

N VANCOUVER AVENUE: COLUMBIA SLOUGH BRIDGE NO. 001696

LEVEL II MITIGATION DOCUMENTATION

PORTLAND, MULTNOMAH COUNTY, OREGON



Prepared for
David Evans and Associates, Inc.
Portland, Oregon
and
City of Portland
Bureau of Transportation

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REPORT NO. 2438

Archaeological Investigations Northwest, Inc.

2632 SE 162nd Ave. • Portland, OR • 97236

Phone 503 761-6605 • Fax 503 761-6620

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LOCATION: Section 16, Township 1 North, Range 1 East, Willamette Meridian
N Vancouver Avenue, Portland, Multnomah County, Oregon;
Spanning Lower Columbia Slough

USGS QUAD: *Portland, OR-WA, 7.5-minute, 1990*

UTM COORDINATES: Easting - 525938, Northing - 5047928, Zone 10
The coordinates represents the structure's southeast corner.

PRESENT OWNER: City of Portland

**DATES OF
CONSTRUCTION:** 1935, 1948

ENGINEER(S): Conde B. McCullough, State Bridge Engineer

PRESENT USE: Transportation - Road Related

**SIGNIFICANCE
STATEMENT:** The N Vancouver Avenue: Columbia Slough Bridge No. 001696 was determined to be eligible for listing in the National Register of Historic Places (NRHP) by the Oregon State Historic Preservation Office (SHPO) in 2009. The N Vancouver Avenue: Columbia Slough Bridge No. 001696 was built as an extension of N Vancouver Avenue, a segment of which was designated Secondary State Highway No. 122 through legislation initiated in the early 1930s. As a result of this designation, the bridge was constructed with State monies apportioned through the National Industrial Recovery Act, which was enacted to create jobs during the 1930 Great Depression. During this period the engineer responsible for the bridge, Oregon State Bridge Engineer Conde B. McCullough, gained an international reputation for his bridge building program with the Oregon State Highway Department (OSHD). The N Vancouver Avenue: Columbia Slough Bridge is representative of the composite type-bridge, a type that McCullough improved upon through scientific investigations in order to provide an economical bridge which used shorter spans but at the same time fostering aesthetic design qualities.

The bridge is significant under Criterion C of the NRHP as an intact example of a composite timber trestle and concrete deck/steel girder bridge with a composite concrete and timber guardrail. The bridge meets slab, beam, and girder bridge requirements for significance because it possesses intact and original railings, it retains the original decorative concrete piers, and the overall design represents advances in bridge engineering from a period of economic hardship during the Great Depression. Alterations to the bridge in 1948 did not compromise the bridge's integrity, since the replacement of the west guardrail was done in-kind and retains the original character of design.

PREPARED BY: Elizabeth J. O'Brien, B. Architecture, AINW, Inc., Portland, Oregon
Judith A. Chapman, M.A., AINW, Inc., Portland, Oregon
Andrea K. Blaser, M.S., AINW, Inc., Portland, Oregon

INTRODUCTION

The N Vancouver Avenue: Columbia Slough Bridge No. 001696 (1935, 1948) was built for Multnomah County by the OSHD in 1935 as part of the Vancouver Avenue Extension project. The N Vancouver Avenue: Columbia Slough Bridge is a 14-span, composite timber trestle and concrete deck/steel girder bridge located over the Columbia Slough (Figure 1; Photos 1 through 15). The bridge funneled traffic from North Portland neighborhoods onto N Vancouver Avenue (Secondary Highway 122) to access the industrial, commercial, and residential areas north of the Columbia Slough. The bridge will be demolished due to structural deficiencies and will be replaced with a new bridge on the same alignment.

The N Vancouver Avenue: Columbia Slough Bridge No. 001696 was recorded and evaluated in a cultural resource report for the bridge replacement project for the Portland Bureau of Transportation (PBOT). At that time, the bridge was recommended to be eligible for listing in the NRHP (O'Brien and Chapman 2009). The determination of eligibility and finding of adverse effect for the demolition of the bridge was concurred by the Oregon SHPO on August 11, 2009 (Johnson 2009). A Memorandum of Agreement (MOA) prepared by the U.S. Army Corps of Engineers and signed by participating parties, including SHPO and PBOT, has outlined mitigation procedures. The MOA stipulations were developed in consultation with the SHPO. Black-and-white digital, archival-quality photographic prints, a physical description, and a historical narrative of the history of the bridge were specified.

