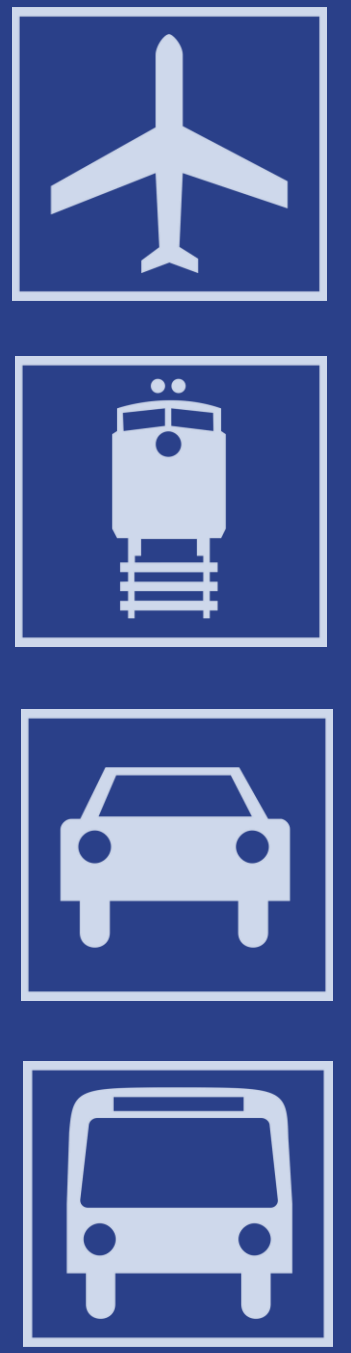
Scour Power Half Hour

(for existing bridges)

Bill Schmidt, PE, INDOT Hydraulics Director

February 17, 2026



Hydraulic Scour Memo Purpose

(for existing bridges)

- Model the hypothetical scour depth (100 and/or 500-year storm)

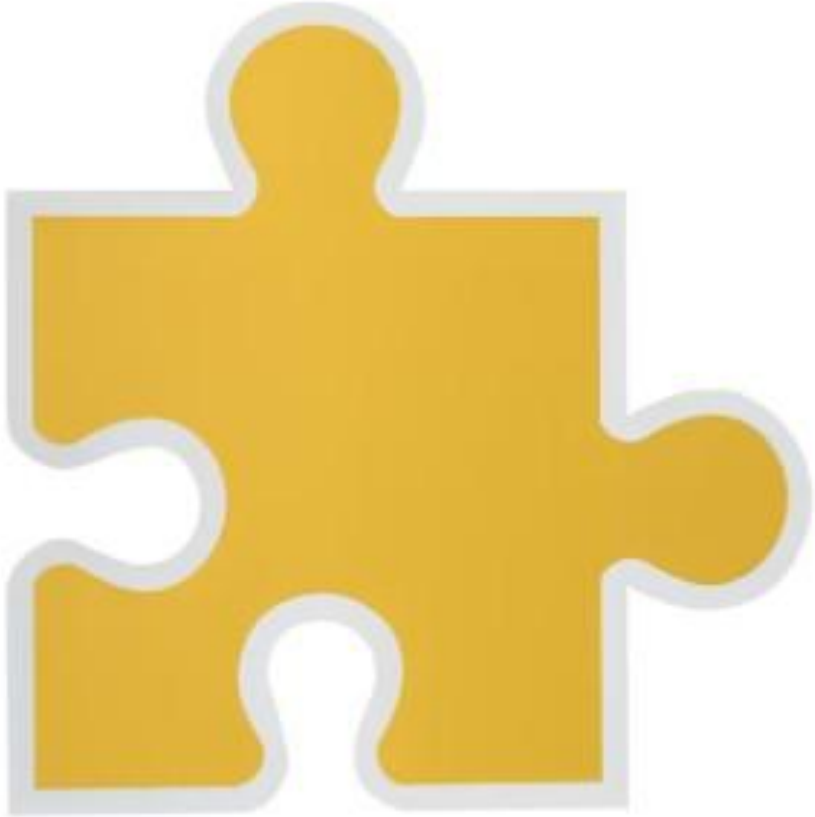
> Part A of this scour letter is provided by the Hydraulics Section and identifies the low scour elevation from the hydraulic analysis and makes recommendations for scour mitigation measures. The hydraulics analysis does not take into account any countermeasures currently in place at the site. The information from Part A may be used by the Bridge Section and the Engineer of Record to make the Bridge Scour Critical Determination in Parts B and C of this letter, unless the final determination is made by the Hydraulics Engineer and noted as such in Part A. The stamp and signature provided by the INDOT Hydraulics Section is for the information provided in Part A.

- If hypothetical scour depth occurs, what is the risk to the bridge?
- Recommend scour countermeasure protection

