



When Preservation Fails: A Story of Alsea Bay

Western Bridge Preservation Partnership

Presented by:

Rebecca Burrow, P.E.

ODOT Bridge Preservation

May 22, 2017

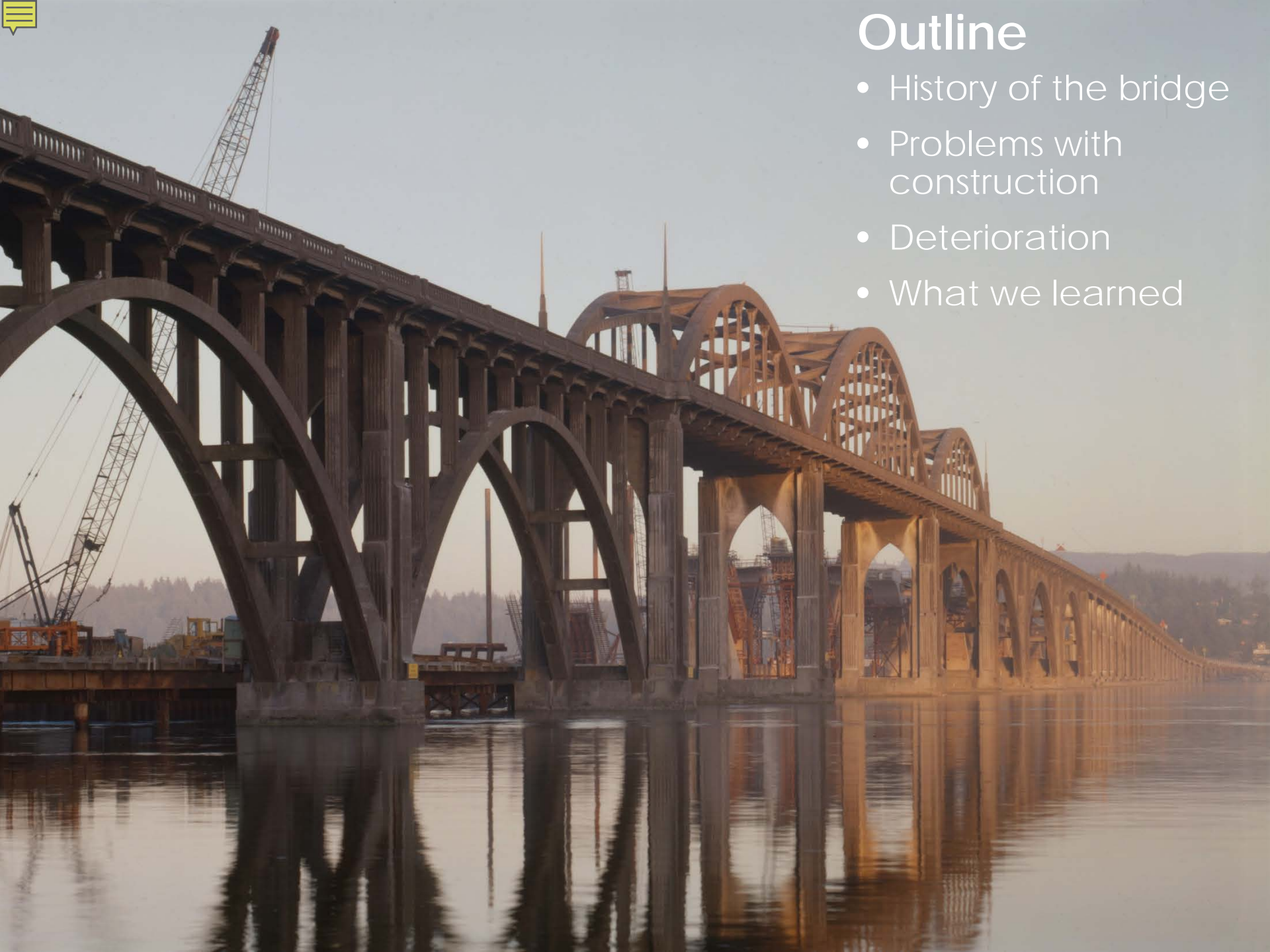






Outline

- History of the bridge
- Problems with construction
- Deterioration
- What we learned