This mitigation report follows SHPO guidelines for Historic American Engineering Record (HAER)-equivalent documentation. The MOA also stipulates that the four original concrete endposts on the 1935 bridge be retained and reinstalled at the wing walls on the new bridge. This documentation and two sets of archival-quality black-and-white photographs will be submitted to the Oregon Historical Society in Portland and the Knight Library Special Collections in Eugene. Photocopies of the documentation will be submitted to PBOT, SHPO, and the Multnomah County Library in Portland. The archival black-and-white photographs are reproduced in Appendix A and historical photographs of the bridge construction taken in 1935 are shown in Figures 3 through 6. Appendix B includes copies of the OSHD drawings from 1933 which served as as-builts when the bridge was completed in 1935. Additional drawings show repairs made to the handrails and substructure in 1949 as a result of the 1948 flood. The original plans and historical photographs are on file at the Oregon Department of Transportation (ODOT) Bridge Engineering Section.

The bridge was closed to automobile and truck traffic as a result of a fire under the south bridge approach on October 14, 2008. The proposed project will replace the bridge with a multi-span pre-stressed, precast concrete bridge on the same alignment within the existing right-of-way. Sidewalks and bicycle lanes will be included on both sides of the new bridge. Ramps will be needed to accommodate pedestrian/wheelchair traffic transitions between the bridge and the roadway.

PHYSICAL DESCRIPTION

The N Vancouver Avenue: Columbia Slough Bridge is a composite-type bridge containing 13 timber pile bents (eight bents south and five bents north), each spanning 23 feet and flanking a 75-foot center steel span composed of steel plate I-beam girders supported by 2 cast-in-place vertical concrete piers. The timber-pile bents support an understructure of timber beams, and are alternately tied by timber bracing. Wooden girders at each end are supported by timber pile trestles. Two poured-in-place vertical concrete bents, made aesthetically pleasing yet structurally sound through the utilization of parabolic arch openings,

support the 75-foot center span of steel I-beams and rest on concrete footings. The concrete bents are also accentuated through the use of pilasters on the piers and scrolled brackets on the outer bracing. Sidewalks, the road deck, central vertical piers, and sections of the guardrails are composed of concrete. The concrete roadway is 7.5 inches thick on the steel span, and 6 inches thick on the timber spans. Opposing cantilevered concrete pedestrian walkways extend beyond each side of the structure, supported by either riveted steel, concrete, or wood brackets, depending on location. Decoratively scrolled wood corbels support the exterior sidewalk stringers atop each wood bent. Some of these corbels are replacements, as made apparent by the appearance of pressure-treated wood with prick marks.

The guardrails are a composite of concrete bases, posts, and caps incorporating wood intermediate post members. The design and materials as used in the subject bridge were standardized by OSHD in 1936, although in use by 1933 (Concrete and Timber Handrail for Bridges with Sidewalks, Drawing No. 4519, 1936, ODOT Library, Salem). The guardrails stand 3 feet, 2 inches high and are composed of a framework of cast-in-place concrete ends, intermediate and main posts, and concrete caps. The concrete rail cap is 14 inches wide and 6 inches deep. The interior wood balustrade is composed of robust, jig-sawn profile posts alternated with pointed-arch pendants that would become a popular design motif in the 1930s (Kramer 2004:44). A single “W” guard rail type section is found at the southeast corner of the bridge and likely dates from the late 1940s or 1950s.

HISTORIC CONTEXT

The N Vancouver Avenue: Columbia Slough Bridge is a composite type-bridge that is representative of the engineering contributions made by noted OSHD engineer Conde B. McCullough’s during his tenure working as the State Bridge Engineer. Later, McCullough’s management of the Oregon State Highway Commission Bridge Department as the State Bridge Engineer was recognized for the exceptional abilities that were applied toward organization, the formulation of methods for planning, designing, and maintaining the highway bridge system, and for the “aggressive program” in bridge building (Hadlow 2001:58; Peterson 1935:4). McCullough became internationally known for his advances in bridge design and in part by the publication of his work in 1929, entitled *Economics of Bridge Design* (Kramer 2004:60). This publication was one of several that evolved from his prior experience and studies while working for the Oregon State Highway Commission. His sustained legacy as a master bridge builder is attested through the many bridges he designed that stand today, including his highly acclaimed Oregon coastal bridges that were built within the same period as the subject bridge.