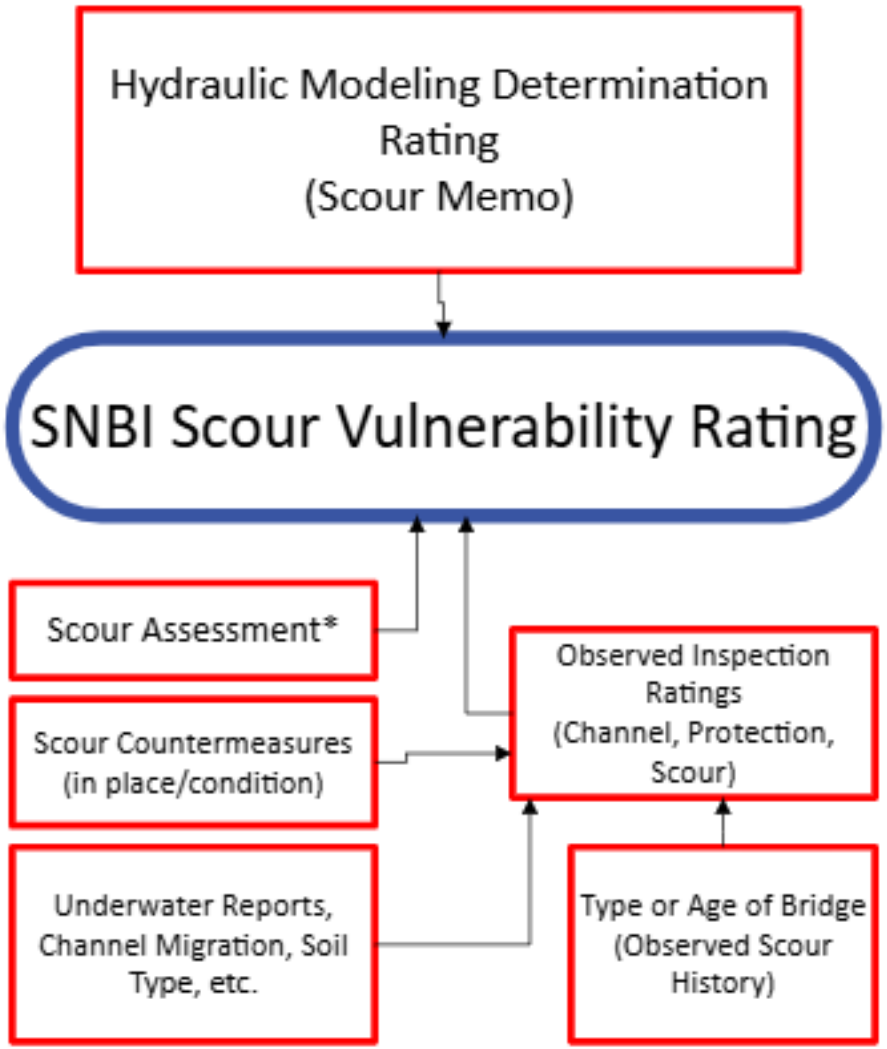
A Piece of the Puzzle

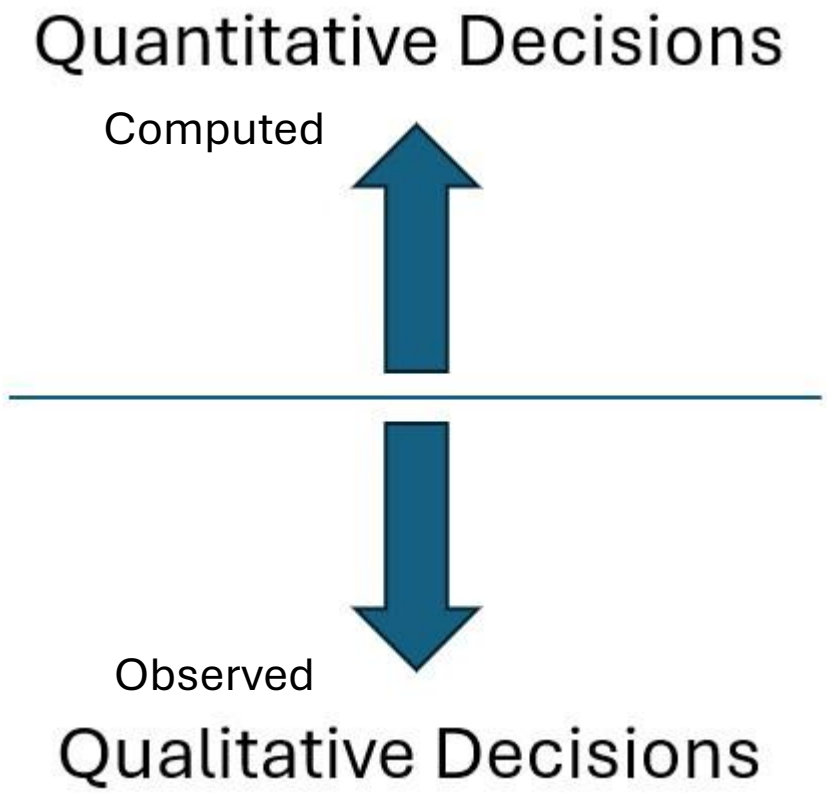
- Hydraulic Scour Determination Rating is only PART of the overall SNBI Scour Vulnerability Rating.

- Hydraulic Scour Determination Rating and SNBI Scour Vulnerability Rating (B.AP.03) do not have to equal – although many times they do



Scour Vulnerability Rating Factors





* Scour Assessment required, if no modeling analysis

New SNBI Scour Vulnerability Rating

- **SNBI Code A:** Best condition, like NBI 113=9 or 8, indicating minimal risk.
- **SNBI Code B:** Good condition with designed, functioning scour protection (like NBI 113=8).
- **SNBI Code C:** Temporary or non-designed protection present; considered scour critical; requires a Scour Plan of Action (POA).
- **SNBI Code D:** Poor condition, like NBI 113=3 or less; considered scour critical; requires a Scour POA.
- **Codes 0 or U:** May be used if a POA is required but not yet implemented, also indicating a critical condition.

SNBI Codes B & C cover scour countermeasures

Scour Memo Changes

Added Language to Part A of the Scour Memo

If scour countermeasures were previously installed and the bridge engineer of record or district bridge asset engineer for structures not currently in the progam has verified the scour countermeasures are still adequate in size, placement, and condition as recommended above, the SNBI (B.AP.03) Scour Vulnerability rating can be changed accordingly, but the scour analysis determination rating in this memo will remain as is. Designers should state in the Bridge Rehabilitation Report and plans that scour countermeasures are in place and verified as of the date of verification.

Creates an option for existing countermeasures in place.

Hydraulics Scour Determination ≠ Scour Vulnerability Rating

Scour Memo Changes

Removed Language in Part B on Scour Countermeasures

Part B Bridge Scour Status (once determination is made, send memo back to INDOT Hydraulics)

☐ Not Scour Critical – Part C not applicable

☐ Scour Critical

☐ Final Determination - The scour countermeasures indicated in Part A of this memo shall be installed, even if the bridge may have sufficient structural and geotechnical capacity in the scoured condition. Part C not applicable

☐ Contingent Determination - If structural and geotechnical analysis indicates that the existing foundations can accommodate all design loads while considering the potential loss of supporting material to the scour depths given in Part A of this memo, the Bridge Engineer of Record may consider the bridge to be Not Scour Critical. All applicable load cases shall be considered to ensure that the foundations are adequate for all vertical, transverse, lateral, and flexural loads. Special attention should be given to changes in bearing types during bridge rehabilitation projects that could lead to changes in the distribution of longitudinal forces and thermal restraint induces forces to the substructure units. In cases where the installation of scour countermeasures is not anticipated to result in significant environmental or economic impacts, the Bridge Engineer of Record may choose to forego this investigation and consider the bridge to be Scour Critical.

