

Local Agency Bridge Scour Program

ODOT/OACES Bridge Maintenance Workshop

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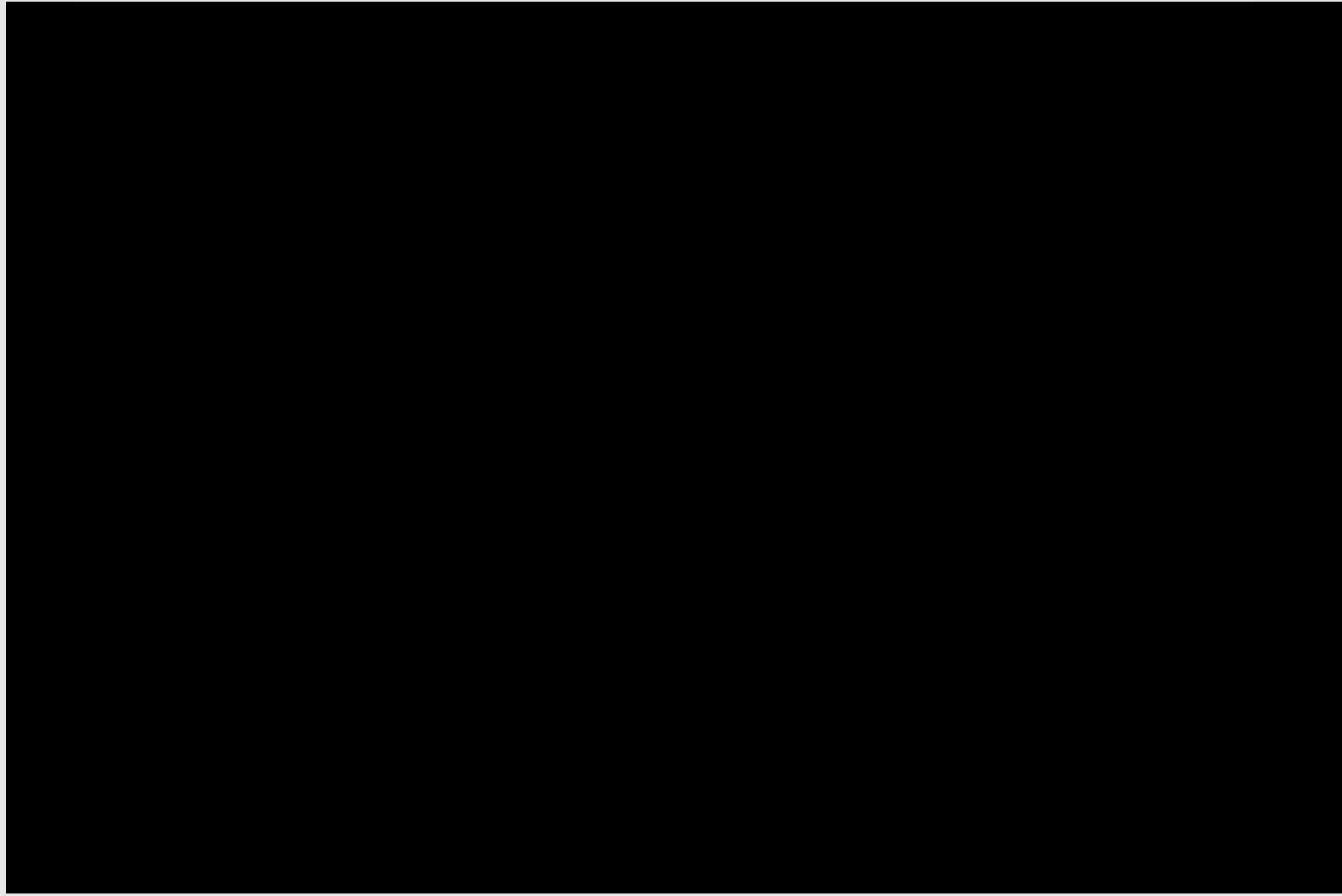


AGENDA

- FHWA Requirements
- Umatilla County Flood Damage 2019
- Scour Code Ratings
- Plan Of Action
- Local Agency Involvement
- Oregon Bridge Failures
- Conclusion



Culvert Failure Video





Scour Program

- Federal Highway Administration (FHWA) established a national scour evaluation program as an integral part of the National Bridge Inspection Program
- 23 CFR 650 Subpart C - NBIS- Scour Critical Bridges



23 CFR 650 Subpart C – Scour critical bridges

Due to 60% bridges fail by scour -FHWA study

Regulation requiring action by the owners.

