BRIDGE UPDATE

Derek Mitch, P.E., District Bridge Engineer

- **H&H Updates – Lindsay Volker, P.E.**
- **Bridge Planning Updates**

H&H UPDATES

- **Cofferdams and Causeways**
  - Must be analyzed for temporary conditions for the 50% AEP (2 year flood)
  - Must have sufficient height for the increased Water Surface Elevation (WSE) due to constriction
- **StreamStats**
  - Cannot be used currently for hydrology.
  - The latest version USGS SIR 2019-5094 does not uniformly estimate flow across the state and therefore cannot be used.
- **Report and Model**
  - Ensure continuity between what is being modeling and what is being written about. Often times the reports are similar with numbers, pictures, plans, or descriptions but do not match the model.
  - Validation for the model should be included in the report, however it should not be used solely for the explanation of ALL results.
  - It is the responsibility of the consultant to QA/QC the model and report prior to submission to the district.
- **Detailed FEMA**
  - Must had a WSE comparison between the Base Flood Elevations from the published FEMA model and the existing conditions with the 1% AEP WSP in the current study model.
  - Must have the FEMA information in the report.

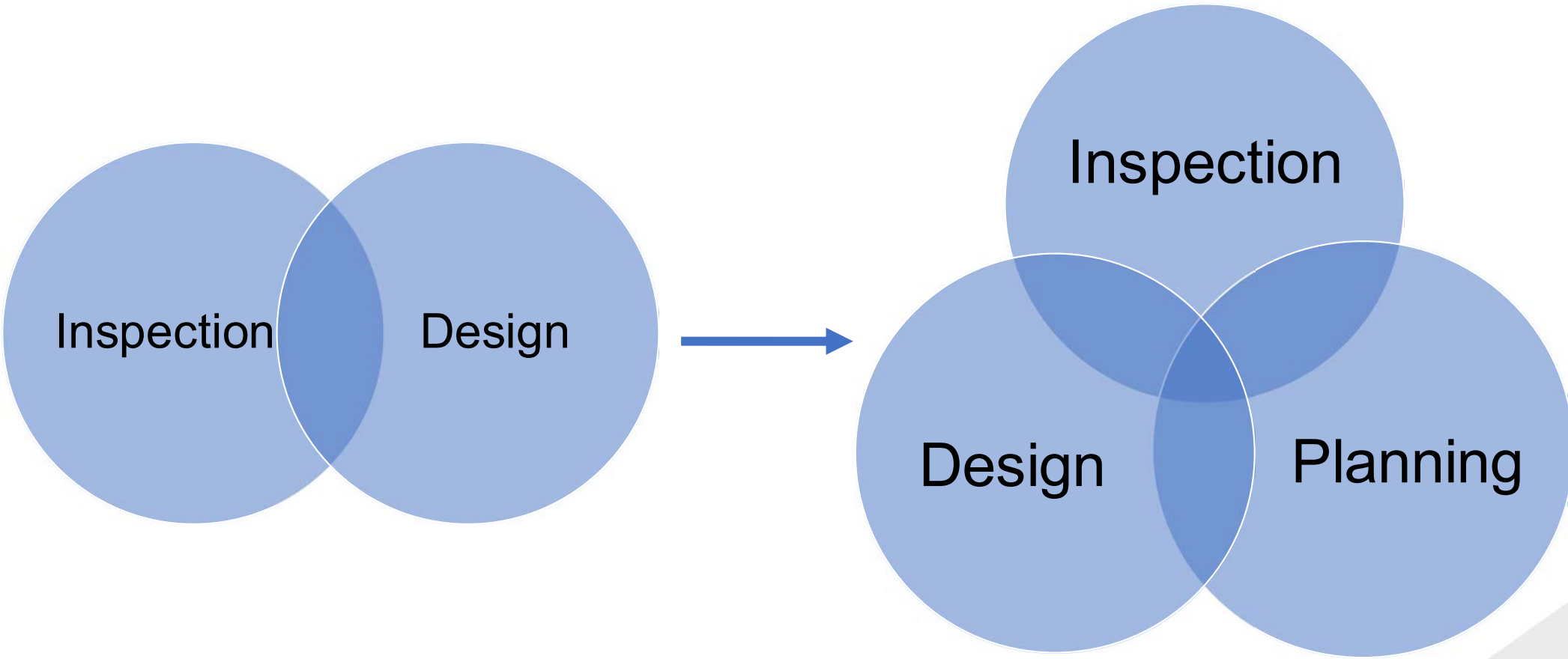
BRIDGE PLANNING – SUMMARY

Derek Mitch, P.E., District Bridge Engineer

- Switching programming from "**Worst 1st**" → "**Lowest Life Cycle**" (LLC)
- Address spike in needs of bridge work due to age of network.
  - 60% of bridges entering end of design life (EOL).
  - Light & Medium preservation to spread out TIP level work.
- Optimize limited funding resources
  - Accomplish improved asset condition within existing funding.

  Or
  - Achieve same projected asset condition with less funding.
- Optimize asset deterioration
  - Large & important structures remain in good condition.
  - Smaller & less important structures see more deterioration.

BRIDGE PLANNING



BRIDGE PLANNING

Bridge Risk Score Calculation

The risk score for each bridge is calculated using the formula below. Appendix Table J.2 defines the factors and the parameters that determine factor values.

$$\text{Bridge Risk} = \left(\sqrt{\text{Deck Area} * \text{Annual Average Daily Traffic}}\right) * F_s * F_{fc} * F_{det} * F_{aadtt} * F_{flood}$$

Appendix Table J.2: Bridge Risk Score Factors

Factor	Definition	Parameter	Factor Value
F_s	Scour Factor	Scour Rating = A	1.2
		Scour Rating ≠ A	1.0
F_{fc}	Fracture Critical Factor	Fracture Critical Rating < 5	1.4
		Fracture Critical Rating ≥ 5	1.0
F_{det}	Detour Length Factor	Detour Length > 30 miles	2.0
		Detour Length ≥ 10 miles	1.5
		Detour Length < 10 miles	1.0
F_{aadtt}	Annual Average Daily Truck Traffic Factor	Truck traffic > 20% total traffic	2.0
		Truck traffic ≥ 10% total traffic	1.5
		Truck traffic < 10% total traffic	1.0
F_{flood}	Bridge Closed for Flooding Event Factor	Bridge has been closed for flooding	3.0
		Bridge has been overtopped due to flooding	1.5
		Bridge has not been closed or overtopped due to flooding	1.0

BRIDGE PLANNING

- **Condition Rating (CR) 9 → Brand new**
- **Condition Rating (CR) 4 → Poor**
- **Condition Rating (CR) 0 → Collapsed in river**
- **A quick look at CR tells the story - a "wave" coming**

Treat Network by CR – Examine Next 30 Years

- CR = 0-2, Deck Area = 16,192 → Needs Replacement (5 years)
- CR = 3, Deck Area = 434,201 → Needs Replacement (10 years)
- CR = 4, Deck Area = 522,953 → Needs Replacement (15 years)
- CR = 5, Deck Area = 6,834,689 → Needs Rehab (15 years)
- CR = 6, Deck Area = 3,010,595 → Needs Rehab (25 years)
- CR = 7, Deck Area = 2,405,674 → Needs Preservation (15 years)
- CR = 8, Deck Area = 518,795 → Needs Preservation (25 years)
- CR = 9, Deck Area = 62,563 → Needs Preservation (40 years)

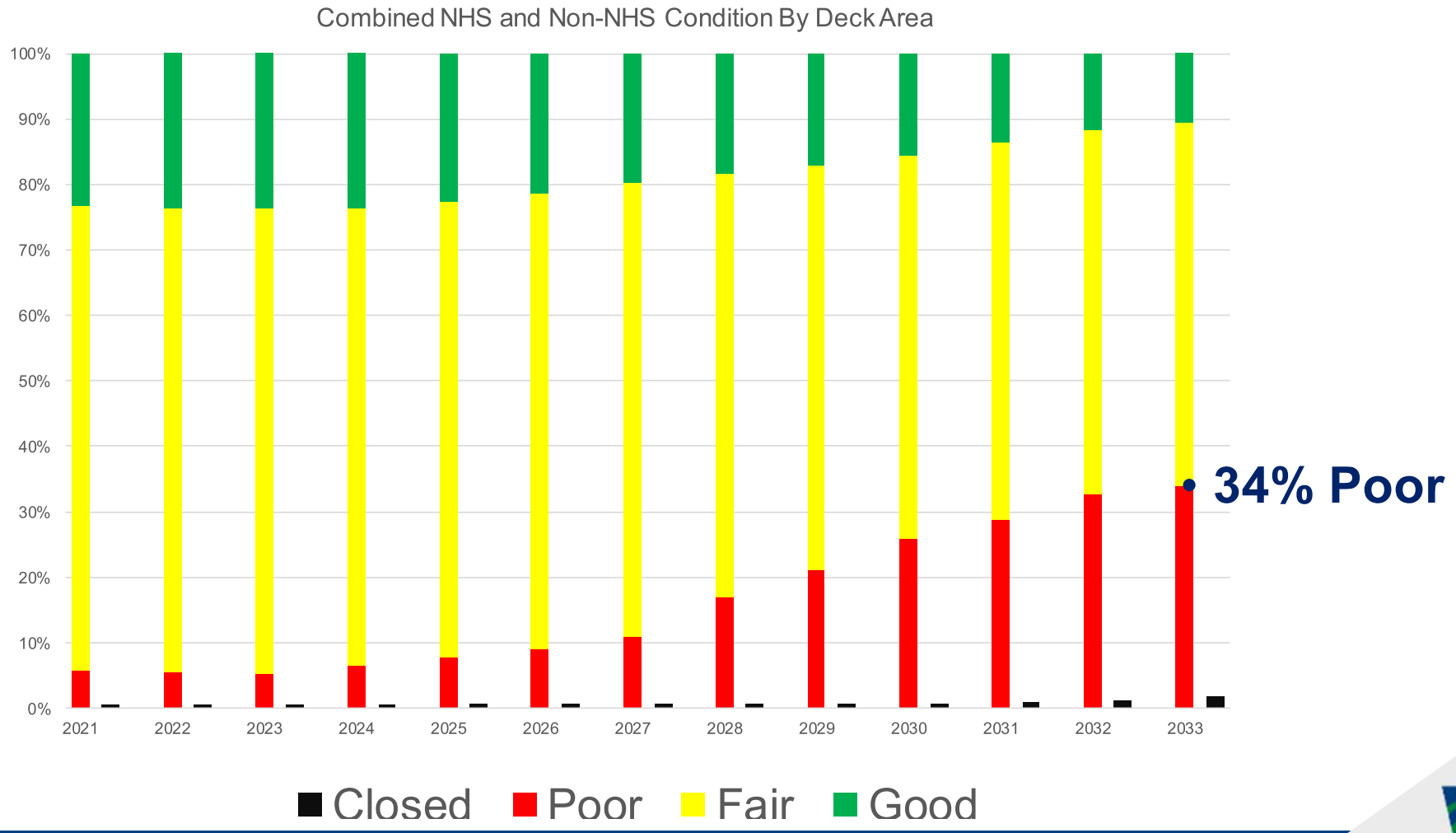
BRIDGE PLANNING

- Bridge design life ~75 years
- Eisenhower Interstate System – started 1956, ended 1972
- 1956 + 75 = 2031, 1972 + 75 = 2047
- 61% of our network in 1950-1979