Another of McCullough’s engineering achievements was the advancement of the composite type-bridge design through experimental work begun in 1932 and conducted at the engineering laboratories at Oregon State College (now Oregon State University). The goal was to develop an economical and well designed version of the composite type-bridge for waterways requiring shorter spans for secondary and less-used roadways. This composite-type bridge was to be used in more travelled areas where an all-wood bridge would be less aesthetically pleasing. The studies of composite-type short span bridge designs were published in 1933 in Technical Bulletin No. 1 by OSHD titled *Loading Tests on a New Composite-type Short-span Highway Bridge Combining Concrete and Timber in Flexure*. The work furthered McCullough’s goal of creating an economical “intermediate” bridge type in terms of cost and life-span. Solutions in combining timber stringer structures with concrete decks were advanced to extend the life of the timber structure, and to strengthen the stringers by allowing the concrete to act as a flange, while enabling greater spacing between expansion joints (Baldock and McCullough 1941:2-3).

The studies furthered the knowledge and engineering of the concrete and wood composite type-bridge by introducing a “rigid shear connection between the timber stringers and concrete deck” and by protecting the wooden understructure with the overhanging concrete decking (Baldock and McCullough 1941:2-3). New standards and methods for preserving the timbers were also presented in the findings. The outcome of the studies assisted in improving bridge-type options. All-wood structures were most economical for small spans, while larger spans serving more traffic were a composite of wood and concrete, and in some instances, steel. Composite bridges were found to be useful for spans not exceeding 30 feet, and were recommended for “crossings of sloughs, swamps, overflow channels and the like” (Myers 1935:4). The new technology was incorporated into bridges beginning in 1932 and by 1935, there were at least 50 composite bridges completed or under construction by OSHD, including the subject bridge, which was completed in 1935. By 1940, a total of 158 composite bridges were constructed in Oregon of varying material and structural combinations (Baldock and McCullough 1941:105).

The composite guardrail design used on the subject bridge became a popular type by the mid-to-late 1930s. Attention in designing the handrail and approaches were important concepts for McCullough. The handrails were the most visible element of the bridge for those travelling across. By incorporating treated wood into the handrail, costs were cut. The close spacing of the concrete posts on the handrails was designed to take horizontal force impacts of 500 pounds per linear foot. There were variations in detailing, design, and material combinations for handrail designs, depending on the location and needs of a project (Baldock and McCullough 1941:134-137). The design was conceptualized for the subject bridge in drawings that were done in 1933. The handrail design was standardized as a new design for composite-type bridges.

The composite type-bridge and “the development of standard specifications for timber for bridges” were encouraged by the timber industry to bolster the sagging timber economy during the Great Depression. The development of the composite bridge helped assuage the timber industries concerns that concrete was favored for many of the larger bridges (Myers 1932:1). The composite type-bridge incorporated treated Douglas fir into the substructures and guardrails from timber specifications developed by OSHD and the timber industry (Myers 1935:4).

Funding for the subject bridge was made available when the 0.56-mile segment of N Vancouver Avenue at Columbia Slough was designated Secondary State Highway No. 122 through legislation initiated in 1931. The legislation allowed the Oregon State Highway Commission and local county courts to designate secondary roads as Secondary State Highways, which funneled funding from State revenues to counties for constructing and maintaining roads. The designation came under the National Industrial Recovery Act, which was enacted by Congress to create local employment opportunities. The funds apportioned in 1933 and 1934 allowed for improvements along these “secondary or feeder roads,” many of which were obsolete or in poor condition. At this time, construction and maintenance of secondary highways became the responsibility of the OSHD (Oregon State Highway Commission 1937:53). Some work projects such as the N Vancouver Bridge over the Columbia Slough extended into the fall of 1935 (Oregon State Highway Commission 1932-1934:31-32). In 1936, there were three roadways near the Columbia Slough in Multnomah County bearing this designation were the Swift Highway, Lombard Street (later Lombard Boulevard), and Vancouver Avenue (Oregon State Highway Commission 1937:114).

Preliminary engineering plans for the subject bridge were made in 1931 by OSHD and submitted for approval to the State War Department in May 1932 (Multnomah County Board of Commissioners 1932). Since the Columbia Slough was designated navigable, approval was

needed by the State War Department. Conde B. McCullough, as OSHD bridge engineer, approved the 1933 designs which were submitted to Multnomah County. Bridge construction was waylaid by difficulties in coordinating the bridge design with Multnomah County specifications. The County was responsible for the grading and the construction of the earthen approaches. A revised OSHD bridge design was presented to the County with an additional span that was adapted to the Columbia Slough banks. A final order for approving the bridge construction was made by the Multnomah County Commission in December 1934 (*The Oregon Daily Journal* 1934). Soon, construction was underway and the County was “making fills and revising grade lines to fit the [revised] bridge” design. The “old bridge stubs” from an earlier bridge presented a problem and had to be cleared prior to construction (George W. Buck, Letter to C.B. McCullough October 19, 1932, Bridge 1696, on microfilm, ODOT, Salem).

