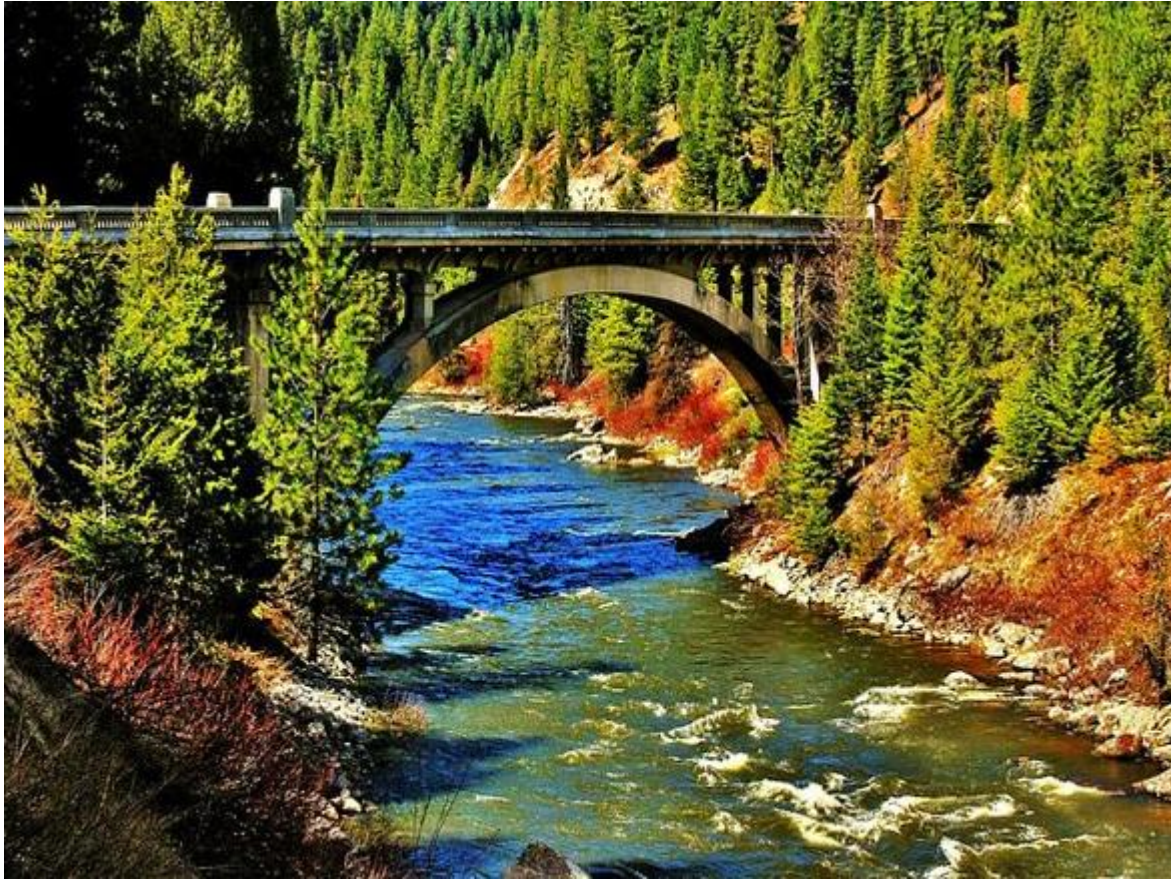


AASHTOWare Bridge Update



Todd Thompson, PE
AASHTOWare Bridge Task Force Chair
August 7, 2018

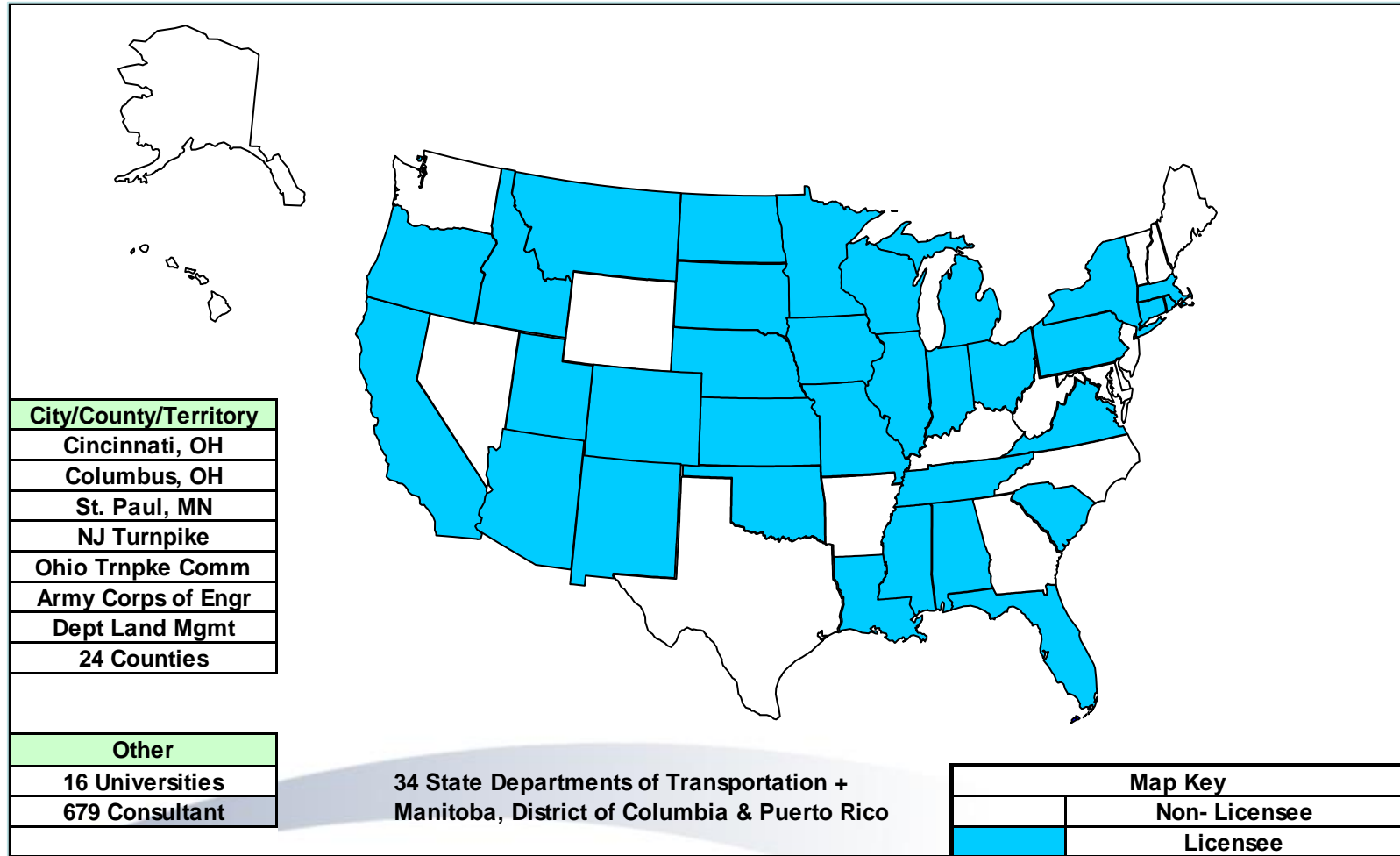
Agenda

- Bridge Design and Rating
 - Task Force
 - Status of the Modernization Project
 - Modernization and Enhancements - 7.1 release
 - Sample of Performance Improvements
 - Regression Testing Tool
 - Integrated Database – Moving Forward