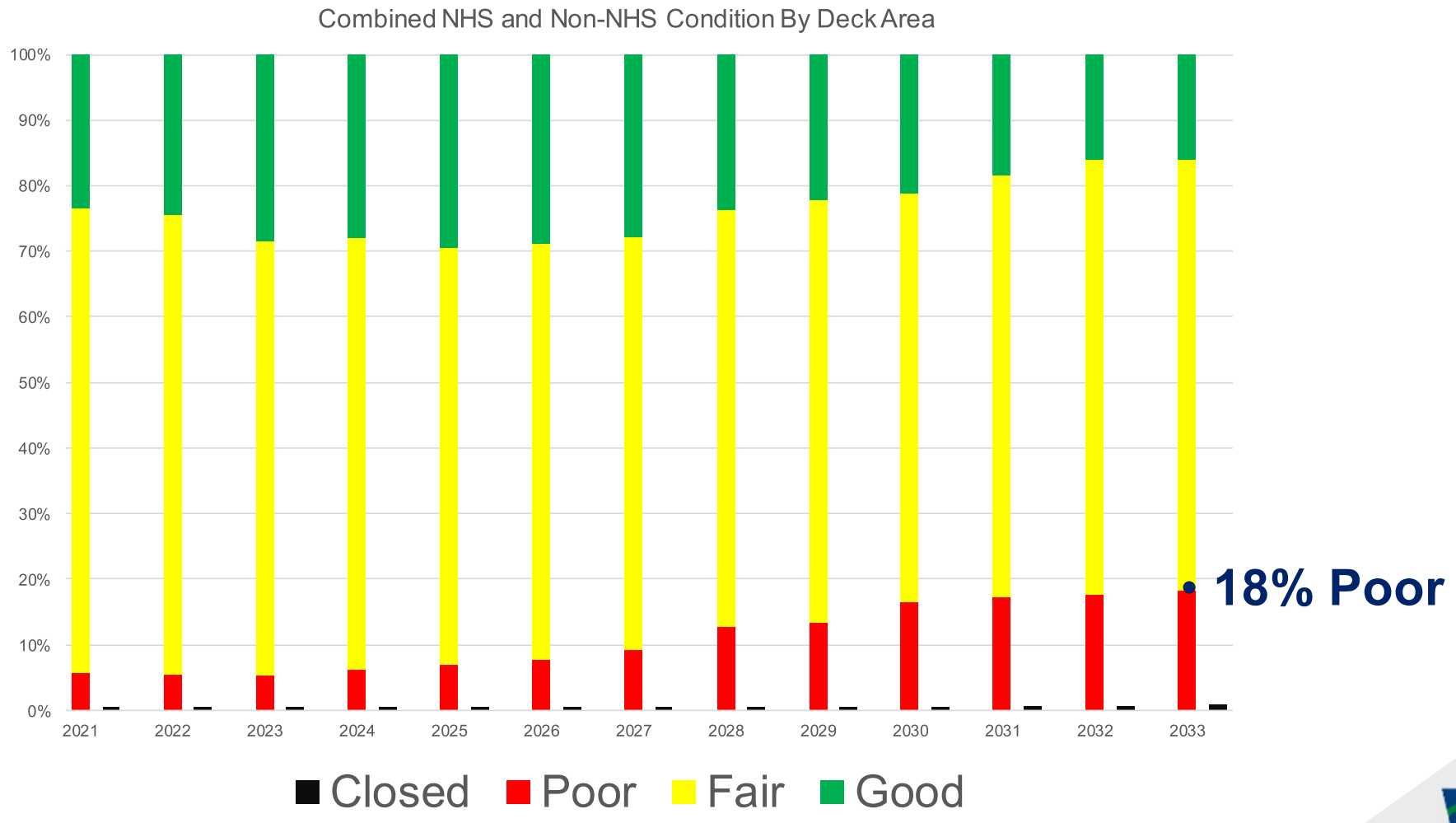
Deck area by Year built

	Adams	Cumberland	Dauphin	Franklin	Lancaster	Lebanon	Perry	York	Total
Before 1929	39,799.60	38,866.90	310,331.10	34,323.90	370,681.30	10,585.00	37,127.70	38,931.70	880,647.21
1930-39	39,470.40	29,984.70	141,061.31	59,610.30	98,780.70	40,290.50	78,018.30	119,943.40	607,159.62
1940-49	45,020.90	10,788.80	82,812.90	44,378.90	163,229.70	78,598.30	19,726.10	77,995.90	522,551.51
1950-59	53,002.00	66,973.00	510,886.40	41,055.30	203,651.51	14,597.90	132,319.90	646,443.52	1,668,929.52
1960-69	188,054.80	670,364.31	1,221,608.81	259,340.11	553,047.41	330,182.21	182,685.60	196,419.50	3,601,702.77
1970-79	8,619.90	306,924.21	1,768,922.20	39,376.80	1,213,390.27	31,411.00	0.00	221,574.00	3,590,218.38
1980-89	39,369.10	50,909.60	383,495.51	45,252.40	134,534.50	25,648.40	9,732.50	97,815.50	786,757.52
1990-99	59,398.20	202,012.20	150,322.80	18,469.10	136,783.91	8,675.20	11,632.20	32,825.30	620,118.91
2000-09	50,049.40	74,398.20	30,321.70	55,438.10	487,132.62	138,792.21	45,588.40	157,955.41	1,039,676.04
2010+	120,145.40	220,978.51	141,533.80	136,124.80	240,241.11	74,223.50	40,084.80	321,177.61	1,294,509.54
Total	**642,929.71**	**1,672,200.43**	**4,741,296.54**	**733,369.72**	**3,601,473.03**	**753,004.23**	**556,915.51**	**1,911,081.85**	**14,612,271.02**

WORST 1ST


Combined NHS and Non-NHS Condition By Deck Area
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
34% Poor
Closed
Poor
Fair
Good

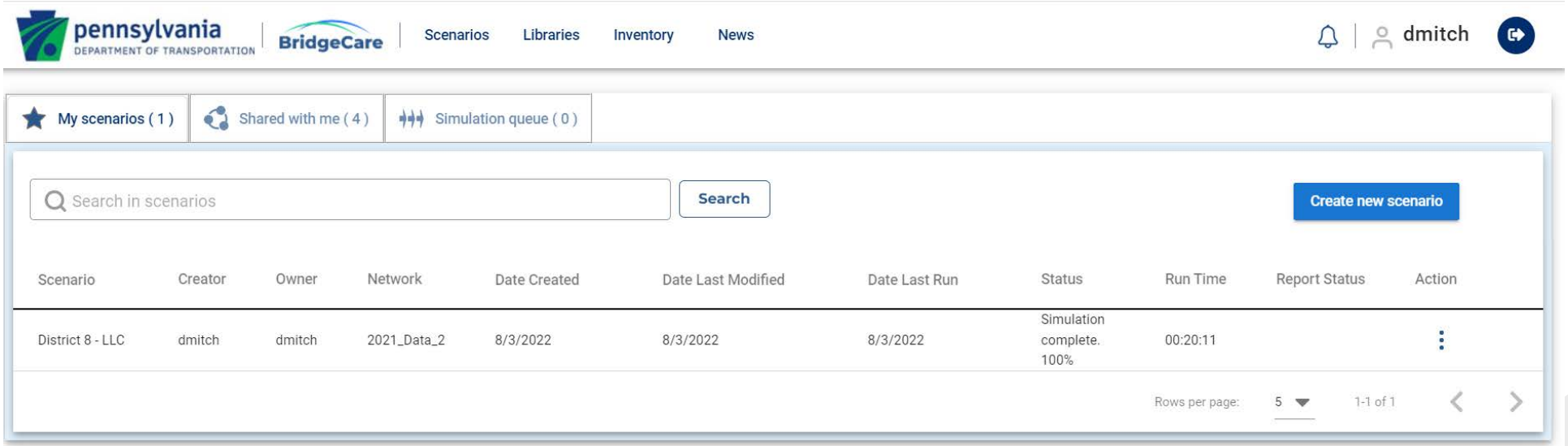
LOWEST LIFE CYCLE COST



BRIDGE CARE

BridgeCare – What is it?

- A web based weighted lowest life cycle analysis tool (MODA).
- Utilizes BMS2 data & historic deterioration curves to determine B/C ratios.
- Either standard library or user assigned costs & treatment libraries
- Think “STLRFD” of planning work.



BRIDGE CARE

BridgeCare – What is it (Cont.)?

- A reduction in unknown risks on the planning side.
- “Pathfinding” tool
- Accurate in “macro” or aggregate level.

BridgeCare – What is it not?

- A panacea for planning
- 100% accurate at the “micro” or individual bridge level
- Substitute for Engineering Judgment / Planning Staff
  - Arch life → Concrete arches seem to last 125yrs, steel arches seem to last 65 years
  - Concrete Tee Beams → can’t do a deck replacement

BRIDGE CARE – STOCK MARKET

Individual Stocks –

Microsoft & Apple over a one year period.

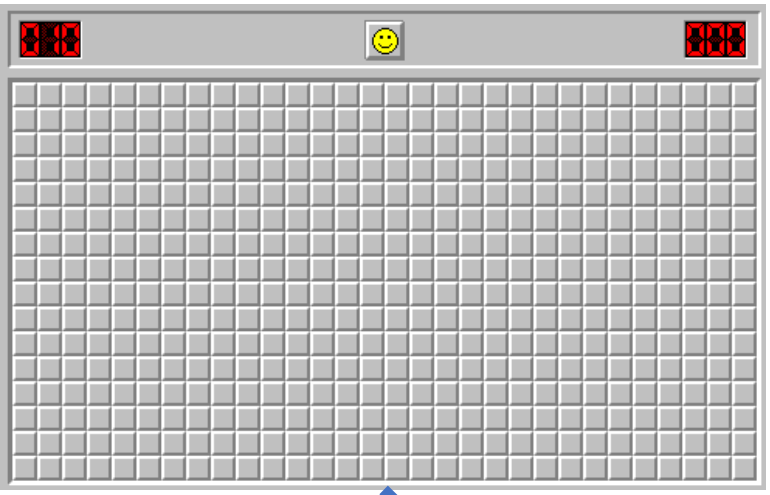
Equivalent to individual bridges

Aggregate Stock:

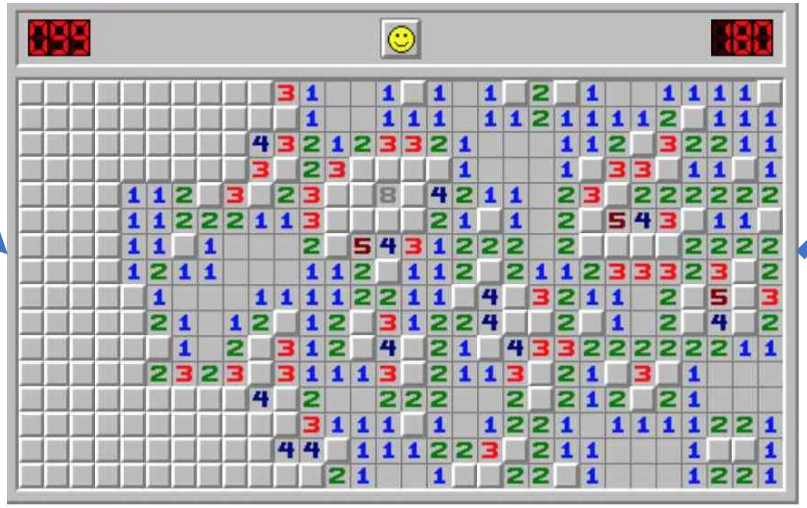
Dow Jones Industrial Average over ~100 yrs.

Equivalent to overall network

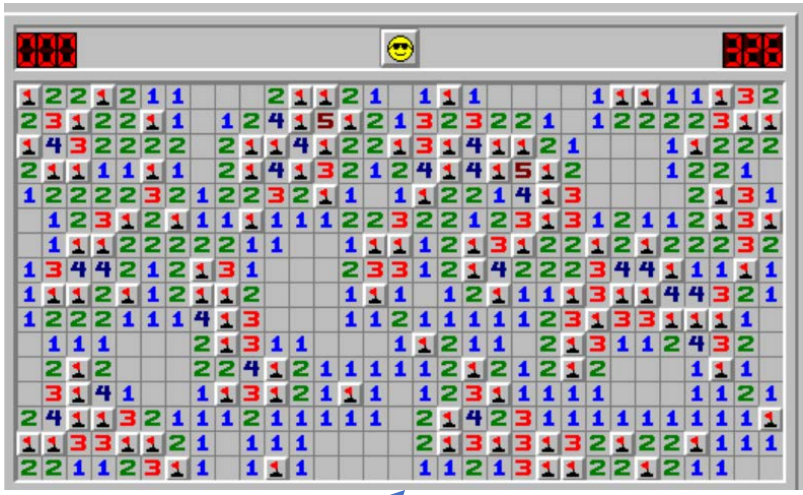
BRIDGE CARE - MINESWEEPER



BridgeCare



Engineering
Judgement /
Planning Staff



BRIDGE PLANNING

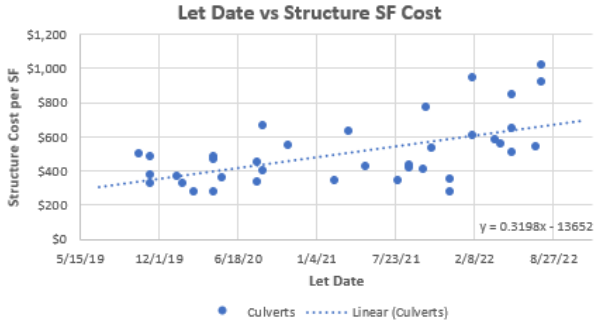
Unit Cost Data: Replacement - Culvert
ECMS Data Range: 08/02/2019 to 08/02/2022

Last Updated: 09/13/22
Updated By: KJS

Data Set Count: 37 Culvert Projects

Instructions:
(1) Cells shaded green are input.
(2) To add a new project, copy a row from the middle of the table and insert the row in the middle of the table. This will retain the drop downs, eliminate the need to reapply the filters to the column headings, and automatically add the new data point to the graph. After insertion, edit all shaded data fields
(3) After all new projects are added, re-sort data using by newest first.
(4) After new cost data is entered, adjust trendline formula input based off of chart.