History of the Alsea Bay Bridge



Conde B. McCullough and the Bridges of the Oregon Coast Highway



History of the Alsea Bay Bridge

Conde B. McCullough and the Bridges of the Oregon Coast Highway

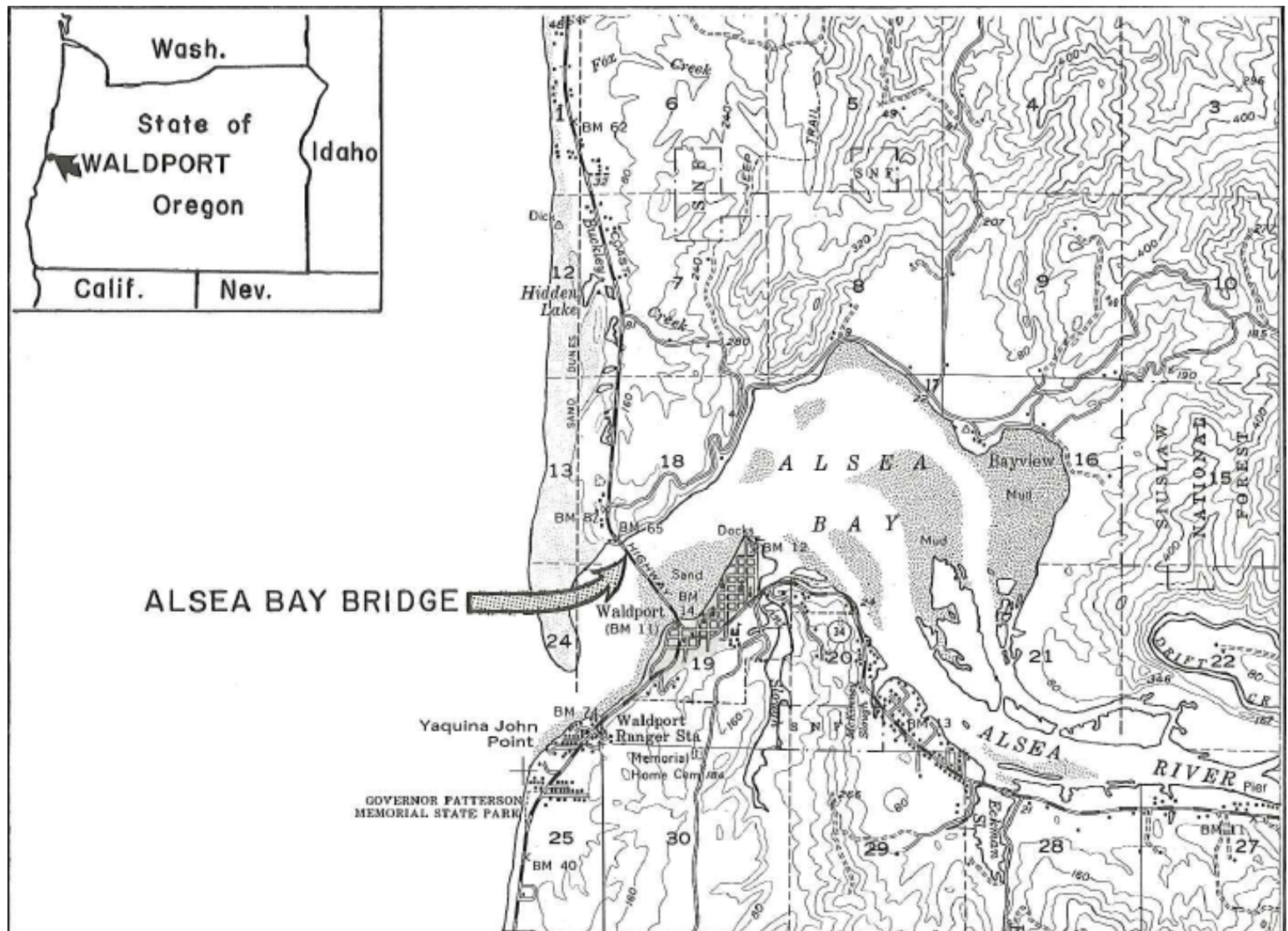
★ ★ USA ★ ★

WORK
PROGRAM

WPA



History of the Alsea Bay Bridge



History of the Alsea Bay Bridge

ALSEA BAY BRIDGE AT WALDPOR
ON OREGON COAST HIGHWAY IN LINCOLN COUNTY
BRIDGE NO. 1746

Description: (From North) 2-62' reinforced concrete deck girder spans.
3-150' reinforced concrete deck arches. 1-154', 1-210', 1-154'
reinforced concrete tied arches. 3-150' reinforced concrete
deck arches. 30 reinforced concrete deck girder spans totaling
1,460'-6". Total length - 3,028'. 2 lanes with 2 sidewalks.