Longtime road construction contractors Joplin & Eldon Contractors were awarded the bridge contract, having the lowest bid of \$46,917.00. The principals of the company were William T. (W. T.) Joplin and Cecil J. (C. J.) Eldon (Bridge No.1696, Construction Documents, on microfilm, ODOT, Salem). C. J. Eldon specialized in bridges, and was listed in the 1930 Census as a general contractor of highway bridges. Joplin, whose father was also a contractor, had begun his career as a day laborer, and by 1920, was working as a road contractor (U.S. Bureau of Census 1920). By the time of the project, both men were seasoned contractors in the field. Much of the bridge fabrication work was undertaken on-site. Concrete work was poured in place and the concrete portion of the handrails was poured on-site. The contractors completed the bridge in August and a final inspection was made on August 31, 1935 (Bridge No.1696, Construction Documents, on microfilm, ODOT, Salem).

The bridge approach pile-bents were damaged both by the 1948 Flood and during repair work to a dam along the Columbia Slough just west of the bridge soon after the flooding occurred (Baldock, R. H., Letter, June 16, 1948, on file ODOT, Salem). Repairs to the bents and other features including the wooden corbels were made in kind in 1949. The primary contractor for the work was E.C. Hall Company. Additional repairs were made in the 1970s and 1980s. The bridge timber understructure was damaged October 14, 2008, by a fire caused by transients finding shelter under the bridge. The bridge was closed permanently to motor vehicles, while allowing pedestrian and bicycle traffic (PBOT 2008).

Bridge Design Comparisons

At least 50 composite bridges were either completed or underway by the beginning of 1935 (Myers 1935:4). The N Vancouver Avenue Bridge was one of seven bridges that crossed the lower Columbia Slough by the late 1940s, and one of two composite bridges. The other bridges crossing the Lower Columbia Slough, all of which are still standing, include:

- Incinerator Road Bridge (Columbia Slough Mile 2.8)
- N Portland Road Bridge (Columbia Slough Mile 4.7)
- Spokane, Portland & Seattle Railway Bridge (Columbia Slough Mile 4.7)
- Union Pacific Railroad Bridge (Columbia Slough Mile 5.1)
- Denver Avenue Bridge (Columbia Slough Mile 6.4)
- MLK/Union Avenue Bridge (Columbia Slough Mile 7.7).

The N Portland Road (1933) bridge, the other composite bridge, and the Denver Avenue (1929), Vancouver Avenue (1935), and MLK/Union Avenue (1917) bridges were constructed by OSHD (U.S. Congressional Record 1949-1950:10).

The N Portland Road bridge (formerly “Swift secondary highway”), was constructed prior to the subject bridge in 1934 using a similar composite type (Myers 1935:4). The concrete pile

bent design varied slightly from the subject bridge by incorporating pointed Gothic-style arch openings. The Swift Highway connected North Portland to the Portland Union stockyards. The bridge retains less integrity than the subject bridge. Many of the understructure wood piles have steel column replacements and the handrail's wood intermediate posts were removed and replaced by an adjacent modern rail.

Conde B. McCullough

Conde B. McCullough, as State Bridge Engineer, was known for his masterful bridge engineering in the 1920s and 1930s, culminating at the height of his career with the construction of the Oregon Coastal Bridges. As a pioneer in the practice of civil engineering, he promulgated a scientific and systematic approach for developing the Oregon state highway system while balancing economy with aesthetically-pleasing bridge design. McCullough came from Ames, Iowa in 1916 to accept a position at Oregon Agricultural College (now Oregon State University) as an assistant professor of civil engineering. Before this, he had gained a solid reputation working for the Iowa State Highway Commission. After three years of teaching, McCullough accepted the position of Oregon's State Bridge Engineer in 1919. During his tenure, which lasted until 1936, McCullough expanded the bridge engineering program for the state road system. He left OSHD at the height of his career to build bridges in Central America along the U.S. Government-sponsored Inter-American Highway. Upon his return in 1937, he rejoined OSHD as an administrator, taking his former honorary title of assistant state highway engineer as a full-time active role. As an administrator, McCullough could no longer follow his calling of bridge engineer, although he was able to continue his study of bridge engineering, highway management, and law. After service to OSHD and to the Salem community, McCullough died in 1946 in his late 50s (Hadlow 2001:1-5).

