

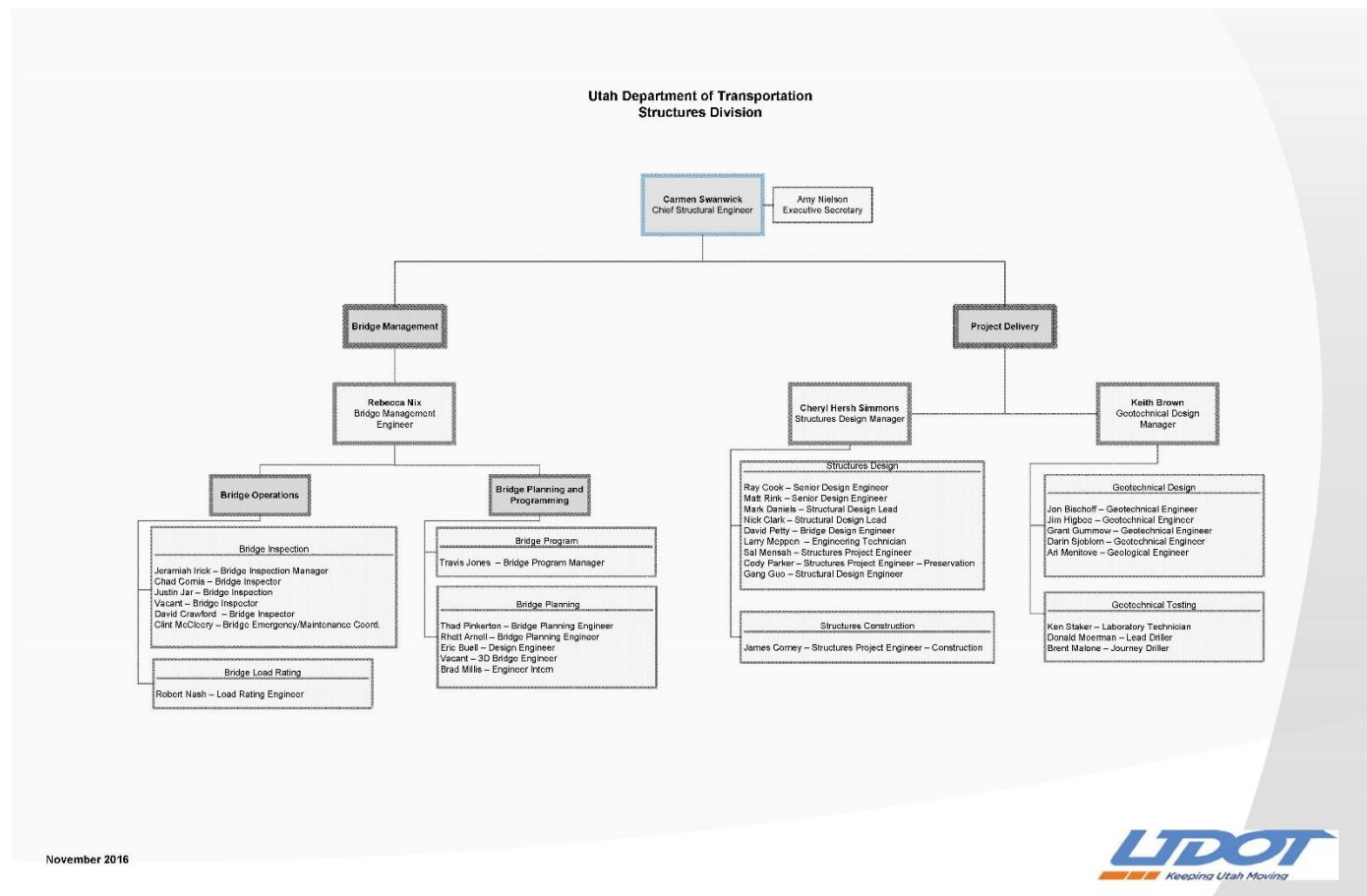
Integrating Inspectors into Project Scoping