Notes:
(1) Items/cost associated with natural streambed material placement/storage
(2) Items/cost associated with unique issues (e.g. sinkhole stabilization) that appear on structures tab block were excluded.
(3) Over-excavation and backfilling of unsuitable material included under other
(4) SF Costs include temporary excavation support and removal of existing structures.



	Structure	Total
2020 Average SF Cost =	$414	$826
2021 Average SF Cost =	$449	$877
2022 Average SF Cost =	$719	$1,301
Overall Average SF Cost =	$507	$974

Trendline Slope =	0.3198
Trendline Y-intercept =	-13652

Structure Trendline		
Date	SF Cost	
#########	$696	Today
6/30/2023	$773	
6/30/2024	$890	
6/30/2025	$1,007	
6/30/2026	$1,124	

Project Data						Structure Data											Construction Cost Data								
																	Low Bidder - Structure Cost								
ECMS Project	Let Date	Dist.	County	Route & Section	Structure Plan Number	No. of Spans	Structure Type	Wing Type	Barrier Type	Span (FT)	Wall Width (FT)	Rise (FT)	Culv. Length (FT)	Staged Constr. ?	Dist. Slab ?	Str. Area (SF)	Lump Sum	Rebar	Rock	TES&PS	Other Str. Item	Existing Removal	Total Structure	Structure SF Cost	Total Constr. SF Cost
87538	7/28/22	8	Lancaster	0772 - 048	S-40076	1	Box - Precast	Combo	Combo G/R	6.00	0.67	3.00	42.13	No	Yes	309	$284,000	$4,800	in LS	$0	$300	$25,000	$314,100	$1,017	$2,198
100292	7/28/22	8	Lebanon	0419 - 009	S-40249	1	Box - Precast	Combo	Combo G/R	7.50	0.67	6.00	57.23	No	Yes	506	$406,976	$26,495	$3,612	$0	$13,179	$17,495	$467,757	$924	$1,606
90846	7/14/22	8	Dauphin	4006 - 006	S-40454	1	Box - Precast	End Section	10M	26.00	1.08	7.50	29.25	No	No	824	$400,000	$4,096	$21,350	$0	$2,070	$20,000	$447,516	$543	$872
89288	5/12/22	8	Lancaster	7101 - BRG	L-65	1	Box - Precast	End Section	10M	16.00	1.08	4.00	31.50	Yes	Yes	573	$391,900	Alt. Bid	$9,800	$37,500	$4,565	$40,000	$483,765	$844	$1,715
89288	5/12/22	8	Lancaster	7101 - BRG	L-64	2	Box - Precast	End Section	10M	12.00	1.00	5.00	43.50	Yes	Yes	1,218	$655,735	Alt. Bid	$9,800	$37,500	$7,500	$80,000	$790,535	$649	$1,318
92562	5/12/22	8	York	2079 - 005	S-40014	1	Box - Precast	End Section	SM G/R	27.00	1.08	6.00	33.75	No	Yes	985	$460,000	$11,820	in LS	$0	$2,240	$30,000	$504,060	$512	$796
100211	4/14/22	8	York	3035 - 001	S-39942	1	Box - Precast	End Section	SM G/R	25.00	1.08	6.00	32.33	No	No	879	$408,719	$3,135	$21,871	$12,276	$3,467	$40,761	$490,228	$558	$922
78655	3/31/22	8	Cumberland	0997 - 039	S-39668	1	Box - Precast	End Section	PA Bridge	18.00	1.08	7.00	35.83	No	Yes	723	$389,900	$8,525	$5,040	$0	$520	$20,000	$423,985	$586	$877
91359	2/3/22	8	York	2002 - 019	S-39830	1	Box - Precast	End Section	SM G/R	7.50	0.67	5.00	29.38	No	Yes	260	$229,000	$850	in LS	$10,000	$2,250	$4,000	$246,100	$947	$1,803

BRIDGE PLANNING

Cost Analysis:

			Total Replacement			Partial Replacement		Rehabilitation		
			Culvert [2]	Bridge [3]	Com-bined	Super-structure	Deck	Stone Arch	Conc. Arch	Preser-vation
Design Cost (Total Cost)		Preliminary Engineering	$296,242	$319,848	$310,518	$215,915	$138,765	$196,528	$220,848	$107,492
		Final Design	$175,172	$229,551	$198,113	$202,539	$257,226	$112,583	$139,289	$163,241
		Preliminary + Final	$471,414	$549,398	$508,631	$418,454	$395,991	$309,111	$360,136	$270,733
		Right-of-Way	$17,438	$19,732	$18,385	$4,271	$7,098	$18,365	$26,709	$238
Design Cost (Cost per SF)		No. of Projects with Design Costs	37	27	64	10	3	3	5	10
		Total Associated SF Area	30,912	100,284	131,196	25,303	20,722	4,222	11,883	143,199
		Average SF Area	835	3,714	2,050	2,530	6,907	1,407	2,377	14,320
		Total Design Cost (PE + FD + R/W)	$18,383,784	$15,346,797	$33,710,629	$4,227,253	$1,209,270	$982,427	$1,934,228	$2,709,704
		Average Cost per SF	$595	$153	$257	$167	$58	$233	$163	$19
Construction Cost (Cost per SF)	Structure Only	2020 Average	$414	$342	$378	(1)	(1)	(1)	(1)	$73
		2021 Average	$449	$406	$426	(1)	(1)	(1)	(1)	$64
		2022 Average	$719	$353	$634	(1)	(1)	(1)	(1)	$97
		Overall Average	$507	$365	$446	$236	$143	$372	$157	$72
	Low Bid (w/o CENG)	2020 Average	$826	$567	$697	(1)	(1)	(1)	(1)	$103
		2021 Average	$877	$752	$812	(1)	(1)	(1)	(1)	$125
		2022 Average	$1,301	$494	$1,115	(1)	(1)	(1)	(1)	$184
		Overall Average	$974	$627	$825	$402	$233	$596	$356	$133
		Constr. Engineering (CENG)	$122	$78	$103	$50	$29	$75	$44	$17
		Low Bid Average + CENG	$1,096	$706	$928	$452	$262	$671	$400	$149
Total (Cost per SF)			$1,690	$859	$1,185	$619	$320	$904	$563	$168

BRIDGE PLANNING

- CR = 4, Deck Area = 522,953 → Needs Replacement (15 years)
- CR = 5, Deck Area = 6,834,689 → Needs Rehab (15 years)

• **Bridge (Light) Preservation →**	**$ 25 / SF**	New Programmatic Preservation
• **Bridge (Medium) Preservation →**	**$ 75 / SF**	
• **Bridge (Heavy) Preservation →**	**$ 150 / SF**	
• **Bridge Deck Replacement →**	**$ 250 / SF**	
• **Bridge Beam & Deck Replace →**	**$ 450 / SF**	~%70 increase to do full replacement
• **Bridge Total Replacement →**	**$ 750 / SF**	
• **Culvert Replacement →**	**$1000 / SF**	

NEW PROGRAMATIC PRESERVATION

- Bridge (Light) Preservation Contract - Reduce long term degradation of bridges (focus on joints & scour).

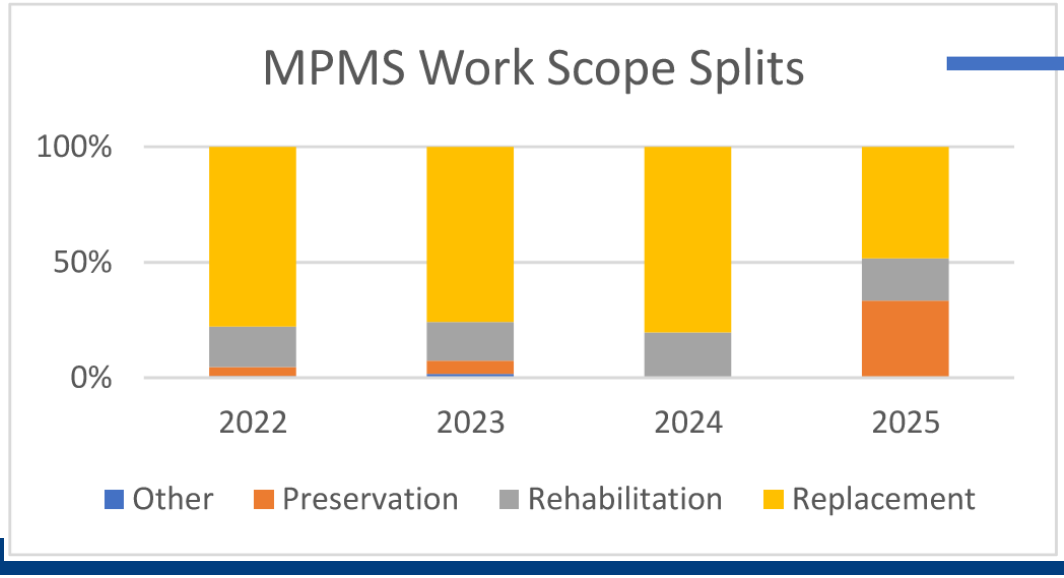


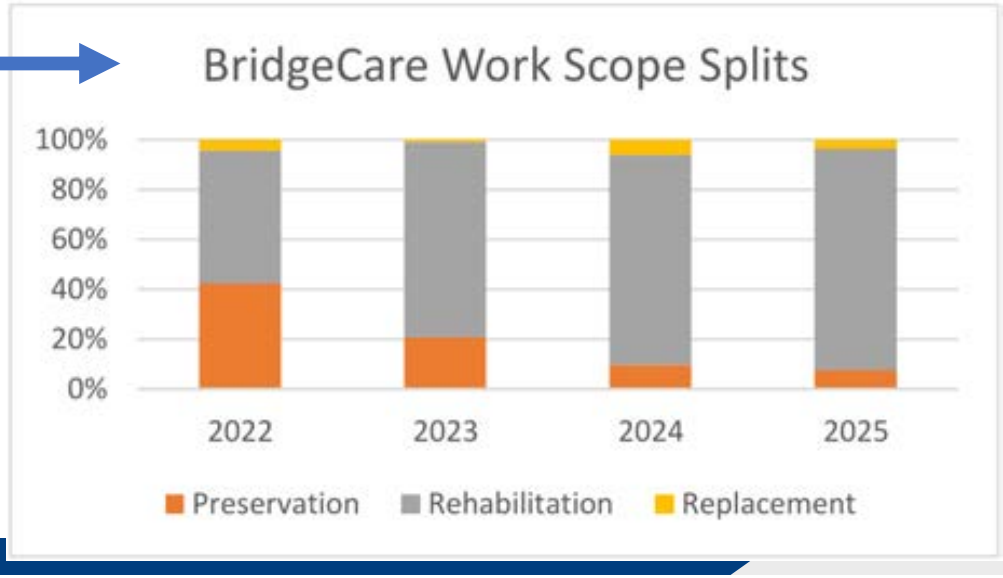
County	Joint Issue PC1/2	Scour Issue PC1/2
Adams	11	23
Cumberland	37	8
Dauphin	34	21
Franklin	9	1
Lancaster	56	46
Lebanon	17	13
Perry	13	10
York	29	47
D8-0	206	169

- Bridge (Medium) Preservation Contract - Prevent full TIP projects - (focus on “surgical” major structure work).