Historical Overview

The N Vancouver Avenue: Columbia Slough Bridge is along a corridor formerly travelled by explorers, trappers, and early settlers. The British Hudson's Bay Company (HBC) was the first to establish a presence on the north side of the Columbia River in 1824 when they erected Fort Vancouver in present-day Vancouver, Washington. The powerful trading outpost was the first established settlement of Euroamericans near the Columbia Slough crossing, as HBC employees engaged in subsistence farming activities while completing their duties for the company. In 1829, the company expanded its reach as John McLoughlin claimed land along the Willamette River south of Fort Vancouver in what would become the townsite of Oregon City. The development of this outpost along the Willamette River created an important north-to-south travel corridor between Oregon City and Fort Vancouver. This travel corridor was approximately along the alignment of N Vancouver Avenue.

Lewis Love, an early settler, saw opportunity to claim land adjacent to the Columbia Slough southeast of the present N Vancouver Avenue Bridge. The two major roads depicted on an early map, the "road from Portland to Vancouver" and a "county road" both cross through Love's homestead (General Land Office 1852). Love operated a ferry, although later a bridge was built across the slough (Manuscript of Captain Lewis Love 1899, Oregon Historical Society Mss 1509). The date of the first bridge over the Columbia Slough in the current project location is unknown. Maps from the late 1880s are inconclusive and the first map reference to a bridge crossing is in 1922 (City of Portland 1922). A bridge may have been in place by the 1910s, when newspaper articles mention the Vancouver Avenue Approach, which connected with the nearby Union Avenue Approach that led to the 1917 Interstate Bridge between Portland and Vancouver. Crossings at the current project area could have occurred earlier by ferry or raft on the 1850s trail from Portland to Vancouver, which extended to the Columbia River crossing point. When the current bridge was completed in 1935, the Vancouver Avenue

Approach was straightened and extended slightly from NE Columbia Boulevard to Union Avenue (Multnomah County Highway Department 1933; ODOT 1935).

Access to the Columbia Slough area was important in relation to its connection to the Interstate Bridge and also to the lands reclaimed within the Columbia River floodplain through the organization of drainage districts between 1917 and 1918. The lower Columbia Slough channel was used for floating log rafts to lumber and shingle mills. Other industries along the Columbia Slough's south bank included meat packing and rendering plants, woodworking, and construction-material manufacturing plants (U.S. Congressional Record 1949-1950:4). A rail line constructed circa 1910, which became the Oregon-Washington Railroad & Navigation Company Kenton line served the neighboring industries that developed along Columbia Slough and Columbia Boulevard (formerly Columbia Slough Road). N Vancouver Avenue channeled traffic to this industry and to Peninsula Drainage District No. 2, which grew with industrial, residential and recreational uses. Some businesses, such as the early G.I. Joe's store at the northeast corner of the bridge, benefitted due to their proximity to the Interstate Bridge, which allowed Southwest Washington residents tax-free shopping (Orkney 2008:6). Since the construction of the Minnesota Freeway (Interstate 5) in 1966, these feeder roads have lost some of their importance, except to local industry, residents, and businesses.

