
VDOT
Virginia Department of Transportation

STATE OF GOOD REPAIR ESTIMATING AND BUDGETING FOR PROGRAM SUSTAINABILITY

VDOT'S BRIDGE CONSTRUCTION BEST PRACTICES WEB SITE

Adam Matteo, PE April 15, 20201
VTCA Consultant Forum

An Opening Apology

Too many words, not enough pictures

A LITTLE BACKGROUND ON THE STATE OF GOOD REPAIR (SGR) PROGRAM

- The State of Good Repair (SGR) Program was established by the General Assembly in 2015. Code of Virginia § 33.2-369
- The program is restricted by law to be used only for deficient pavements and structurally deficient bridges
- SGR represents about half of all bridge funding at $220M per year average ($1.2B in the Six Year Improvement Plan)
- The average cost of an SGR bridge project is $1,150/SF
- *The program is not just for replacement*

FORMER ESTIMATING PRACTICES

- The Dedicated Bridge Fund (DBF) was the precursor to the State of Good Repair (SGR) program
- This program allotted bridge budgets to each district and allowed flexibility in transferring funds between projects
- Minimal initial estimating effort was required, as project budgets could be reduced or increased as project scopes developed
- Funds could be used for fair or structurally deficient bridges

THE ESTIMATING CHALLENGE: FORMAL DESCRIPTION

- The CTB does not permit VDOT to start spending on a project until it is adopted in the Six Year Improvement Plan (SYIP)
  - Expenditure restriction also applies to preliminary engineering, so we can't fully understand the scope until after the project is selected
- Project budgets are established when added to the SYIP
- There is high degree of scrutiny on budget increase requests (budgets are expected to not go up)
- Projects predict forward for 6 years of costs. So in addition to a budget based on preliminary scope, engineers must predict:
  - Six years of future inflation
  - Future bidding environment
  - Future commodities markets

THE ESTIMATING CHALLENGE: INFORMAL DESCRIPTION

1. Engineers must establish a budget based on a minimal scope definition and a projection of prices six years into the future
2. Your budget had better not go up

SOLVING THE ESTIMATING CHALLENGE - 1

- Develop scopes to 15% prior to selection to get the best definition possible using prescoping funds
- Accessing prescoping funds
  - Traditionally bridge has not had wide access to these funds
  - The Infrastructure Development and Location & Design Divisions have committed to making sure bridge projects have access to this money (thanks to Kim Pryor and Susan Keene)

SOLVING THE ESTIMATING CHALLENGE - 2

- **Provide preliminary plans at the time of selection:**
  - Bridge Plan Sheet
  - Bridge Cross Section
  - Approach Roadway Section
- **Organize estimates using standard form. Break out cost elements**
  - Contingency by phase
  - Right of way
  - Bridge
  - Inflation
  - Utilities
  - CEI
  - PE
  - Roadway
  - MOT
- **Review and comment on estimates and prescoping documents**

SOLVING THE ESTIMATING CHALLENGE - 3

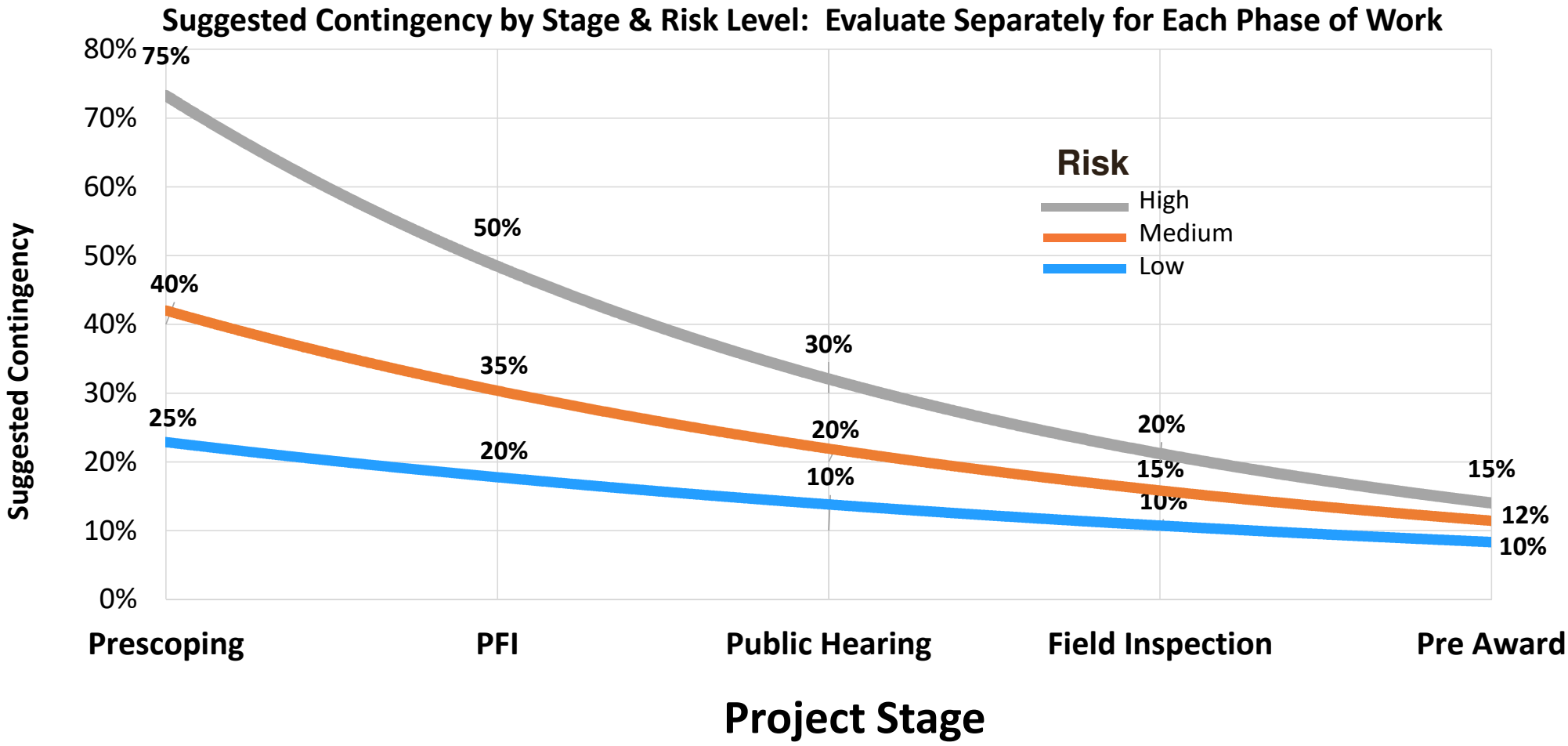
- Establish a single set of consistent estimating guidelines for all construction projects (SMART Scale and SGR)
  - PMO 3.6 Project Development and Budget Estimates
  - PMO Estimate Workbook
  - SGR website
- Provide guidance on contingency levels by phase
- Provide general guidance on annual inflation
- PCES
- Provide square foot costs for bridge projects for 1st cut estimating (coming soon)

SOLVING THE ESTIMATING CHALLENGE - 4

Review projects at milestones

- Use estimate worksheet (available on website)
- Track contingency and inflation as project progresses
- Draw down contingency as scope definition improves
- Draw down inflation as remaining years of project are reduced
- This frees up funds for use on other projects

MANAGING CONTINGENCY (FROM COST ESTIMATE WORKBOOK)



Another Form? What's With You Guys?