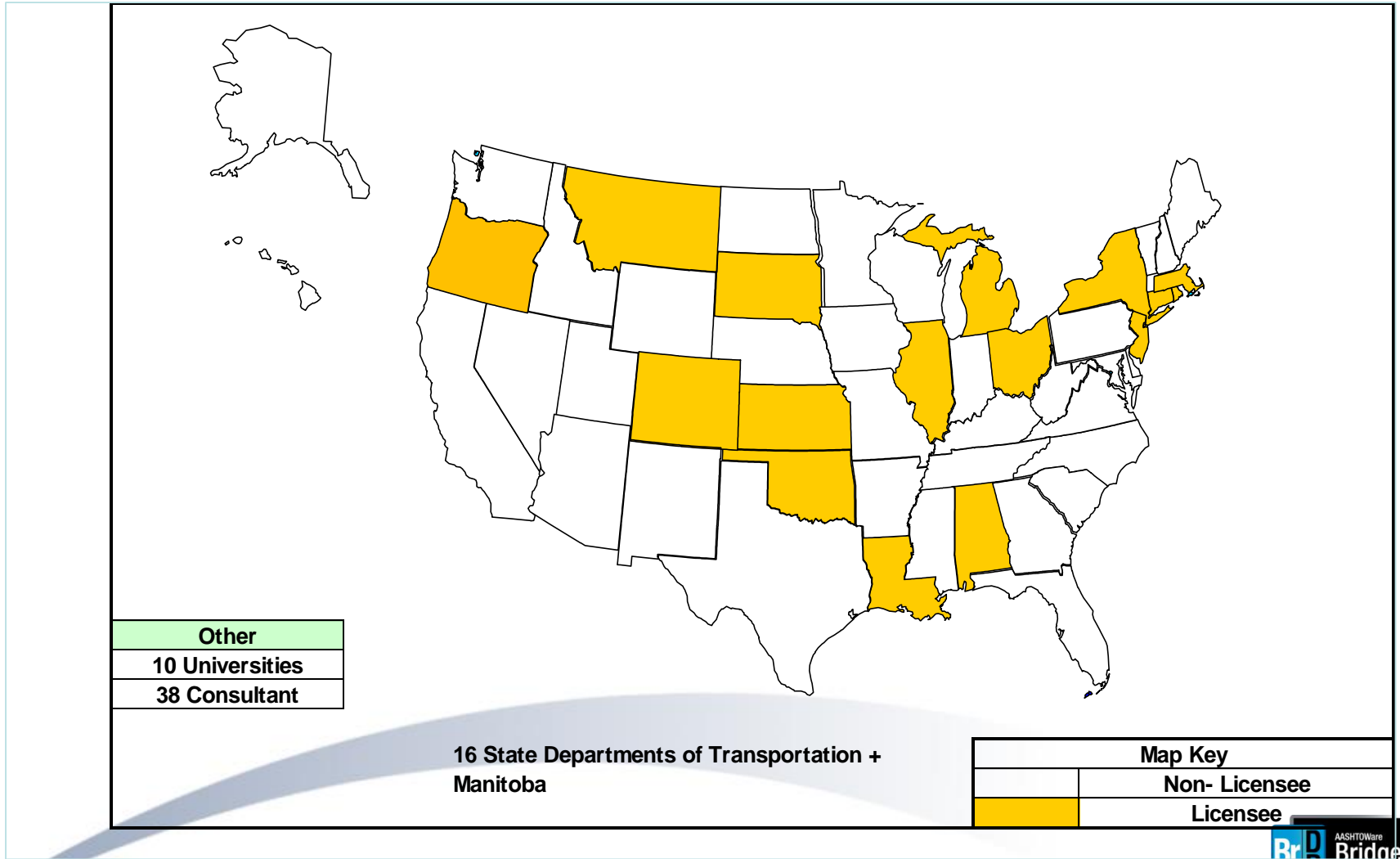
AASHTOWare Bridge Task Force

Chair	Todd Thompson	South Dakota
Vice Chair	Eric Christie	Alabama
Member – BrM	Bruce Novakovich	Oregon
Member – BrM	Craig Nazareth	Rhode Island
Member – BrM	Mark Faulhaber	Kentucky
Member – BrM	Beckie Curtis	Michigan
FHWA Liaison – BrM	Derek Constable	FHWA
Member – BrR	Joshua Dietsche	Wisconsin
Member – BrD	Jeff Olsen	Montana
Member – BrD*	Dean Teal	Kansas
Member – BrR	Ping Lu	Iowa
Member – BrR	Vinacs Vinayagamoorthy	California
FHWA Liaison – BrDR	Tom Saad	FHWA

Bridge Rating Licensees (FY18)



Bridge Design Licensees (FY18)



Releases since last year

- 6.8.2 Release – July 2017
 - AASHTO LRFD Specification updates (8th Edition)
 - But no future interims in following with COBS decision to not publish interims to LRFD Specifications
 - AASHTO Manual for Bridge Evaluation Specification updates (3rd Edition)

Release this year

- 6.8.3 Release – Summer 2018 – Coming soon
 - Phase 1 of the Modernization - Legacy user interface coupled with both the legacy analysis module and the modernized analysis module.