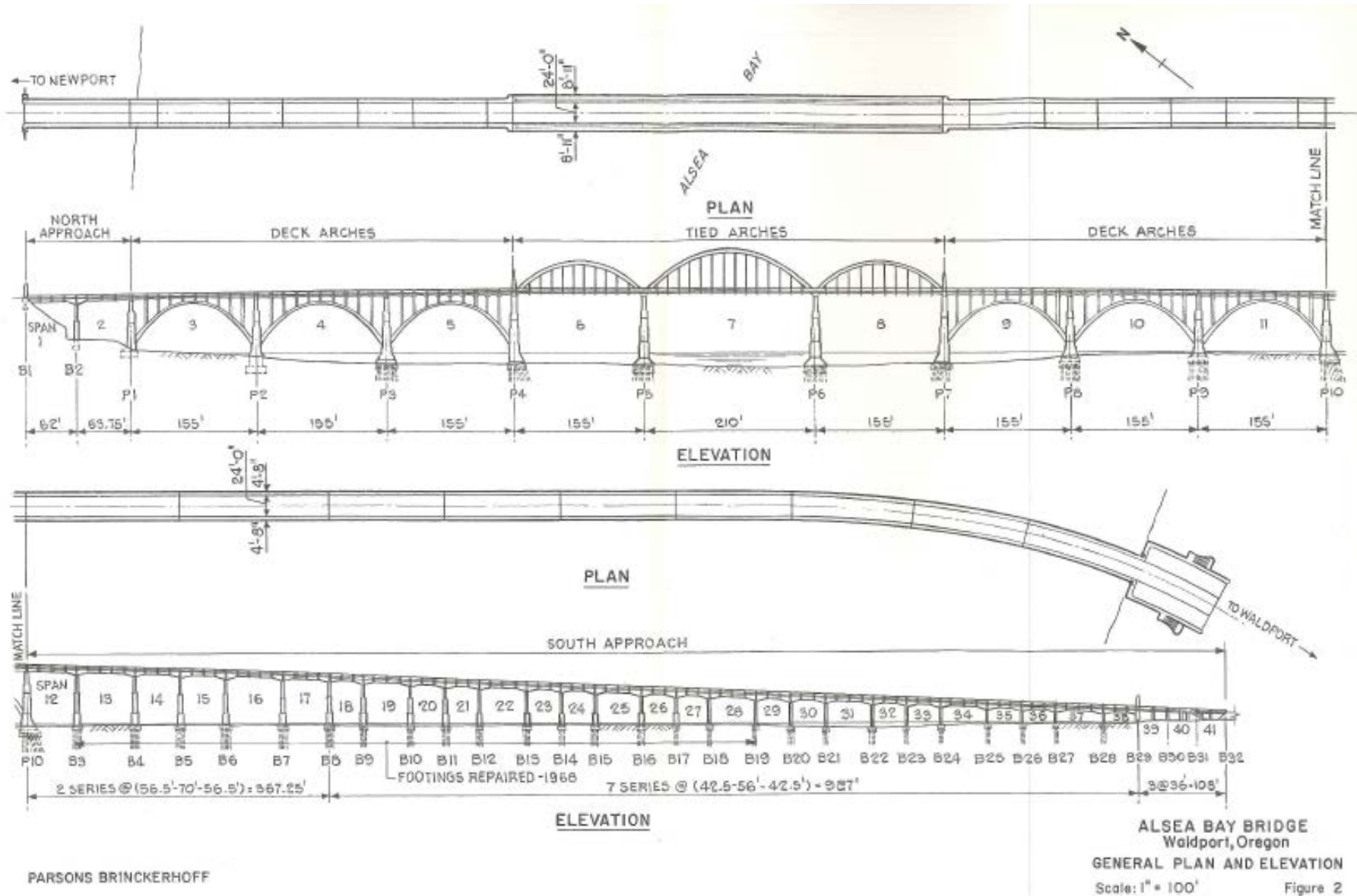
Constructed: 1934-36

<u>Principal Quantities:</u>	Excavation	8,973	cubic yards
	Piling	71,806	linear feet
	Concrete	19,298	cubic yards
	Metal Reinforcement	1,884,423	pounds
	Structural Steel	265,204	pounds