- We can't track contingency and inflation if we don't know what they are
- Acting like a business means keeping the program organized, particularly considering its size, complexity, and importance
- By explicitly stating contingency by phase and stage we are keeping track of our assumptions, which can be revisited at any time as the project develops
- Come on, the form isn't that bad. It's just a page.

I don’t share blame

I don’t share credit

I don’t share desert

Who Did The Work?

Todd Springer provided the energy and effort to organize the system. He worked closely with the Project Management Office (PMO) to improve guidance and provide consistency among programs.

A Multiple Choice Test

WHOSE ESTIMATE IS IT ANYWAY?

1. The district bridge office's
2. The consultant's
3. Todd Springer's
4. Pete Buttigieg's
5. VDOT's

WHAT HAPPENS WHEN ESTIMATES DO INCREASE?

- Review scope
  - Can any elements be eliminated or simplified?
  - Were common sense engineering principles applied?
  - Are supplemental funding sources available?
- Review contingency – can it be drawn down?
- Review inflation
- Reach out to other disciplines for input and advice
- When ready to request additional funds, fill out Budget Increase Request Form (available on website)

WHAT HAPPENS WHEN ESTIMATES DO INCREASE?

Additional Published Guidance Forthcoming

- Budget increase requests are limited to one per project
- Adjust estimate in Project Pool but do not request budget increase at every milestone. Make sure you can live with amount requested
- This may create discomfort with dashboard
- Infrastructure Investment Division establishes limits on budget increases in IIM-IID-3
  - All budget increases require approval of state structure & bridge engineer
  - Estimates over established thresholds require chief engineer approval

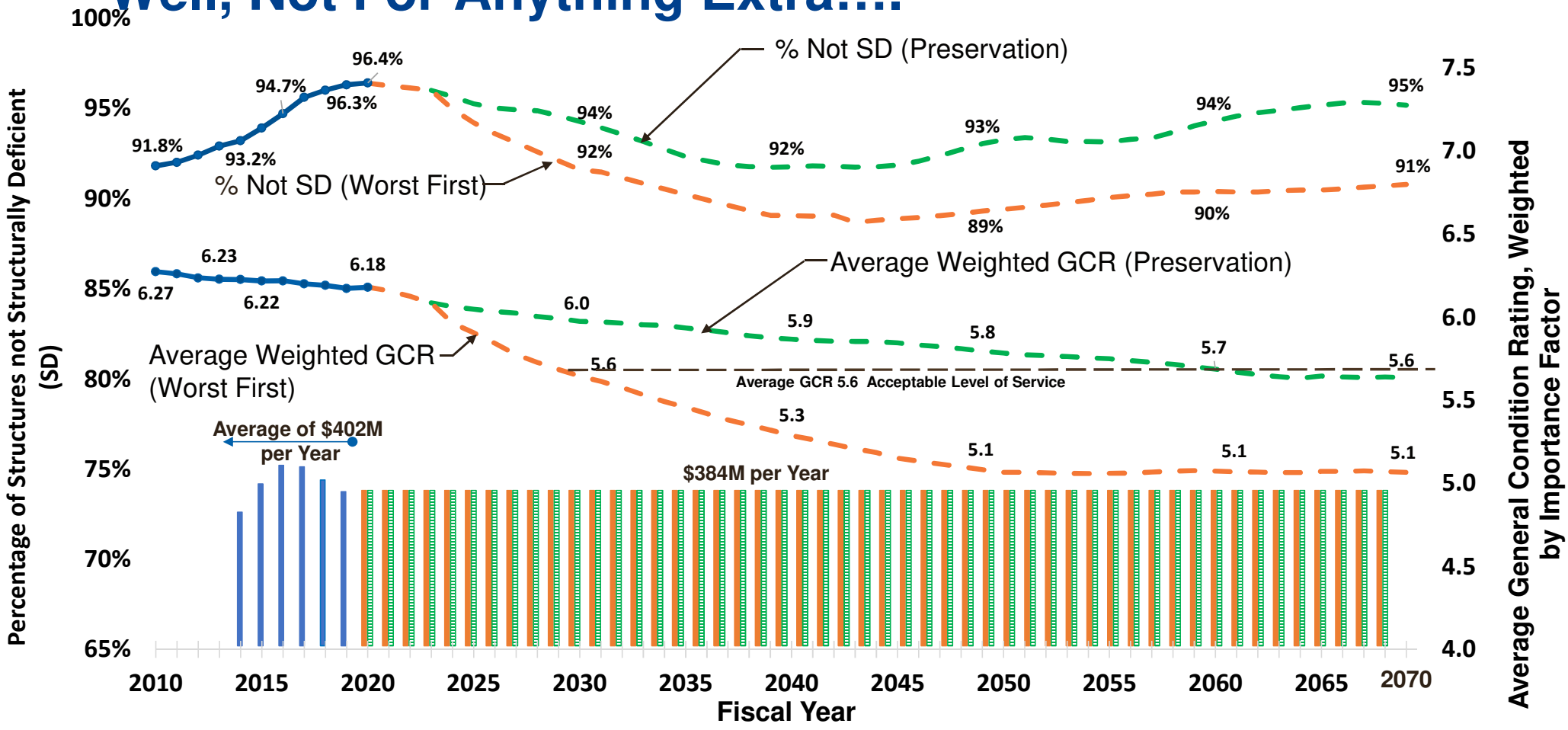
IMPORTANT LIMITS ON COSTS – APPROACH WORK

- The SGR Bridge Program is NOT a roadway improvement program
- Reasonable but strict limits are established in IIM-S&B-95
- VDOT has a long history of saying “hey, while we’re out there...”
- Don’t do this – it will break our bridge program

SO WHAT DO WE DO IF A ROADWAY ADJACENT TO A BRIDGE NEEDS IMPROVEMENT?

- Call 1-800-SMART-SCALE
- The SMART SCALE program was developed for just this sort of thing
- SMART SCALE applications can and should be submitted in concert with SGR funding applications
- We will be developing guidance this year to establish best practices for coordinated SMART SCALE/SGR applications
- We hope that joint applications will receive more favorable scores (this has not been established yet)

What's The Big Deal? Doesn't SGR Have Plenty of $$? Well, Not For Anything Extra….