BRIDGE PLANNING

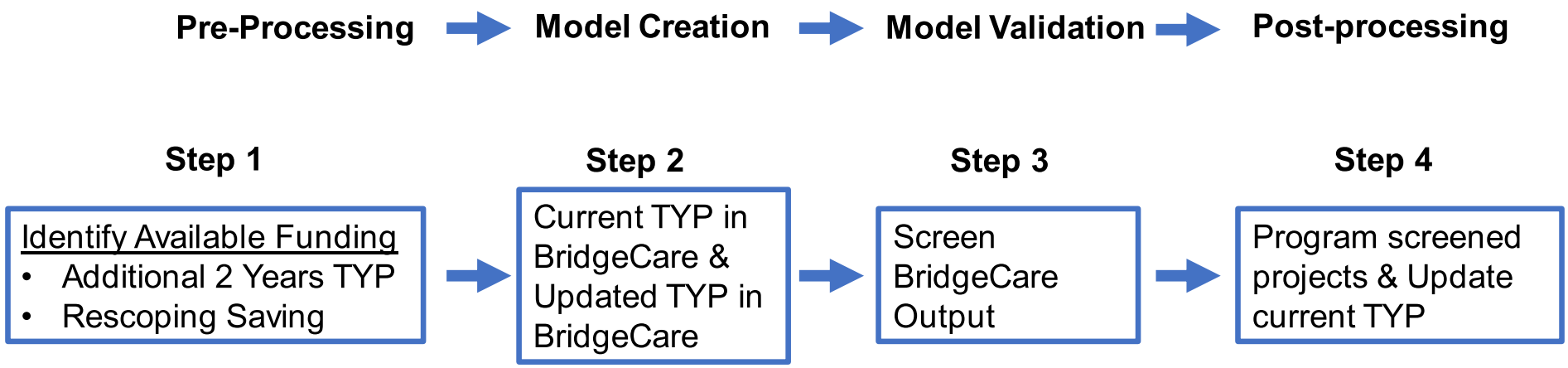
- Another angle - BAMS
- Bridge Asset Management → BridgeCare Software
- Can compare our planned project (MPMS) to our theoretical "perfect" LLC scopes.
- Reality is in between, because it will always be a mix.





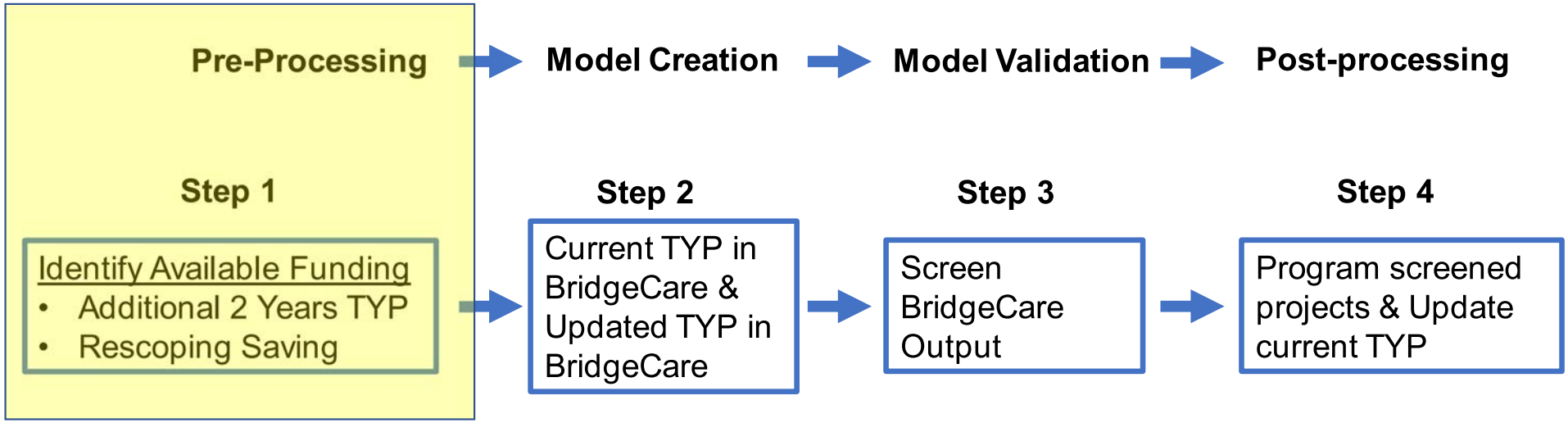
BRIDGE PLANNING

- High-level overview



BRIDGE PLANNING

- High-level overview



BRIDGE PLANNING

- Step 1 – Identify Available Funding
- Pennsylvania 2023 Transportation Program Financial Guidance

Breakdown of funding by percentage assigned for bridge work.

Appendix 2: FFY 2023 -- Highway/Bridge Base Funding Allocation ($000)

Region	NHPP	STP	State Highway (Capital)	State Bridge	Off System Bridges (BOF)	HSIP	Highway Freight Program	Rail Highway Safety	CMAQ	STP TAP Set-Aside	STP-Urban	Carbon Reduction	PROTECT	Bridge Formula Program (BRIP)
Lebanon	2,006	1,915	2,526	1,372	1,372	1,363	0	0	1,318	0	0	0	0	1,265

Lebanon County - Without State Highway						
Funding Pot	NHPP	STP	State Highway	State Bridge	BOF	BRIP
Amount	$2,006	$1,915	$0	$1,372	$1,372	$1,265
Bridge Allocation	$802	$766	$0	$1,372	$1,372	$1,265
Total	$5,577					

BRIDGE PLANNING

- Step 1 – Funding

- Typical Approach

Prior TYP
2021-2033

→

Current TYP
2023-2033 – From TYP
2034-2035 – New years to program

- New Approach

Prior TYP
2021-2033

→

Current TYP
2023-2033 – Re-evaluate
2034-2035 – New years to program

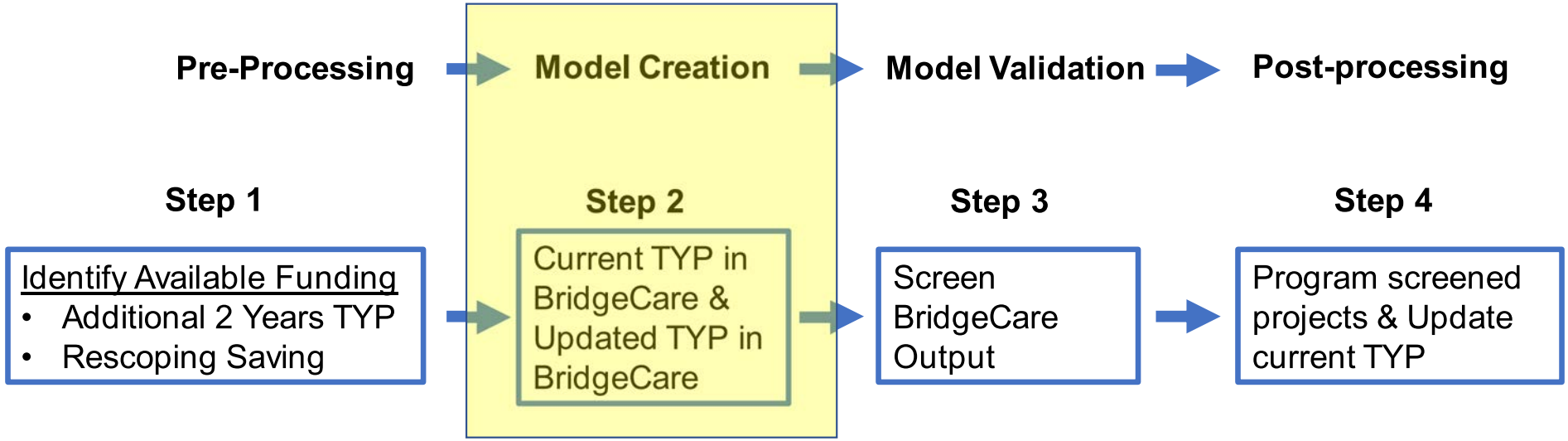
→

Adams
New Years funding = $11 M
Rescoping funding = $ 5 M
Total = $16 M

HATs
New Years funding = $86 M
Rescoping funding = $71 M
Total = $157 M

BRIDGE PLANNING

- High-level overview



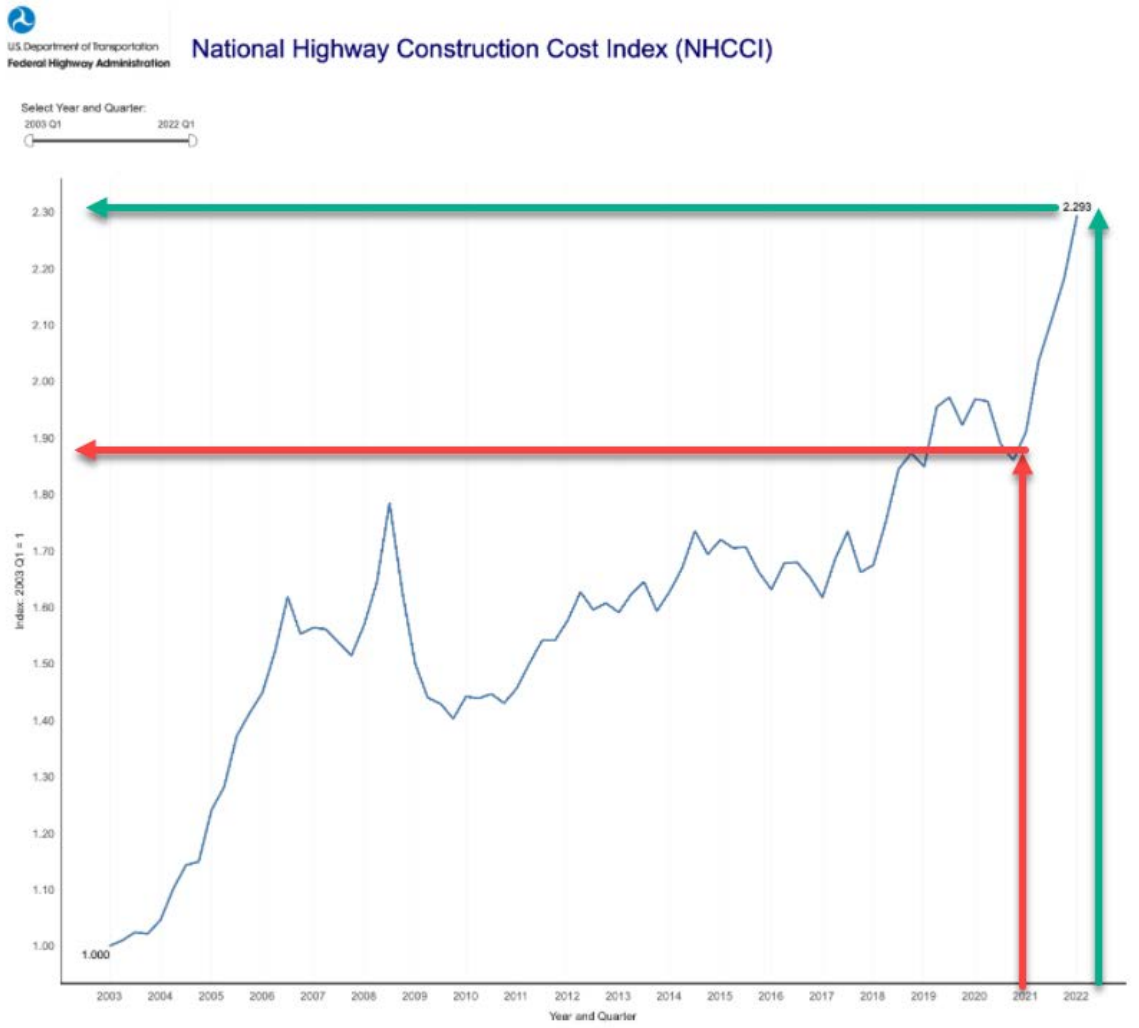
BRIDGE PLANNING

- Step 2 – Building Current & Updated TYP
  - Want to be able to see “gains” from LLC

- Scenario 1 – Current TYP – **Business As Usual (BAU)**
  - Update costs for inflation
  - Current TYP is only 10 out of 12 years, need to fill out years 11 & 12.
  - Business As Usual → fill up years 11 & 12 with replacements.