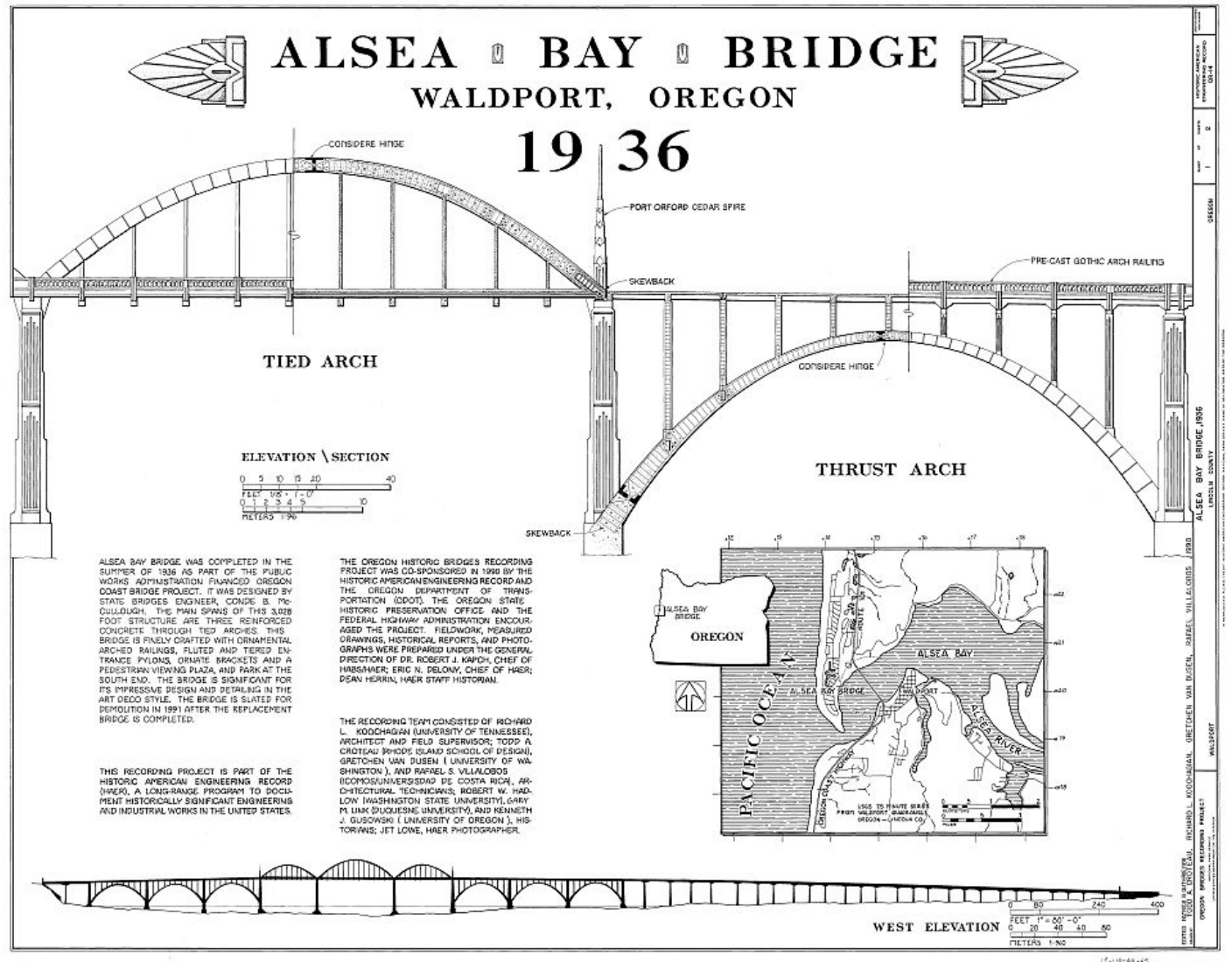
Construction Cost: \$746,762.28



History of the Alsea Bay Bridge

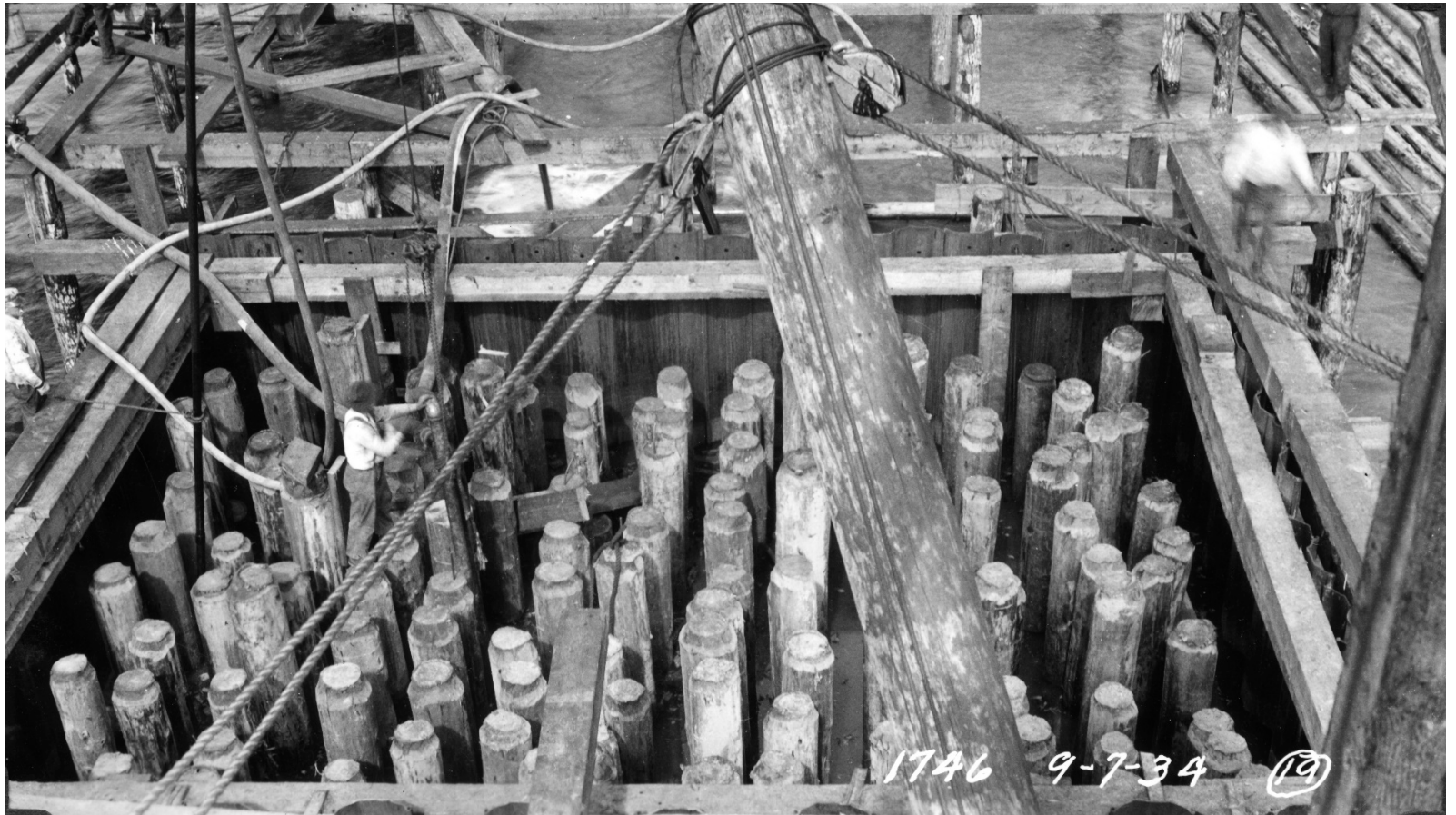


History of the Alsea Bay Bridge



Construction Problems

Building Materials: Hemlock Piles



Construction Problems

Building Materials: Concrete Aggregate



Construction Problems

Building Materials: Concrete Aggregate



Construction Problems

Building Materials: Concrete Aggregate



Construction Problems

Building Materials: Concrete Additive

Form 1000 - 10-1-42

OREGON STATE HIGHWAY COMMISSION
MATERIALS DEPARTMENT
SAMPLE DATA SHEET

Laboratory number
(Do not use this space)

Project Alsea Bay Bridge

Highway Oregon Coast

Contractor

Contract No. 1620

Submitted by Marshall Dresser Title Res. Engr.

Identification of sample: HD 18609

Shipped 4-5-35 By PP

Sampled by Marshall Dresser Title

If sample submitted is of material to be used in construction or maintenance
Kind of material Red Dog Diatomaceous Silica To be used in

What particular part of work Class A, B, D

Purpose of test to determine suitability

Source of sample Atomite Products

Has material from same source been tested previously Yes

Quantity of material represented by sample 20 Tons

Average length of haul to job, by rail _____ water _____

Sample H. D. No. 18609

Prefix No. 21PT

County Lincoln

State Project No. 982

Address Waldport

DIATOMITE INDUSTRY

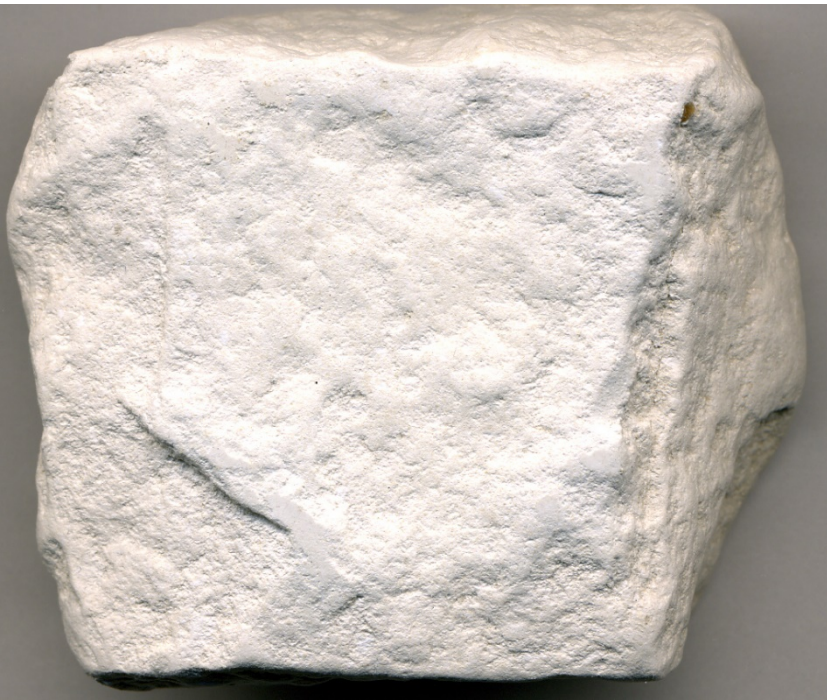
Diatomite is mined and milled at the Atomite Corporation plant twelve miles northwest of Redmond, Oregon. It is marketed in three principal grades for definite uses. They are:

RED DOG: Which is an admixture for concrete. The use of this material in concrete construction is becoming very prominent and has been used by the U. S. government for the last three years in all their dams and concrete work. Its value to the trade is that it renders the concrete more workable, prevents segregation of the aggregate, gives a smoother surface, insures adhesion to reinforcing steel, and lubricates the mixture with a minimum amount of water. This also permits of more rapid drying and setting of the concrete and renders it nearly 100% water proof.



Construction Problems

Diatomite



Construction Problems

Other Problems: Scour and
Efflorescence





Construction Problems

Completion?



Deterioration

1937

SUPPLEMENTARY			
BRIDGE INSPECTION AND MAINTENANCE REPORT			
OREGON STATE HIGHWAY COMMISSION — BRIDGE DEPARTMENT			
For bridge over	<u>Nisus Bay</u>	Hwy. No. <u>9</u>	Section No. <u>21-22</u> Br. Loc. No. <u>168.07</u>
County	<u>Lincoln</u>	Mileage numbering from	<u>Astoria</u>
General description	<u>32 RCDB spans, 6 RC deck arches, 5 RC tied arches</u>		Sheet <u>1</u> of <u>1</u>
Inspection made by	<u>V. L. Goodnight</u>		Date <u>October 1937</u>

REMARKS

(Use second sheet when space below is not sufficient; also, list cause of all defects such as cracking and scaling of concrete whenever possible.)

No scouring around footings of south approach bents where brush and gravel was placed during construction.

Cracks in sidewalks and deck slab bent #1---
Center arches and about middle of south approach.
Sidewalk cracked loose from plaza.

5th expansion joint south of arch spans has spalled back 2 $\frac{1}{2}$ " next to last joint on south approach spalled 3".



Deterioration

1954

REMARKS

(Use second sheet when space below is not sufficient; also, list cause of all defects such as cracking and scaling of concrete whenever possible.)

- (1) Hanger columns on thru arch spans are spauling, reinforcing exposed. Light control house need painting.

1968

REMARKS

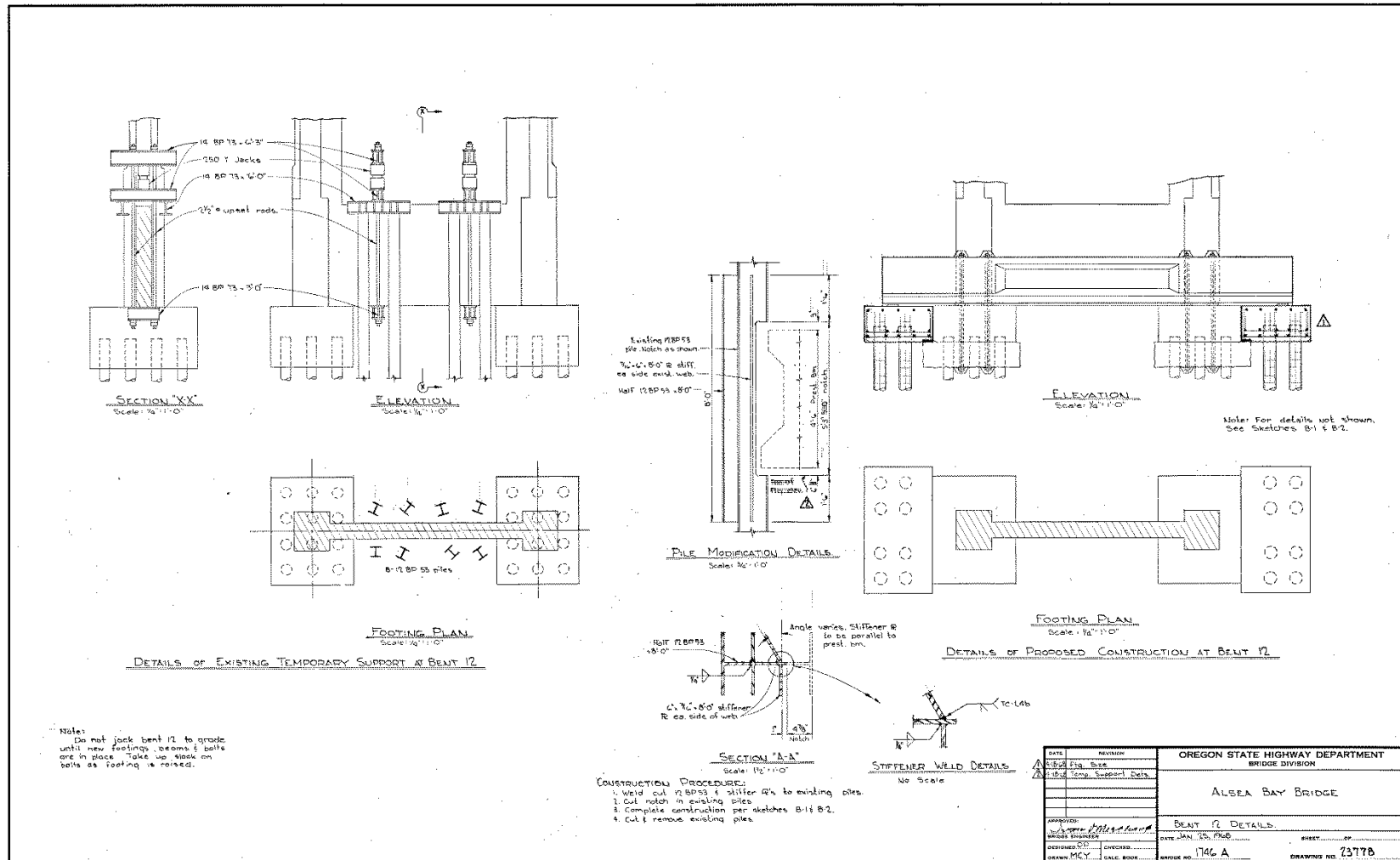
(Use second sheet when space below is not sufficient; also, list cause of all defects such as cracking and scaling of concrete whenever possible.)