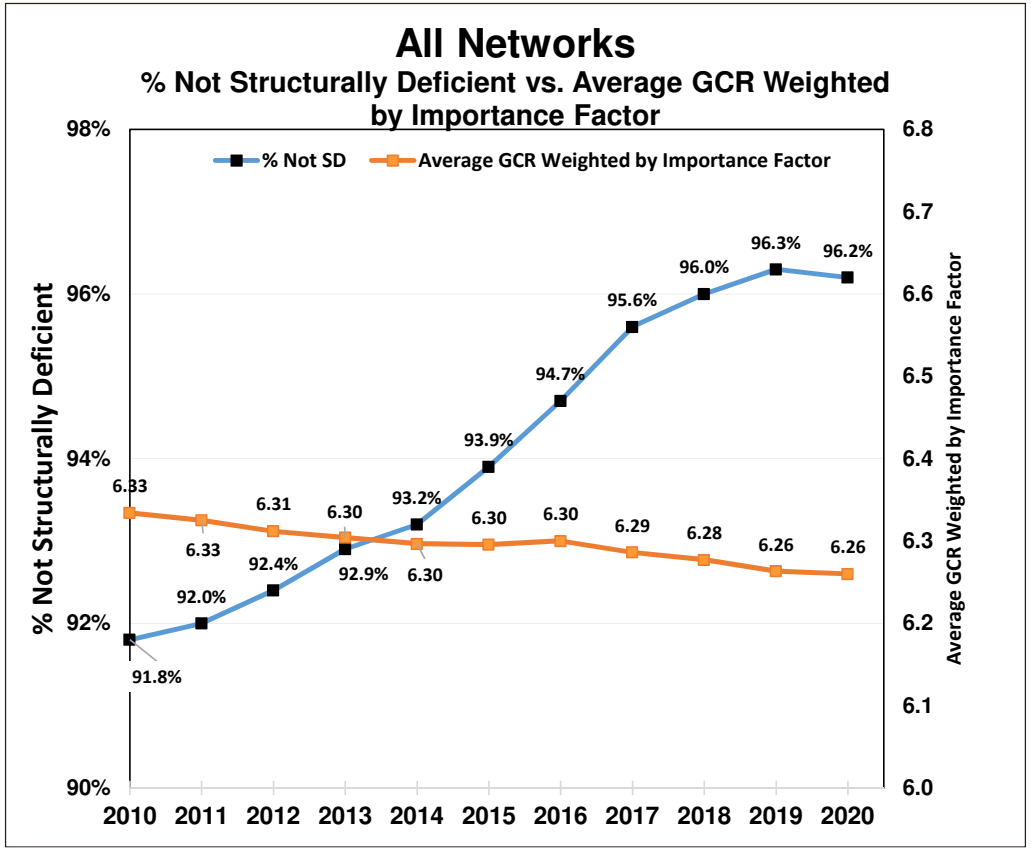
Actual

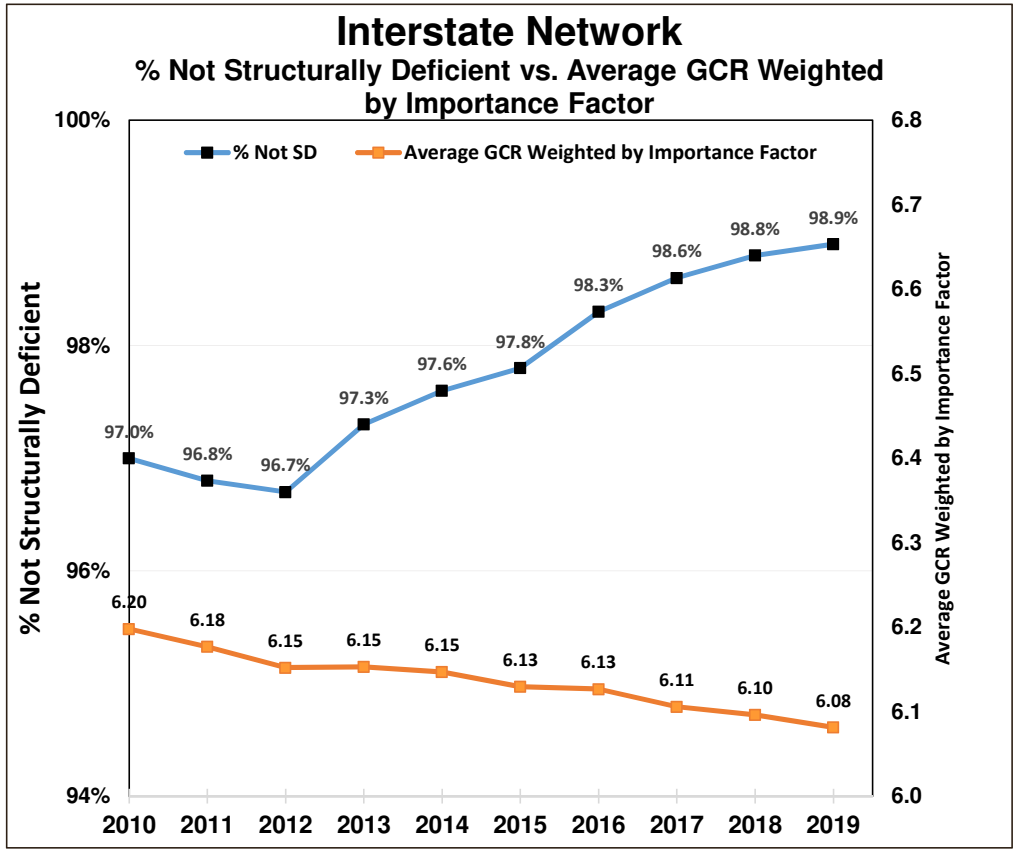
Results w/ Current Approach

Results with Proposed Approach

- All Future Expenditures Are in 2019 Dollars
- Excludes Special Structures

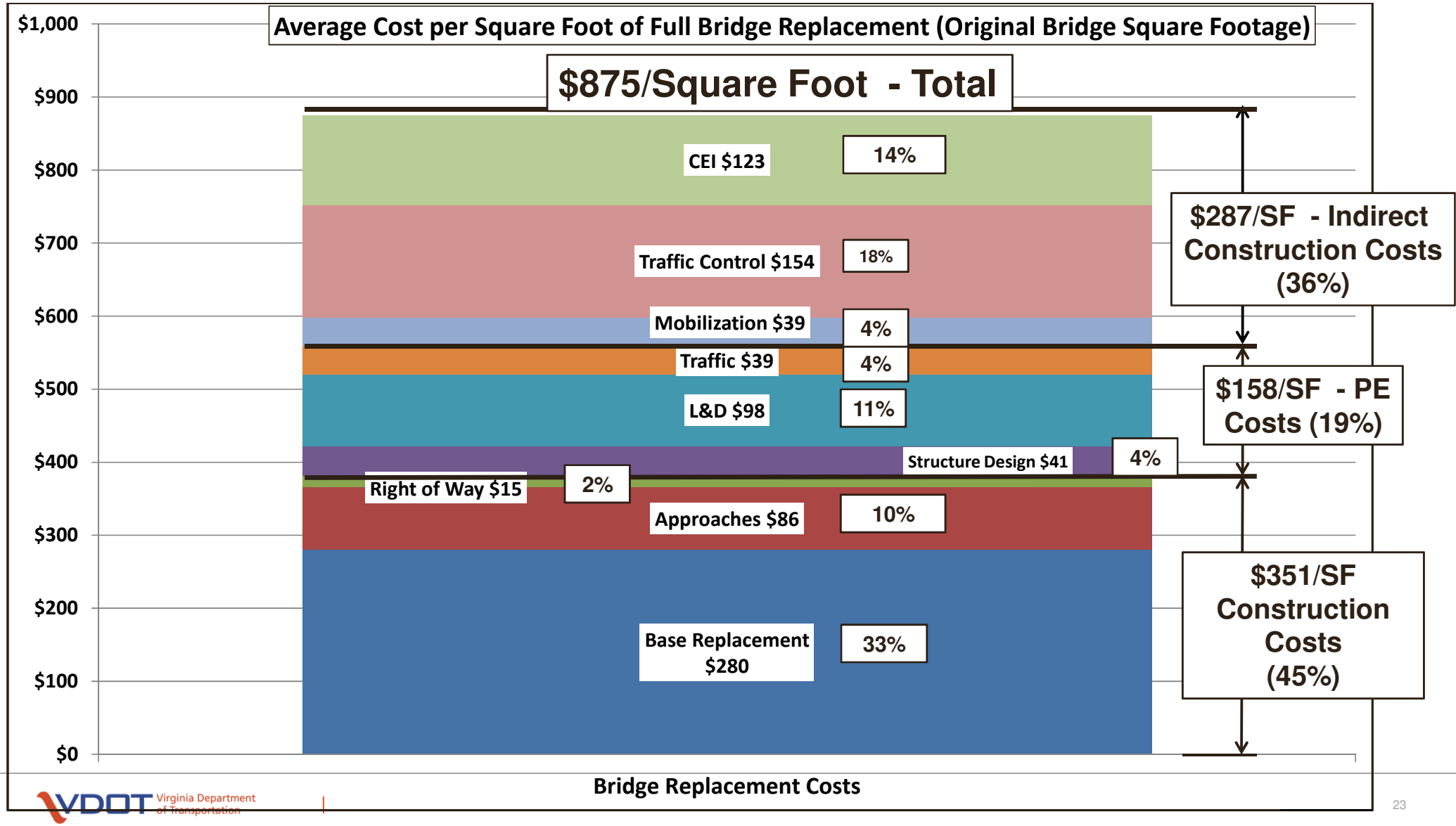
Overall Inventory Condition - Historical





IMPORTANT LIMITS ON COSTS – SCOPE OF WORK

- **The SGR Bridge Program is NOT limited to replacements**
  - **Projects only need to remove SD status (and we hope to make fair bridges eligible soon)**
  - **Selection formula was developed to favor projects that rehabilitated and preserved rather than replaced (cost-effectiveness factor)**
  - **Office practice (Manual of the Structure and Bridge Division) ensures that rehabilitation projects will be long lasting and provide good life cycle value (not a "Band-Aid")**
- **Durable rehabilitations usually cost 15% to 20% of replacement and provide 30 to 40 years if done right**


Average Cost per Square Foot of Full Bridge Replacement (Original Bridge Square Footage)
$875/Square Foot - Total
$1,000
$900
$800
$700
$600
$500
$400
$300
$200
$100
$0
CEI $123
14%
Traffic Control $154
18%
Mobilization $39
4%
Traffic $39
4%
L&D $98
11%
Structure Design $41
4%
Right of Way $15
2%
Approaches $86
10%
Base Replacement $280
33%
$287/SF - Indirect Construction Costs (36%)
$158/SF - PE Costs (19%)
$351/SF Construction Costs (45%)
Bridge Replacement Costs