Rebecca Nix
Utah Department of Transportation

Summary

- Inspection Program
- Bridge Health Index

UDOT Structures Group

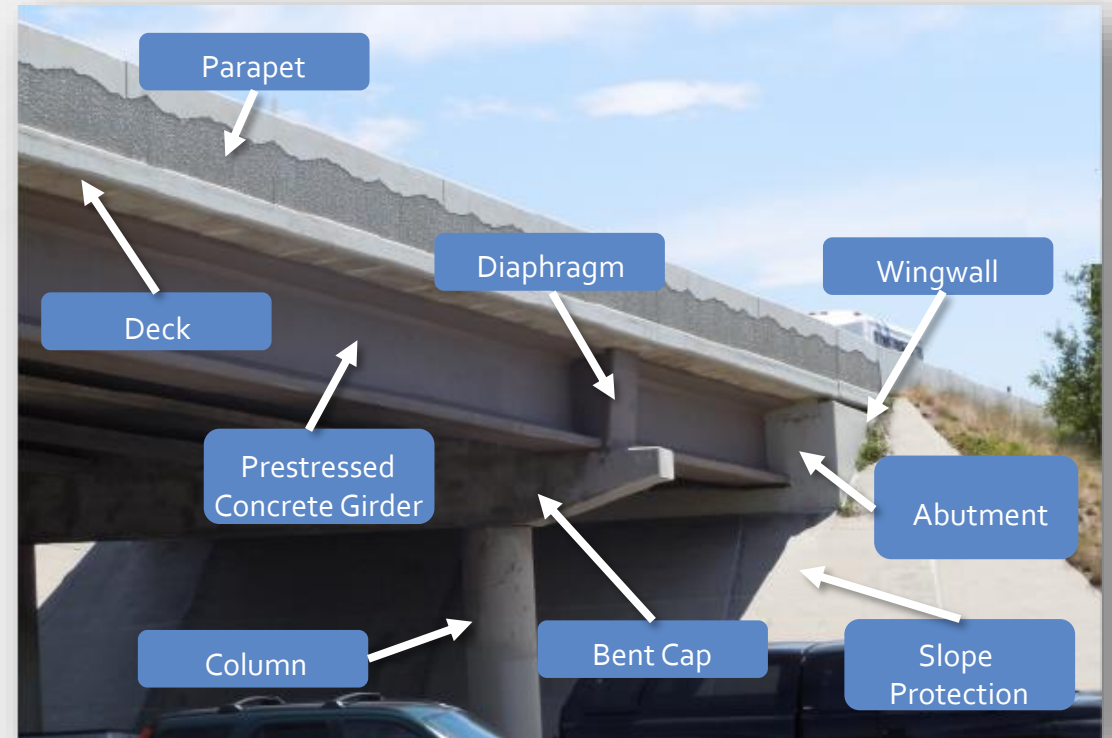


NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018

PRACTICES WE CAN NOT AFFORD TO DEFER

Bridge Inspection in Utah

- Inspect all state and local bridges
 - Approximately 3000 bridges total
- Element Level Inspection beginning in 1990s
- AASHTO Bridge Elements beginning in 2014



Inspection Work Candidates

- Identify work candidates
- Identify priority
- Identify responsibility

Work
Add New ☒ Show All ☐ Show Open All Sources

Candidate Name	Action	Date Recommended	Target Year	Estimated Cost	Status	Work Assignment	Priority	Structure Unit	Date Completed	Description	Source
WorkCandidate193	Paint / Seal Parapets	5/19/2015			Approved	1	Low	2 / Type = F		Paint/Seal Parapets	
OC 259-TQRH-051915-489620FD07D	Replace Parapets	5/19/2015	2015			0	Medium	2 / Type = F		Replace parapets	
WorkCandidate192	Crack Seal Deck Asphalt	5/19/2015			Approved	1	Normal	2 / Type = F		Crack Seal Deck Asphalt	Inspector Recommended
OC 259-TQRH-051915-0C78B9FA6AF	Update Barrier to Standard	5/19/2015	2015			0	Medium	2 / Type = F		Update Barrier to Standard	

Type of Work
Candidate Name:
Structure Unit:
Action Type:
Action:
Date Recommended:
Priority:
Date Completed:
Target Year:
Assigned:
Work Assignment:
Status:
Source:

Work Estimates
Estimated Quantity:
Cost per unit:
Calculate
Estimated Cost (\$):

Paint the bridge railing.