- Requires a bridge owner to identify scour critical bridges
- Report to FHWA.
- Develop a POA to monitor known and potential scour deficiencies.
- Address critical findings of these bridges.

Strategies to Meet CFR Requirements

Identify Deficient bridges

- Inspect Scour Critical bridges.
- Resolve Unknown Foundations bridges.
- Report to FHWA; data management.
- Work with Local Agencies on Deficient bridges.
- FHWA Inspection QA Audit annually.





Bridge failures - Oregon

- Umatilla County
- February 2020



Scour Critical Bridge Failures

Umatilla County Br#59C435





Scour Critical Bridge Failures

Umatilla County Br#59C439





Scour Critical Bridge Failures Umatilla County Br#59C378





Scour Critical Bridge Failures Umatilla County Br#59C428





Scour Critical Bridge Failures Umatilla County Br#59C93



Scour Code Rating - Changing

Two Parts: Theory: Calculated scour and Observed scour

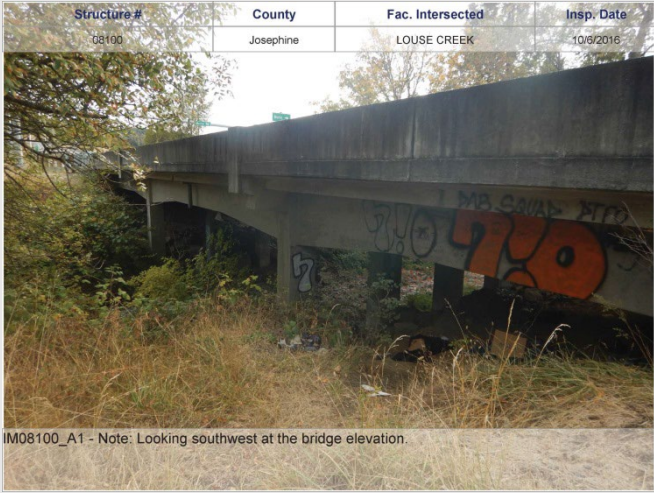
- N: Not over waterway
- U: Unknown foundations-scour critical due to no documentation.





Scour Code Rating

Scour critical for Observed.



Purpose of Plan Of Action



Describes procedures for inspectors and engineers to implement before, during, and after a flood event to protect the traveling public.



Describes the countermeasures selected to address the vulnerability of the bridge scour.

Plan Of Action (POA) –What is in POA

ODOT provides support for local agencies

1. General Information
2. Responsibility for POA
3. Scour Vulnerability
4. Recommended Action(s) (see section 6 & 7)
5. NBIS Coding Information
6. Monitoring Program
7. Countermeasure Recommendations
8. Bridge Closure Plan
9. Detour Route
10. Attachments



Who is Responsible?



Plan Of Action

Section 2 – Who is responsible for POA?

2. RESPONSIBILITY FOR POA

Author(s) of POA (name, title, agency/organization, telephone, pager, email):

N/A

Date: _____

Concurrences on POA (name, title, agency/organization, telephone, pager, email):

N/A

POA updated by (name, title, agency, organization): N/A

Date of update: _____

Items update: _____

POA to be updated every 24 months by (name, title, agency/organization): N/A

Date of next update: 6/1/2009

Plan Of Action

Section 3 – How the vulnerability are accessed?