- Scenario 2 – Updated TYP – **Revised & Rescoped (R&R)**
  - Update costs for inflation
  - Rescope selected TYP projects
  - Add new work according to BridgeCare screening

BRIDGE PLANNING



2021 Index– 1.85

2022 Index – 2.31

Net = 2.31/1.85 = 1.25 → <u>25%</u>

BRIDGE PLANNING

- Adams County – Bridge Funding (2023 - Pre TIP Update)

State Bridges								2023 (Pre TIP/TYP Update)		
MPMS	BRKEY	B/C/A/S	ADT	Detour	Risk	DA (SF)	Width	Const $	Scope	LET
90692	85	S	7572	7	1465	315	0	$805,000	Replacement	2023
106666	102	S	8789	15	3047	445	1	$788,201	Replacement	2023
87433	72	S	3148	8	1322	260	1	$1,062,900	Replacement	2024
106665	99	B	4830	5	2440	1002	1	$1,232,800	Rehabilitation	2024
87431	181	S	485	8	367	269	1	$521,984	Replacement	2024
99832	281	B	592	7	2556	4748	1	$3,193,000	Preservation	2024
90740	246	B	1006	9	1457	2262	0	$3,136,000	Replacement	2026
90698	168	B	1185	12	2790	2891	1	$2,200,000	Replacement	2027
78642	201	B	214	12	2812	7069	0	$5,655,200	Rehabilitation	2027
80962	238	B	2507	3	2139	1450	1	$1,305,000	Replacement	2028
90752	290	C	726	8	548	528	0	$800,000	Replacement	2028
90782	366	B	1146	9	1429	2059	0	$1,350,000	Replacement	2029
90782	367	B	1146	9	1216	1491	0	$1,350,000	Replacement	2029
117174	303	C	182	7	424	400	0	$500,000	Replacement	2030
99727	11	C	9267	7	3145	462	0	$100,000	Preservation	2034
90686	84	S	6849	7	1795	473	0	$355,000	Replacement	2034
90699	176	B	427	11	864	754	1	$600,000	Replacement	2034
99751	249	B	623	13	1702	1882	0	$250,000	Preservation	2034
99751	250	C	663	12	744	360	0	$250,000	Preservation	2034
99752	252	A	355	5	952	882	0	$115,000	Preservation	2034
99756	253	B	911	7	1264	729	0	$100,000	Preservation	2034
99756	254	S	904	7	1184	640	0	$75,000	Preservation	2034
87432	278	S	656	2	699	301	1	$362,000	Replacement	2034

In “Project Delivery Pipeline” Do not modify

In TIP – Rescope and add projects

In TYP – Rescope, Replace, Add, or change Let Dates

BRIDGE PLANNING

Bridge Scope Review Committee

- Staff
  - District Bridge Engineer
  - Assistant Bridge Engineer – Design
  - Assistant Bridge Engineer – Inspection
  - Planning & Programming Unit Delegate
  - Construction Unit – Structure Control Engineer
- Review inspection reports for every project on TYP
  - Adjust scope with an emphasis on LLC
  - Total Projects Reviewed = 570
  - Total Projects Rescoped = 275

Selected Cost Data - Total Cost		
#	Scope	Cost / SF
0	None	*$0*
1	Minor Repairs	*$100*
2	Preservation	*$168*
3	Rehab & Deck Replacement	*$320*
4	Rehab & SS Replacement	*$619*
5	Full Replacement	*$859*
6	Culvert Replacement	*$1,690*
7	Culvert Relining	*$846*

BRIDGE PLANNING – TIP UPDATE

- Adams County – Bridge Funding (2023 – BAU vs R&R)

Bridges		2023 (Pre TIP/TYP Update)		
MPMS	BRKEY	Const $	Scope	LET
90692	85	$805,000	Replacement	2023
106666	102	$788,201	Replacement	2023
87433	72	$1,062,900	Replacement	2024
106665	99	$1,232,800	Rehabilitation	2024
87431	181	$521,984	Replacement	2024
99832	281	$3,193,000	Preservation	2025
90740	246	$2,569,111	Replacement	2026
90698	168	$3,382,015	Replacement	2027
78642	201	$5,294,866	Rehabilitation	2028
80962	238	$1,747,160	Replacement	2030
90752	290	$636,207	Replacement	2030
90782	366	$2,555,396	Replacement	2030
90782	367	$1,850,459	Replacement	2031
117174	303	$511,327	Replacement	2031
99727	11	$130,001	Preservation	2031
90686	84	$680,533	Replacement	2031
90699	176	$1,084,824	Replacement	2032
99751	249	$529,570	Preservation	2032
99751	250	$101,299	Preservation	2033
99752	252	$248,183	Preservation	2033
99756	253	$205,131	Preservation	2034
99756	254	$180,088	Preservation	2034
87432	278	$433,066	Replacement	2034

In "Project Delivery Pipeline"
Do not modify

In TIP – Rescope and add projects

$22 Million → $17 Million

In TYP – Rescope, Replace, Add, or change Let Dates

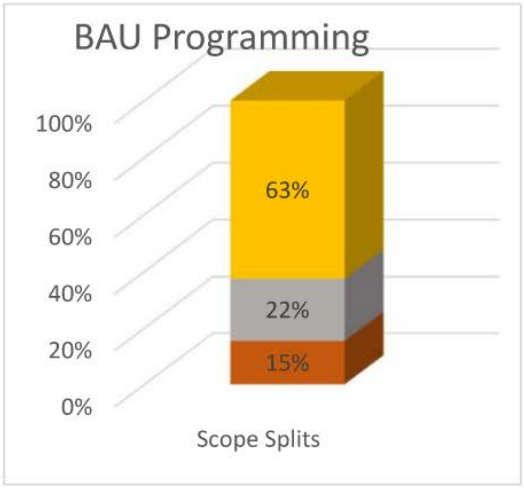
"Frees" ~$5 million

2023 (Post TIP/TYP Update)	
Const $	Scope
$1,851,315	Rehabilitation
$2,437,098	Rehabilitation
$6,322,042	Rehabilitation
$362,513	Preservation
$1,327,904	Replacement
$306,410	Preservation
$383,946	Preservation
$1,036,167	Replacement
$118,969	Preservation
$1,225,268	Replacement
$380,927	Rehabilitation
$297,126	Preservation
$58,541	Preservation
$0	Remove
$122,102	Preservation
$0	Remove
$852,017	Replacement

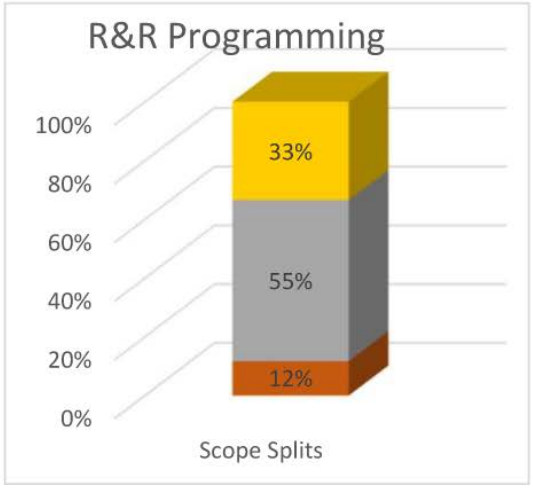
BRIDGE PLANNING – TIP UPDATE

- Adams County – Bridge Funding (2023 – BAU vs R&R)

Total	Funding	% Funding
Preservation	$4,587,273	15%
Rehabilitation	$6,527,666	22%
Replacement	$18,628,184	63%



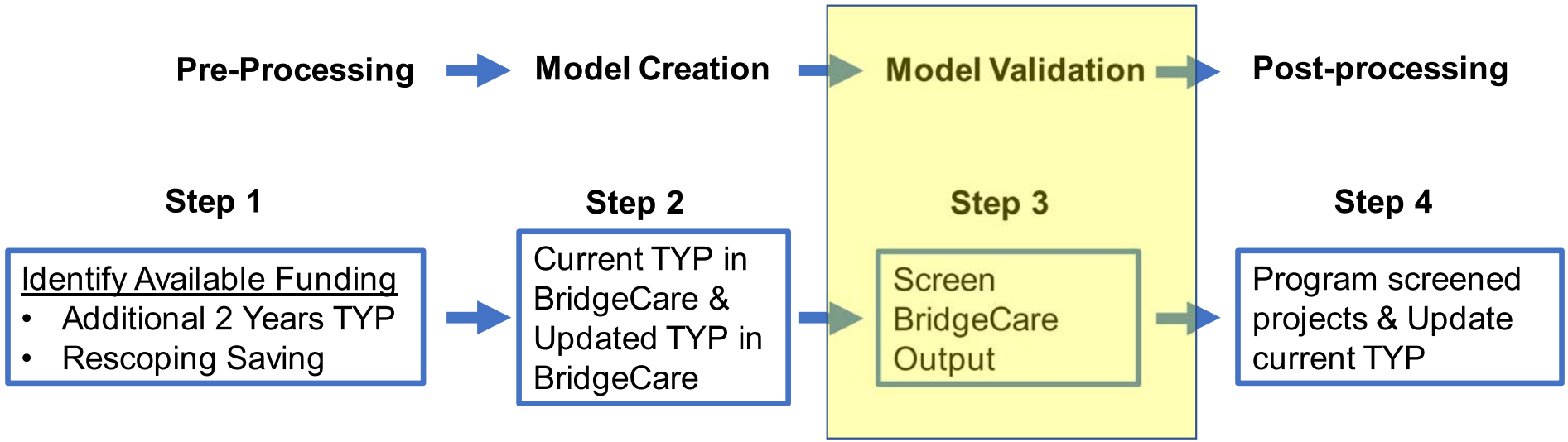
Total	Funding	% Funding
Preservation	$3,534,439	12%
Rehabilitation	$16,555,500	55%
Replacement	$10,088,764	33%



Close match to BridgeCare

BRIDGE PLANNING

- High-level overview



BRIDGE PLANNING

- Step 3 – Model Validation
  - Verify MPMS treatments
  - Verify MPMS budgets
  - Verify BridgeCare treatments
  - Verify BridgeCare budgets

#	Scope	Cost / SF
0	None	*$0*
1	Minor Repairs	*$100*
2	Preservation	*$168*
3	Rehab & Deck Replacement	*$320*
4	Rehab & SS Replacement	*$619*
5	Full Replacement	*$859*
6	Culvert Replacement	*$1,690*
7	Culvert Relining	*$846*

Width	
0	None
1	Minor Neck Down
2	"1 Lane Bridge"

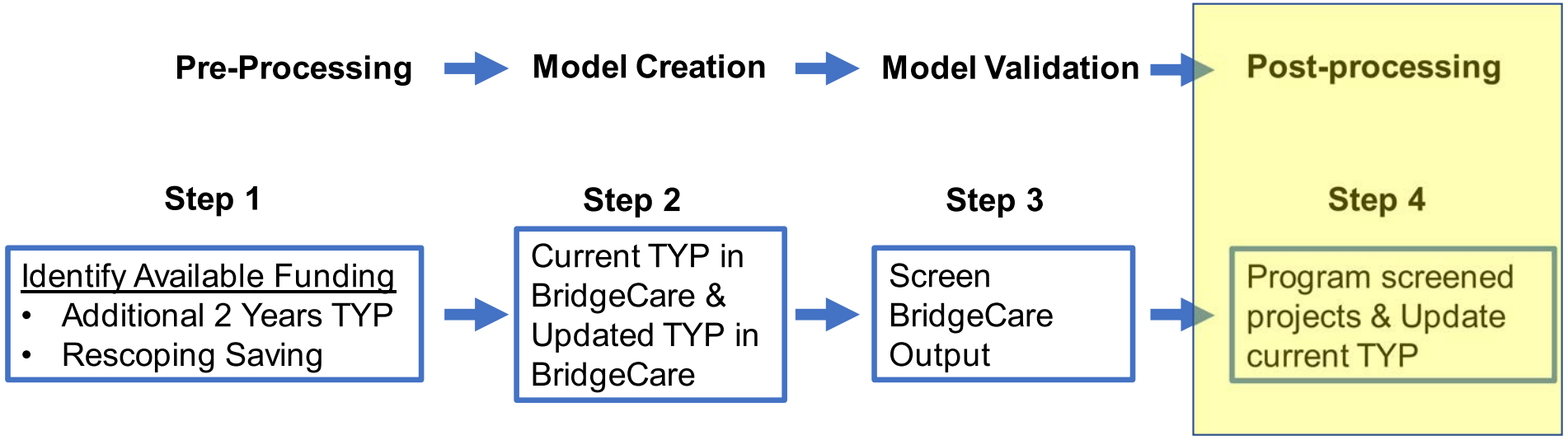
2023 Inflation =	1.21
BAMS --> D8-0 Cost Factor	1.54

