhood of West Seattle, as buses would no longer have to travel through all of downtown to enter the viaduct. The Pike Place Market area could also benefit from more northerly ramps, as plans were being made to replace much of the market with large parking structures and to build a "ring road" north of the market in Belltown. Another change that had occurred was the city's adoption of a one-way street system throughout downtown, which did not conform to the planned ramps. The congestion on the viaduct had grown to such an extent that some were reluctant to provide opportunities to enter directly from downtown, preferring off-ramps only.

The highest priority was given to providing access from the south, and the Seneca Street off-ramp was selected to be built first, despite its location on a west-bound street. The need was considered so urgent that the city financed construction completely with its own funds, rather than going through a process to seek state or federal assistance. Funding was hard to come by, as bids were over the original estimates and exceeded the amount the city had set aside.[75] A major design consideration was the extremely tight configuration, with only 7 feet of clearance from one building rather than the usual minimum of 15 feet. State and federal agencies approved this deviation as long as the city would condemn part of the building and grant an easement to the building owner, so that it would not be necessary to remove the corner of the building.

One factor that had changed since the design of the viaduct itself was the increased influence of the city's art and design community. The proposed design for the Seneca ramp was reviewed, as required, by the Municipal Arts Commission, a group of prominent leaders in the spheres of design and business. Their comments are notable:

> Although the proposed design…has been…carefully prepared both as to its optical view from the driving surface, and from underneath, we are concerned as to whether the designers have taken into sufficient consideration the potential of the streets upon which the ramp are to be constructed. Granted that the area at present is strictly limited in use, serving the produce industry, should we not consider the strong probability that such activities will move in the future to a more suitable area, leaving this section for development into first-class office properties?

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[74] Finke 1952: 50.
[75] "$90,000 More Sought for Viaduct Ramp," *Seattle Times*, April 15, 1961: 18.

> The Commission feels that, under the best circumstances, ramps in the center of the streets will not contribute to the appearance of the property below and adjoining such ramps. Hence it is our thought that any structures which must be built should be as clean in design as possible, in order to encourage orderly and attractive development of private structures along these streets. [76]

It is not known whether this request had any impact on the final design, as the design presented to them for review, and any subsequent changes, are not clear.

The Seneca Street off-ramp contract was awarded to Willar Construction Company on May 15, 1961 for a contract price of $353, 784. Construction proved to be more difficult than expected because of the complex design, constricted space and unforeseen foundation problems. However, the work was completed in October 1961.

Several years passed before the Columbia Street on-ramp was designed and funded. It was completed by Will Construction Company on February 1, 1966 at a cost of $237,063. This ramp rises from the southwest corner of 1st Avenue and Columbia Street, curving slightly northward as it merges with east side of the viaduct. Despite the proximity to buildings, the construction process seems to have gone smoothly. The neighbors seem to have been tolerant of the project impacts and the city sometimes accommodated their requests. The publisher of the *Daily Journal of Commerce*, which was (and still is) located immediately beneath the ramp, wrote to the city noting that the construction annoyance, dust and noise were not bad and that the recommended sound proof windows and acoustical material blocked the noise well. He also felt the use of solid railings, as he had requested, helped to reduce the noise. However, the view obstruction was considerable.[77] This ramp is the only place where the rails are solid aggregate panels rather than two narrow concrete rails.

THE VIADUCT IN OPERATION

The first three sections, extending from Battery Street to Railroad Way/S. Dearborn Street, were completed and opened to traffic on April 4, 1953. The structure had been largely completed for some time and in August 1952 pedestrians were invited onto the structure during the Seafair festival, experiencing a new and exciting vantage point for enjoying the waterfront festivities. The final opening was delayed due to a union dispute and a shortage of lighting fixtures.