Inspection Work Candidates

1F 258	Route: 00015	MP: 151.06	I-15NB Bridge over a County Road, south of Hatton
Routine Maintenance			
Medium	Remove Debris from Drains	Remove debris from the drains and drain boxes. 02/22/2017: Drains are functioning properly.	
1F 259	Route: 00015	MP: 158.26	I-15 NB Bridge at the Meadow Interchange
Routine Maintenance			
Medium	Seal Con. Slope Protectn Joints	02/23/15: Remove vegetation and seal cracks in the slope. 02/21/2016 DED: Work candidate still applies.	
Sign Maintenance			
Medium (Safe)	Update / Install Clearance Sign	Update clearance sign to read 16' 00". 02/21/2017 Clearance sign are correct. DED	
1F 287	Route: 00015	MP: 157.54	I-15NB Bridge over a County Road south of Meadow
Routine Maintenance			
Medium	Seal Con. Slope Protectn Joints	Remove vegetation and seal cracks in the slope protection. 02/21/17 RFC: Work candidate still applies.	
	Remove Debris from Drains	Repair erosion in the southeast corner next to the approach slab drain box. 02/21/17 RFC: Appears to have been completed.	
Sign Maintenance			
High (Safety)	Update / Install Clearance Sign	Update the clearance signs to read 15' 2". Generated by user "Ryan Cuzme" on 2/21/2017	
1P 4	Route: 00015	MP: 146.49	I-15 NB Bridge at the Kanosh Interchange
Routine Maintenance			
Medium	Crack Seal Deck Asphalt	Crack seal the asphalt wearing surface. Generated by user "Ryan Cuzme" on 2/22/2017	
Medium	Seal Con. Slope Protectn Joints	Remove vegetation and seal cracking in the slope protection. 02/22/17 RFC: Work candidate still applies.	
Medium	Seal Relief / Backwall Joints	Remove debris from the strip seal joint. 02/22/17 RFC: Work candidate still applies.	
3F 203	Route: 00015	MP: 166.77	I-15SB Bridge at the North Fillmore Intchg.
Routine Maintenance			
Medium	Seal Con. Slope Protectn Joints	Remove vegetation and seal cracks in the slope protection.	
Medium (Safe)	Repair Parapets	2/26/2017: Replace the missing metal bridge rail at the northwest end of the structure.	
Sign Maintenance			
High (Safety)	Update / Install Clearance Sign	2/26/2017: Update the eastbound clearance sign to read 15' 11".	
3F 258	Route: 00015	MP: 151.08	I-15 SB Bridge over County Road,south of Hatton
Routine Maintenance			
Medium	Crack Seal Deck Asphalt	Crack seal the asphalt patched pothole in Lane 2. Generated by user "Randy Haider" on 2/22/2017	
3F 259	Route: 00015	MP: 158.32	I-15SB Bridge at the Meadow Interchange
Routine Maintenance			
Medium	Remove Debris from Drains	Remove asphalt over the deck drain and roadway drain grate. 2/21/17 RH: Work candidate still applies.	

Station 4482
3/8/2018
Page 2 of 3

AASHTO National Bridge Elements

- Not overall condition assessment
- Requires identifying extent and quantity of defects
- Additional documentation time is needed

Deck (058): 4 Poor
Superstructure (059): 4 Poor
Substructure (060): 4 Poor

Elem	Str. Unit	Env	Description	Quantity	Units	Qty. 1	Qty. 2	Qty. 3	Qty. 4
12	101	Mod. (3)	Re Concrete Deck	9772.46	sq.ft	0.000	4997.76	4774.70	0.000
109	101	Low (2)	Pre Opn Conc Girder/Beam	1257.7	ft	1186.70	63.000	8.000	0.000
205	101	Mod. (3)	Re Conc Column	6	each	0.000	2.000	4.000	0.000
215	101	Low (2)	Re Conc Abutment	95	ft	28.000	67.000	0.000	0.000
234	101	Low (2)	Re Conc Pier Cap	135	ft	83.000	50.000	2.000	0.000
310	101	Mod. (3)	Elastomeric Bearing	20	each	0.000	20.000	0.000	0.000



Defect Elements

- Not all defects are created equal



Bridge Joints

- Minor element
- Generally not a significant safety concern



Bridge Joints - Implications

- 2007



Bridge Joint - Implications

- 2016



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PRACTICES WE CAN NOT AFFORD TO DEFER


Inspection QC/QA

- Field Reviews (Quality Control)
 - In the field review of inspections
 - 3% of inspections monthly
- Quality Assurance
 - Desk Review
 - 1% of bridges annually
- Compile and distribute findings

OD 642

Fremont River Bridge, west of Torrey

Inspection Date: June 13, 2017



38 / 3	Re Concrete Slab	Total: 1,170 sq.ft	CS1: 1,165 sq.ft (100%)	CS2: 4 sq.ft (0%)	CS3: 0 sq.ft (0%)	CS4: 0 sq.ft (0%)
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06/09/2015

Topside of slab is covered with asphalt so it could not be seen. Underside is in good condition with very few random tight surface cracks. 2 sq.ft. area of cracking and delaminating in the center of the S. headwall face. No exposed rebar associated with spalled area.

08/13/2017

The underside of the slab was inspected and in good condition. The following deficiencies were noted for the South headwall

1080 / 3	Delamination/Spall/Patched Area	Total: 3 each	CS1: 0 each (0%)	CS2: 3 each (100%)	CS3: 0 each (0%)	CS4: 0 each (0%)
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06/13/2017

There was a spall with exposed bar 3'x1' on the South headwall

1130 / 3	Cracking (RC and Other)	Total: 1 each	CS1: 0 each (0%)	CS2: 1 each (100%)	CS3: 0 each (0%)	CS4: 0 each (0%)
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08/13/2017

The south headwall had 1 crack 1/8" with efflorescence.