BRIDGECARES Suggested Projects

BRKey	Bridge Length	Deck Area	Structure Type	BPN	Risk Score	Treatment	BAMS Yearly Cost	BAMS Scope	Agree %	D8-0 Scope	Notes	$/SF	D8-0 Cost
13	154	7,007	P/S, I beams	2	12,249	Deck Replacement	$ 2,285,636	3	50%	0	LMC Overlay skews recommend.	0	$ -
52	42	2,297	Concrete(in place), Slab (solid)	2	7,850	Superstructure Rep Rehab	$ 1,371,608	4	50%	5	Major cracks in substructure	1,040	$ 3,675,282
100	36	943	Concrete(in place), T-beams	3	3,551	Superstructure Rep Rehab	$ 515,330	4	100%	4	Agree	749	$ 1,087,315
115	45	2,066	Concrete(in place), Slab (solid)	3	13,632	Deck Replacement	$ 547,822	3	100%	3	Agree	387	$ 1,230,938
119	36	1,188	Concrete(in place), T-beams	3	1,864	Deck Replacement	$ 344,304	3	0%	1	Deck is good, scuppers are issue	121	$ 221,247
162	31	775	Steel, I beams	3	1,919	Deck Replacement	$ 193,750	3	75%	3	Paint beams	387	$ 461,862
235	66	2,211	P/S, Box beam - adj	3	8,992	Superstructure Rep Rehab	$ 1,281,577	4	100%	3	Agree	387	$ 1,317,649
294	51	1,811	P/S, Box beam - (spread)	4	1,031	Deck Replacement	$ 590,573	3	100%	3	Agree	387	$ 1,078,970
321	25	450	Masonry, Arch culvert	4	528	Culvert Rehab (Other)	$ 122,932	7	100%	7	Agree	1,024	$ 708,577
342	36	745	Steel, I beams	3	1,329	Superstructure Rep Rehab	$ 431,946	4	100%	3	Agree	387	$ 444,103
447	32	576	Steel, I beams	L	882	Superstructure Rep Rehab	$ 314,705	4	0%	5	One-lane bridge safety concern.	1,040	$ 921,460
						Total =	**$ 8,000,184**					**Total =**	**$ 11,147,402**

BRIDGE PLANNING

- High-level overview



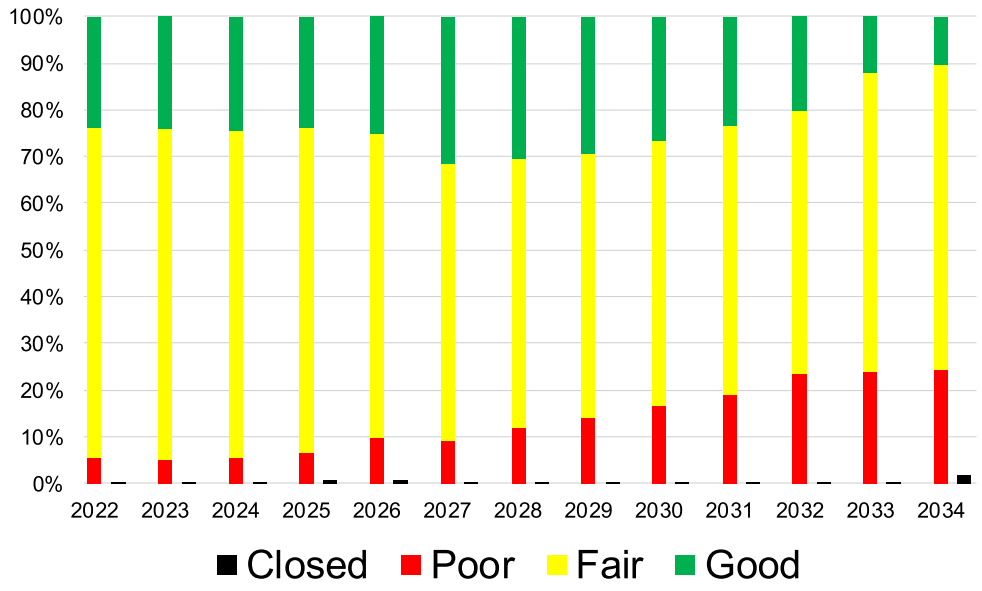
BRIDGE PLANNING – TIP UPDATE

- **Outputs – HATs**
- 4 Graphs to tell the story
  - Performance of network over time
  - Total Deck Area Percentage
  - NHS Deck Area Percentage
  - Non-NHS Deck Area Percentage
- BAU – "Business As Usual" – program replacements
- R&R – Revised & Rescoped – focuses on LLC
- All graphs go from BAU → R&R

BRIDGE PLANNING

- HATs TYP – Business As Usual vs Revised & Rescoped

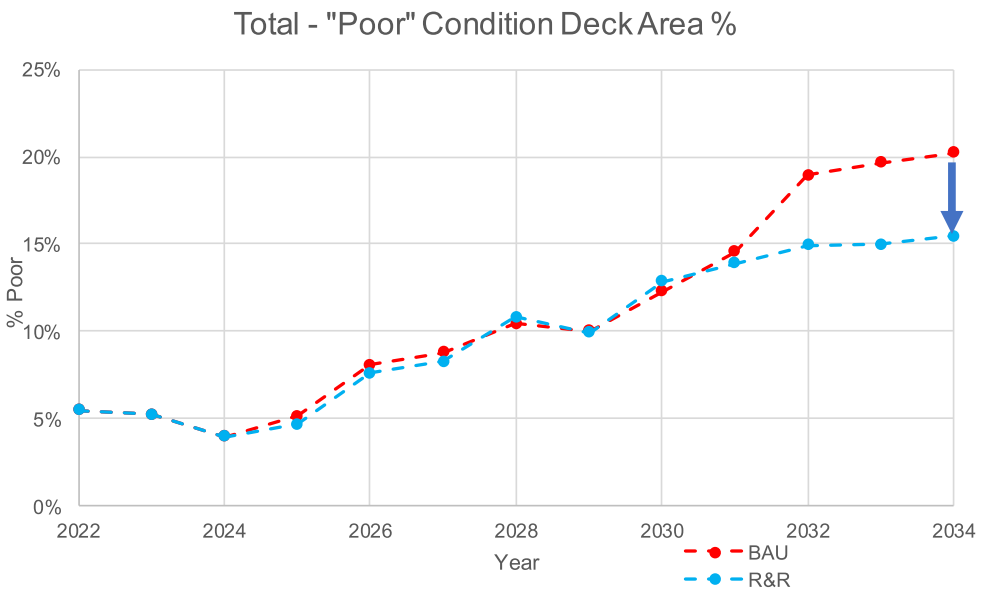
BAU

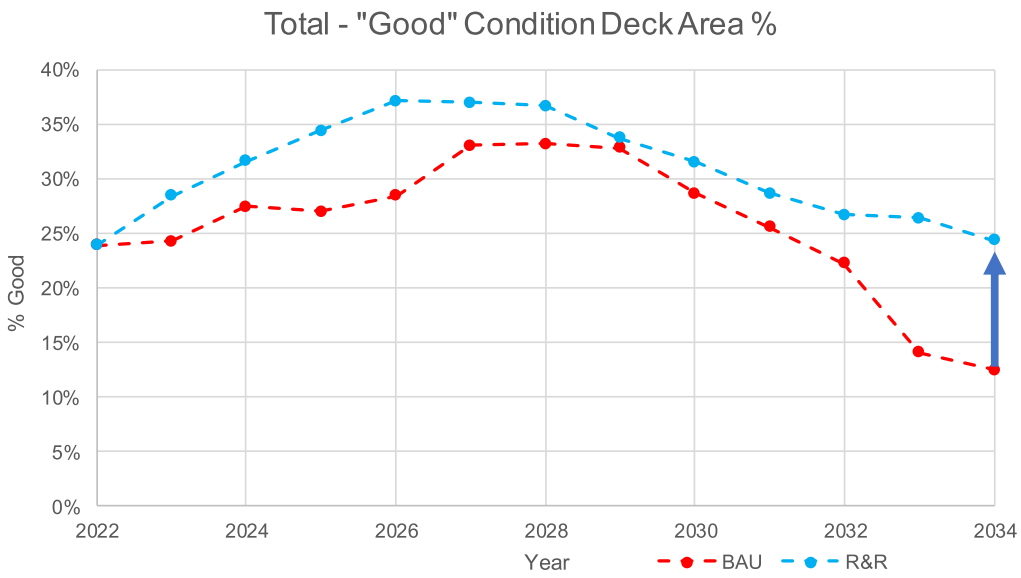


R&R

BRIDGE PLANNING – TIP UPDATE

- HATs TYP – Business As Usual vs Revised & Rescoped



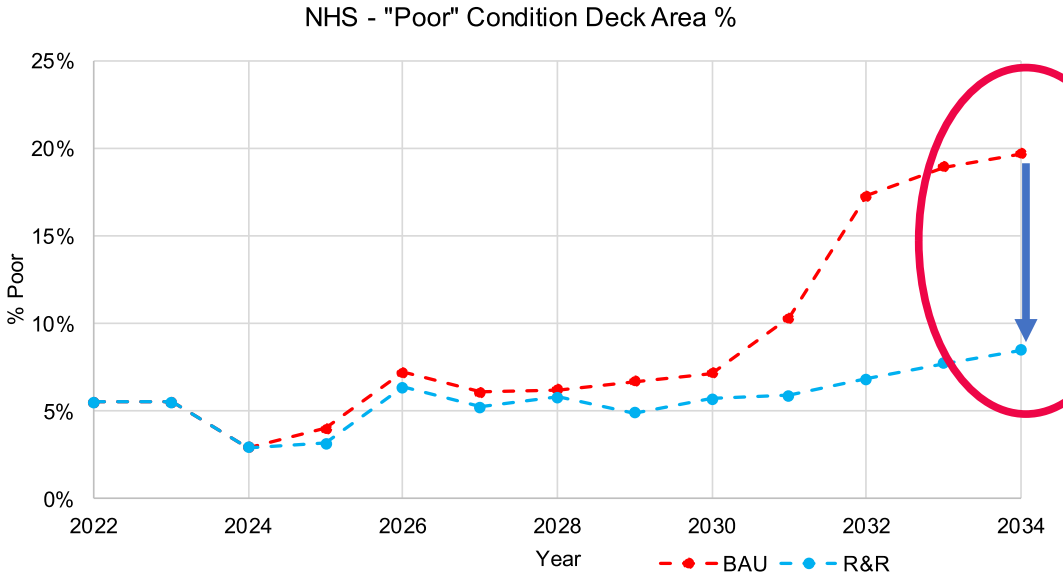


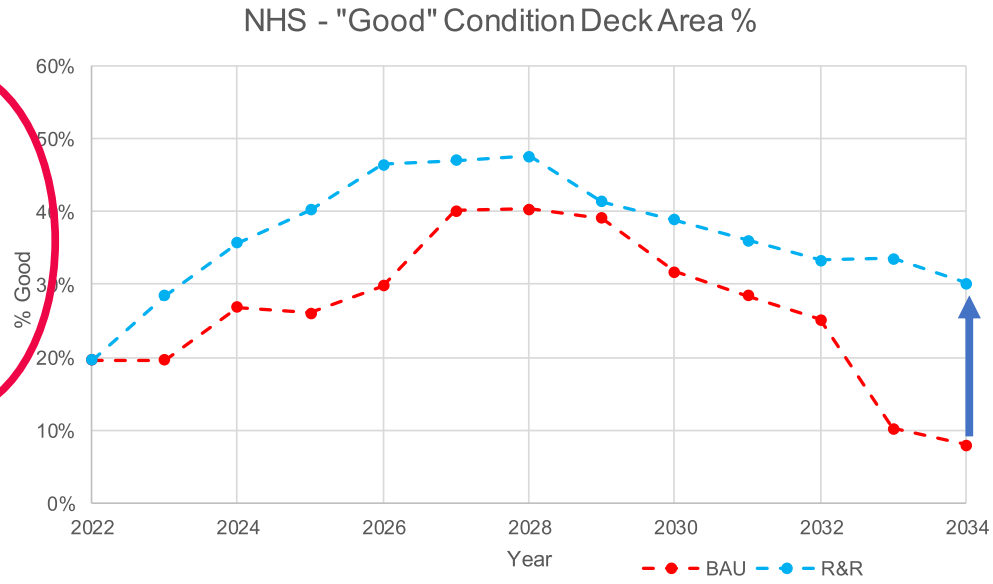
Base 31% reduction in “Poor” bridges at same funding levels