☐ ~~Contingent Determination - If Part A indicates that the scour countermeasures shown in the existing plans are sufficient, the Bridge Engineer of Record may verify that these countermeasures are still in place and thereby determine the bridge to be Not Scour Critical due to the presence of previously installed scour countermeasures.~~

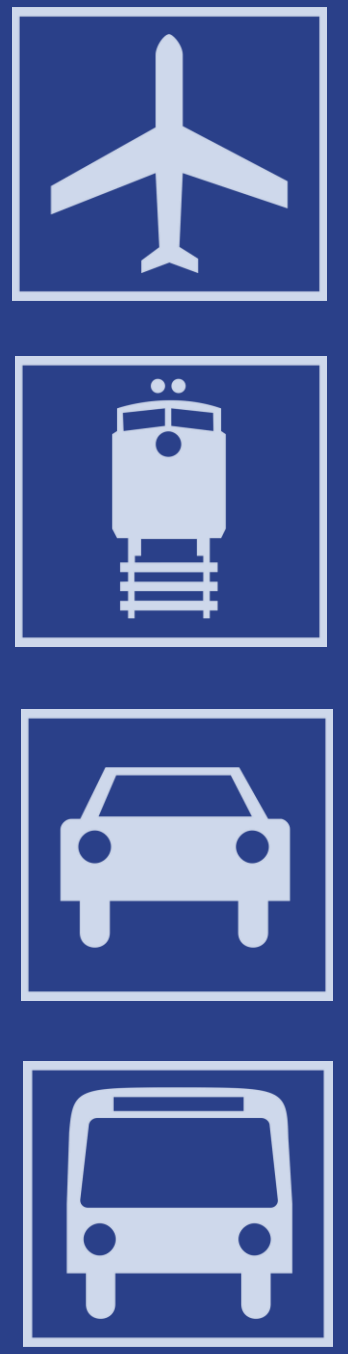
Conclusion

- Hydraulic Scour Determination and Scour Vulnerability are not the same

- Hydraulics will propose scour countermeasures based on modeling analysis results; but whether the countermeasures have been placed per design will not be part of the Hydraulic Scour Determination.

  This will be determined by:

  - Bridge Design Processes
  - SNBI Scour Vulnerability Rating



Scour from an Inspector's Perspective

Jake Gould, PE

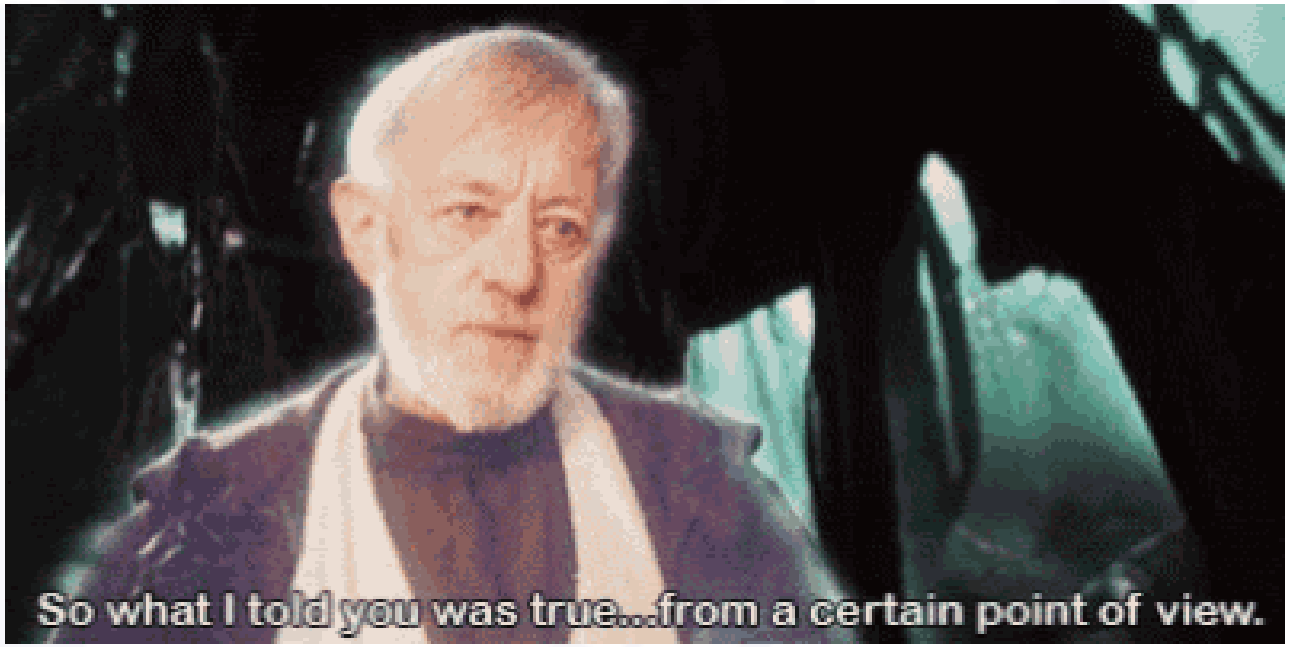
Bridge Inspection Area Engineer, Indiana Department of Transportation

NextLevel INDIANA

How does this Whole Scour Thing Work?

Work Done in the Field

- Evaluating channel & protection at the bridge
- Assigning condition ratings



Work Done in the Office

- Scour Appraisal
- Adjust condition ratings as needed
- Create Scour POA

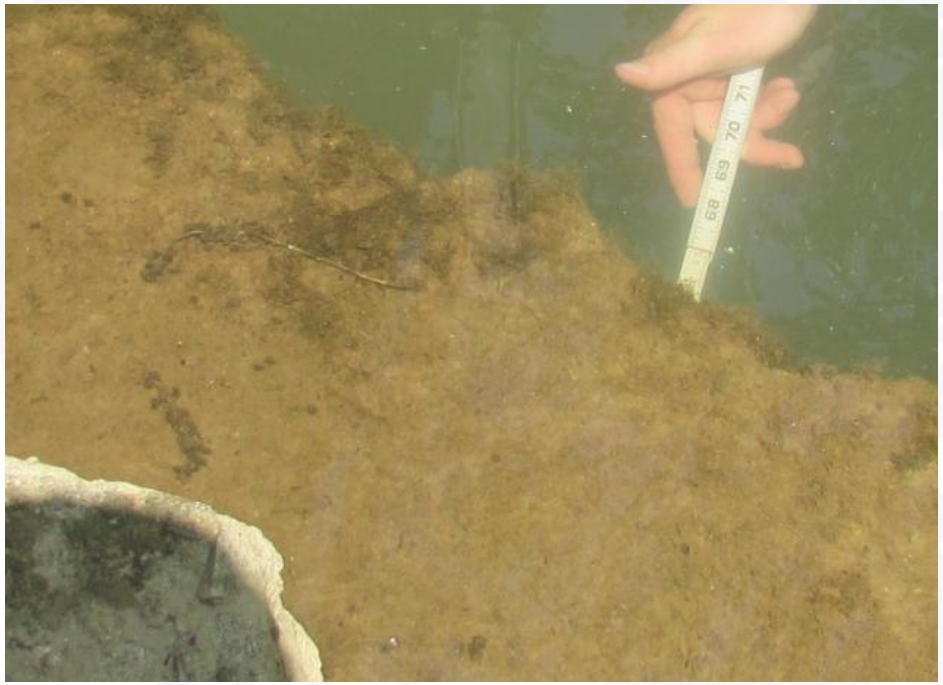
SNBI has changed all bridge inspection fields