215 / 2	Re Conc Abutment	Total: 79 ft	CS1: 79 ft (100%)	CS2: 0 ft (0%)	CS3: 0 ft (0%)	CS4: 0 ft (0%)
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06/09/2015

Abutments are in good condition with few random tight surface cracks.

08/13/2017

The abutments were inspected and in good condition. Abutment 2 was in 2 feet of water and inspected for any undermining for a length of 25'. The footing was not impacted or exposed, there was no undermining.

321 / 3	Re Conc Approach Slab	Total: 547 sq.ft	CS1: 547 sq.ft (100%)	CS2: 0 sq.ft (0%)	CS3: 0 sq.ft (0%)	CS4: 0 sq.ft (0%)
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06/09/2015

Approach slabs are covered with asphalt so they could not be seen. No visible settlement in surface.



Collaborative Peer Review

- Twice per year
- All teams inspect the same two bridges
- Include inspection, planning, and programming groups
- Review of inspections and inspection program
- Review Program QC/QA



STRUCTURES DIVISION MEMORANDUM

QC/QA PROCEDURES FOR THE BRIDGE INSPECTION PROGRAM

To: UDOT Structures Division
Consultant Bridge Inspectors

From: Rebecca L. Nix *Rebecca Nix*
Bridge Management Engineer

Date: February 22, 2018

QC/QA procedures for the Bridge Inspection Program must be done according to the Structures Division QC/QA Procedures and the Bridge Management Manual.

The 2017 audit of QC/QA documentation and inspection field reviews found the following items are not consistently applied.

1. Data Management:

a. For sister structures:

- There will only be one I Drive folder for the pair of structures.
- For the inspection report, create a year folder and place the reports and QC documentation for both structures within the same folder.
- For the inspection photos, there will be a bridge number folder for each bridge. Within each bridge folder, create a year folder for each inspection event.
- Update the folder structure on the I Drive when the file structure does not match this format.

b. For report file naming:

- Name the final report, Struct#.pdf, including the directional indicator.
- Name on QC report, Struct#_QC.pdf, including the directional indicator.

2. Inspection Procedures:

- Ensure that the second team member is reviewing the bridge with the inspector of record in the field to gain concurrence on notes and deficiencies.
- Notes should be entered into either the standalone database or live database at the bridge site, and should be reviewed by the field checker while at the bridge site.
- If there are notes in the report stating that a portion of the bridge cannot be inspected due to limitations, a followup inspections should be scheduled.

3. General Notes:

- Verify the vertical clearance of over and undercrossings during each inspection. Note in the general notes that the vertical clearance was verified, and note if it was spot checked or if every measurement point was verified. Verify overclearances and update to 99.99 if no overhead obstructions are present.
- Identify the Inspection Team Lead for each inspection in the General Notes.

Structures Division | Telephone (801) 965-4188 | Facsimile (801) 965-4187 | www.udot.utah.gov
Calvin Rampton Complex | 4501 South 2700 West | Mailing Address P.O. Box 148470 | Salt Lake City, Utah 84114-8420



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PRACTICES WE CAN NOT AFFORD TO DEFER

Inspection Findings Meeting

- Review any high priority work items
- Include planners in discussion
- Indicates focus areas



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PRACTICES WE CAN NOT AFFORD TO DEFER

Bridge Health Index

- Additional data allows for a more comprehensive evaluation of condition for prioritization

$$H_e = \frac{\sum_s k_s q_s}{\sum_s q_s}$$

Where:

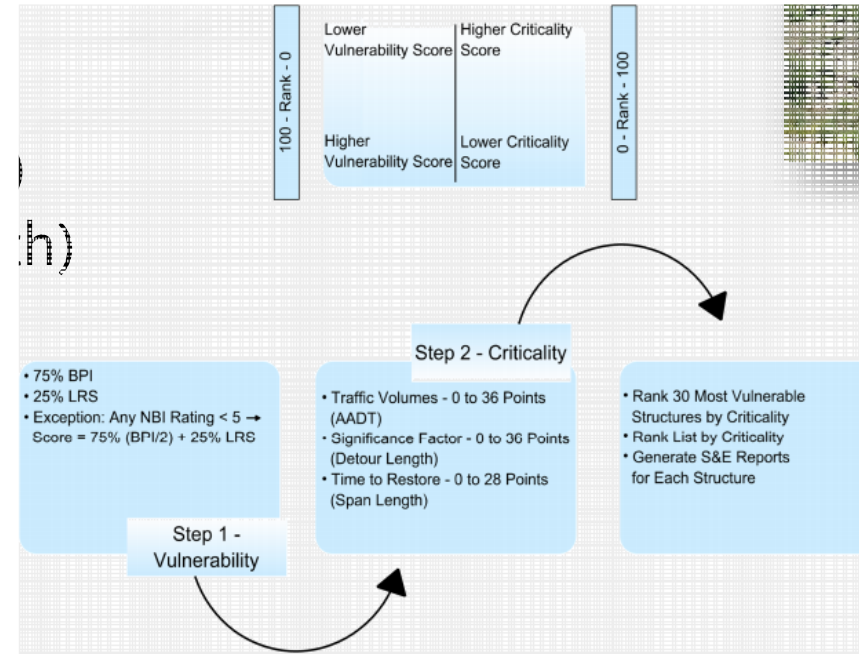
- H_e = health index of the individual element
- s = index of the condition state
- q_s = element quantity in s^{th} state
- k_s = health index coefficient corresponding to the s^{th} condition state for each element