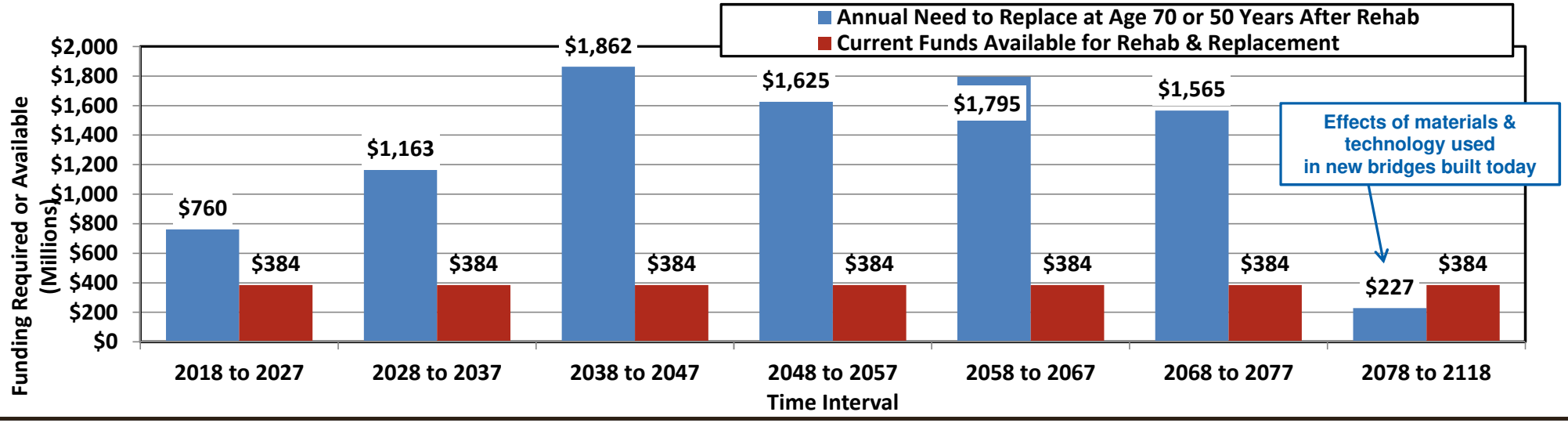
Some Examples of What We Can Do

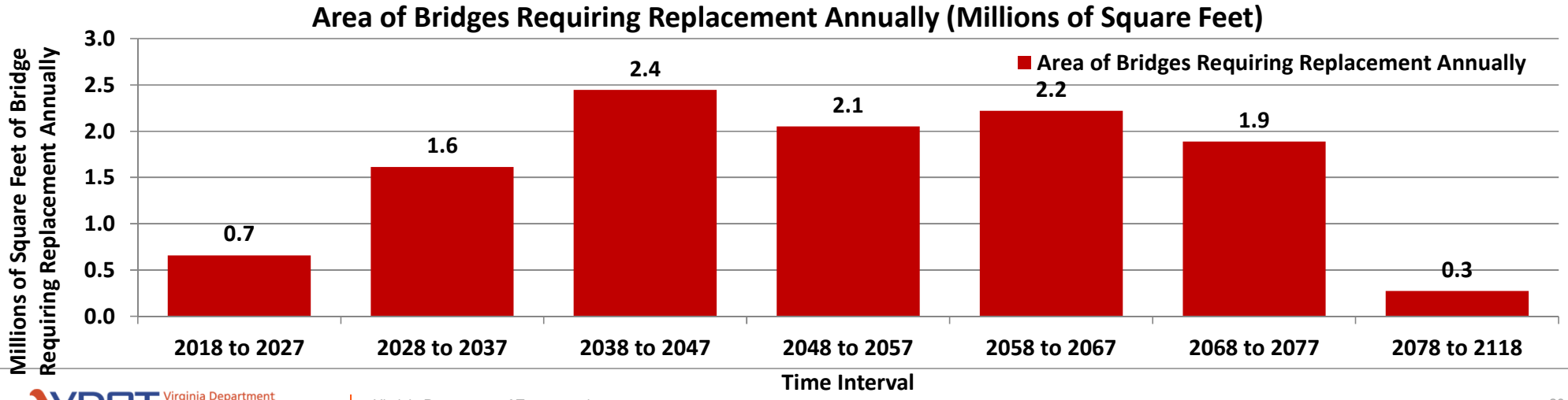
The next few slides are provided to convince you that there is not enough money in the SGR program to replace every bridge, but if we act now we have alternatives

The Age Problem

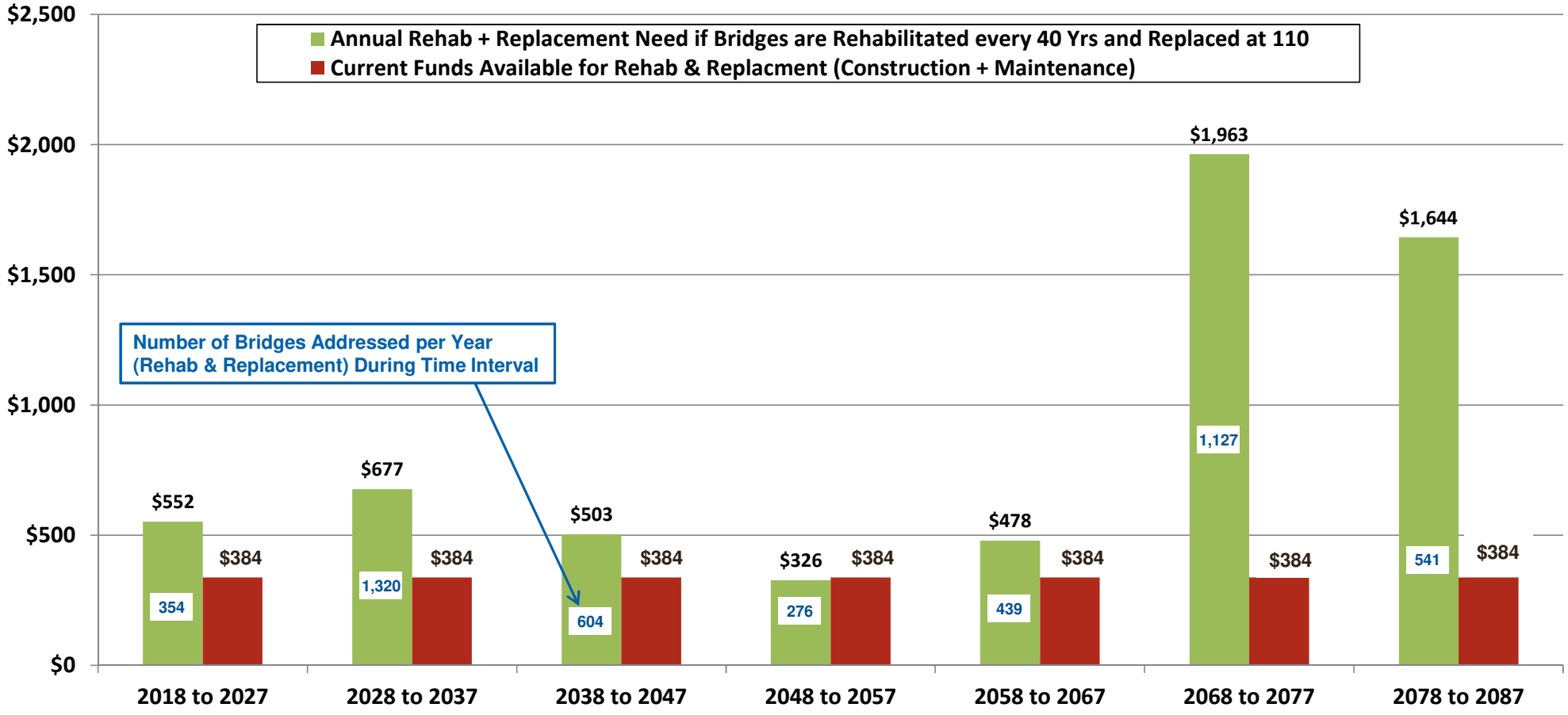
- The Average Age of a Bridge in Virginia is 50 years old
- Bridges built before 2007 were estimated to have a 50 year service life
- 92% of Virginia bridges were built before 2007
- That's a problem

Scenario #1: Annual Funds Needed to Replace at Age 70 or 50 Years after Last Rehab