NextLevel INDIANA

Fields Changed by Inspectors

Independent of Scour Evaluation

- (B.C.09) Channel
- (B.C.10) Channel Protection
- (B.C.11) Scour



DONE FROM THE FIELD

Dependent on Scour Evaluation

- (B.AP.03) Scour Vulnerability
- (B.AP.03b) Scour Critical Safety Status
- (B.AP.03b) Date of Countermeasures Placed or Field Verified
- Scour documentation in the bridge file and reviewed
- Full Name
- Scour Validation Date
- (B.AP.04) Scour Plan of Action

DONE FROM THE OFFICE

What is Done in the Field

B.C.09 Channel Condition Rating

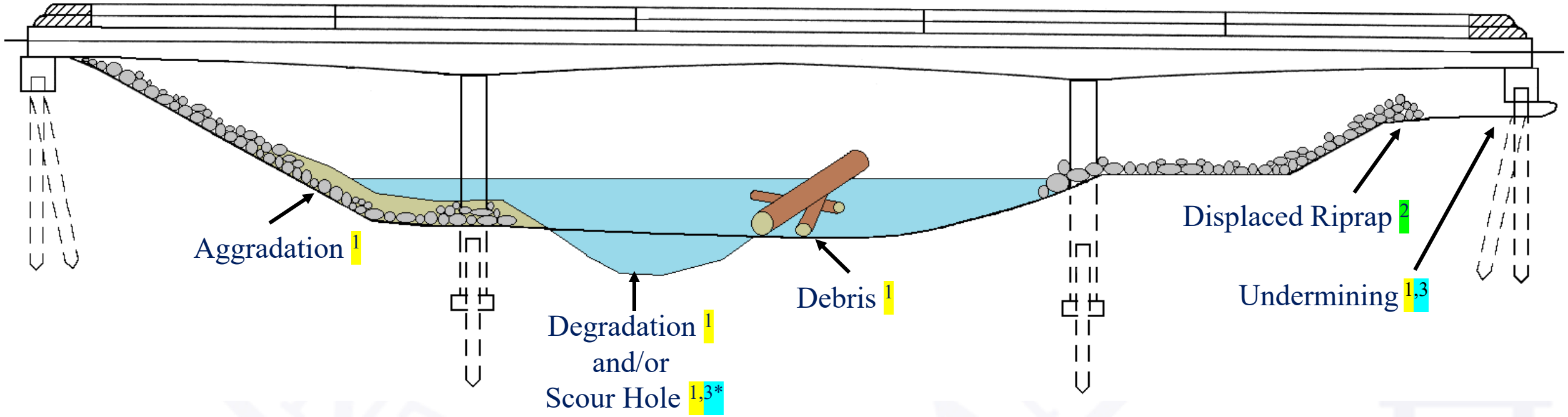
- Used to provide a condition rating for the channel at the bridge.

B.C.10 Channel Protection Condition Rating

- Evaluate the condition and effectiveness of channel protection devices installed on banks or in the stream to mitigate channel issues that may impact the bridge.

B.C.11 Scour Condition Rating

- Evaluates the observed or measured scour at a structure.



What is Done in the Office

- Information gathered from the field affects the scour appraisal. Depending on changes, a new appraisal need to be done.
- What is a Scour Appraisal?

SCOUR APPRAISAL
A risk-based and data-driven determination of a bridge's vulnerability to scour, resulting from the least stable result of scour that is either **observed** or **estimated** through a scour evaluation or a scour assessment.

↓

OBSERVED SCOUR
Info from B.C.11 Scour Condition Rating.

↓

ESTIMATED SCOUR	
↓	↓
SCOUR SCREENING / ASSESSMENT	**SCOUR EVALUATION**
Flow charts to be developed by INDOT	Calculations

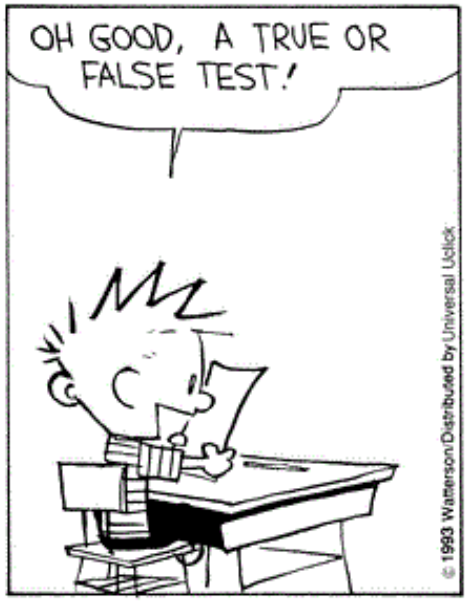
The (B.AP.03) Scour Vulnerability & (B.C.11) Scour Condition ratings should be consistent.

What Answer Did You Get?

- How do we give a different value than the scour appraisal?
  - Good – Rehabilitation / Maintenance Work
  - Bad – More scour issues which triggers another scour appraisal

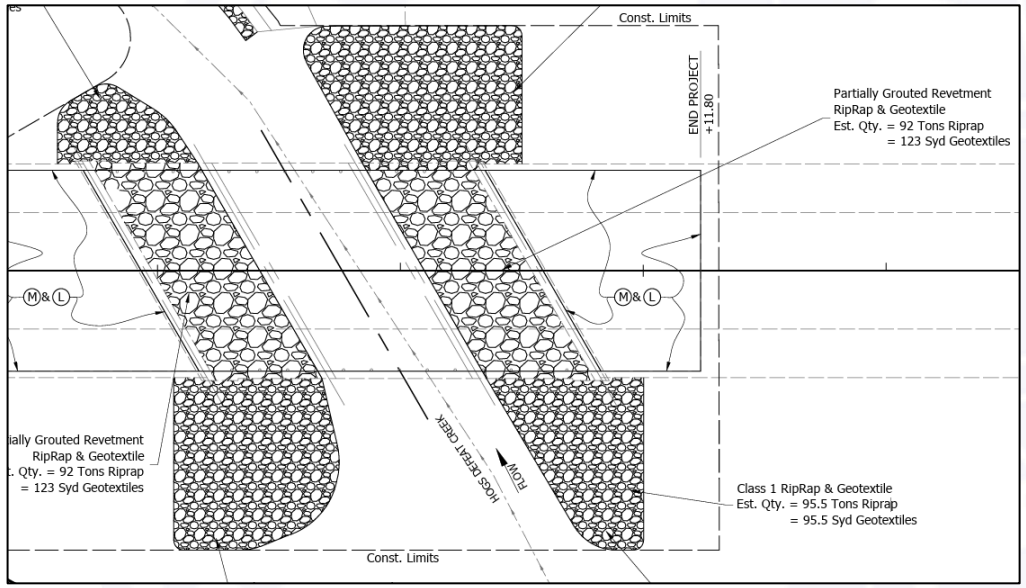
  Need to run a new scour appraisal if above happens.