And:

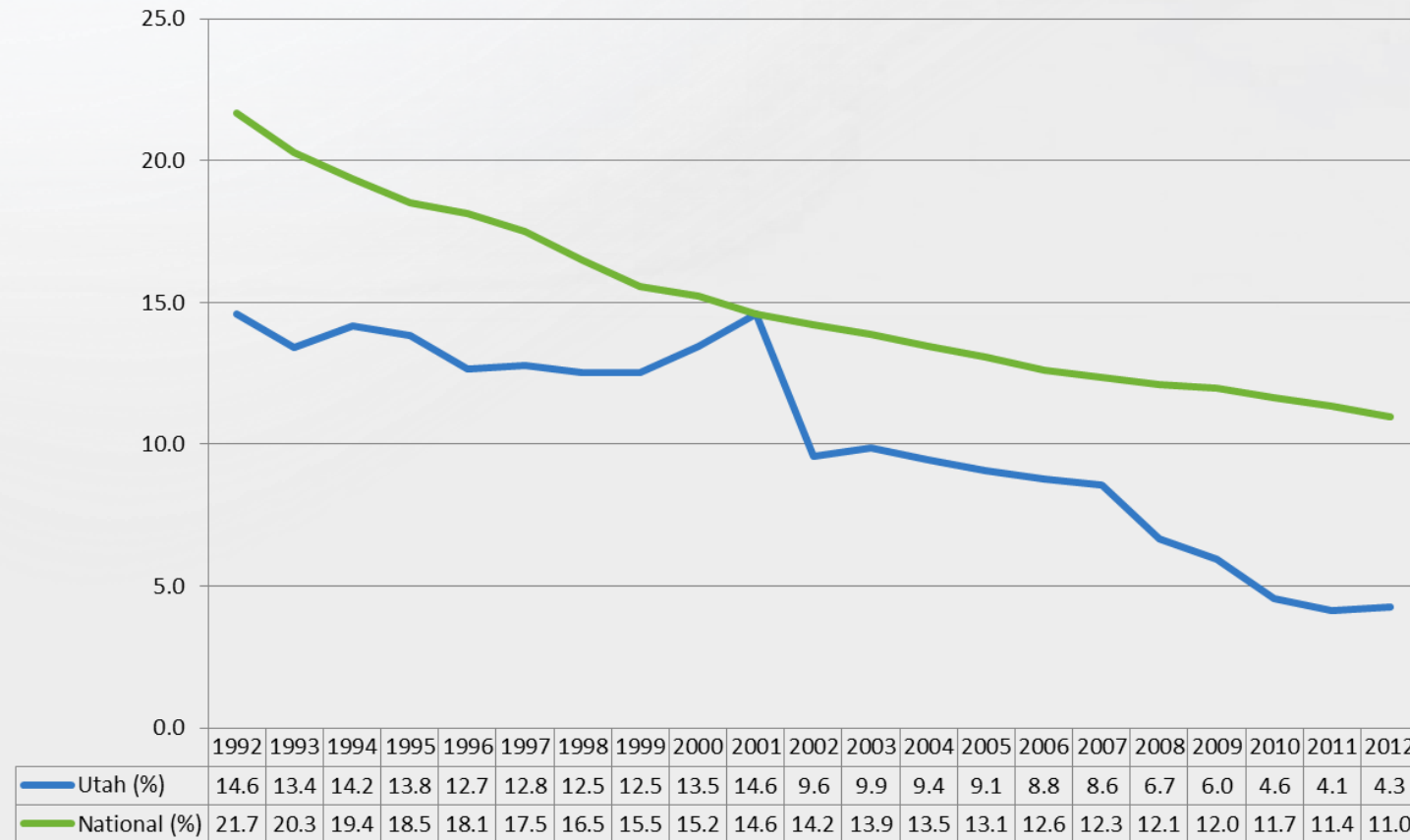
- Coefficient for the 4 condition states — k_1 = NBI Factor, $k_2 = 0.66$, $k_3 = 0.33$, $k_4 = 0$
- NBI conversion factors are determined from the following table, based on the most recent NBI value given to the deck, superstructure or substructure category:

Bridge Health Index Prioritization

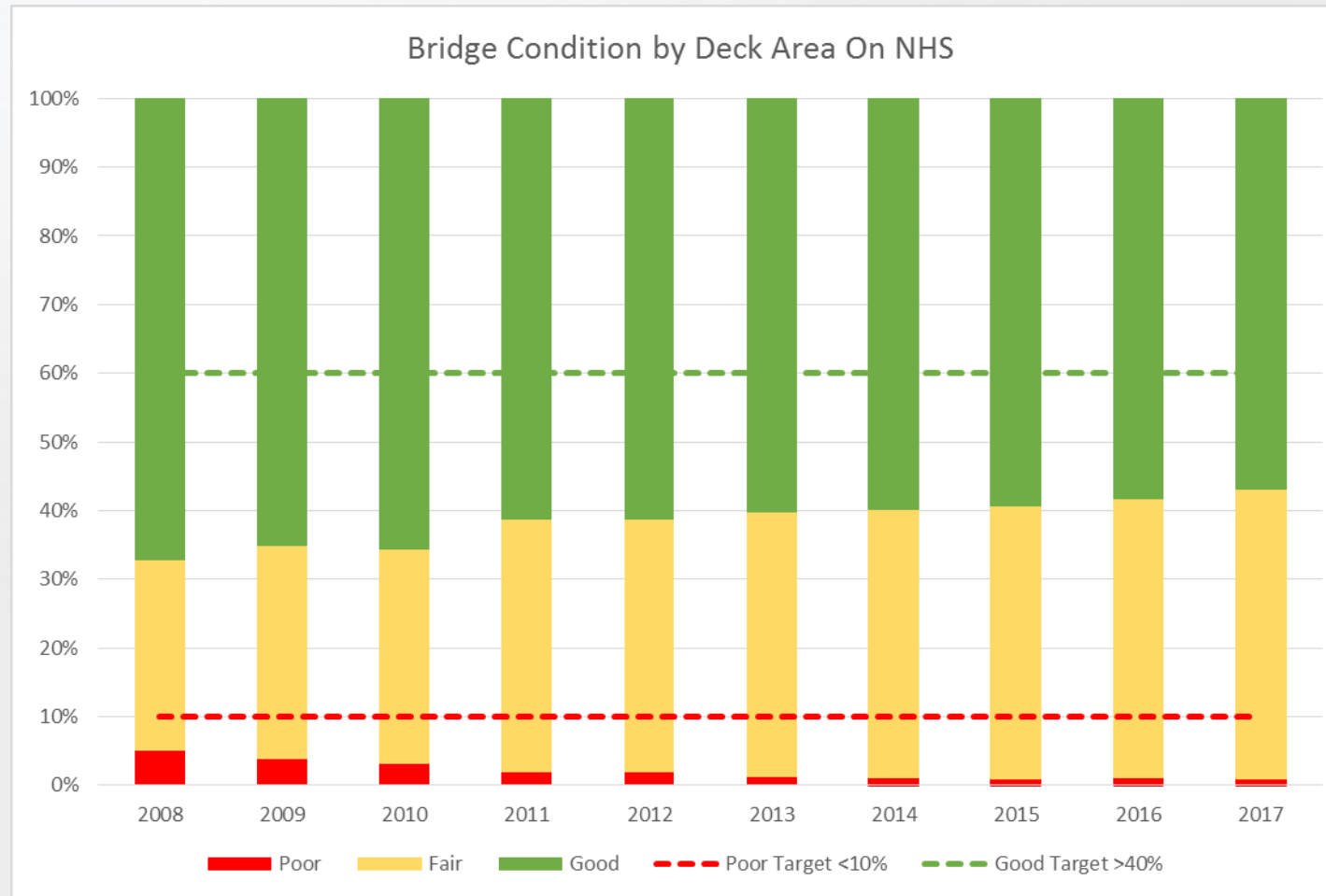
- Vulnerability
 - Bridge Planning Index (75%)
 - Load Rating (25%)
- Criticality
 - Traffic Volumes
 - Significance (detour length)
 - Time to Restore (span length)