Next Releases

- Summer 2019 – Two concurrent releases
 - 6.8.4 Release
 - Phase 2 of the Modernization – Legacy user interface coupled with the legacy and modernized analysis module.
 - 7.0 Release
 - Phase 2 of the Modernization - Modernized user interface coupled with the modernized analysis module. Also includes several rating tool enhancements.



Next Releases

- 7.1 Release - Summer 2020
 - Phase 3 of the Modernization
 - Agency-requested Enhancements
 - User-requested Enhancements
 - Task Force-requested Enhancements

3-Year Release Roadmap

	Legacy System	Modernized System	Notes
2018	<div style="border: 1px solid black; padding: 5px; display: inline-block; margin-bottom: 10px;">6.8.3</div>  Legacy User Interface  Legacy & Modernized AASHTO Engine	<ul style="list-style-type: none"> • <i>Modernization Phase 1 release</i> ✓ <i>Modernized AASHTO Engine</i> • <i>Modernization Phase 2 release:</i> ✓ <i>Modernized User Interface and AASHTO Engine</i> 	<p>Software Requirements</p> <ul style="list-style-type: none"> ✓ Windows 7, 8 and 10 ✓ SQL Server 2014 ✓ Oracle 10.2, 11.2 and 12.1 ✓ 64 bit install, 32 bit available <p>Upgrade Path</p> <ul style="list-style-type: none"> ✓ 6.8.3 ⇒ 6.8.4 ✓ 6.8.3 ⇒ 7.0
2019	<div style="border: 1px solid black; padding: 5px; display: inline-block; margin-bottom: 10px;">6.8.4 </div>  Legacy User Interface  Legacy & Modernized AASHTO Engine	<div style="border: 1px solid black; border-radius: 15px; padding: 5px; display: inline-block; margin-bottom: 10px;">7.0</div>  Modernized User Interface  Modernized AASHTO Engine	<p>Software Requirements</p> <ul style="list-style-type: none"> ✓ Windows 7, 8 and 10 ✓ SQL Server 2017 ✓ Oracle 11.2 and 12.2 ✓ 64 bit install <p>Upgrade Path</p> <ul style="list-style-type: none"> ✓ 6.8.4 ⇒ 7.0 ✓ 6.8.4 ⇒ 7.1 ✓ 7.0 ⇒ 7.1
2020	 <i>Support for 6.8.4 and all earlier versions will cease effective June 30, 2021</i>	<div style="border: 1px solid black; border-radius: 15px; padding: 5px; display: inline-block; margin-bottom: 10px;">7.1</div>  Modernized User Interface  Modernized AASHTO Engine	<p>Software Requirements</p> <ul style="list-style-type: none"> ✓ Windows 8 and 10 ✓ SQL Server 2017 ✓ Oracle 11.2 and 12.2 ✓ 64 bit install <p>Upgrade Path</p> <ul style="list-style-type: none"> ✓ 7.1 ⇒ 7.2







3-Year Release Roadmap


	Legacy System	Modernized System	Notes
2018	<div style="border: 1px solid black; padding: 5px; display: inline-block; margin-bottom: 10px;">6.8.3</div>  Legacy User Interface  Legacy & Modernized AASHTO Engine		<p>Software Requirements</p> <ul style="list-style-type: none"> ✓ Windows 7, 8 and 10 ✓ SQL Server 2014 ✓ Oracle 10.2, 11.2 and 12.1 ✓ 64 bit install, 32 bit available <p>Upgrade Path</p> <ul style="list-style-type: none"> ✓ 6.8.3 ⇒ 6.8.4 ✓ 6.8.3 ⇒ 7.0