- After scour appraisals have been completed, results can be found…
  - Look at memos, plans, assessments, etc.

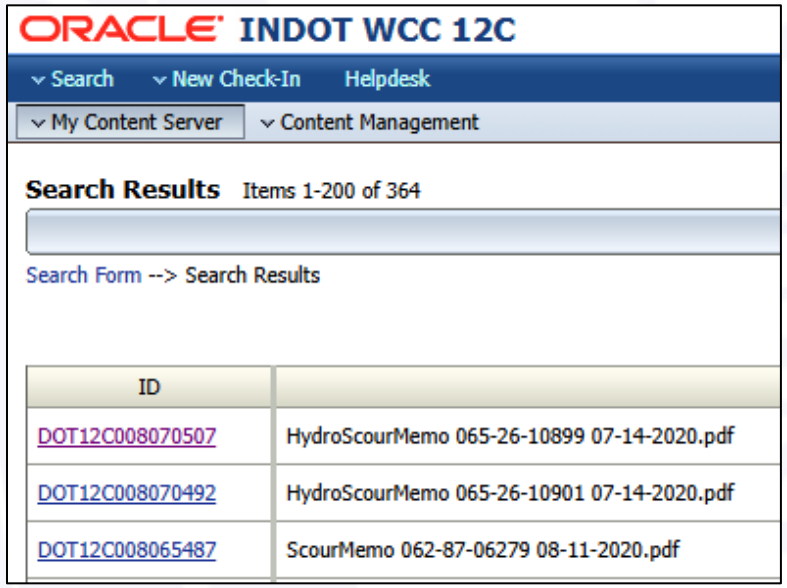


What Answer Did You Get? continued…

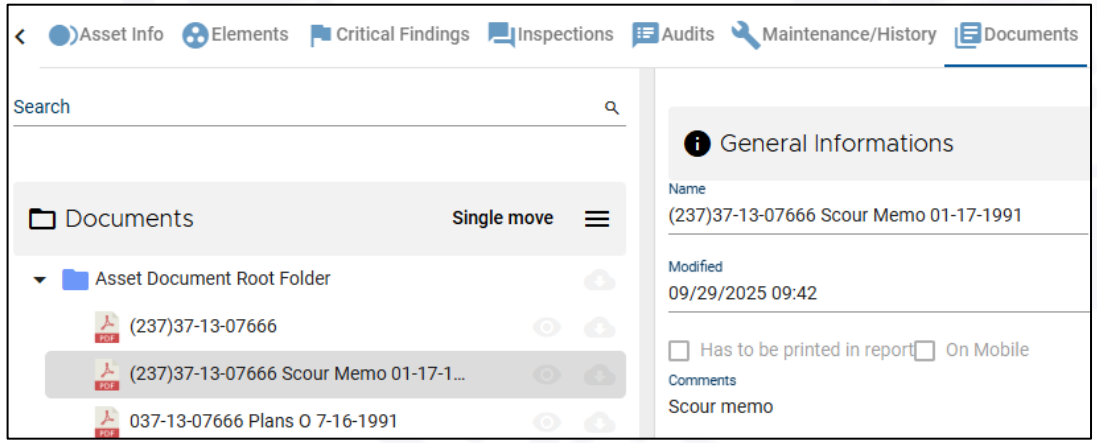
Bridge Plans



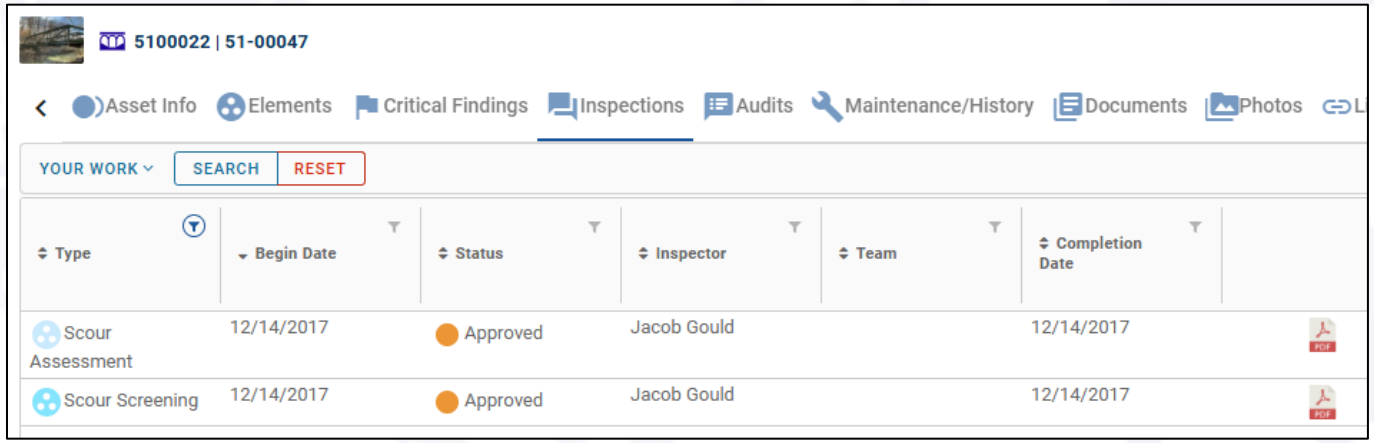
ITAP – ERMS



iTAMS – Asset Documents



iTAMS - Inspections



What Answer Did You Get? continued…

Scour Screening

Initial Scour Screening Procedure for Local Public Agencies

1. Is the bridge over a waterway?	Y
2. Are all of the foundations on dry land well above flood water elevations or floodway?	N
3. Was the bridge designed and constructed to resist scour? Do plans show depth of foundation to be below the depth of Q100 scour (with sufficient length for friction piles)?	U
4. Are spread footings on erosion resistant rock or pile foundations of sufficient depth (20') below scour with no signs or history of scour?	U
5. Is the bridge a single span that meets all the following criteria:	N
i. appropriately sized scour countermeasures in place AND	
ii. elevation of stream bottom is above bottom of footing/pile cap AND	
iii. does not have any signs or history of scour	
6. Is the bridge a 4-sided box culvert or a pipe culvert with no signs or history of scour?	N
7. Is the bridge a single span concrete arch bridge with no signs or history of scour?	N

NBI 113 (current asset value) 8

NBI 113 (Scour Screening Results) Coding: NA

Scour Evaluator Coding:

Justification (if different):

Scour Assessment

Scour Assessment for Local Public Agencies

1: CULVERTS:

1. Is the bridge a 4-sided box culvert or a pipe culvert? — No, go to 2a

2: HISTORICAL SCOUR PERFORMANCE:

2a. Has the bridge experienced a flood with a documented 100 yr return interval which did not result in significant scour? — Unknown, go to 2b

2b. Is the bridge >50years old with no signs or history of scour, and not on granular or soft soil? — No, go to 3

3. SCOUR COUNTERMEASURES:

3a. Are scour countermeasures in place, functioning properly, and have minor to no damage? — No, go to 4

3b. Are the scour countermeasures appropriately sized? ?