1. * Floor beams show numerous longitudinal crack on the bottom faces. There should be checked over and many should be sealed. Some will need patching.
2. Expansion joints need repouring, concrete deck broken at edge of 4 expansion joints
4. ^{XX}_{*} Under the sidewalk left side at south end of bridge, the concrete has been damaged by driftwood fire, some resteel exposed.
3. Four hangers have spalled areas reinforcing exposed.



Deterioration

Scour Repairs - 1968



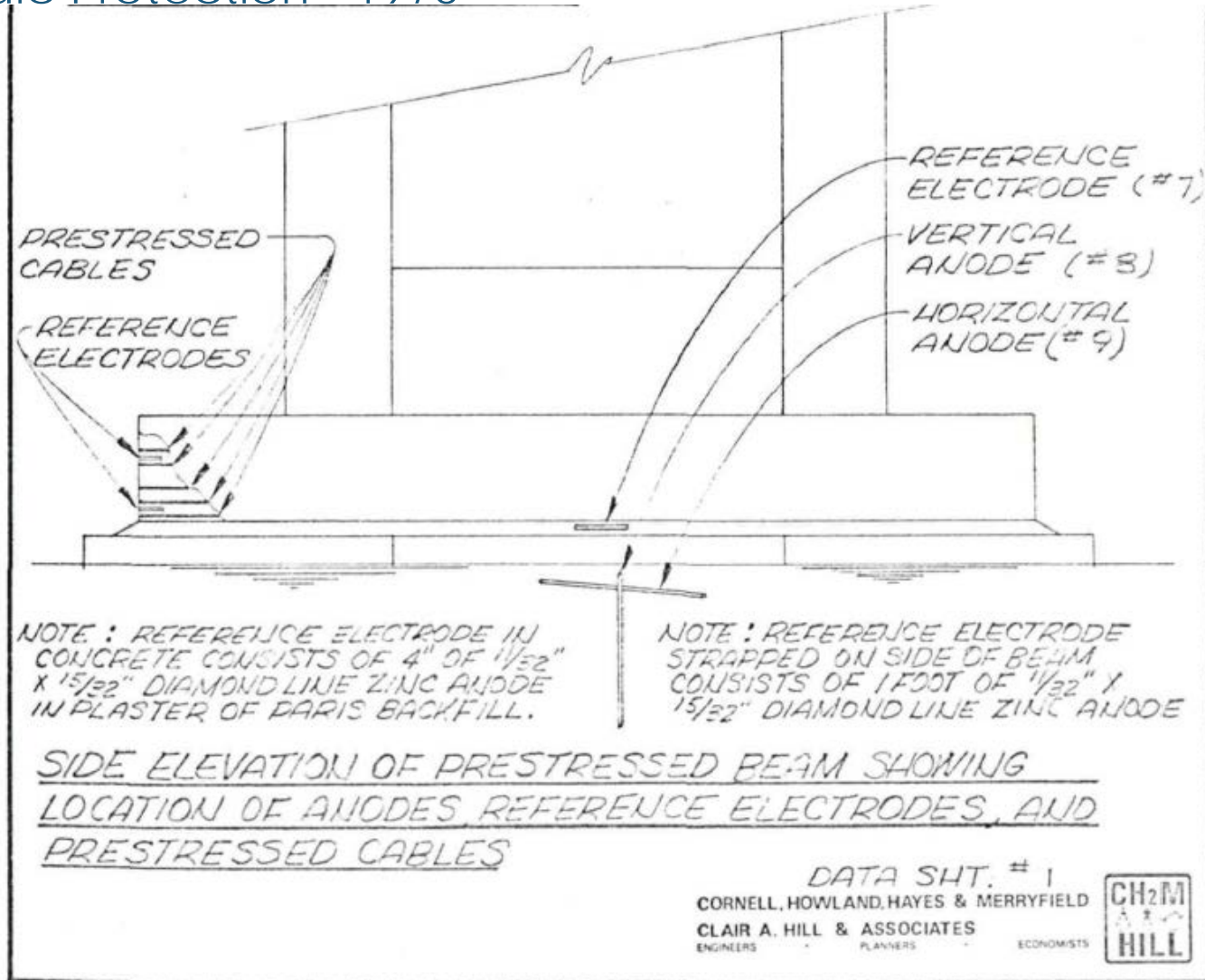
Deterioration

Scour Repairs - 1968



Deterioration

Cathodic Protection - 1973



Deterioration

Cathodic Protection - 1976

Form 81.734.3030

OREGON STATE HIGHWAY DIVISION

INTER-OFFICE CORRESPONDENCE

Salem, Oregon 97310

February 24, 1976

FILE:

FROM: H. M. Laylor
Chemist

SUBJECT:

TO: MEMO TO THE FILES

MAINTENANCE ENGINEER				
RECEIVED				
FEB 25 1976				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ME	AME	AME	OE	AG
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BME	SME	AA	FILE	TA

