

BIG CREEK BRIDGE
Oregon Coast Highway (U.S. 101),
spanning Big Creek
Florence Vicinity
Lane County
Oregon

HAER No. OR-86

HAER
ORE
20-FLO.V,
2-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Western Region
Department of the Interior
San Francisco, California 94107

Attendance
Follows

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HAER No. OR-86

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2

Location: Spanning Big Creek on the Oregon Coast Highway, US 101 (M.P. 175.02), approx. 15 miles north of Florence, Lane County, Oregon.

USGS Heceta Head Quadrangle
UTM Coordinates: 10.410665.489160

Date of Construction: 1931

Engineer: Conde B. McCullough, Oregon State Bridge Engineer

Builders: Union Bridge Company, under a cooperative agreement with:
Oregon State Highway Commission, Lane County, and
the U.S. Bureau of Public Roads

Present Owner: Oregon Department of Transportation

Present Use: Highway Bridge

Significance: The Big Creek Bridge is significant as one of the earliest examples of reinforced concrete tied-arch bridge construction in the Pacific Northwest region of the United States. The Big Creek Bridge is also significant as the work of a master, Oregon State Bridge Engineer, Conde B. McCullough, and due to its thematic association with the design and construction of several other major reinforced concrete bridges designed by McCullough and erected along the Oregon Coast Highway in the 1930s. Conde Balcom McCullough served as State Bridge Engineer, and later as the Assistant State Highway Engineer for Oregon from 1919 until his death in 1946. McCullough is significant for his use of innovative bridge technology, and for his visually appealing designs. He has attained international recognition for the large-scale structures he designed to span the major rivers and estuaries along the Oregon coast for the completion of the Oregon Coast Highway in the 1930s. Eric Delony, Chief of the Historic American Engineering Record (HAER), states in his recent book, Landmark American Bridges, "This family of bridges represents some of the best and most innovative concrete and steel bridges in the world."

The Big Creek Bridge is also significant due to its association with the development and completion of the Oregon Coast Highway (US 101) in the 1930s. The completion of the Oregon Coast Highway was a major public works effort in the early and mid-1930s to establish an uninterrupted transportation route from California to Washington, and was a major factor in the development of commerce and tourism in Oregon's coastal regions, and has since become one of the most notable scenic routes in the United States.

The Big Creek Bridge was determined eligible for the National Register of Historic Places in June 1994.

Report Prepared By: James Norman, Cultural Historian
Oregon Department of Transportation

Date: August 1995

I. DESCRIPTION AND ENGINEERING HISTORY

The Big Creek Bridge consists of a 36.6m (120ft) reinforced concrete through tied arch main span, flanked by three reinforced concrete deck girder approach spans [two-12.2m (40ft), one-10.7m (35ft)], for a total length of 71.7m (235ft). The design of the tied arch ribs of the main span is based on an elliptical curve, and features slender hangers (vertical supports) and massive rhombic cross braces. The arch span has an internal clearance of 8.5m (28 ft), and carries a 8.2m (27ft) roadway [two 4.1m (13.5ft) travel lanes]. The approach spans have arched fascia walls with brush-hammered inset panels. There are two 1.5m (5ft) sidewalks outside the arches which are lined with an ornate arched balustrade concrete railing and supported by deep brackets extending from the deck support floor beams. Vertical clearance ranges from 3.5m (11.4ft) to 5.1m (16.6ft). Bronze name plaques are mounted at either end of the bridge indicating that the structure was built in 1931 by the Union Bridge Company under a cooperative agreement between the Oregon State Highway Commission, Lane County, and the U.S. Bureau of Public Roads.

The Big Creek Bridge is one of the earliest examples of reinforced concrete tied-arch bridge construction in the Pacific Northwest region of the United States. The tied arch is an adaptation of the “bowstring arch-truss” developed by Squire Whipple in 1841 and first expressed in a concrete form as one of the variations of the “rainbow arch” bridges designed and popularized in the 1910s and 1920s by Iowa bridge engineer, James B. Marsh. The Big Creek Bridge was designed by Oregon State Bridge Engineer, Conde B. McCullough, and is one of three nearly identical single span tied arch bridges built in 1931 along the Oregon Coast Highway (the Wilson River (Tillamook County) and Tenmile Creek (Lane County) bridges* each used the same 36.6m (120ft) tied arch design with slightly varying approach span configurations). The tied arch design was selected for the lowland coastal location due to inadequate foundation conditions which would have rendered laterally-stressed abutments unstable, and due to the need for minimum profile supporting piers to accommodate high water during flood periods and extreme tidal conditions. By utilizing a tied arch configuration, lateral stresses were removed from the arch ends, and did not need to be compensated for by massive abutment structures. Since the lateral forces were balanced within the arch itself, the bridge loads were transmitted vertically through the piers, allowing for the narrow, low mass pier design needed for the tidal flat area at the bridge site. McCullough considered his design and use of a tied arch configuration as an approach to solving the problems of lowland coastal sites to be rare and innovative in the United States. His particular adaptation of the tied arch design was credited in the technical literature as having the unique feature of using the bridge deck slab itself as the “tie” structural member. McCullough later incorporated the tied arch, both in steel and concrete, into many of his larger multi-span bridges.