Scenario #2: Annual Funds Needed to Rehab Every 40 Years and Replace at Age 110

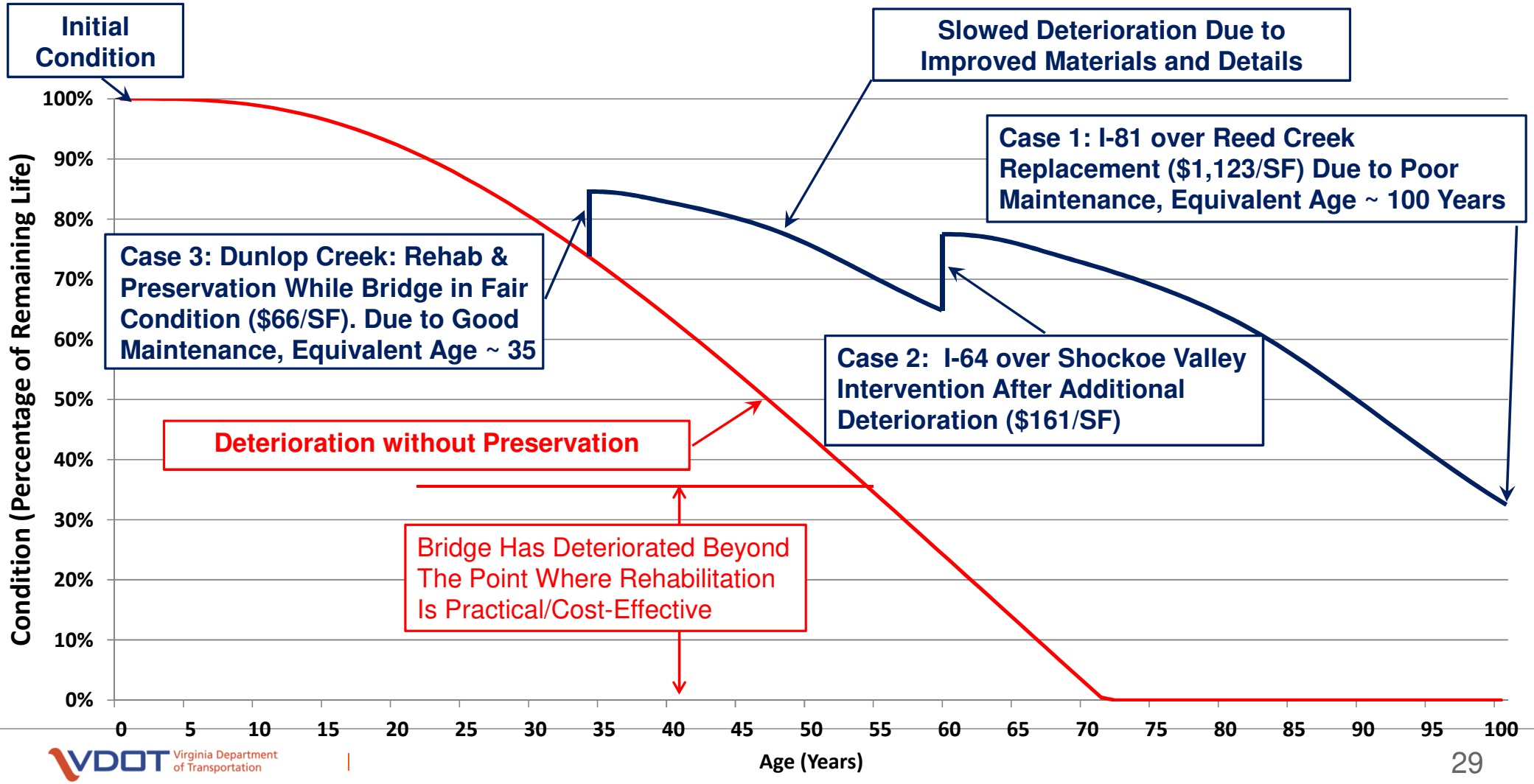


- Assumes Bridges Built Since 2007 Replaced at Age 100
- $384M = $225M from Construction and $159M from Maintenance
- VDOT Replaces 126 Bridges/Year, half of which are completed by Bridge Crews

Three Case Studies of Interstate Bridges

Comparison of Three Recent Interstate Bridge Projects							
Project	**Age at Action**	**Year of Last Rehab**	**Action**	**Required Cost/SF**	**Years to Next Major Effort**	**Cost per Year of Beneficial Life (per Square Foot)**	**Historical Level of Routine Maintenance Provided**
I-81 over Reed Creek	58	1991	Replacement	$1,123	75	$15	Low
I-64 over Shockoe Valley	48	N/A	Rehabilitation - Late	$161	30	$2.1	Medium
I-64 over Dunlop Creek	49	1978	Rehabilitation - Timely	$66	40	$.90	High

Case Study Bridges: Locations on Deterioration Curve



Case 1: I-81 over Reed Creek

- Became SD in 2012
- Poor Maintenance over Life
- Replacement Required ($1,123/SF)
- 2-3 Years of Construction

Fatigue Cracks

Bottom of Bridge Deck

Bottom of Bridge Deck

Case 2:
I-64 over Shockoe Valley

Prior to Treatment

Prior to Treatment

Hydromilling – Preparing the Deck for Placement of a Concrete Overlay

Concrete Overlay

I-64 over Shockoe Valley
After Overlay

I-64 Over Shockoe Valley Project Summary

Ideal Repair and Preservation	
Overlay	$6M
Beam Repairs	$2M
Substructure Surface Repair	$2M
Painting	$11M
Joint Elimination	$1M
Total	$22M
($161/Square Foot)	

Actual Repair (Removed SD Status)	
Overlay and Joint Seals	$6M
Beam Repairs	$2M
Substructure Surface Repair	$2M
Painting *Not Done*	
Joint Elimination *Not Done*	
Total	$10M
($73/Square Foot)	

Repair was Performed, but Maintenance Funding Wasn't Available for All Preservation Activities. Additional Preservation Actions Are Required to Sustain the Life of the Rehabilitated Bridge.

Replacement Would Have Cost $136M ($875/SF)
Plus 14% Size Increase

Case 3:
I-64 over Dunlop Creek

Bridges were built in 1966

Replacement in 10 to 15 Years would have cost $30M to $35M

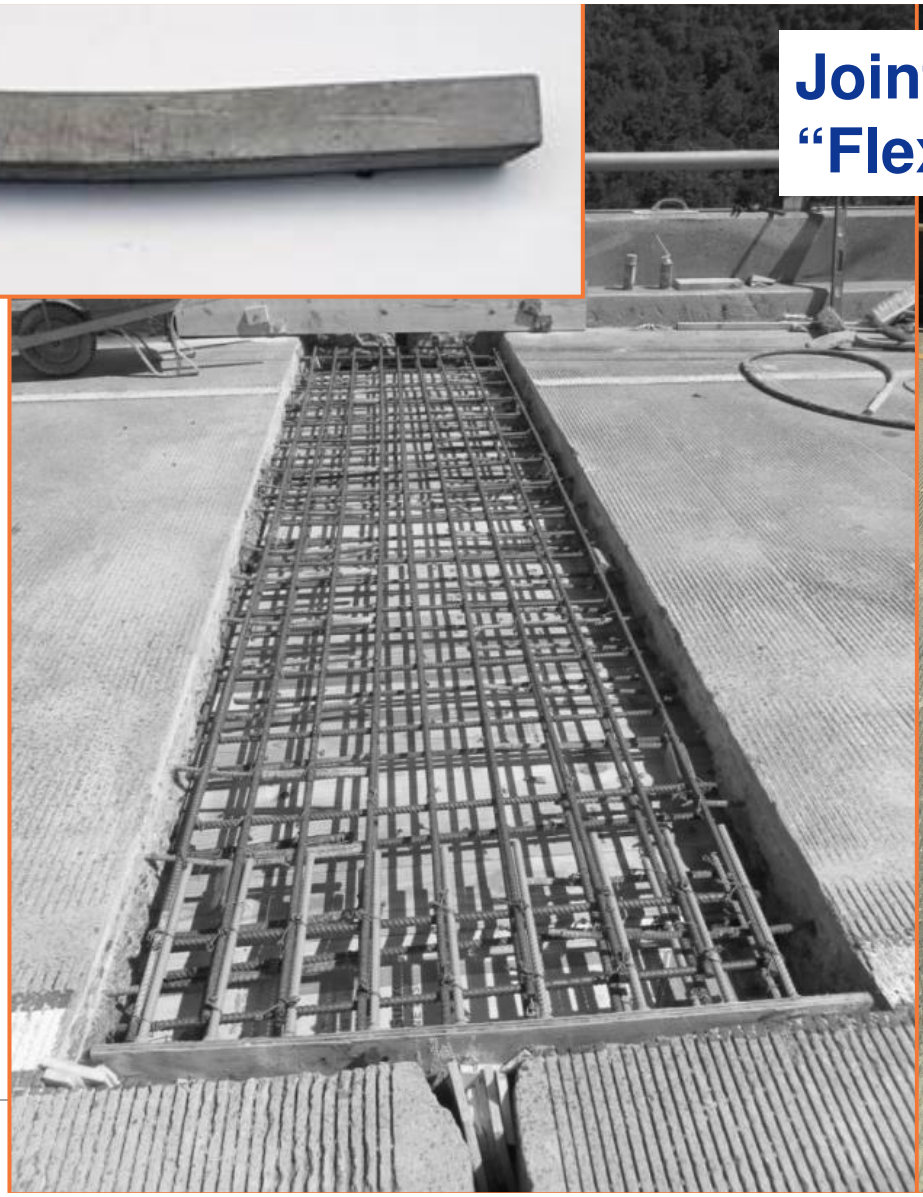
$2.5M was used to rehabilitate the bridges

