Western Bridge Engineers Seminar
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Accelerated Bridge Construction of the West Humbug Creek Bridge

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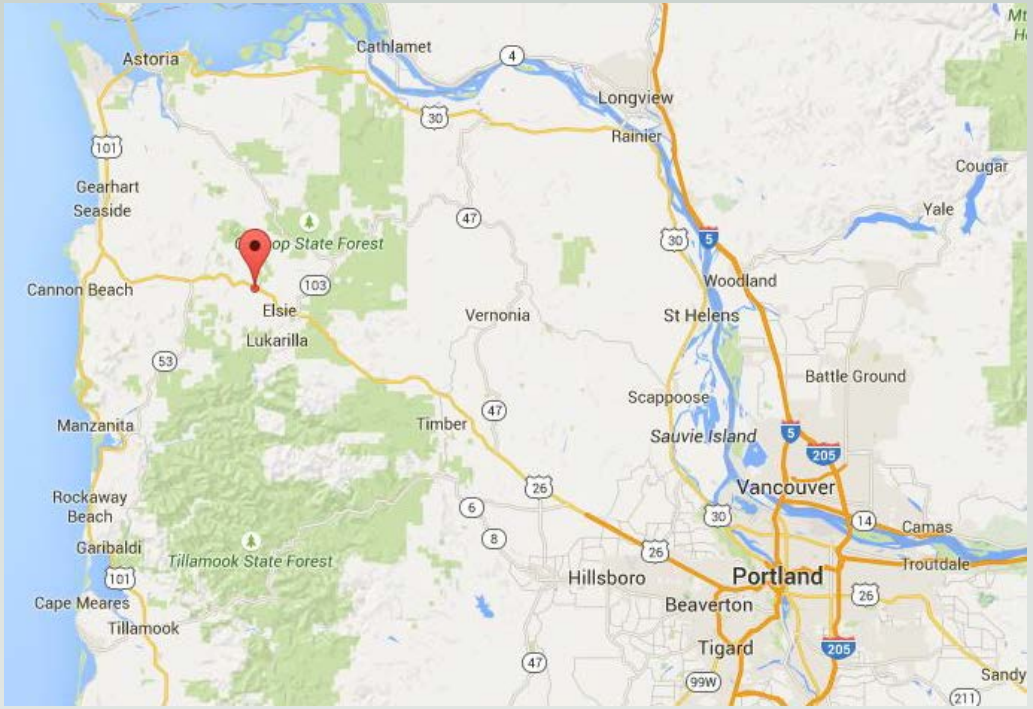
Presentation Overview

- **Project Background**
- Alternatives
- Design
- Construction
- Lessons Learned

Project Background: Location and Usage

- ADT is 6,500, 11% trucks
- NHS Route
- Main route from Portland to Seaside with limited detour options
- 16 miles east of Seaside
- High seasonal variability in traffic and directional imbalance!



Project Background

- Project History
  - US26 at MP 16.28, built in 1934
  - 59-foot-long, three-span, timber bridge, supported on pedestals on sandstone

Project Background: Considerations for Replacement

- 2010 Sufficiency Rating: 53%
- Scour Critical Bridge
  - In July 2007, scour repairs were performed on the footing at bent 2 and became undermined almost immediately
- Timber Girders with reinforced concrete deck
- 24-foot roadway width
- RF = 1.2

Project Background: Project Team

- ODOT
  - Ken Kohl, PE (PM)
  - Craig Shike, PE
    (Bridge Ops & Standards)
  - Tanarat Potisuk, PE
    (Concrete Standards)
- OBEC Design Team
  - Bob Goodrich, PE (PM)
  - Andy Howe, PE (EOR)
- General Contractor
  - Oregon State Bridge
  - HP Civil (Sub)
  - Axis Crane (Sub)
- Precast Fabricators
  - Knife River (Deck Panels)
  - RB Johnson (Girders, Pile Caps, Impact Panels)

Project Background

- FHWA Innovative Bridge Research and Deployment (IBRD) Program. Grant awarded of $400,000.

- Building off of the Burnt River Project & Salt Creek Viaduct V-E.