The Big Creek Bridge is also significant as the work of a master, Oregon State Bridge Engineer, Conde B. McCullough, and due to its thematic association with the design and construction of several other major reinforced concrete bridges designed by McCullough and erected along the Oregon Coast Highway in the 1930s. Conde Balcom McCullough served as State Bridge Engineer, and later as the Assistant State Highway Engineer for Oregon from 1919 until his death in 1946. He authored a number of books and technical articles on bridge design and construction. McCullough is significant for his use of innovative bridge technology, and for his visually appealing designs. He has attained international recognition for the large-scale structures he designed to span the major rivers and estuaries along the Oregon coast for the completion of the Oregon Coast Highway in the 1930s. These bridges, including the Rogue River (Gold Beach), the Yaquina Bay, the Alsea Bay, the Coos Bay (McCullough), the Siuslaw (Florence), the Umpqua (Reedsport), the Wilson River, Tenmile Creek, and a number of thematically-similar concrete beam and girder structures, were built during a period of about six years (from the early to mid-1930s) to complete the route of the coast highway from Washington to California. The bridges used many common design themes and elements, including stylized bridge railing ballustrades, curved bracketing, arched fascia walls with brush-hammered inset panels, and art deco ornamentation which often appears as fluting and embellishment of entrance pylons, columns, stringers, piers and other vertical structural members. Eric Delony, Chief of the Historic American Engineering Record (HAER), states in his recent book, Landmark American Bridges, “This family of bridges represents some of the best and most innovative concrete and steel bridges in the world.”

The Big Creek Bridge is also significant due to its association with the development and completion of the Oregon Coast Highway (US 101) in the 1930s. The completion of the Oregon Coast Highway was a major public works effort in the early and mid-1930s to establish an uninterrupted transportation route from California to Washington. The effort was aided by the PWA-sponsored Oregon Coast Bridges Project which provided funds for the construction of modern bridges to replace the existing slow, cumbersome ferries which serviced the crossings of the larger bays, rivers and estuaries. The completion of this route was a major factor in the development of commerce and tourism in Oregon's coastal regions, and has since become one of the most notable scenic routes in the United States.

In summary, the Big Creek Bridge is an excellent example of 1930s state-of-the-art short-span bridge engineering technology, as expressed by internationally-recognized bridge engineer, Conde B. McCullough, to address the specific design problems presented by a lowland coastal location. The bridge design is an integral part of McCullough's body of work, and a contributor to the thematic continuity of the group of reinforced concrete bridges built along the Oregon coast in the 1930s. It is one of the three earliest examples of reinforced concrete tied arch highway bridges in the Pacific Northwest region of the United States. The aesthetic of the Big Creek Bridge is considerably enhanced by its outstanding scenic coastal site and isolated environment.

* Note - The Wilson River Bridge was determined eligible for the National Register in May 1985, and recorded for HAER in 1990 (HAER No. OR-39). The Tenmile Creek Bridge is currently included in the reserve category of historic bridges in ODOT's Historic Bridge Inventory.

II. SOURCES

Smith, Norman, and Dykman. Historic Highway Bridges of Oregon. OHS Press, Portland, 1989.

Condit, Carl W. American Building Art. Oxford University Press, 1960.