- Overlays
- Joint elimination
- Substructure repairs
- Painting

Proactive rehabilitation is expected to last 40 years

Prior to Construction: Deteriorated Deck

Joint Elimination with “Flexible” Concrete



Rigid Overlay over Hydromilled Surface

I64 Over Dunlop Creek After Completion

A Tale of 3 Interstate Bridges

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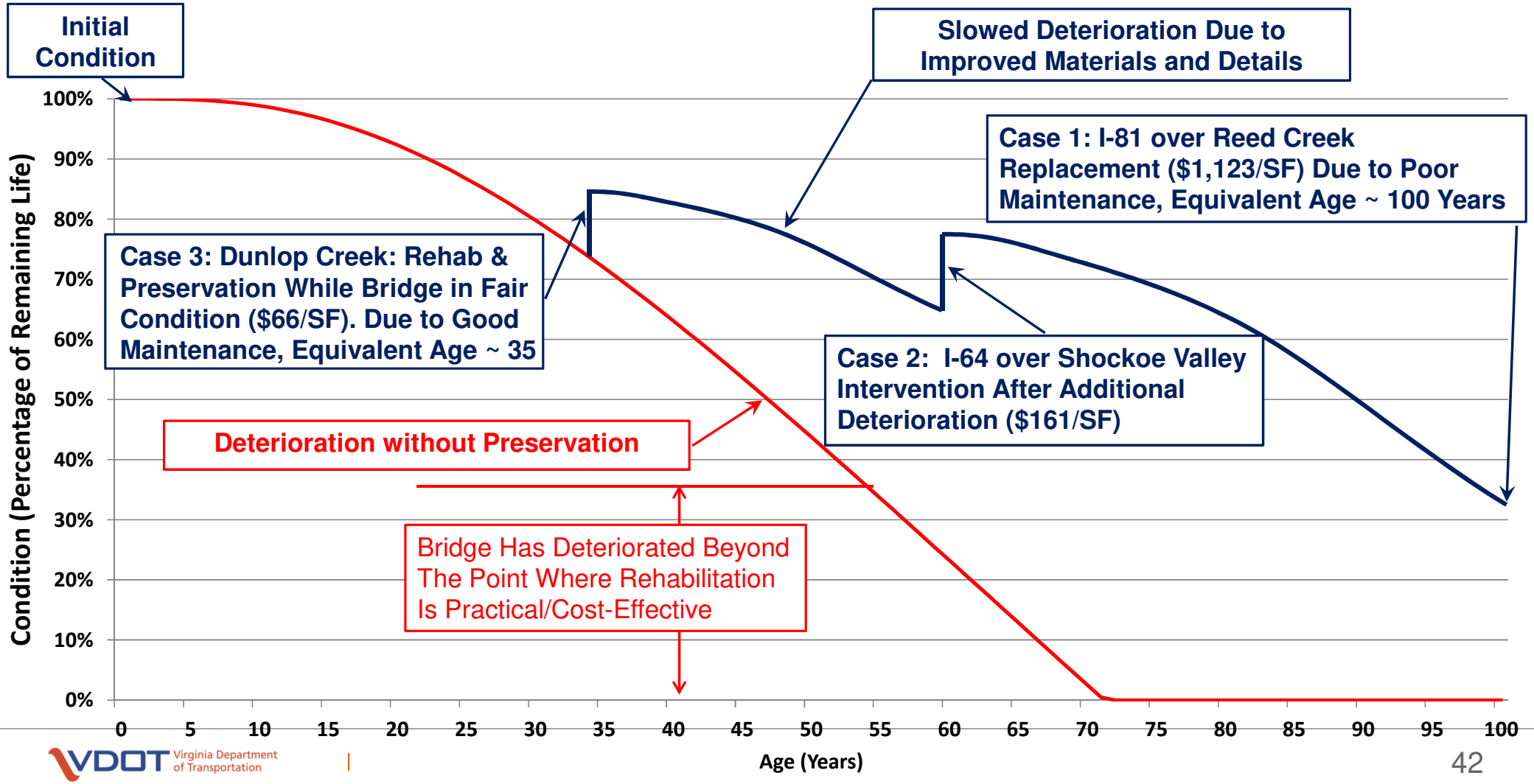

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Bottom of Bridge Deck

Bottom of Bridge Deck

Case 2:
I-64 over Shockoe Valley

Prior to Treatment
Structurally Deficient

Prior to Treatment

Hydromilling – Preparing the Deck for Placement of a Concrete Overlay

Concrete Overlay

I-64 over Shockoe Valley
After Overlay

I-64 Over Shockoe Valley Project Summary

Ideal Repair and Preservation		Actual Repair (Removed SD Status)	
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Beam Repairs	$2M	Beam Repairs	$2M
Substructure Surface Repair	$2M	Substructure Surface Repair	$2M
Painting	$11M	Painting *Not Done*	
Joint Elimination	$1M	Joint Elimination *Not Done*	
Total	**$22M**	**Total**	**$10M**
($161/Square Foot)		**($73/Square Foot)**	