3c. Has the bridge experienced a flood with a documented 50yr return interval with no damage to the installed countermeasures

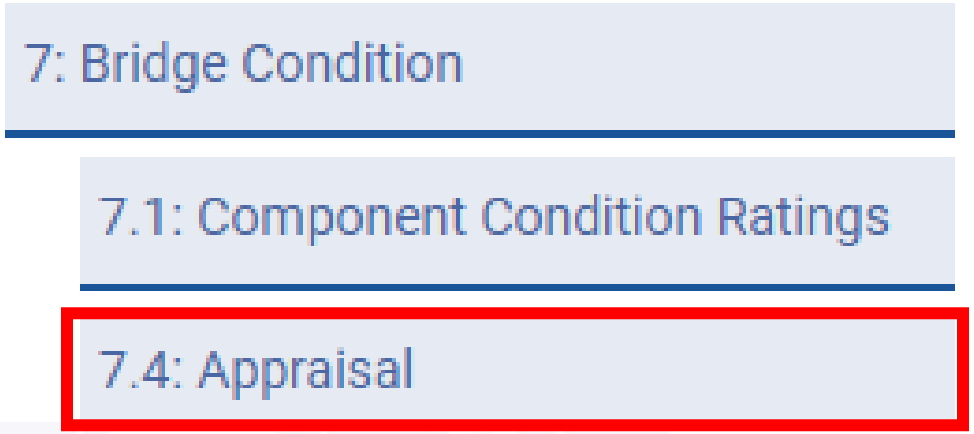
3d. If scour countermeasures are present, were they installed to correct a previously existing problem with scour?

NextLevel INDIANA

Bridge Designer "What does this mean for me?"

Where to Find the Results in iTAMS?

- Asset - SNBI, Subchapter 7.4 – **LOOK HERE!!**



- Asset – NBI, Subchapter 3.4 – Old information

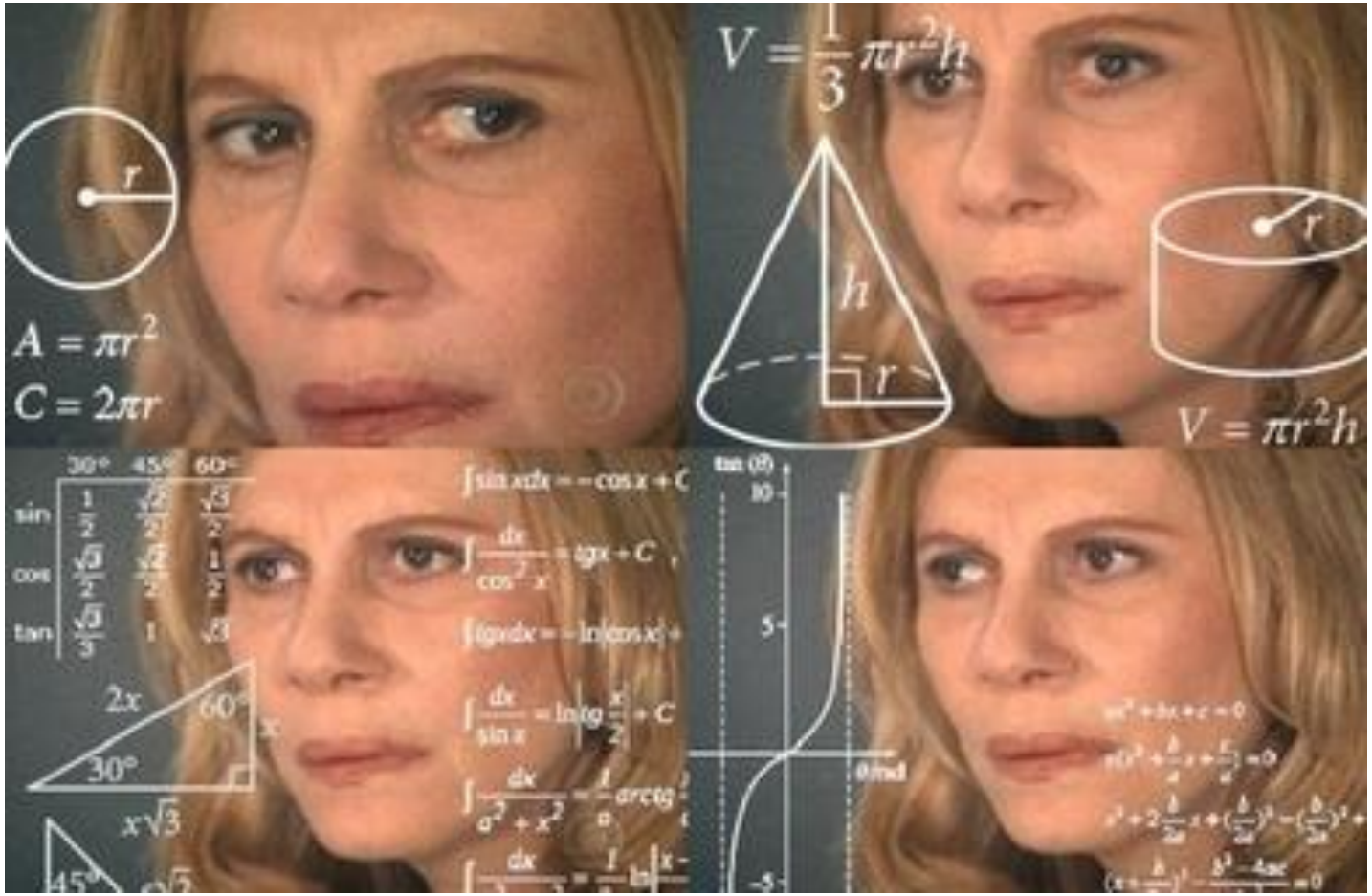
Scour Plan of Action (POA)

Details what happens when a qualifying rain (triggering) event occurs and what actions need to take place. All bridges considered scour critical (B.AP.03) must have a Scour POA.

- Items detailed in the Scour POA
  - Triggering events & history
  - Monitoring plan and response
    - Visit bridge on a set interval until water recedes
  - Anticipated repairs & date

- Allowable Scour Triggers
  - 2.5 inches or more rainfall in a 24-hour period.
  - 10-year flow rate or flood stage (Q10) is exceeded.
  - Notification of a significant flood event from a recognized authority.