Base 96% increase in “Good” bridges at same funding levels

BRIDGE PLANNING – TIP UPDATE

- HATs TYP – Business As Usual vs Revised & Rescoped



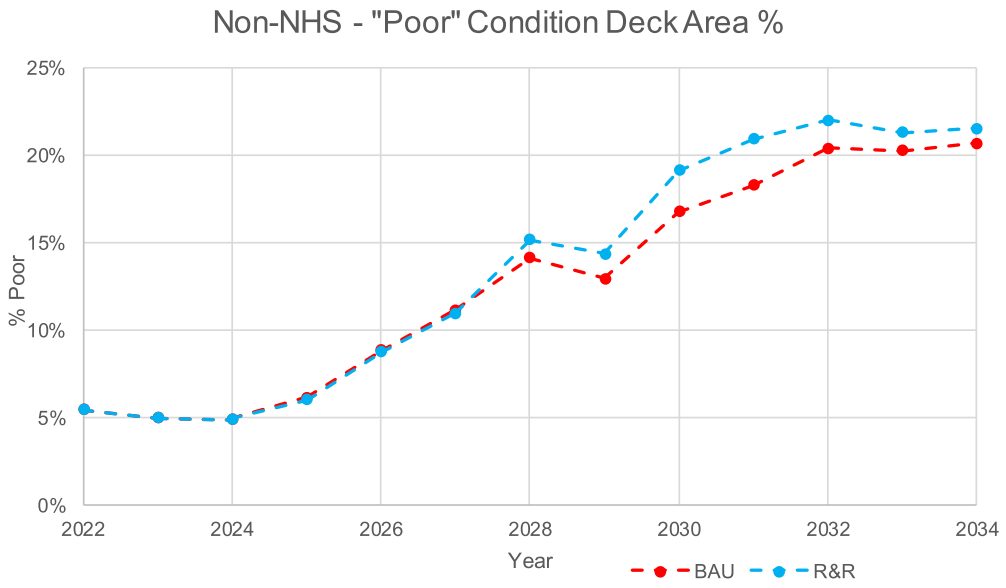


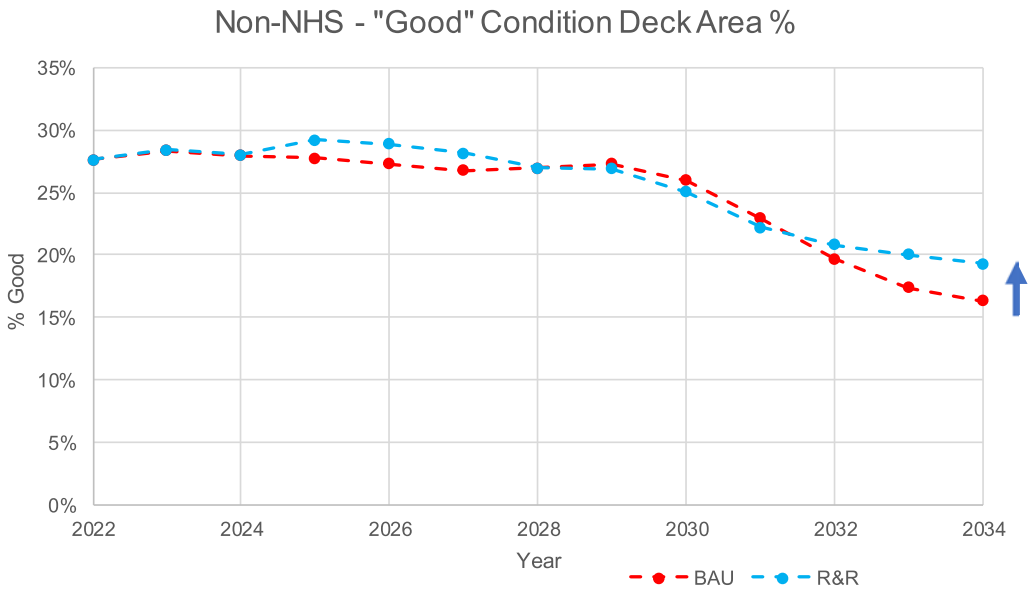
Base 57% reduction in “Poor” NHS bridges at same funding levels

Base 276% increase in “Good” NHS bridges at same funding levels

BRIDGE PLANNING – TIP UPDATE

- HATs TYP – Business As Usual vs Revised & Rescoped





Base 4% increase in “Poor” Non-NHS bridges at same funding levels

Base 18% increase in “Good” Non-NHS bridges at same funding levels

BRIDGE PLANNING – TIP UPDATE

HATs MPO bridge budget = ~$43 M/yr

- Total Deck Area = 5,070,000 SF
  - "Poor" Deck Area = 20.23% → 15.43% → Delta = 4.80%
  - Replacement DA = 4.80% x 5,070,000SF → 243,400 SF
  - Replacement Cost = 243,400 SF x $859/SF = $209M
  - "Closed" Deck Area = 0.09% → 1.24% → -1.15%
  - Replacement DA = 1.15% x 5,070,000 SF → -58,300 SF
  - Replacement Cost = -58,300SF x $859/SF = $-50M
- **"New funding" need for same effect = $159M → 3.7yrs of funding.**
- **Difficult to quantify value for:**
  - **Minimizing issues on NHS system.**
  - **Amount of "good" bridges increasing substantially.**

BRIDGE PLANNING – TIP UPDATE

- **Consultant Take-Aways**
- Major programming changes mostly done for now
- Future efforts aimed at optimizations
  - Grouping projects for efficient bidding/MPT.
  - Corridor projects for limited access highways.
  - Adjusting Let Dates based on condition ratings.
- Future work:
  - Overall funding is unchanged; work will continue to flow.
  - More work on higher risk (i.e. volume) bridges.
  - Less replacements, more preservation & rehab.

- **Derek Mitch, P.E., District Bridge Engineer**

Questions?

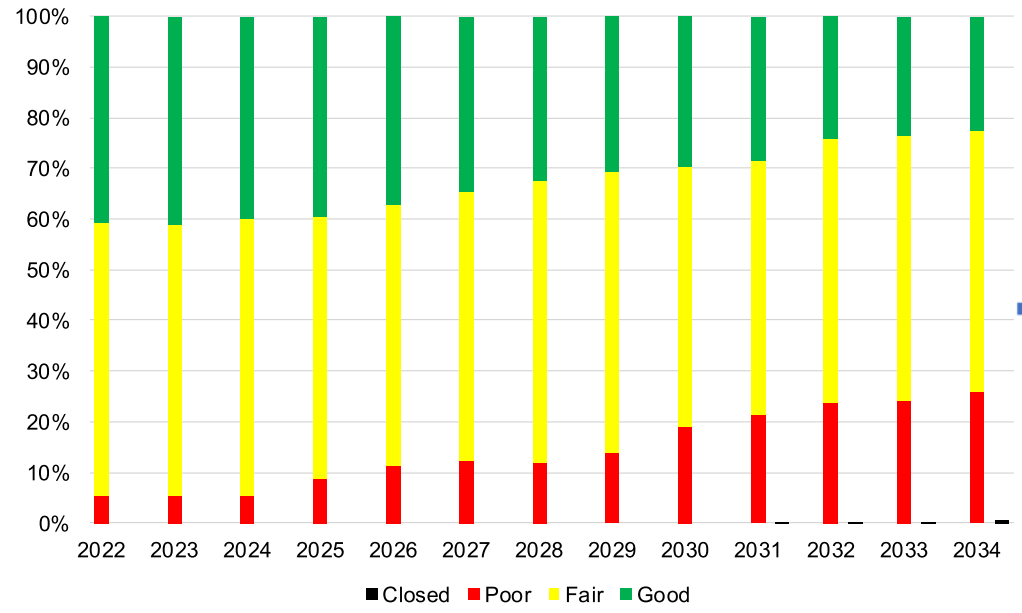
BRIDGE PLANNING – TIP UPDATE

- **Outputs - Adams**
- 4 Graphs to tell the story
- Performance of network over time
- Total Deck Area Percentage
- NHS Deck Area Percentage
- Non-NHS Deck Area Percentage
- BAU – "Business As Usual" – program replacements
- R&R – Revised & Rescoped – focuses on LLC
- All graphs go from BAU → R&R