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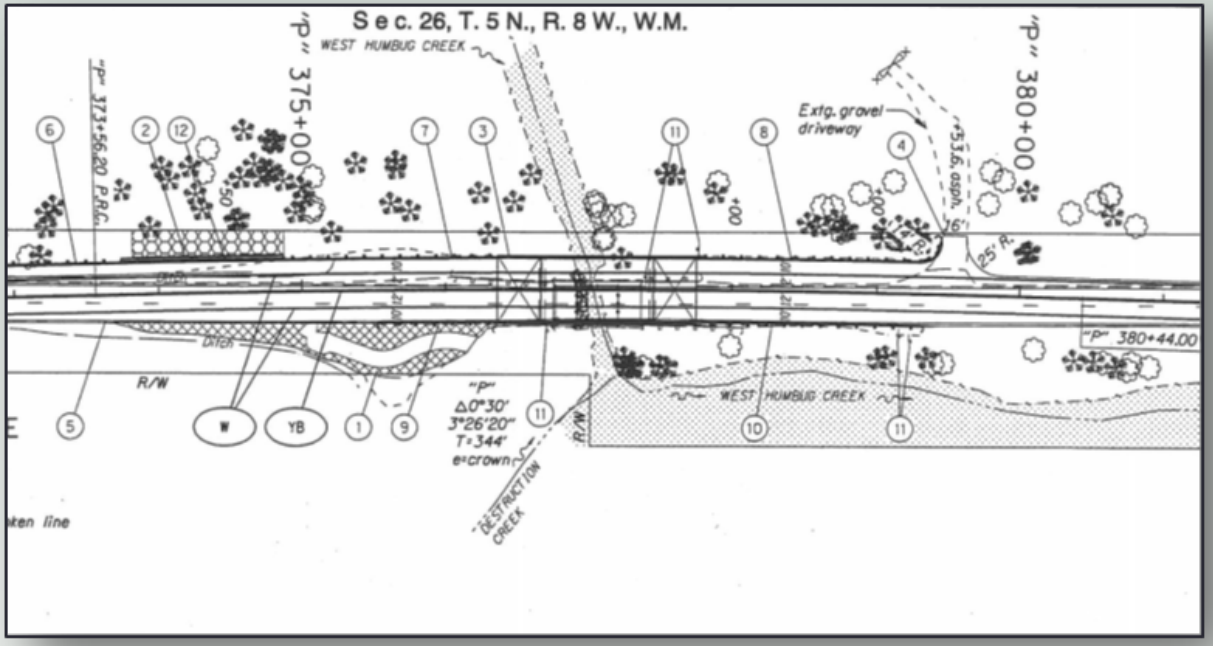
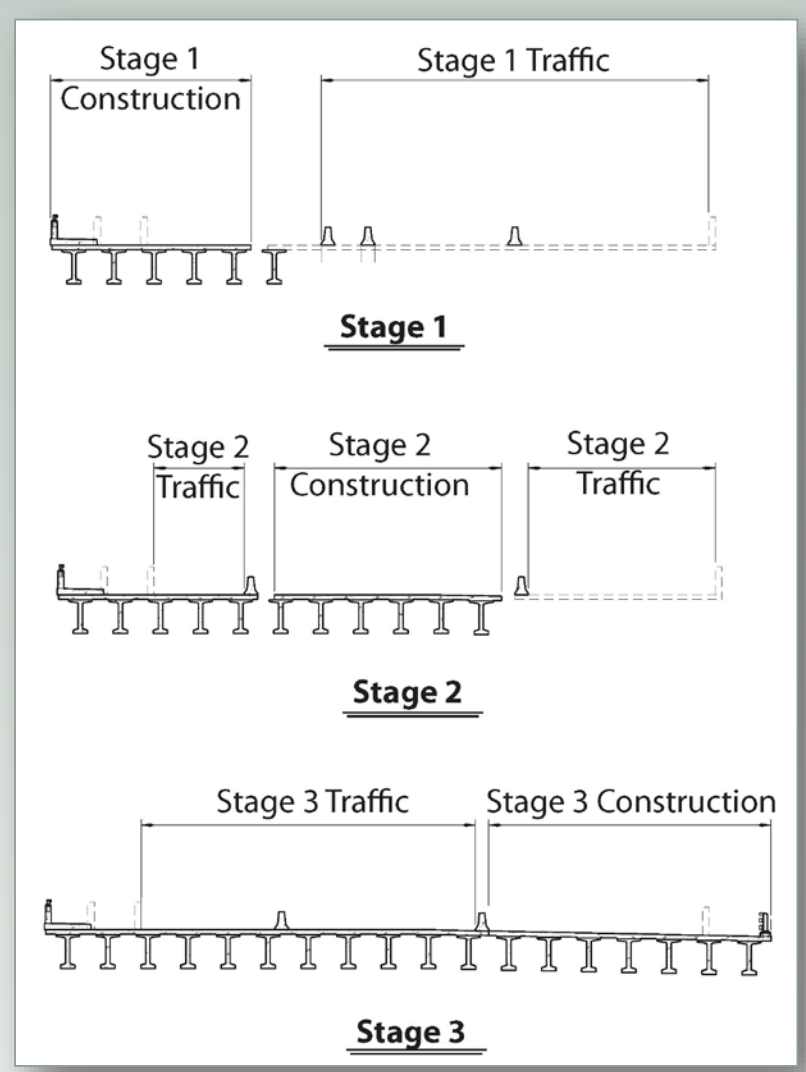
Alternatives: Site Constraints