The ceremonial opening featured Mayor Allan Pomeroy; William Bugge, the Director of Highways; D.K. MacDonald, president of the Automobile Club of Washington; and Seafair Queen Iris Adams. The public was entranced by the breathtaking view and the quick trip around downtown. The *Seattle Post-Intelligencer* called it "a royal necklace across the bosom of the Queen

[76] Robert H. Schulman, Municipal Arts Commission, to Roy W. Morse, City Engineer, February 16, 1960
[77] Monte Brown, Publisher, *Daily Journal of Commerce*, to Roy Morse, City Engineer, March 23, 1966.

City of the Pacific Northwest."[78] The viaduct and tunnel were widely publicized, with articles in *Business Week*, *American City*, *Public Works* and *Civil Engineering*, as well as newspapers.

Since its opening in 1953, traffic has steadily increased, as population and vehicle usage have grown. The completion of the parallel I-5 freeway in the early 1960s replaced US 99 as the area's primary north-south route and reduced viaduct traffic by two-thirds. Despite this, the viaduct, which was anticipated to carry 60,000 vehicles a day, now carries approximately 103,000 vehicles a day, or 20 to 25 percent of the traffic through downtown Seattle. It is an important commuter route, with about 25 percent of these vehicles during the morning peak period and 28 percent during afternoon rush hours.[79] The viaduct is crucial to transit operations, especially for service to West Seattle. It is also a vital freight route, serving the Duwamish and Ballard-Interbay industrial areas and the Port of Seattle. The construction of major sports and events facilities in the immediate vicinity has given the viaduct a new regional role as well.

One important benefit was the additional parking spaces provided beneath the new structure. As auto use increased in the years following the war, downtown Seattle businesses had become extremely concerned about the lack of parking. Suburban shopping centers attracted customers with ample convenient parking, and downtown business leaders wanted to compete. Waterfront businesses, such as the Olde Curiosity Shop, applauded the new parking for tourists visiting the increasing number of waterfront attractions. Some felt that the parking could be enhanced, however. In 1952, Mayor Allan Pomeroy vetoed Council Bill 72471 because he wanted further study of a privately-sponsored idea to place mechanical devices beneath the viaduct that would allow 1,000 additional cars to be parked three high.[80] The Engineering Department, however, was skeptical about the device obstructing the roadway and interfering with utility maintenance, and the project went nowhere.[81]

The viaduct has operated for more than fifty years relatively without serious incident. However, some viaduct incidents have made the news. Early in the morning of December 4, 1975 a tanker truck jackknifed, spilling 3,700 gallons of gasoline onto the roadway near S. Washington Street. The resulting fire incinerated the six electrical trunk lines carried on the underside of the lower deck, leaving the heart of downtown Seattle without power for 36 hours (Seattle City Light's difficulties were increased by the fact that its electricians were on strike). Although no one was injured, flaming liquid cascaded over both sides of the viaduct, onto parked cars and a train below. Flames damaged several nearby buildings, including one containing a crowded discotheque. Property damage was estimated at $750,000.

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[78] *Seattle Post-Intelligencer*, "Alaskan Way Viaduct Rims Seattle Waterfront," April 5, 1953, p. 17.
[79] Washington State Department of Transportation, SR 99: Alaskan Way Viaduct and Seawall Replacement Project Draft Environmental Impact Statement, July 2006.
[80] Mayor Allan Pomeroy to Seattle City Council, July 2, 1952.
[81] R. W. Finke, City Engineer, to Mayor Allan Pomeroy, June 30, 1952.

Originally, flammable liquids had been prohibited on the viaduct because of the danger of such an accident, but in 1961 the ban was limited to rush hour periods, over the objections of the Seattle Fire Department. Fuel dealers, seeking to save travel time, said that there was no fire hazard and that San Francisco and Los Angeles freeways did not have such limitations.[82] At that time water standpipes were installed every block along the length of the structure. Following the fire the viaduct was closed to traffic for the Engineering Department to assess damage to the structure, but it was determined to be safe and was reopened the next morning. Because of the potential for disaster, the National Traffic Safety Board sent an investigative team to study the issue. They determined that the accident was due to driver error, with contributing factors including excessive speed, a wet roadway and the lack of an anti-lock brake system.