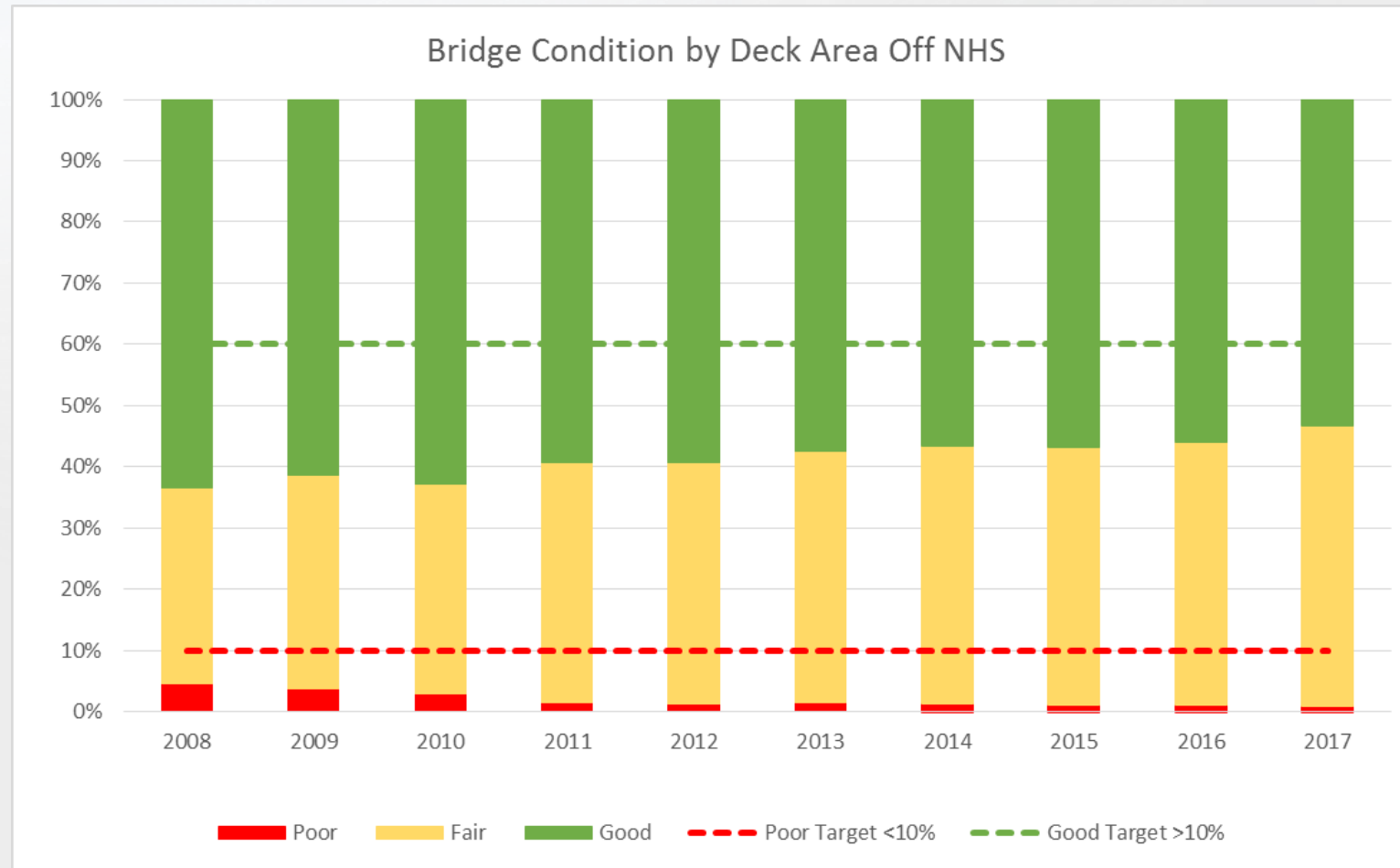
As of 2012 all structurally deficient bridges programmed