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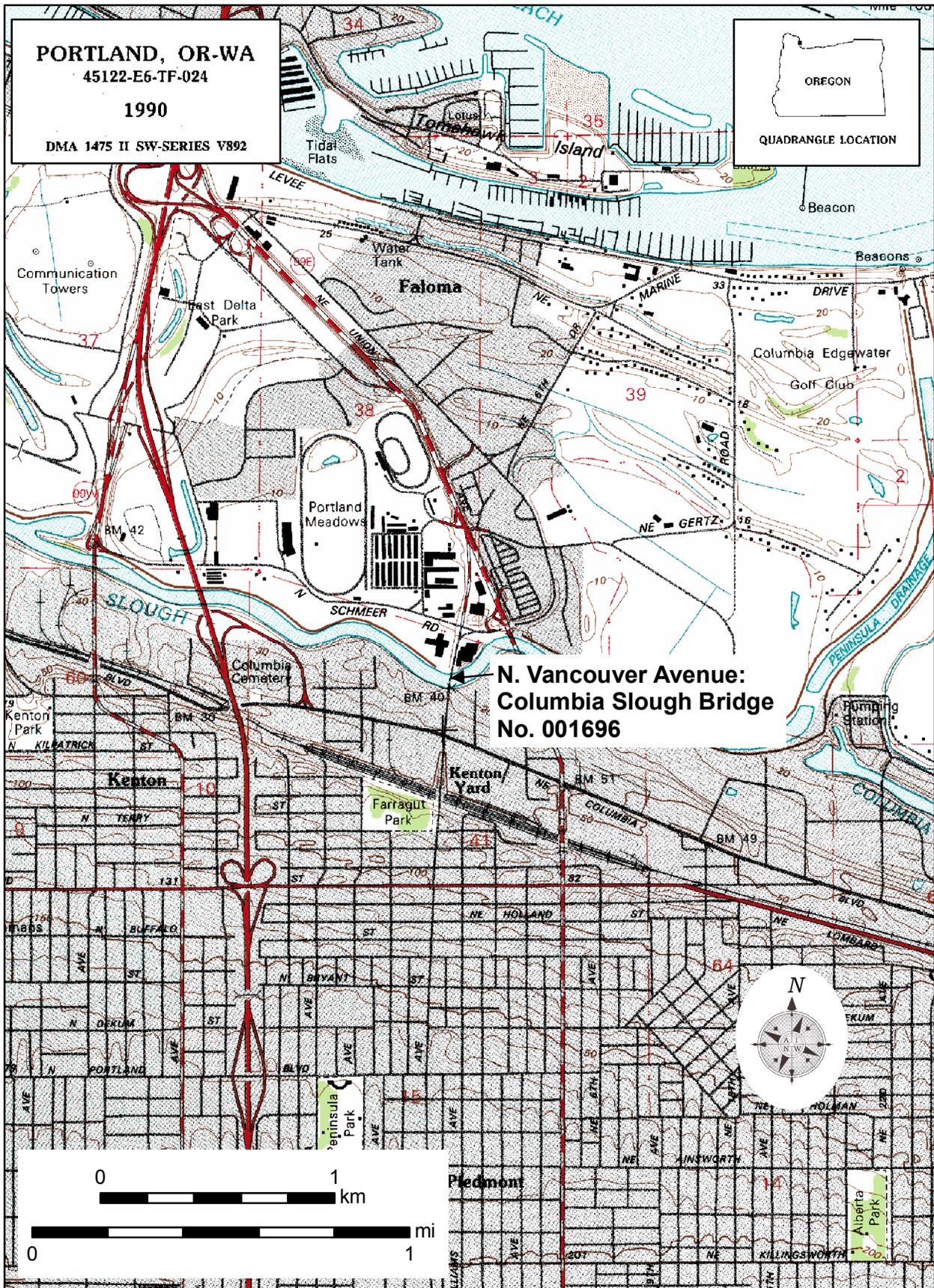


Figure 1. N. Vancouver Avenue: Columbia Slough Bridge (No. 001696) Portland, Oregon.