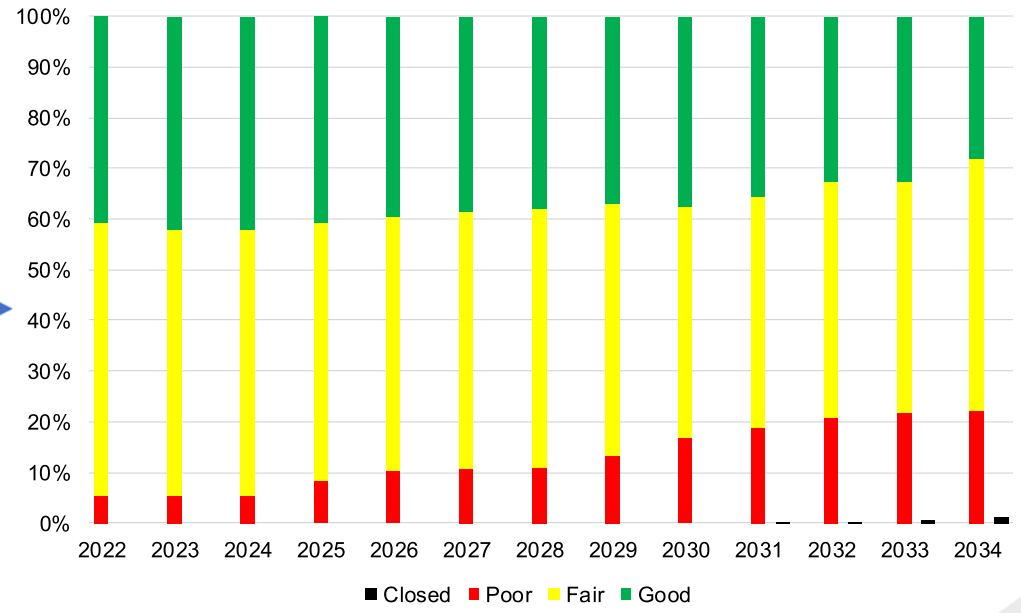
BRIDGE PLANNING

- Adams TYP – Business As Usual vs Revised & Rescoped

BAU

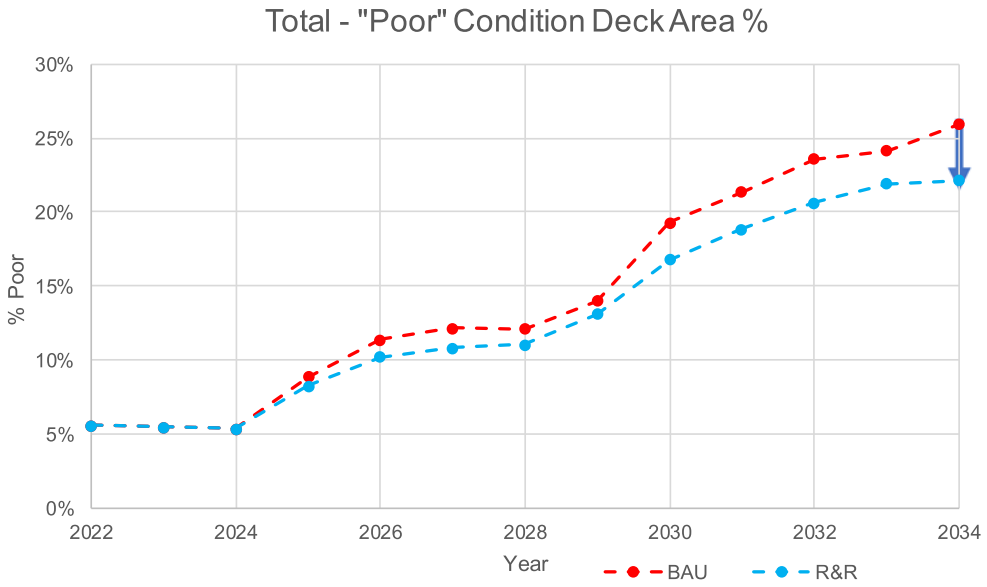


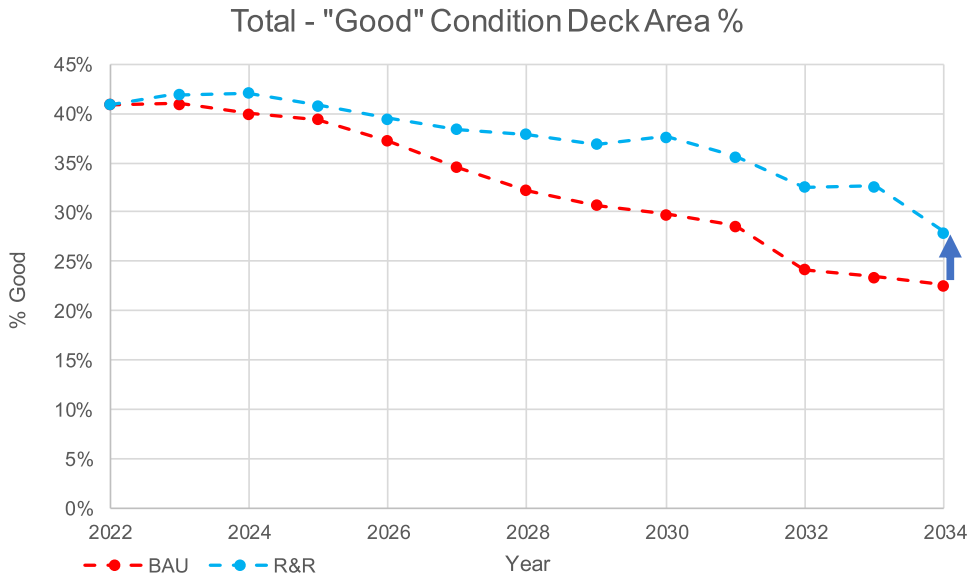
R&R



BRIDGE PLANNING – TIP UPDATE

- Adams TYP – Business As Usual vs Revised & Rescoped



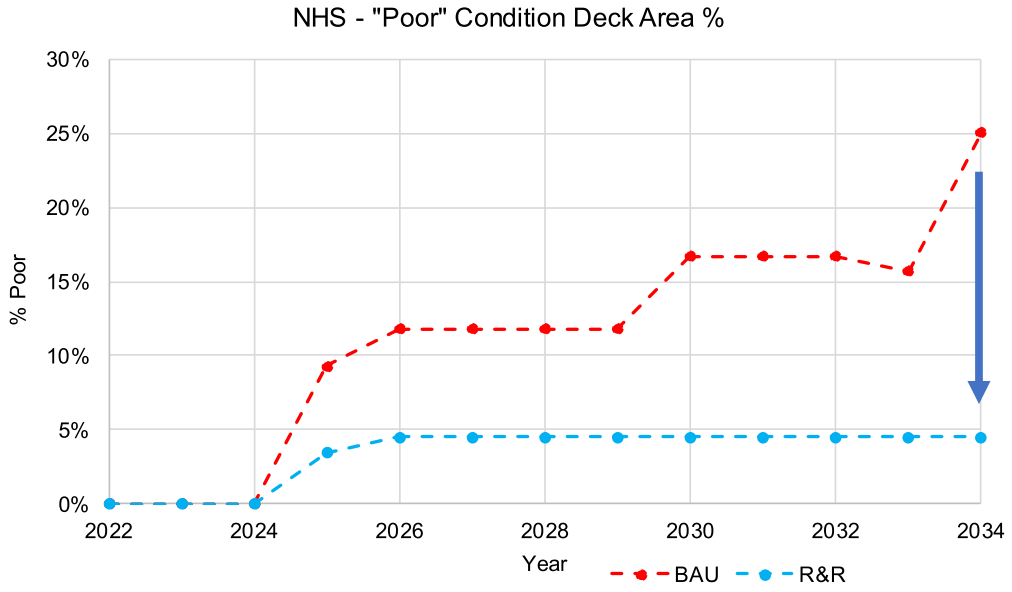


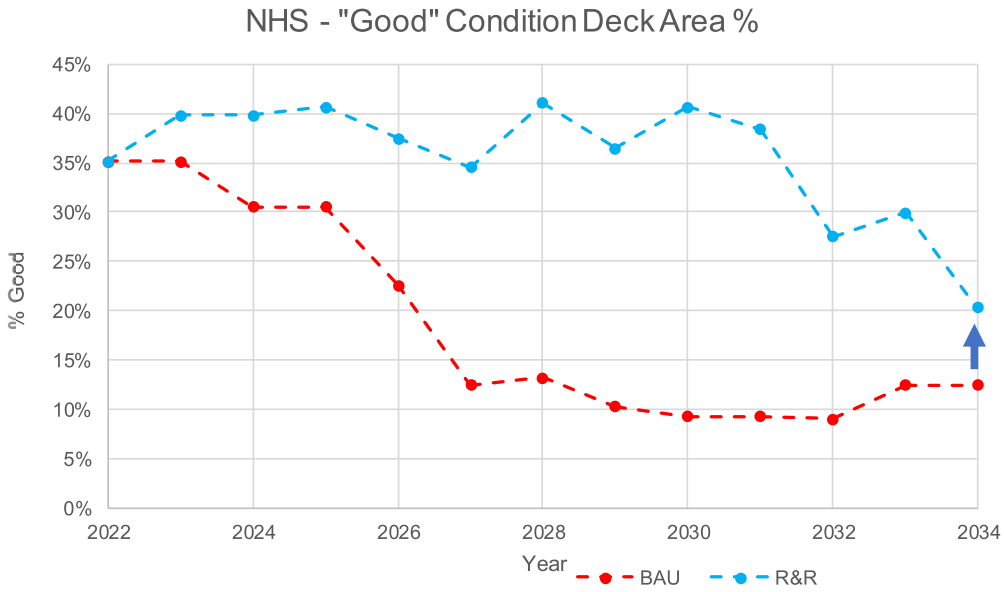
Base 17% reduction in “Poor” bridges at same funding levels

Base 24% increase in “Good” bridges at same funding levels

BRIDGE PLANNING – TIP UPDATE

- Adams TYP – Business As Usual vs Revised & Rescoped



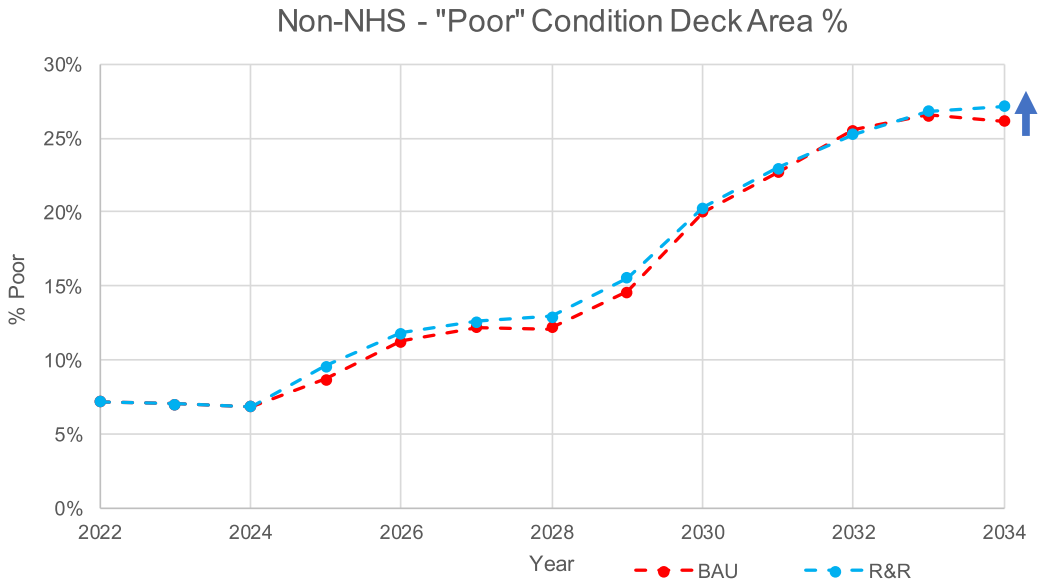


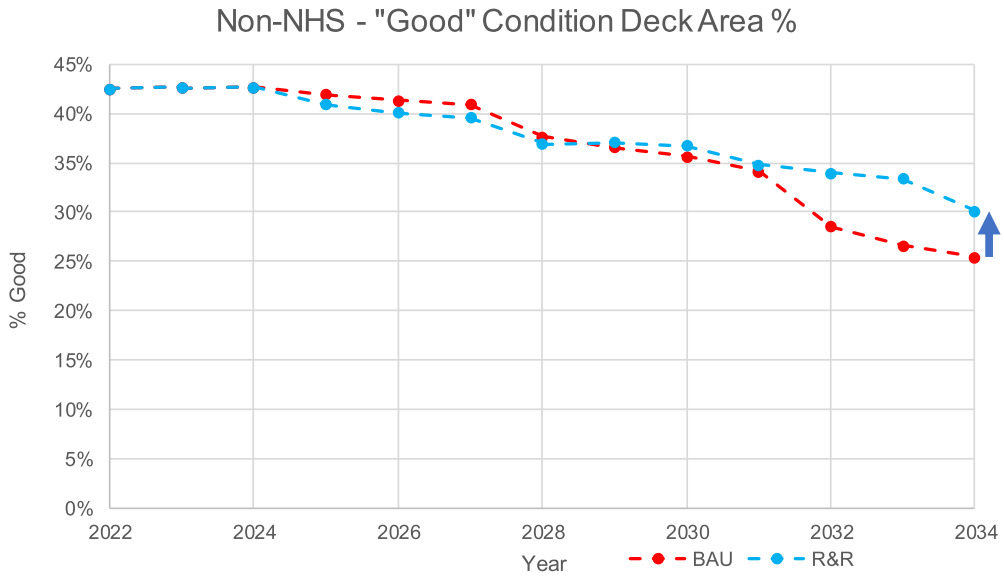
Base 82% reduction in “Poor” NHS bridges at same funding levels

Base 64% increase in “Good” NHS bridges at same funding levels

BRIDGE PLANNING – TIP UPDATE

- Adams TYP – Business As Usual vs Revised & Rescoped





Base 4% increase in “Poor” Non-NHS bridges at same funding levels

Base 18% increase in “Good” Non-NHS bridges at same funding levels

BRIDGE PLANNING – TIP UPDATE

- Currently on TIP vs Updated (Adams only)
- Adams MPO bridge budget = ~$5.5 M/yr
- Total Deck Area = 740,827 SF
  - "Poor" Deck Area = 25.91% → 22.13% → Delta = 3.78%
  - Replacement DA = 3.78% x 740,827 SF → 28,000 SF
  - Replacement Cost = 28,000SF x $859/SF = $24M
  - "Closed" Deck Area = 1.21% → 0.62% → 0.59%
  - Replacement DA = 0.59% x 740,827 SF → 4,400 SF
  - Replacement Cost = 4,400SF x $859/SF = $3.8M
- **Total "New funding" need for same effect = $27.8M → 5yrs of funding**
- **Difficult to quantify value of minimizing issues on NHS system**

BRIDGE PLANNING

- Pennsylvania 2023 Transportation Program Financial Guidance

100% Bridge

40% Bridge

0% Bridge

Bridge Programmatic Funding

Appendix 2: FFY 2023 -- Highway/Bridge Base Funding Allocation ($000)

Region	NHPP	STP	State Highway (Capital)	State Bridge	Off System Bridges (BOF)	HSIP	Highway Freight Program	Rail Highway Safety	CMAQ	STP TAP Set-Aside	STP-Urban	Carbon Reduction	PROTECT	Bridge Formula Program (BRIP)	Total
DVRPC	121,609	27,899	43,021	38,354	[illegible]	24,528	0	0	39,553	7,932	85,174	0	0	41,313	448,080
SPC	93,590	38,926	45,969	49,056	[illegible]	13,550	0	0	22,909	3,657	39,272	0	0	52,795	393,854
Harrisburg	23,190	8,533	11,130	10,690	[illegible]	3,897	0	0	4,968	938	10,067	0	0	11,432	91,758
Scranton/WB	17,218	7,168	8,494	8,712	[illegible]	4,142	0	0	0	805	8,641	0	0	8,584	69,145
Lehigh Valley	19,691	6,836	9,906	7,581	[illegible]	5,224	0	0	6,386	1,333	14,320	0	0	7,848	84,638
NEPA	8,306	7,844	8,319	4,458	[illegible]	3,292	0	0	536	0	0	0	0	5,055	43,101
SEDA-COG	19,685	9,795	12,409	12,650	[illegible]	2,377	0	0	0	0	0	0	0	12,018	78,172
A										0	0	0	0	2,472	16,550
J										0	0	0	0	3,005	23,920
C										0	0	0	0	1,969	15,806
W										0	0	0	0	3,749	24,558
E										0	0	0	0	3,013	25,288
L										848	9,105	0	0	7,827	75,556
Y										489	5,256	0	0	3,509	43,483
R										562	6,031	0	0	6,743	59,755
L										0	0	0	0	1,265	13,137
M										83	894	0	0	2,319	17,667

Lebanon County - Without State Highway						
Funding Pot	NHPP	STP	State Highway	State Bridge	BOF	BRIP
Amount	$2,006	$1,915	$0	$1,372	$1,372	$1,265
Bridge Allocation	$802	$766	$0	$1,372	$1,372	$1,265
Total	$5,577					
BAMS Budget (65% of Total to account for design/insp costs)	$3,625					

→ BridgeCare Budget