Note: Modernization Phase 1 release

✓ *Modernized AASHTO Engine*

3-Year Release Roadmap



	Legacy System	Modernized System	Notes
2019	  Legacy User Interface  Legacy & Modernized AASHTO Engine	  Modernized User Interface  Modernized AASHTO Engine Rating Tool Enhancements	Software Requirements <ul style="list-style-type: none"> ✓ Windows 7, 8 and 10 ✓ SQL Server 2017 ✓ Oracle 11.2 and 12.2 ✓ 64 bit install Upgrade Path <ul style="list-style-type: none"> ✓ 6.8.4 ⇒ 7.0 ✓ 6.8.4 ⇒ 7.1 ✓ 7.0 ⇒ 7.1

 *Support for 6.8.4 and all earlier versions will cease effective June 30, 2021*

Modernization Phase 2 release:

- ✓ *Modernized User Interface and AASHTO Engine*

3-Year Release Roadmap

	Legacy System	Modernized System	Notes
2020		<div style="text-align: center; border: 1px solid black; border-radius: 15px; padding: 5px; width: fit-content; margin: 0 auto;">7.1</div>  Modernized User Interface  Modernized AASHTO Engine User-requested enhancements	Software Requirements <ul style="list-style-type: none"> ✓ Windows 8 and 10 ✓ SQL Server 2017 ✓ Oracle 11.2 and 12.2 ✓ 64 bit install Upgrade Path <ul style="list-style-type: none"> ✓ 7.1 ⇒ 7.2

Enhancements for 7.0 Release

Rating Tool Highlights

- Very fast computation of rating factors using precomputed live load independent data and hardware improvements
- The Tool can be used by permitting systems using either web services or the BrR Analysis API
- Rating results exactly match the BrR results (i.e. using the same computations, no approximations or simplifications)
- LFR capability

Enhancements for 7.0 Release

Rating Tool Enhancements

1. Addition of Culvert rating
2. Addition of LFR Floor Systems rating
3. Addition of LFR for concrete multi-cell boxes rating

Enhancements for 7.1 Release

More than 30 enhancements planned including the following:

- Prestressed Concrete Design Tool – Phase 2
- Steel Design Tool
- New Timber Module
- Improved Analysis Reports
- 13 of the Top 15 User-requested Enhancements
- 10 Agency-requested Enhancements

Modernization Progress

Phase 1 - Analysis Module Conversion to C#

- Scheduled for release Summer 2018 with 6.8.3
- Conversion is complete and testing is in progress

Phase 2 – User Interface Conversion to C#

- Scheduled for release Summer 2019 with 7.0
- Development is approximately 75% complete

Performance Improvements

6.8.3 Beta Analysis Time Comparison (from Caltrans)

Type	Total Time (sec)		Mod/Leg	x Faster
	Legacy	Modernized		
3 span RC Box	1831	709	39%	2.6
2 span RC Box	2666	911	34%	2.9
4 span slab	544	330	61%	1.6
4 span slab	482	363	75%	1.3
4 span PS-I	2182	798	37%	2.7
3 span PS-I	1830	389	21%	4.7