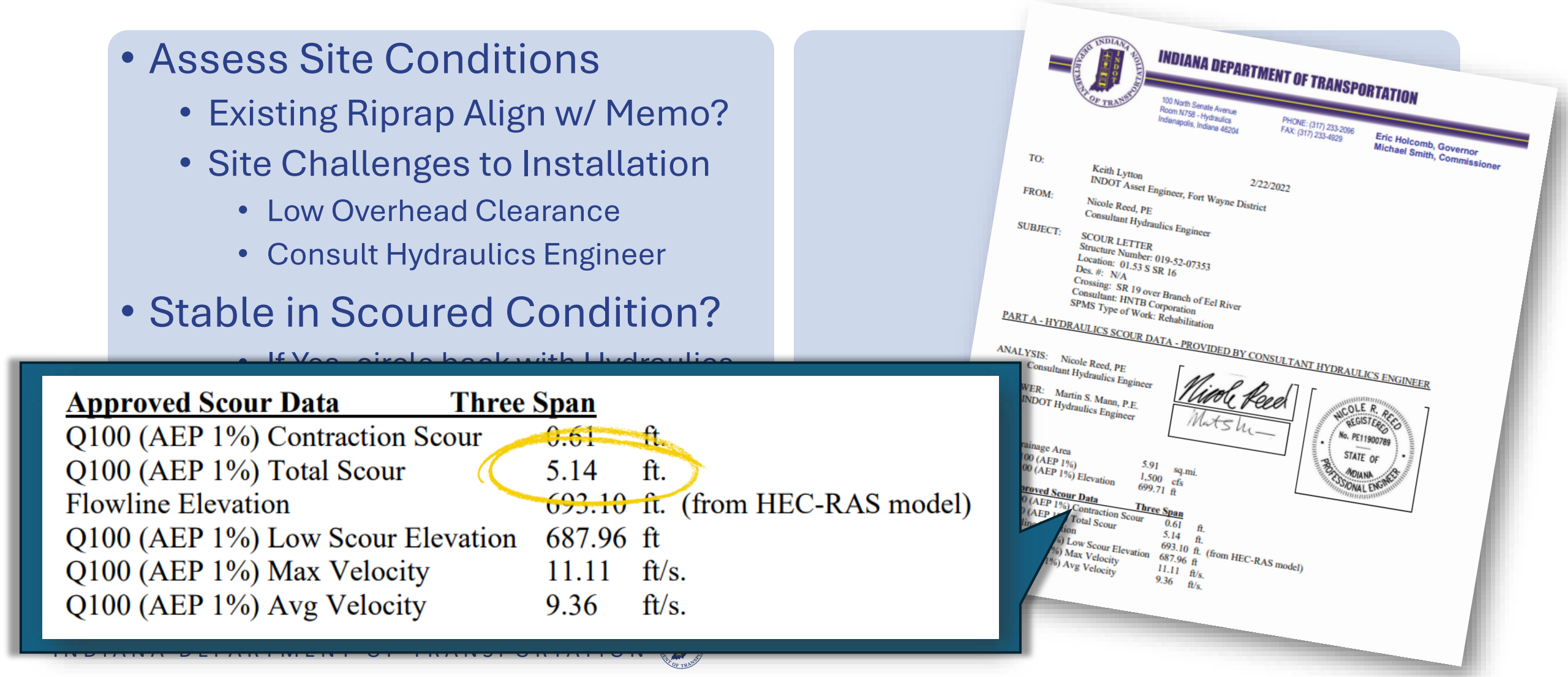
NextLevel INDIANA



- Designers

Designer's Role
- Incorporating a Scour Memo into Project

- Assess Site Conditions
  - Existing Riprap Align w/ Memo?
  - Site Challenges to Installation
    - Low Overhead Clearance
    - Consult Hydraulics Engineer
- Stable in Scoured Condition?
  - If Yes, circle back with Hydraulics



INDIANA DEPARTMENT OF TRANSPORTATION

100 North Senate Avenue
Room N758 - Hydraulics
Indianapolis, Indiana 46204

PHONE: (317) 233-2096
FAX: (317) 233-4929

Eric Holcomb, Governor
Michael Smith, Commissioner

TO: Keith Lytton
INDOT Asset Engineer, Fort Wayne District

2/22/2022

FROM: Nicole Reed, PE
Consultant Hydraulics Engineer

SUBJECT: SCOUR LETTER
Structure Number: 019-52-07353
Location: 01.53 S SR 16
Des. #: N/A
Crossing: SR 19 over Branch of Eel River
Consultant: HNTB Corporation
SPMS Type of Work: Rehabilitation