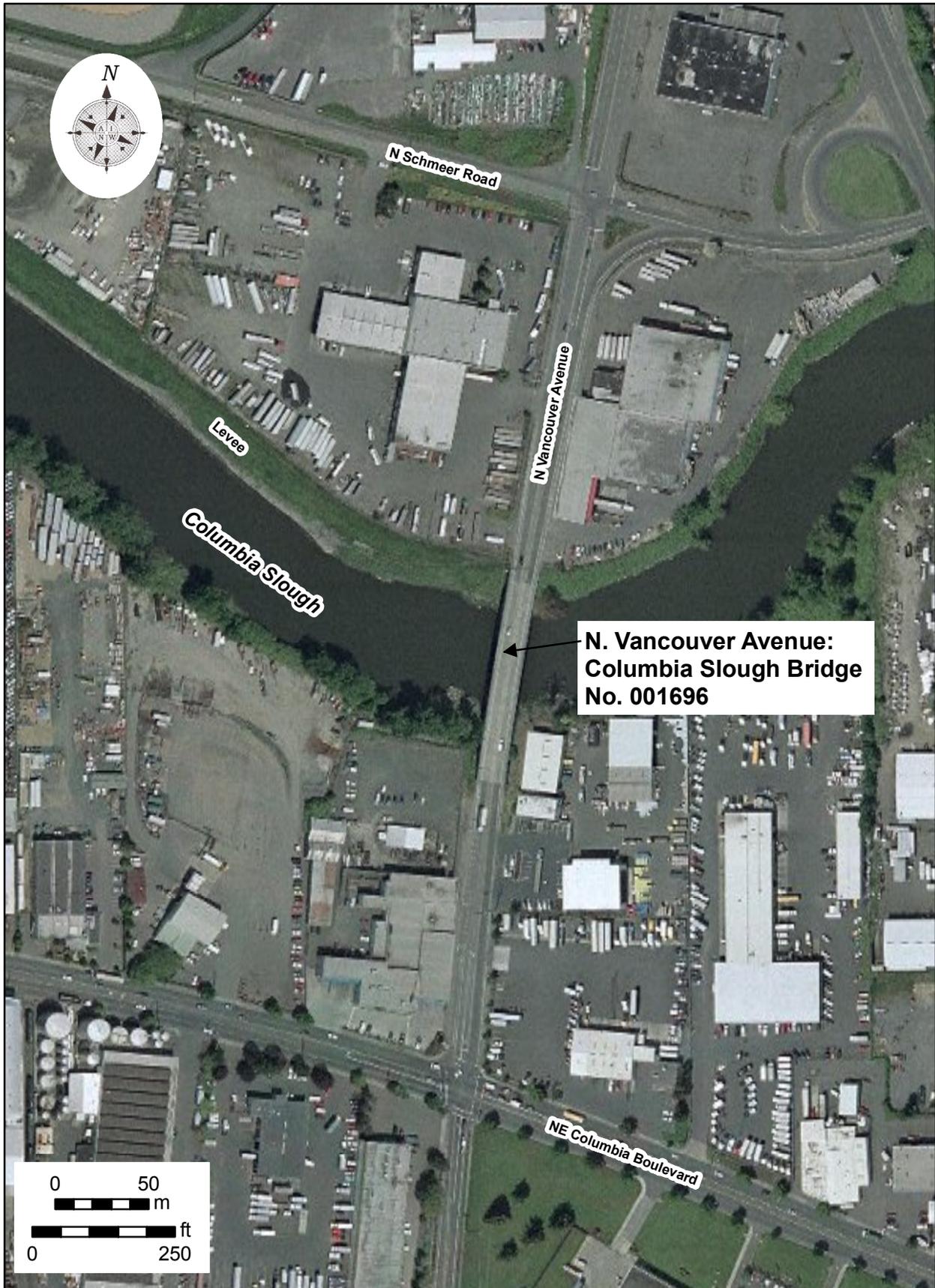


Figure 2. N. Vancouver Avenue: Columbia Slough Bridge (No. 001696) aerial view.