- Adjacent wetlands/waters
- Cultural site
- Old growth trees
- Narrow right-of-way
- Summer in-water work window



Alternatives: Traditional Methods

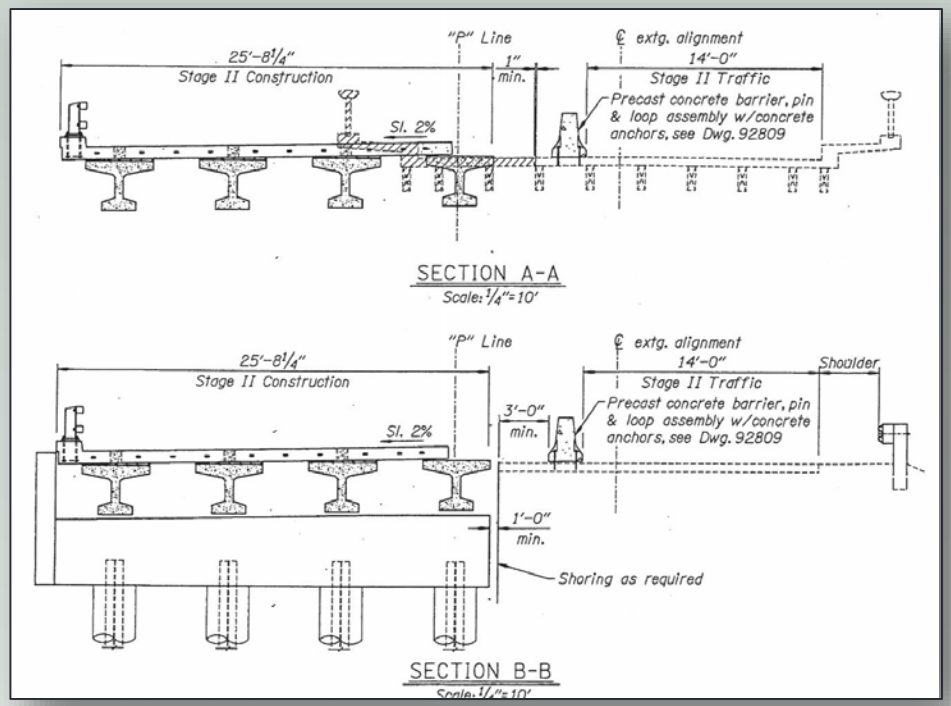
- Detour/Diversion
- Closure
- Staging/ABC