3. SCOUR VULNERABILITY				
a. Current Item 113 Code:	<input type="checkbox"/> 3	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 1	Other: <input type="text"/>
b. Source of Scour Critical Code:	<input checked="" type="checkbox"/> Observed	<input type="checkbox"/> Assessment	<input type="checkbox"/> Calculated	Other: <input type="text"/>
<p>c. Scour Evaluation Summary: INSPECTION: Bent 2 had a concrete overpour countermeasure installed, followed by a large riprap countermeasure that have both failed. Bent 2 is undermined 3' from center to downstream end. Existing bridge is undersized causing high velocities and increased scour. Recommend that the bridge be replaced as soon as possible. Jrw, user #152, 08-05-08.</p> <p>EMBANKMENT SCOUR: Countermeasures have failed. Bridge must be replaced to provide stability, jrw, 08-05-08.</p>				
d. Scour History:	<input type="text"/>			



Plan Of Action

Section 4 –What are the recommendations?

4. RECOMMENDED ACTION(S) (see Sections 6 and 7)				
	<u>Recommended</u>		<u>Implemented</u>	
a. Increased Inspection Frequency	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
b. Fixed Monitoring Device(s)	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
c. Flood Monitoring Program	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
d. Hydraulic/Structural Countermeasures	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No



20.52
FG

2012/02/09

Plan Of Action

Section 5 – Coding and notes on the vulnerability.

5. NBI CODING INFORMATION		
	<u>Current</u>	<u>Previous</u>
Inspection date	3/13/2007	10/18/2006
Item 113 Scour Critical	2 SC - Extensive Scour	2 SC - Extensive Scour
Item 60 Substructure	3 Serious	4 Poor
Item 61 Channel & Channel Protection	5 Bank Prot Eroded	5 Bank Prot Eroded
Item 71 Waterway Adequacy	8 Equal Desirable	8 Equal Desirable
Comments: (drift, scour holes, etc. – depict in sketches in Section 10)	INSPECTION: Bent 2 had a concrete overpour countermeasure installed, followed by a large riprap countermeasure that have both failed. Bent 2 is undermined 3' from center to downstream end. Existing bridge is undersized causing high velocities and increased scour. Recommend that the bridge be replaced as soon as possible. Jrw, user #152, 08-05-08. EMBANKMENT SCOUR: Countermeasures have failed. Bridge must be replaced to provide stability, jrw, 08-05-08.	



Field observation of the footing vulnerability



Debris between column & footing



Plan Of Action

Monitor for Maintenance Personnel

Section 6- What Flood monitoring Program planned?

Flood Monitoring Program

Type: Visual inspection
 Instrument (check all that apply):
 Portable Geophysical Sonar Other: Soundings at piers and abutments

Flood monitoring required: Yes No

Flood monitoring event defined by (check all that apply):
 Discharge _____ Stage At or above bank full discharge
 Elev. measured from _____ Rainfall _____ (in) per _____ (hour)
 Flood forecasting information: _____
 Flood warning system: _____

Frequency of flood monitoring: 1 hr. 3 hrs. 6 hrs. Other: _____

Post-flood monitoring required: No Yes, within _____ days

Frequency of post-flood monitoring: Daily Weekly Monthly Other: _____

Criteria for termination of flood monitoring: Active scouring no longer measured

Criteria for termination of post-flood monitoring: _____

Scour alert criteria for each pier/abutment: _____

Scour critical criteria for each pier/abutment: _____

Note: Additional details for action(s) required may be included in Section 8.

Action(s) required if scour alert criteria detected (include notification and closure procedures): _____

Action(s) required if scour critical criteria detected (include notification and closure): _____

Contact person (include name, title, agency/organization, telephone, pager, e-mail): N/A



What Plan of Action Needed –provide riprap



What Remedy?

Visual inspection after a high water event and routine inspection to 12 months



Loss of bearings

Plan Of Action, Bridge Closure

Section 8 – When Maintenance Personnel to close Bridge

8. BRIDGE CLOSURE PLAN

Scour monitoring criteria for consideration of bridge closure:

- Water surface elevation reaches _____ at _____
- Overtopping road or structure
- Scour measurement results / Monitoring device (See Section 6)
- Observed structure movement / Settlement
- Discharge: _____ cfs/cms
- Flood forecast: _____
- Other: Debris accumulation Movement of riprap/other armor protection
- Loss of road embankment



Plan Of Action, Bridge Closure

Section 8 –When Maintenance Personnel to close Bridge



**Close the bridge
what detour?**

Plan Of Action - attachments

Section 10 – Information for Maintenance Personnel.