The viaduct has experienced two significant earthquakes. The first one, a 6.5 magnitude event on April 29, 1965, caused no obvious damage to the viaduct. However, buildings in nearby Pioneer Square suffered considerably and it is possible that latent damage occurred to the viaduct. However, the magnitude 6.8 Nisqually earthquake in February 2001 damaged the viaduct's joints and columns, generally weakening the structure. Some footings are set into soil that presents a significant danger of liquefaction in an earthquake. Although the reinforcement and construction techniques used in the structure's original construction were typical for the 1950s, they are no longer considered adequate to prevent significant damage in this type of soil. Noticeable settling occurred in one part of the structure following the earthquake.

For these reasons, the Washington State Department of Transportation and the City of Seattle began the process of planning a replacement for the viaduct. In the meantime, the viaduct is monitored regularly to track the settling or any other damage. Extensive reinforcement has been added to columns that are at risk, in the vicinity Columbia Street and Yesler Way. Repairs have also been made to column foundations, driving steel and concrete micropiles and adding steel and concrete around the footings.

EFFECTS AND IMPACTS OVER TIME

Despite the viaduct's effectiveness as a transportation artery, calls for its demolition have been heard since at least the late 1960s, barely a decade after its completion. The evolution of shipping technology and the movement of the Port of Seattle to containerized shipping meant that larger docks were needed, making the central waterfront piers obsolete for shipping purposes. Even when the viaduct was being designed, some people expected the produce warehouses to soon move to a less-congested location.

In the early 1960s the port and local business groups unveiled several proposals for developing the waterfront from Pike to Washington streets with hotels, restaurants, shops and other attractions.[83]

[82] "Council OK's Fuel Trucks in Viaduct," *Seattle Times,* August 29, 1961: 26.
[83] Dick Moody, "Waterfront Plan Includes Park and Sky Ride," *Seattle Times,* April 9, 1965: 31.

A 1969 study by George Rockrise, a San Francisco architect, called for the viaduct's removal, placing the traffic in a tunnel or lidding it so that the waterfront could be developed with hotels, apartments and parks.[84]

Variations on this theme, proposed by a wide variety of groups and agencies, have persisted over the following forty years, and continue today. Office, residential and retail uses came to occupy most of the warehouses that once lined the east side of Alaskan Way. In the mid-1970s the city invested significantly in enhancing the waterfront, building a public park and aquarium near the foot of Pike Street. Nearby, a major restoration took place at the Pike Place Market and a new Pike Street Hillclimb ascended beneath the viaduct to connect the waterfront (and its parking lots) with the market, the city's most popular tourist attraction.

Also in the 1970s-80s, extensive building renovations occurred along Western Avenue and in Pioneer Square, another historic neighborhood adjacent to the viaduct. People moved into restored offices and condominiums and flocked to new restaurants and clubs. A waterfront streetcar line, using historic trolley cars, began operating in 1982, connecting the central waterfront and the Pike Street Hillclimb with Pioneer Square and, later, the International District to the east. An adjacent bike trail and landscaping were added. The Port of Seattle transformed the northern waterfront, near Bell Street, by adapting a large warehouse into its headquarters and building a marina and conference center, with a large hotel, offices and condominiums on the upland side.

In 1988 a city proposal to dramatically transform the waterfront for recreation and park use failed at the polls. However, significant changes had already occurred, short of removing the viaduct or traffic on Alaskan Way. Perceptions of the waterfront had changed. People who come to the waterfront for enjoyment and those who live or work nearby are more conscious of the noise and visual impacts of the viaduct than people who used the waterfront in early years. It is not surprising that for nearly forty years there have been regular calls to either replace the viaduct or to somehow mitigate its impacts. The debate continues today, as people weigh the importance of the facility as a transportation corridor with its impacts on the urban environment.

[84] Dorpat 2006: 242.

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