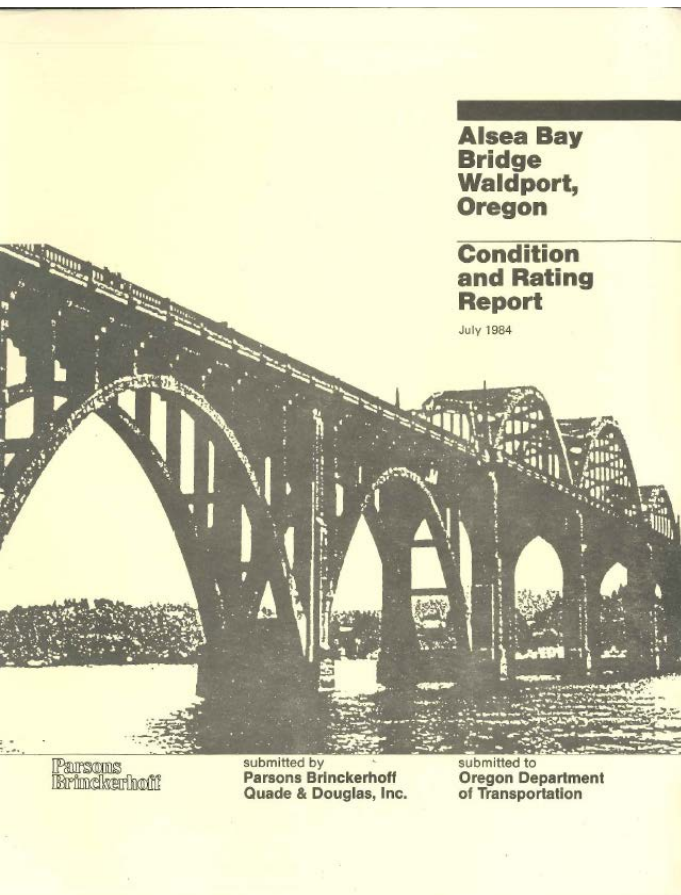
Cathodic Protection System on the Alsea Bay Bridge:

An inspection of eight randomly-selected beams was made to determine the physical condition of the system. It was found that:

A complete electro-chemical evaluation of each beam should be made and, if the results are consistent with the initial findings, one or two beams should be chosen, removed from the pier and sent to Salem for evaluation. The probability that several of the beams are near or in failure is sufficiently great that disturbing any in place for strand inspection is not advised.



Deterioration



Condition Evaluation, 1984





Deterioration

Scaling, 1984

LOOSE CONCRETE ON ALSEA BRIDGE
TO BE REMOVED BY HIGHWAY DIV

October 19, 1984
84-87-S



Deterioration

Scaling, 1984

LOOSE CONCRETE ON ALSEA BRIDGE
TO BE REMOVED BY HIGHWAY DIV

October 19, 1984
84-87-S



The rehabilitation study stated the bridge would last only about five more years if deterioration were not stopped. At that time, more serious restrictions would be necessary, along with extensive maintenance.



Deterioration

End of Life, 1990-91



BRIDGE INSPECTION REPORT OREGON STATE HIGHWAY DIVISION

BRIDGE NO. 1746

RCDG &
BRIDGE TYPE RC Tied Arch NAME Alsea Bay (STATE, FAS, FAU, OS) HWY. NO. 9
CROSSING (OVER, UNDER) Bay COUNTY Lincoln INSP. FREQ. 6 Mon MILE POST 155.54
DISTRICT 4 YEAR BUILT 1934 A.C. (in.) --- DATE 3/6/90 INSPECTORS: Don Silbernagel
SIGNATURES _____

REMARKS (Key-in to item and number above)

There is extensive corrosion, cracking, and spalling throughout the deck and superstructure. There is heavy transverse cracks and some map cracking throughout the deck. Deck joints are open, edges of joints are broken in places (No Problem). The const. joint between deck & sidewalk slabs appear to be open up in places (No Change). The anchor bolts at the roller bearing have rusted in half. Bearings in Deck Arches have failed and temporary bearings were added. The ends of the interior beams at Bent 16 (over rockers) are spalled 2" to 3" Deep. Additional pile were driven to prevent settlement in S. approach spans. Cathodic protection is not working & beyond repair. North approach shows erosion under backwall and some settlement of A.C.

REMARKS (Key-in to item and number above)

THERE IS EXTENSIVE CORROSION, CRACKING AND SPALLING THROUGHOUT THE DECK AND SUPERSTRUCTURE. MANY STIRRUPS NEAR MIDSPAN OF THE DECK ARCH BEAMS ARE HAVE 75 TO 100% SECTION LOSE. MANY OF THE BEAM ENDS AND BEARING AREAS FOR THE SAME AREA HAVE SPALLED, PROVIDING VERY LITTLE BEARING AREA. TEMP BEARING