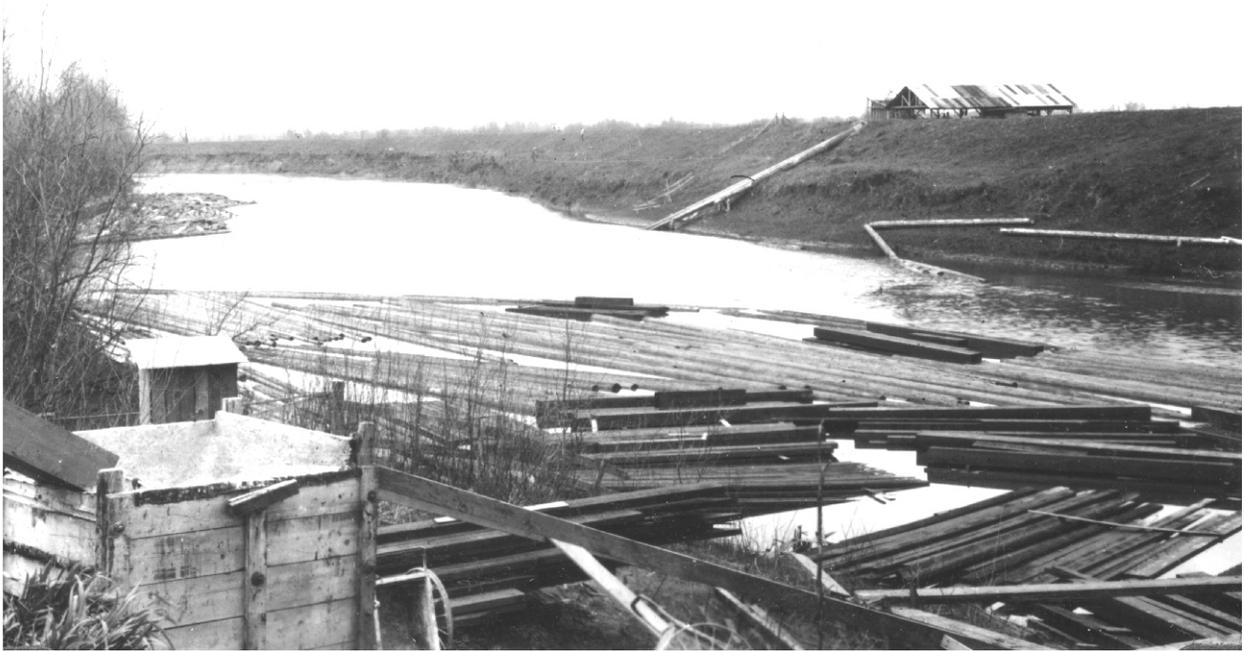


Figure 3. This historical photograph was taken in April, 1935, prior to the construction of the N. Vancouver Avenue: Columbia Slough Bridge. The view is towards the northwest. (Courtesy Oregon Department of Transportation.)



Figure 4. This historical view of the Columbia Slough Levee shows the bridge construction location. Timber stubs in the water are likely the remnants of a prior bridge. The view is towards the north. (Courtesy Oregon Department of Transportation.)



Figure 5. A 1935 view from the southern approach showing the bridge construction in process. The view is towards the north. (Courtesy Oregon Department of Transportation.)

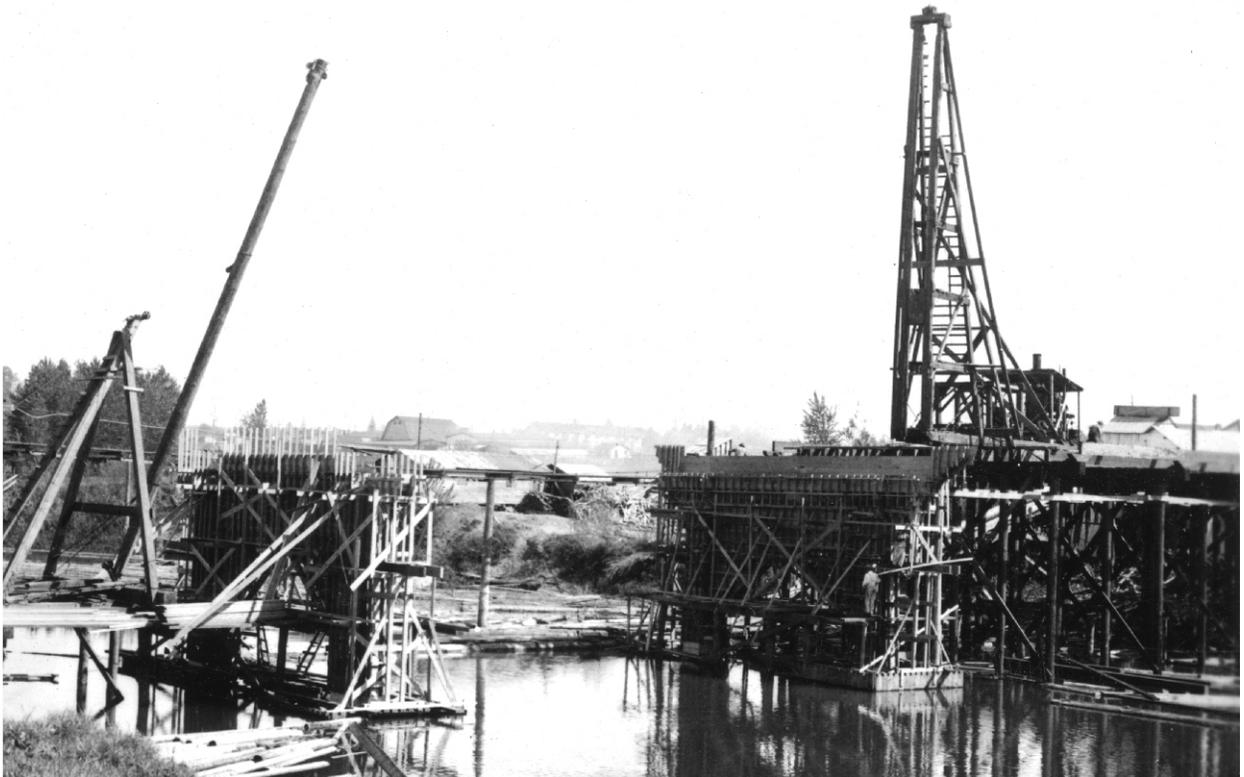


Figure 6. The concrete pile bents for the new bridge were under construction in 1935. The view is towards the southeast. (Courtesy Oregon Department of Transportation.)