10. ATTACHMENTS	To VIEW, ADD, or REMOVE attachments, click in the Text Box beneath the attachment's Check Box.
Please indicate which materials are being submitted with this POA:	
<input type="checkbox"/> Attachment A: Boring logs and/or other subsurface information	
<input checked="" type="checkbox"/> Attachment B: Cross sections from current and previous inspection reports \\Scdata\BridgeMgmt\X-Channel\Region5\PDF\P01C830.PDF \\Scdata\BridgeMgmt\X-Channel\Region5\PDF\XC01C830.PDF	
<input type="checkbox"/> Attachment C: Bridge elevation showing existing streambed, foundation depth(s) and observed and/or calculated scour depths	
<input type="checkbox"/> Attachment D: Plan view showing location of scour holes, debris, etc.	
<input checked="" type="checkbox"/> Attachment E: Map showing detour route(s) \\Scdata\bridge_detours\01C830.jpg \\Scdata\bridge_detours\01C830.tif	
<input type="checkbox"/> Attachment F: Supporting documentation, calculations, estimates and conceptual designs for scour countermeasures.	
<input type="checkbox"/> Attachment G: Photos	
<input type="checkbox"/> Attachment H: Other information:	

Plan Of Action

- Section 10- Attachments- detour map



Scour Fixes - Countermeasures



Three Scour Countermeasures

- Flood Monitor and Inspection.
- Fix Monitoring.
- Hydraulic/Structural Fixes.



What is needed to evaluate scour code per NBIS?

- **As-Built Drawings**
- **Foundation Report.**
- **Pile Records and Drill Logs**
- **Hydraulic Reports** (scour analysis report included report).





Agency Involvement | Update ODOT with Repairs

Monitoring
during and
after high
water events

Document
history of
Scour
inspection &
Scour fixes

Update POAs &
Detour Maps

Examples of Local Agency Structure Failures from scour





Summary of Local Agency Structure Losses 2007- Present

<u>County</u>	<u>Year</u>	<u>Losses</u>
Umatilla Co	2020	5 bridge loss & 6 bridges damaged
Tillamook Co	2018	1 bridge (57c44) due to Roadway failure
Josephine Co	2017	1 Bridge & 1 culvert losses
City of Portland	2016	1 Bridge loss
Benton Co	2012	1 bridge loss due to Tree fell on bridge from scour
Marion Co	2011	1 Culvert loss
Clackamas Co	2011	1 bridge & roadway damaged
Baker Co	2010	2 bridges lost
Polk Co	2010	1 bridge loss
Tillamook Co	2007-2009	2 bridge & 2 culvert & roadway
Yamhill Co	2007	1 bridge & 1 bridge interior bent footing & approach



Scour Critical Bridge Failures

Oregon Local Agency Bridge Failures



Josephine Co | Culvert
January 2017

Scour Critical Bridge Failures

Oregon Local Agency Bridge Failures



Josephine Co | Sand Creek
January 2017

Scour Critical Bridge Failures

Oregon Local Agency Bridge Failures



Josephine Co | Three Mill Rd
McMullin Creek
January 2017

Scour Critical Bridge Failures

Oregon Local Agency Bridge Failures



City of Portland | Johnson Creek
December 2016

Pictures from City of Portland

Scour Critical Bridge Failures

Oregon Local Agency Bridge Failures



Tillamook County | December 2018

Scour Critical Bridge Failures

Oregon Local Agency Bridge Failures



Local Agency Scour Bridge Failures Yamhill County, 2007

Ayers Creek Bridge failure



Installed a Bailey Bridge using Salem, Milwaukie bridge crews, LGS & county.