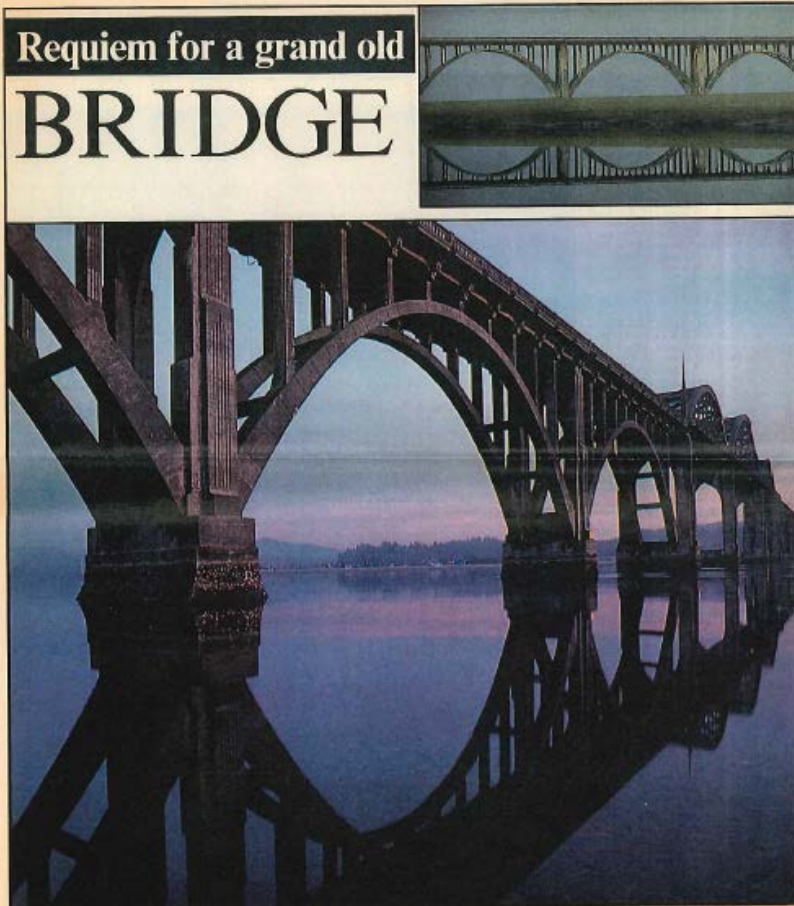


Aftermath



Aftermath

Old Bridge Loved



Historic Bridge Interpretive Center





Aftermath



Coastal Bridge Preservation Program

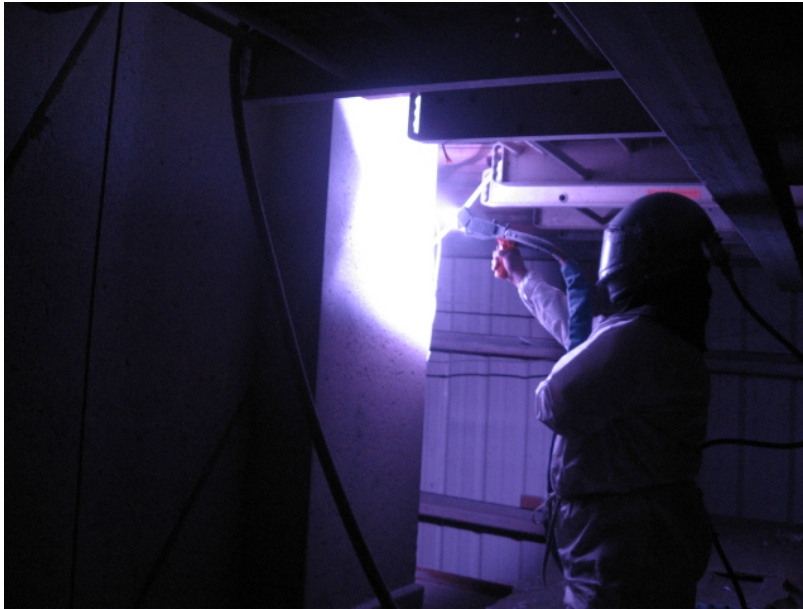
- 13 bridges with impressed current CP
- 2 more in development



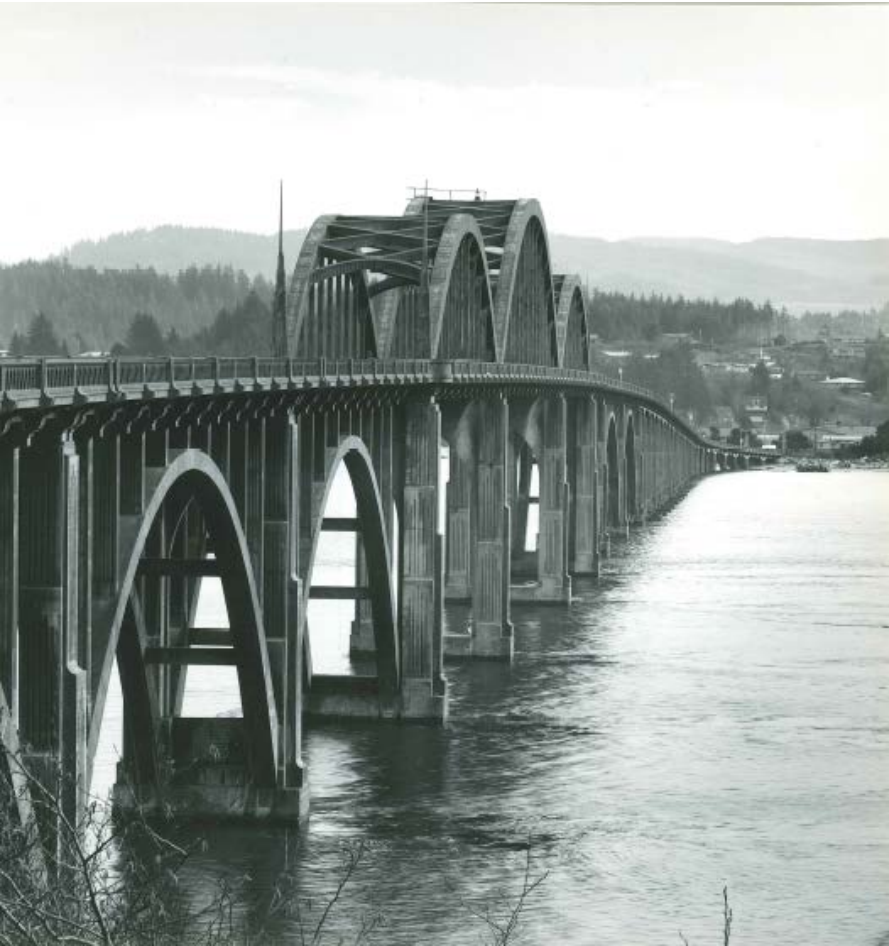


Aftermath

Coastal Bridge Preservation Program



Aftermath



- Replacement in 1991:
 - \$52M
- Estimated Replacement Cost Today:
 - \$225M
- Estimated Rehabilitation Cost Today:
 - \$60M



Thank you.