PART A - HYDRAULICS SCOUR DATA - PROVIDED BY CONSULTANT HYDRAULICS ENGINEER

ANALYSIS: Nicole Reed, PE
Consultant Hydraulics Engineer

WER: Martin S. Mann, P.E.
INDOT Hydraulics Engineer

NICOLE R. REED
REGISTERED
No. PE11900789
STATE OF
INDIANA
PROFESSIONAL ENGINEER

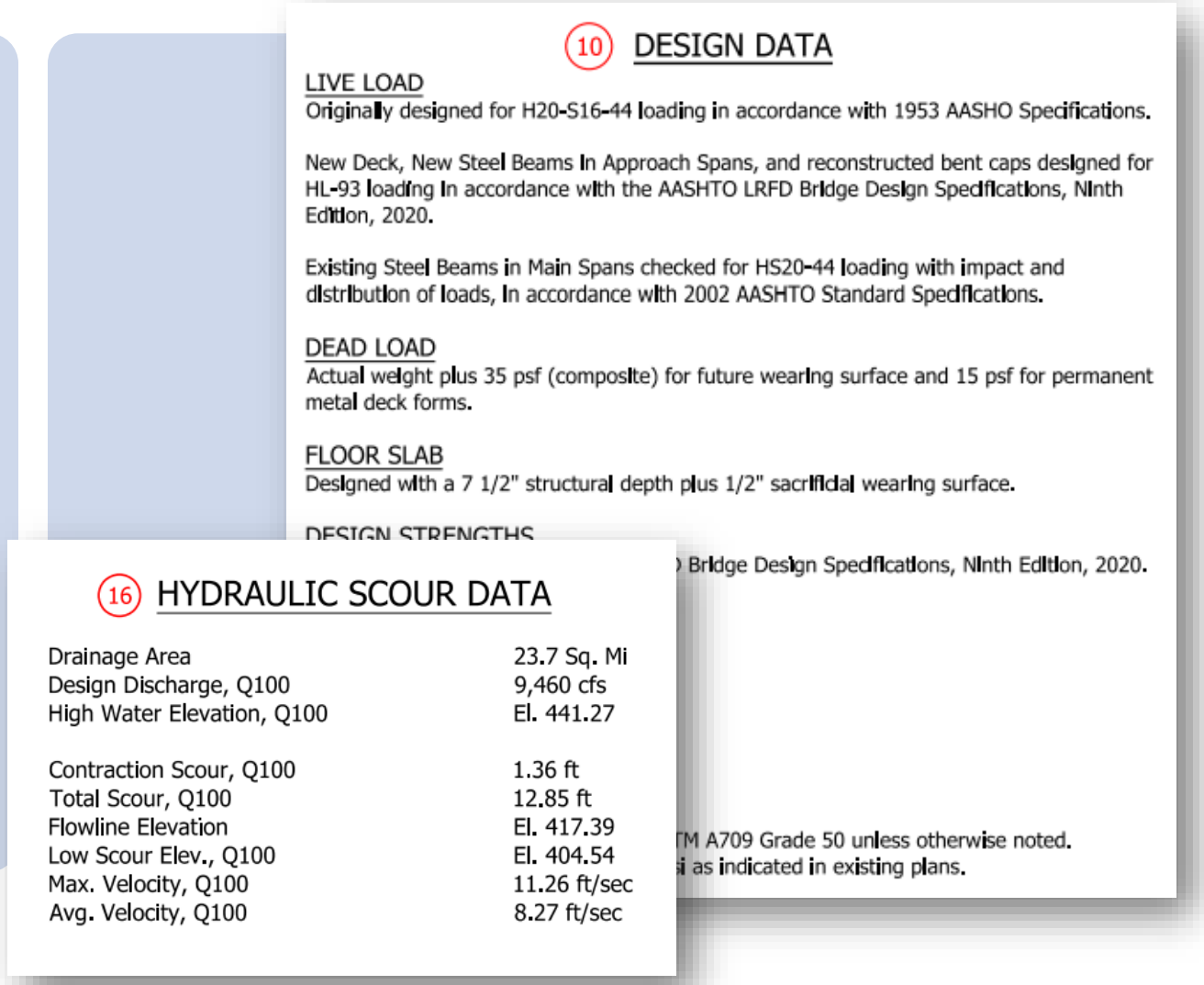
rainage Area 5.91 sq.mi.
00 (AEP 1%) 1,500 cfs
00 (AEP 1%) Elevation 699.71 ft

roved Scour Data Three Span
(AEP 1%) Contraction Scour 0.61 ft.
Total Scour 5.14 ft.
ion 693.10 ft. (from HEC-RAS model)
) Low Scour Elevation 687.96 ft
%) Max Velocity 11.11 ft/s.
1%) Avg Velocity 9.36 ft/s.

Approved Scour Data	Three Span	
Q100 (AEP 1%) Contraction Scour	0.61	ft.
Q100 (AEP 1%) Total Scour	5.14	ft.
Flowline Elevation	693.10	ft. (from HEC-RAS model)
Q100 (AEP 1%) Low Scour Elevation	687.96	ft
Q100 (AEP 1%) Max Velocity	11.11	ft/s.
Q100 (AEP 1%) Avg Velocity	9.36	ft/s.

Designer's Role
- Documenting Design Decisions for Inspection

- Design Data (Preservation)
  - Structure Stable for Scour
    - Supporting Calculations included in Project Design Comps
  - Scour Countermeasures Specified per Scour Memo dated XX-XX-XXXX
  - Existing scour countermeasures field verified on XX-XXXX meet requirements in Scour Memo dated XX-XX-XXXX



10 DESIGN DATA

LIVE LOAD
Originally designed for H20-S16-44 loading in accordance with 1953 AASHO Specifications.

New Deck, New Steel Beams In Approach Spans, and reconstructed bent caps designed for HL-93 loading In accordance with the AASHTO LRFD Bridge Design Specifications, Ninth Edition, 2020.

Existing Steel Beams in Main Spans checked for HS20-44 loading with impact and distribution of loads, In accordance with 2002 AASHTO Standard Specifications.

DEAD LOAD
Actual weight plus 35 psf (composite) for future wearing surface and 15 psf for permanent metal deck forms.

FLOOR SLAB
Designed with a 7 1/2" structural depth plus 1/2" sacrificial wearing surface.

DESIGN STRENGTHS

) Bridge Design Specifications, Ninth Edition, 2020.

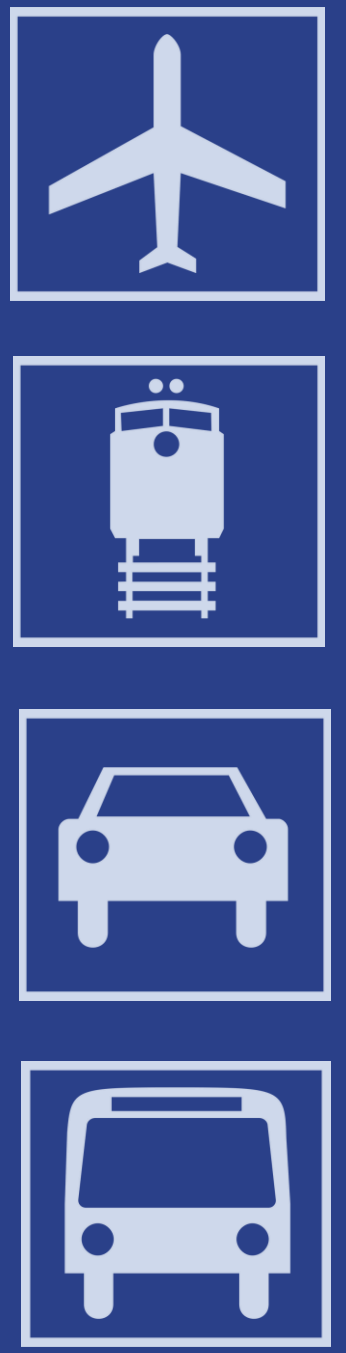
TM A709 Grade 50 unless otherwise noted.
si as indicated in existing plans.

16 HYDRAULIC SCOUR DATA

Drainage Area	23.7 Sq. Mi
Design Discharge, Q100	9,460 cfs
High Water Elevation, Q100	El. 441.27
Contraction Scour, Q100	1.36 ft
Total Scour, Q100	12.85 ft
Flowline Elevation	El. 417.39
Low Scour Elev., Q100	El. 404.54
Max. Velocity, Q100	11.26 ft/sec
Avg. Velocity, Q100	8.27 ft/sec

Contact Information

- Bill Schmidt wpschmidt@indot.in.gov
- Jake Gould jgould@indot.in.gov
- Stephanie Wagner swagner2@indot.in.gov



Do not edit
How to change the design

Audience Q&A

ⓘ The Slido app must be installed on every computer you're presenting from

slido