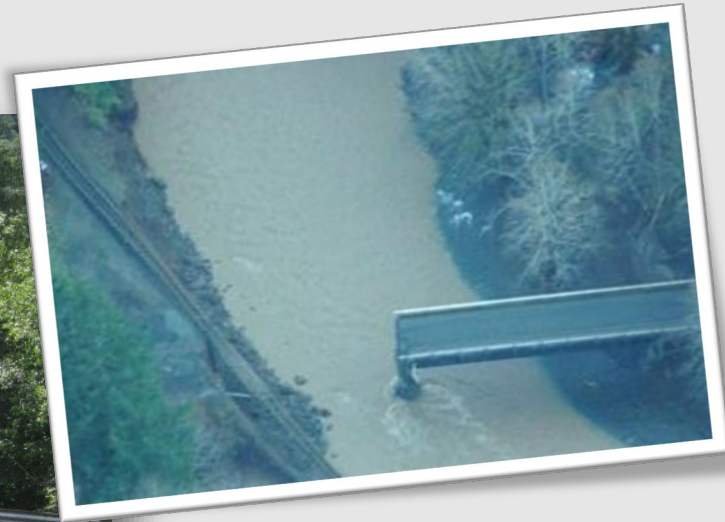
Kutch Road approach and interior footings failure



- Cost comparison of repair options vs. replacement.
- Assisted with federal emergency repair funding.

Local Agency Scour Bridge Failures Tillamook County, 2007

Salmonberry Bridge failure



- Cost analysis of repair option vs replacement.
- Assisted for federal emergency funding.

Solutions

County	ODOT involvement with solutions
Yamhill	<p>Ayers Road Bridge:</p> <ul style="list-style-type: none">• Installed a Bailey Bridge using Salem, Milwaukie bridge crews, LGS & county.• Assisted with federal emergency funding. <p>Kutch Road:</p> <ul style="list-style-type: none">• Cost comparison of repair options vs. replacement.• Assisted with Federal Emergency Repair Funding.
Tillamook	<p>Salmonberry Bridge</p> <ul style="list-style-type: none">• Cost analysis of repair options vs. replacement.• Assisted for federal emergency funding. <p>Blain Road</p> <ul style="list-style-type: none">• Installed Bailey Bridge by Milwaukie Bridge Crew, LGS & County.• Champion to receive ARRA funding.• Reviewed plans.• Review plans and assisted with delivery of project.

Local Agency Scour Bridge Failures Tillamook County, 2009

Blaine Road culvert failure



Installed Bailey Bridge by Milwaukie
Bridge Crew, LGS & County



- Champion to receive ARRA funding.
- Review plans and assisted with delivery of project.

Solutions

Local Agency	ODOT involvement with solutions.
Baker	Gulick Road Bridge <ul style="list-style-type: none">• Coordinated with the county for POA for approval from FHWA.• Provided engineering expertise to Bridge Selection Committee for bridge funding. Holbrook Creek Road <ul style="list-style-type: none">• Coordinated with county for POA for approval from FHWA.
Marion	Nusome Road <ul style="list-style-type: none">• Worked with ODOT to acquire used prestressed concrete slabs.• Replaced with culvert.

Local Agency Scour Bridge Failures Baker County, 2010

Gulick Road bridge failure.



Coordinated with county for POA for approval from FHWA.

Holbrook Creek Road bridge failure



Provided engineering expertise to Bridge Selection Committee for bridge funding.

Scour Bridge Failures Baker County, 2010

Halbrook Road bridge failure



Coordinated with county for POA for approval from FHWA.
Scheduled to be replaced with Local Bridge Program Funding

Local Agency Scour Failures Marion County, 2011

Nusom Road culvert failure



- Worked with ODOT to acquire used prestressed concrete slabs.
- Replaced with culvert.

Conclusion



- **Scour Critical bridges:** know your scour critical bridges and their vulnerabilities are.
- **When to monitor:** visual inspection during and after high water events of plan of action for Scour Critical Bridges.
- **Stop monitor:** know when you can stop monitoring.
- **What to look for:** know what to look for during high water event that would require closing a bridge.

Conclusion



- **Update ODOT:** repairs so we can re-evaluate the scour code.
- **Inform:** the state if there are changes.
- **Due diligence:** in sending documents.
- **Follow-up:** with consultants to submit documents.

Thank you!



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