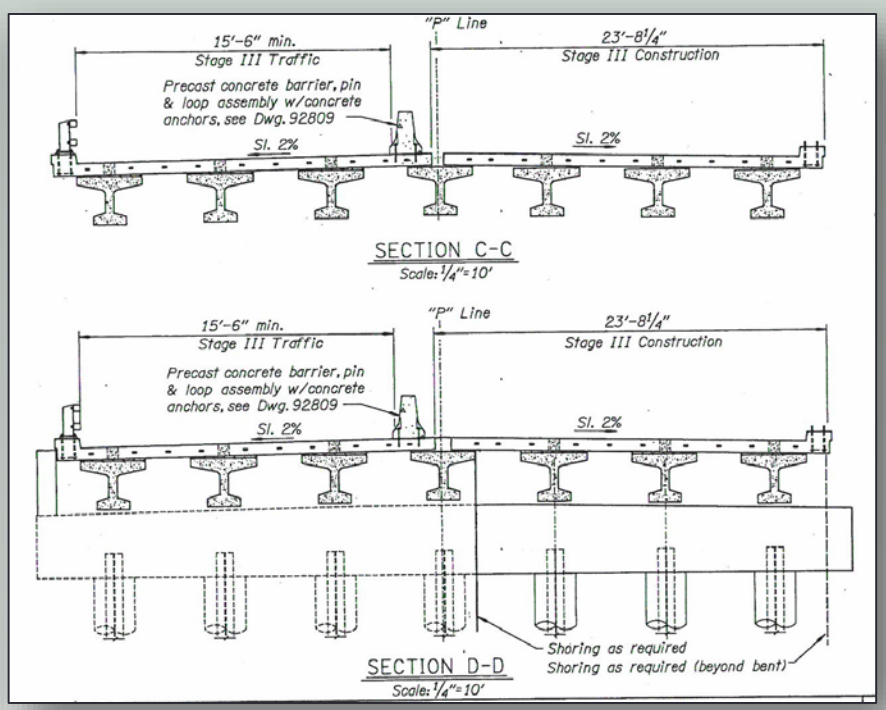


Alternatives: ABC Methods

- Sliding
  - Not practical given R/W, wetlands, etc.
- SPMT's
  - Require extended (hours) full closure, requires access from below
- Prefabricated/Preassembly
  - Prefabricated concrete elements Post tensioned with closure pours
  - Burnt River Bridge

Alternatives: Staging + ABC





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Design: Foundation

- Prebored Piling
  - (7) HP 12x74 per bent
  - Installed with CFA
- Precast/PT Caps
  - (5) 1 3/8-inch threaded Rod

Design: Superstructure

- (7) 36-inch Deck Bulb-T
- Steel Plate Diaphragms

Design: Deck

- (18) Interior Panels
  - 8’ x 23’
- (4) Exterior Panels
  - 2.5’ x 23’
- Longitudinally Post Tensioned
  - (4) strands per tendon, 20 tendons
- 1-inch A307 Leveling rods
- Match Cast
- Class 6000 flowable concrete for build-up

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Construction

Construction: Schedule

- **Stage 1**
  - Constructed Roadway Widening
  - Installed 10 of 14 piling *(4 pile ahead of schedule)*
  - June 2nd-27th *(4 weeks, per contract)*
- **Stage 2 Phase 1 and 2**
  - Removed existing west-bound half of bridge & installed new west-bound half
  - July 27th-August 1st *(1 week ahead of schedule)*
- **Stage 3 Phase 1**
  - Completed remaining 4 piling
  - Excavated Swales
  - August 3rd-5th *(1.5 weeks ahead of schedule)*
- **Stage 3 Phase 2**
  - Remove remaining bridge
  - Installed east-bound half of bridge
  - August 10th-15th *(1.5 weeks ahead of schedule)*
- **10 additional days to complete, 8 days with flaggers**
  - Landscaping
  - Punch list
  - Rip Rap Removal per Permit
  - Swale Construction
  - Extra Work
- **Total of 43 days on-site**

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Lessons Learned

- Reduce CIP concrete whenever possible
  - Foundation closure pours
  - Beam pedestals (Contractor elected to eliminate)
  - Deck buildup, blockouts, and closure pour
  - Pile Blockouts (Contractor reduced with CMP sleeve)

- Specify a minimum number of concrete mix designs
  - Class 6000 Flowable for Deck
  - Class 3300 for Foundation

- Better to be too high than too low?

Lessons Learned

- PT Ducts for threaded rods
  - CMP vs PVC

Lessons Learned

- QA/QC of Precast Elements
  - Dimensional issues
  - Concrete Strength
  - Different precast suppliers
    - Finish
    - Width » Consider Impact Panel CP

Lessons Learned

- Consider closure pour for impact panels down center line consistent with bridge deck
  - Alleviate difficulty with splicing tie rods on the crown
  - Allow for adjustment in width to match bridge

- Misc. Items: Removal of leveling bolts, edge girder forms instead of foam

Lessons Learned

Traffic In Design

- Verify Traffic Count Data
  - $72^{o}F$ = 6,000 ADT in summer
  - What does $100^{o}F$ yield?
- Coordinate with other projects
  - Days vs. nights
  - Consecutive schedules
  - Consolidating traffic
- Advanced Warning Devices
  - PCMS
  - Regional VMS'

Traffic In Construction

- Learn Traffic Patterns
  - Peak Flows
- Flagger Education
  - Unbalanced Queues
- Coordination with adjacent projects
- Public Information
  - Press Releases

Summary

- Prefabricated/Preassembly ABC is a viable option
  - Closure Pours vs. PT & Match Cast
- Strive for tight tolerances on precast elements
- Be mindful of traffic data

Questions