Performance Improvements

Test Case – 10 span continuous P/S I beam

Legacy: 172 seconds

Modernized: 40 seconds

Modernized is 4.3 times faster

Regression Comparison Tool

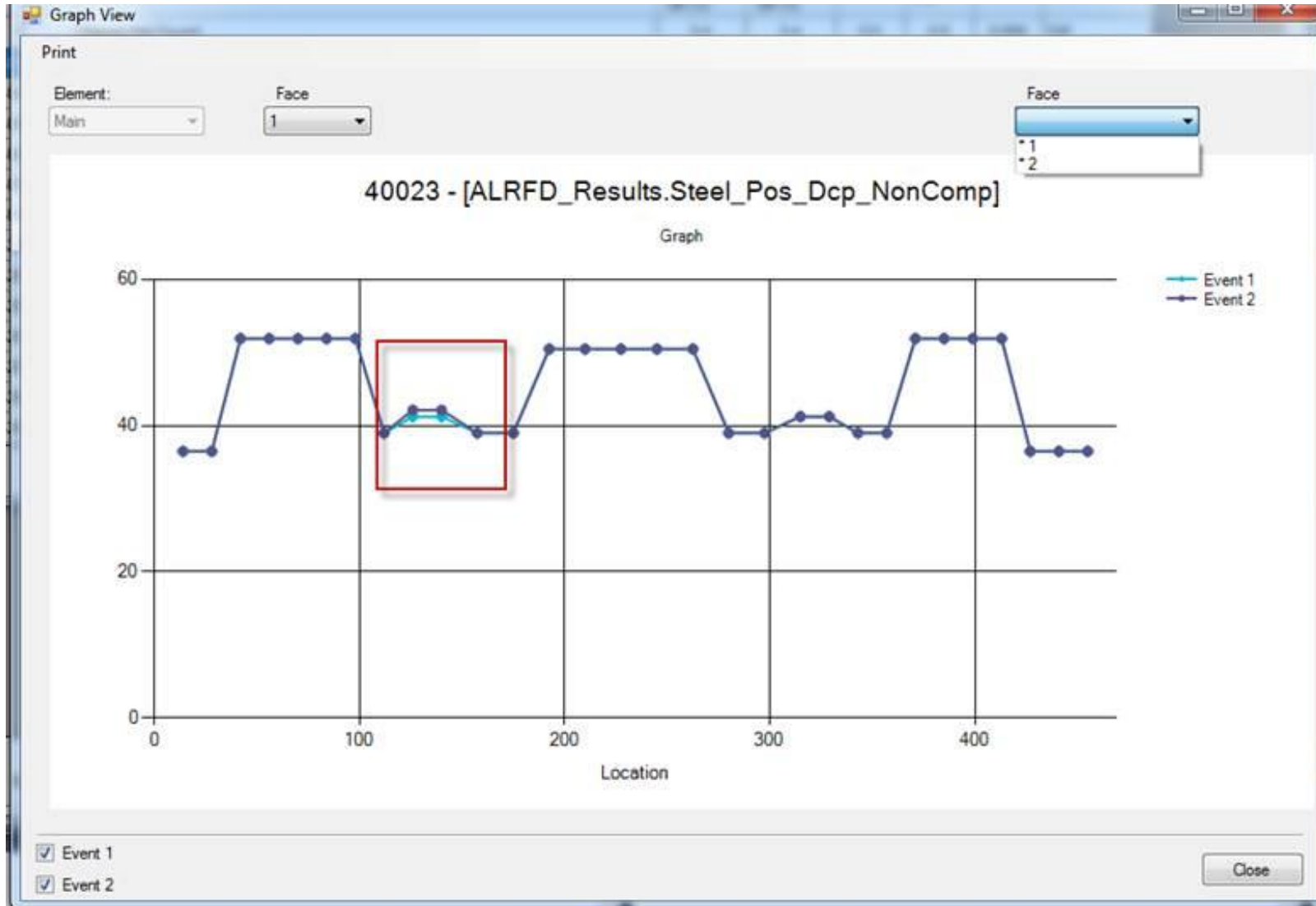
Regression testing is a form of testing that verifies that the work performed to add new features and capabilities did not break or inappropriately alter the existing code causing incorrect results or behavior.

- The modernized engine should produce almost exactly the same results as the legacy engine
- Therefore a large part of the testing of the modernized analysis module is regression testing

Regression Comparison Tool

- Tools to be used for testing must be able to easily compare two sets of data to identify differences
- The Regression Comparison Tool was written for this exact purpose
- In addition to reporting text differences as in a string comparison it can report numerical differences with respect to a tolerance
- Numerical differences can be shown graphically

Regression Comparison Tool



Integrated Database

- Baker surveyed the 5 states that have used integrated DBs before
 - 2 responses
 - 1 said no big deal
 - 1 said big deal as manually had to do work

Integrated Database

- BrDR is not compatible with current BrM
- BrM 5.2.1 is the most current version to support integrated DB with BrDR 6.8.2
- BrM 5.2.3
 - BrM uses GUIDs and not keys in their DB
 - BrM updated their DB from SI to USC units

Webservices Approach

- **The use case:** BrR knows the bridge and the bridge GUID, and now needs data from BrM about the bridge to fill in the BrR record.

Thank you