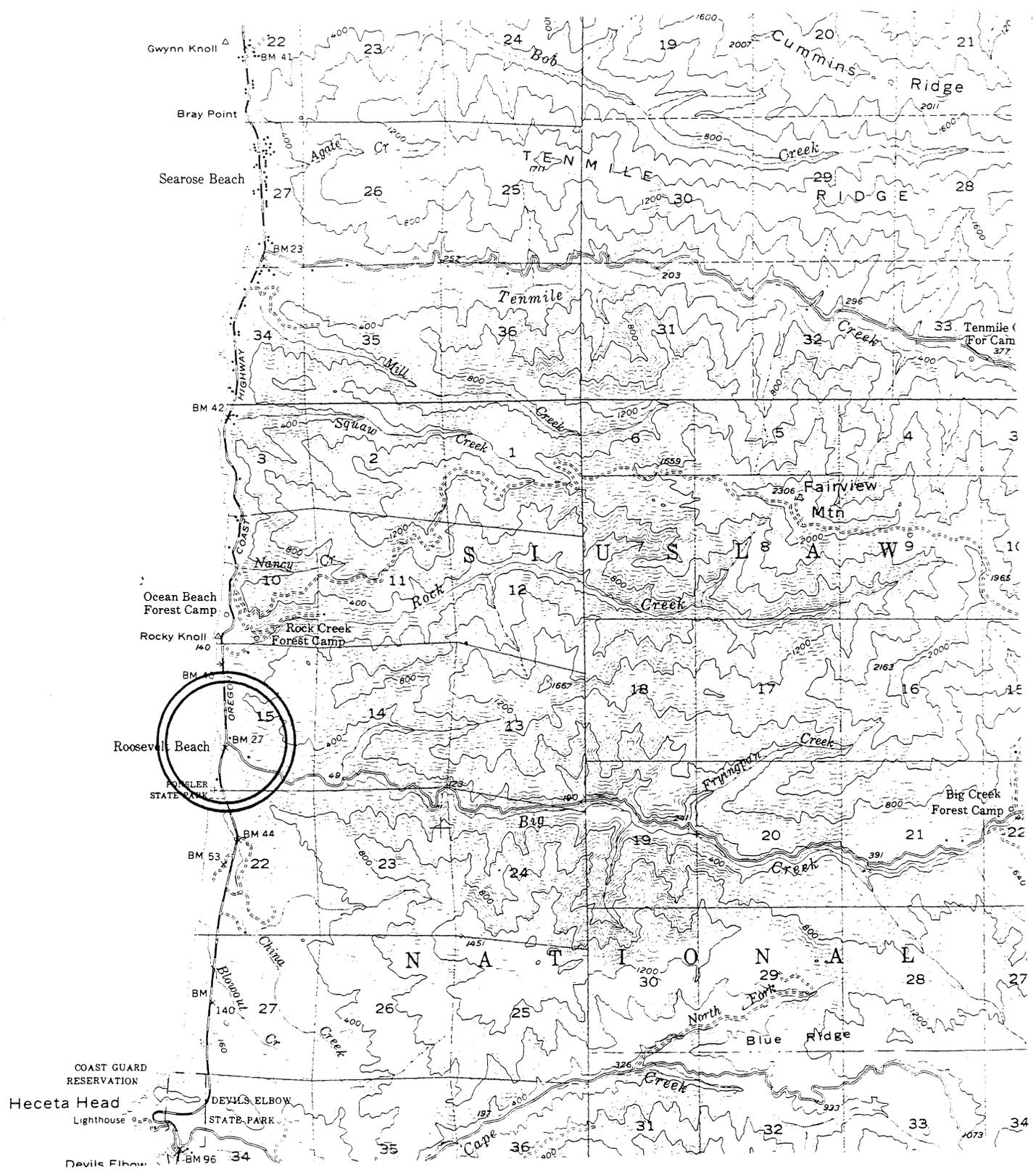
Hadlow, Robert W. "Wilson River Bridge at Tillamook, 1931." HAER No. OR-39, 1990.

McCullough, Conde B. "Design of a Bowstring-Arch Bridge," Engineering News Record, August 27, 1931.

Delony, Eric. Landmark American Bridges, American Society of Civil Engineers, New York, 1993.

III. PROJECT INFORMATION

This documentation has been prepared for the Oregon Department of Transportation, which is proposing to slightly alter the original design of the wind braces of the Big Creek Bridge, to improve the vertical clearance at the bridge portals. The existing "X" style wind braces will be modified at the portals such that the the lowest members of the X will be removed and replaced with a single horizontal member, resulting in a shape similar to "V". Project plans are available on request.



Heceta Head Quadrangle, Lane County, Oregon
15 Minute Series, USGS

ADDENDUM TO:
BIG CREEK BRIDGE
Spanning Big Creek on Oregon Coast Highway (US101)
Florence vicinity
Lane County
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