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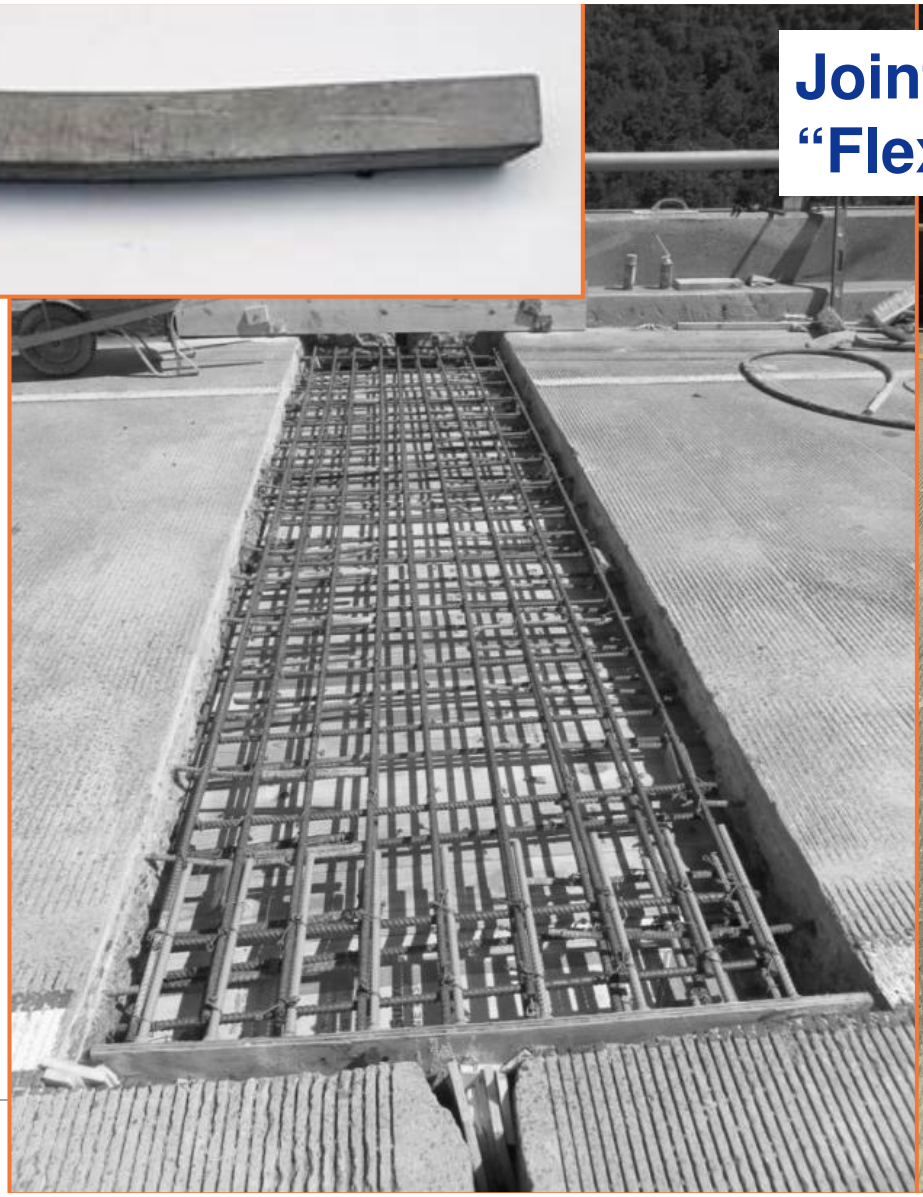


Rigid Overlay over Hydromilled Surface

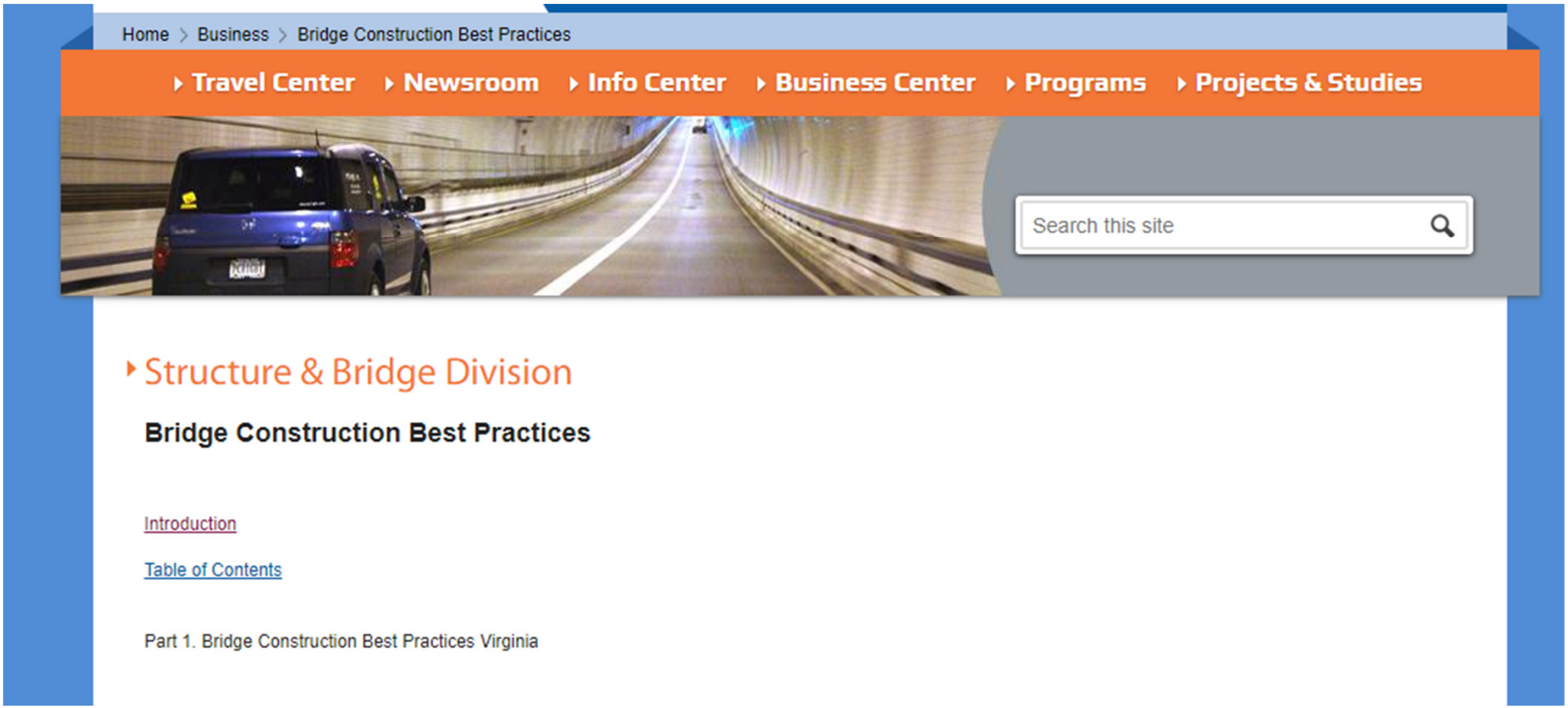
I64 Over Dunlop Creek After Completion

POTENTIAL FUTURE DEVELOPMENTS FOR SGR

- Non-NBI bridges – challenges for locality inspections
- Fair bridges – the holy grail. Need to change the law
- IIM on cost increases
- IIM on joint SGR/SMART SCALE projects
- Schedule of significant dates in the annual program

Enough Finger Wagging – On To Something Positive

Bridge Construction Best Practices Web Site



Now Live!

http://www.virginiadot.org/business/bridge-construction-best-practices.asp