Bridge Condition



Bridge Condition



Preservation Programs

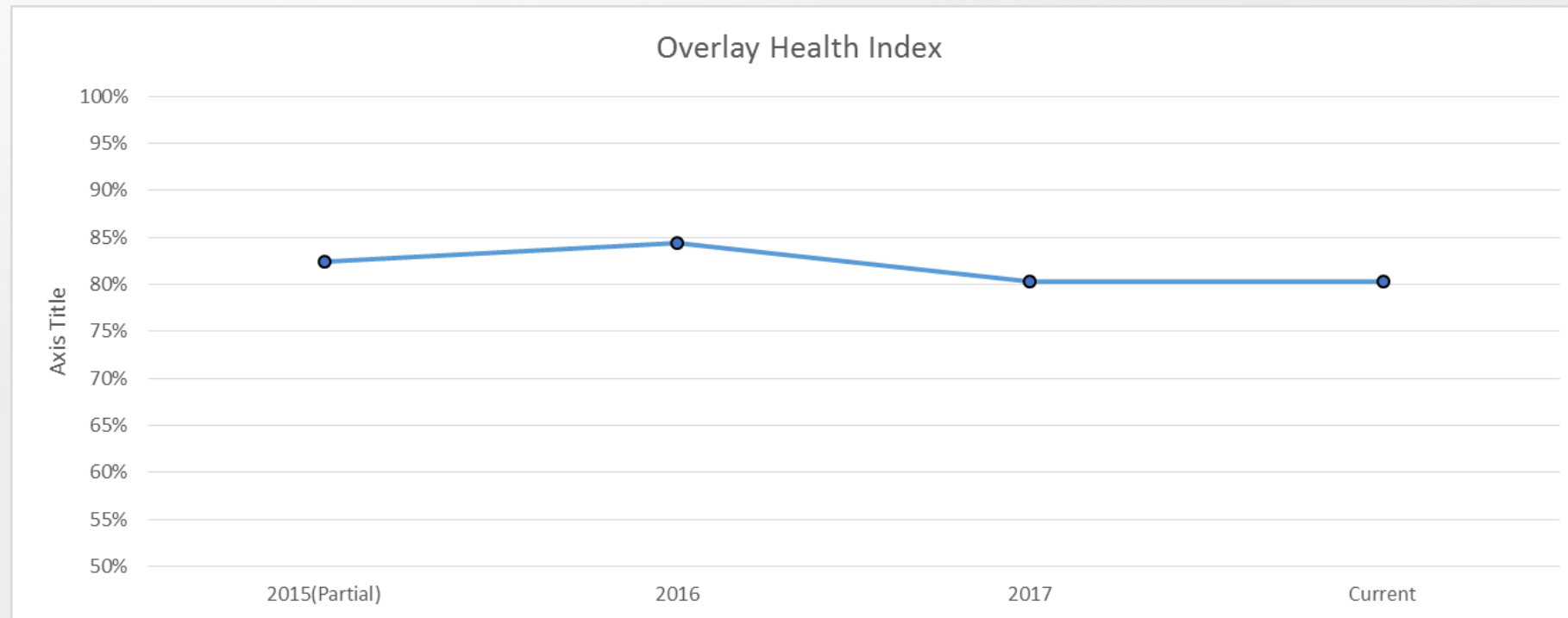
- Bare Deck / Overlay
- Paint
- Columns



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PRACTICES WE CAN NOT AFFORD TO DEFER

Overlay Health Index



Initial Project Scoping

Shed Maintenance Recommendations

Status	Priority	Action	Date Proposed	Notes
Approved	Medium (Safety)	Install / Replace Object Markers	05/19/2015	Place object markers at the turndown ends of all approach rails.
Approved		Paint / Seal Parapets	05/19/2015	Paint the bridge railing.
Approved	Normal	Crack Seal Deck Asphalt	05/19/2015	Crack seal the wearing surface.

UDOT Structures Work Candidates

Status	Priority	Action	Date Proposed	Year Sch	Notes
Approved	Medium (Safety)	Update Barrier to Standard	05/22/2017	2018	Generated by user "Nash Wilson" on 7/7/2017 Install bridge rail, approach rail, transitions, and end treatments that meet current standards.

1C 700; I-215 NB Ramp Over I-215 and I-80

1. Structure Data

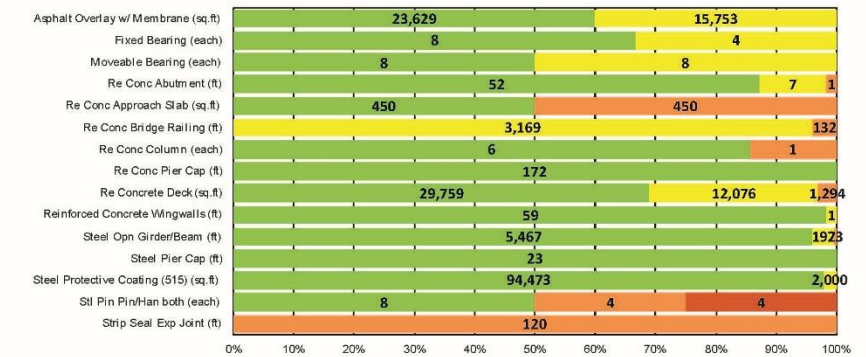
Structure ID	Year Built	Structure Type	# of Spans	Length	Deck Area	Max Span Length	Skew	Rebar Type	Funding	Rank
1C700	1985	Steel Continuous Stringer/Girder	8	5430 Feet	43130 SQFT	179 Feet	99°	Epoxy Coated Rebar	NHPP, SA	22.7

Group	Over					Under				
	Facility Conf'd	MP	Functional Class	Lanes	AAOT Over	% Trucks Traffic	Feature Intersected	MP	Functional Class	AAOT Under
R2180 215 Interchange	RP1215NB TO I80WB	0.1	Urban Interstate	1	85,560	20%	+215, I-80 & 4 INT.R	22.2	Urban Interstate	85,560

2. Current Condition Summary

Bridge ID	NB Deck	NB Super	NB Sub	NB Culvert	Bridge Health Index	Operating Load Rating	Rolling Date	Sufficiency Rating
1C700	6	5	6	N	70.09	1.24	January 07, 2016	64.50

Wearing Surface Element	NB Reported Wearing Surface	UDOT Data Surface Thickness	Last Inspection Date
Asphalt Overlay w/ Membrane	6 Bituminous	2	December 06, 2016



Questions?