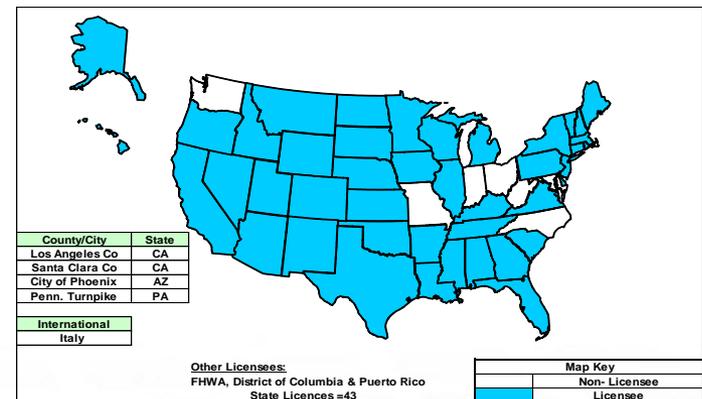


AASHTOWare Bridge Management



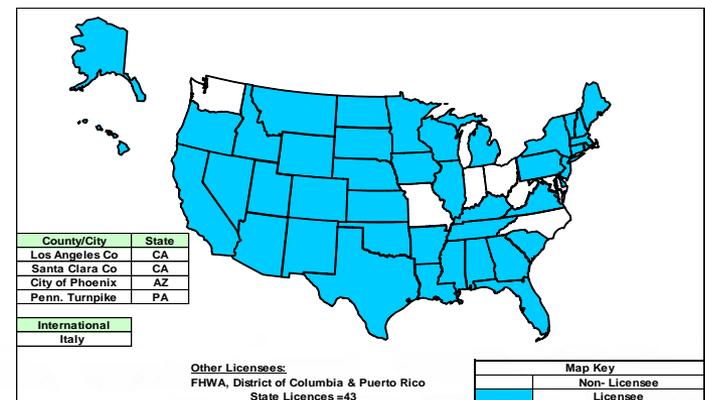
Contest and Prizes

- Contest and prizes at the end!



Pontis Basics

- Development started in the early 1990s under FHWA guidance
- Result of many millions invested by states and FHWA
- Part of AASHTOWARE – BRIDGEWare software
- Licensed by more than 40 states
- Supports AASHTO element level inspection and management



Overview of Pontis 5.2

- AASHTOWare Product being developed under contract by Bentley
- Next generation of Bridge Management
- New Web interface/architecture
- National Bridge Elements
- Licensed by over 40 state DOTs
 - Also utilized by local and international agencies



Pontis — AASHTOWare Bridge Management

- Pontis 5.2 is funded by a voluntary \$5M pool from more than 20 state DOTs, under DOT guidance and expertise
- Tools that are easier to use and understand:
 - Planning
 - Deterioration
 - Risk
 - Multi-objective analysis
 - Lifecycle costs
 - Project models
 - Dashboards
 - Corridor planning



Advantages of Pontis as a BMS

- Full support and maintenance provided by AASHTO
- Developed over the past 20 years through extensive research and user feedback
- Enhancements and features are fully coordinated with AASHTO guidelines (including element revisions)
- Incorporation of FHWA regulatory requirements
- Software created by DOTs for DOTs
 - Development administered and overseen by task force of state DOT representatives.

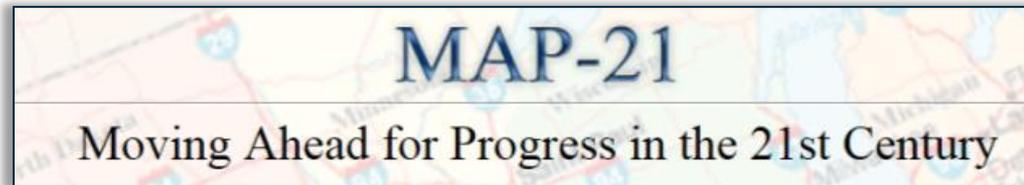
Basic Approach of BrM 5.2

- Utilize extensive research and lessons learned over past 20 years
 - Continue to evaluate best approach and layout
 - Give Task Force recommendations
 - Technical Review Team (TRT) Expert Panel of State Representatives
- Develop the trunk of 5.2 and outward functionality at each level
- Multiple-phased implementation

Full Support of MAP-21 Requirements

Bridge Management System that is:

- Risk Based
- Data Driven
- Supports Performance Measures
- Supports National Bridge and Tunnel Elements



Pontis 5.2 Phases

- Development on 5.2 moving forward rapidly
- Phased releases
 - Version 5.2.1 (Fall 2013)
 - Core program framework, risk assessments, integrated utility functions, network corridors
 - Support for new AASHTO element revisions
 - Version 5.2.2 (mid 2014)
 - Implementation of new deterioration models and multi-objective analysis
 - Version 5.2.3 (early 2015)
 - Integrated project and program planning
 - All administrative features

Pontis 5.2.1

- Actively being developed
- Three Main Parts
 - Bridge Groups- 5.2.1(a) *Done*
 - Risk Assessments – 5.2.1(b) *Done*
 - Utility Functions – 5.2.1(c) *In Progress*

Incorporation of user requests:

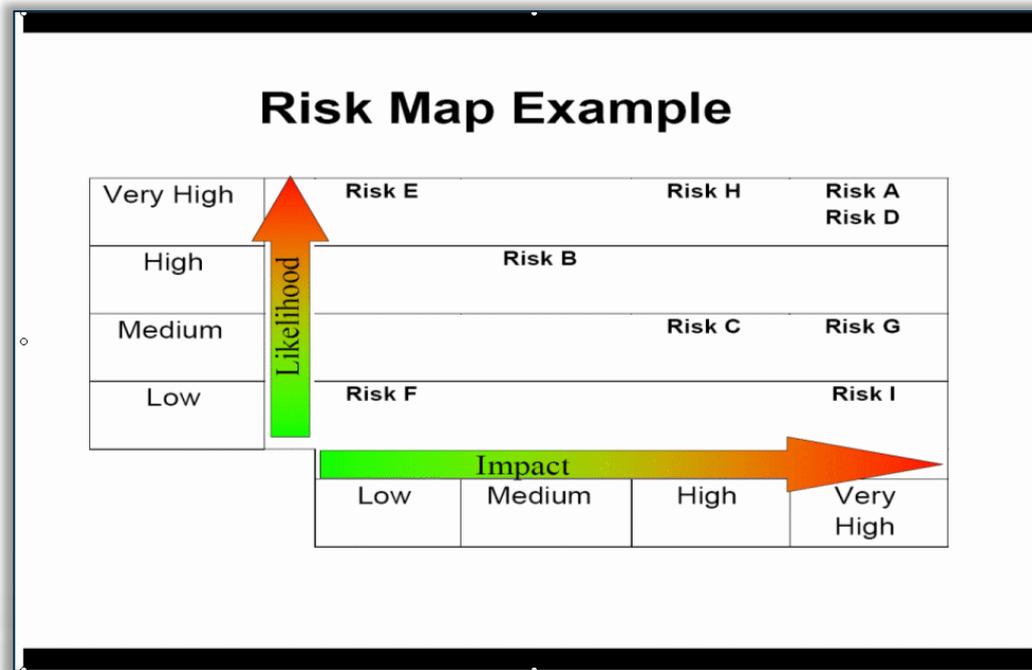
- Addressing tickets and incorporating as we go
- New features – advanced filters/Excel output

Bridge Groups

- Easy to use, new Web interface
- Network Corridors or user-defined groups of bridges
- Ability to group bridges based on a variety of factors
 - Simple creation list of common fields
 - Advanced fields
- Ability to group bridges allows for easier management and planning

Risk Assessments

- Incorporation of Risk Assessments
 - Creation of new database data structures
 - Interface for creation of new Risk Assessments
 - Directly supports MAP-21



Risk Assessment Types

- Ability to have user-defined risk assessment types
- Support for agency-specified scales and formulas
- No limit to the number of assets created

The screenshot displays the 'Assessment Definitions' application window. The interface includes a navigation menu on the left with categories like Security, Parameters, and Definitions. The main area is titled 'Assessment Definitions' and contains a list of assessment types on the left, with 'Scour' selected. To the right, the configuration details for the 'Scour' assessment are shown, including fields for Candidate ID, Label, Auto Generation, Manual Generation, Checking, Interval (months), and Likelihood. The Likelihood section includes Minimum Value (1) and Maximum Value (5) fields. Below this, the Consequence to Structure section has Minimum Value (1) and Maximum Value (10) fields. The Final Risk Value section has Minimum Value (1) and Maximum Value (50) fields. A Description field at the bottom provides context for the assessment scale.

Assessment Definitions

Bridges Inspection Analysis Reports Gateway Admin

Add New Assessment Definition

Assessment

- Scour
- Seismic
- Fatigue
- Impact
- Other
- Adv Deterioration
- Deficient Width

7 Assessment Definitions

Selected Items: Duplicate Delete

Save

Candidate ID: Scour

Label: Risk from floods

Auto Generation: Not Automatic

Manual Generation: Manual

Checking: Requires Review

Interval (months): 12 Edit Formula

Likelihood

Minimum Value: 1 Maximum Value: 5

Consequence to Structure

Minimum Value: 1 Maximum Value: 10

Final Risk Value

Minimum Value: 1 Maximum Value: 50

Description:

This is a risk assessment for scour, expressed on a 0-9 scale where 0 means a scour event has already closed the structure, and 9 means the structure is on dry land with no scour risk.

Work Accomplishments/Requests

- Work Requests/Accomplishments
 - Allow for setting Agency priority, cost, assignment and whether work is programmed
 - Interface for external work accomplishments
 - Better able to integrate with maintenance management systems

Bridge: 04 07598 Facility Carried: Jesse Ownes Pkwy Metric English

Completed Work Events:

Completed Date	Project Category	Insp Before	Insp After	Cost (\$k)	Work Order Number	Contract Number
10/3/2011	Repair Deck	10/2/2010	10/10/2012	30.0	555-695	12365485
5/21/2010	Repair Deck	5/21/2009	5/21/2011	14.5	555-125	12365485
1/11/2011	Repair Deck	5/21/2009	5/21/2011	34.75	555-135	12365485
3/24/2010	Repair Deck	5/21/2009	5/21/2011	16.5	555-525	12365485
5/21/2010	Repair Deck	5/21/2009	5/21/2011	14.5	555-005	12365485
5/21/2010	Repair Deck	5/21/2009	5/21/2011	9.5	555-137	12365485
5/21/2010	Repair Deck	5/21/2009	5/21/2011	44.0	555-182	12365485

9 Past Events

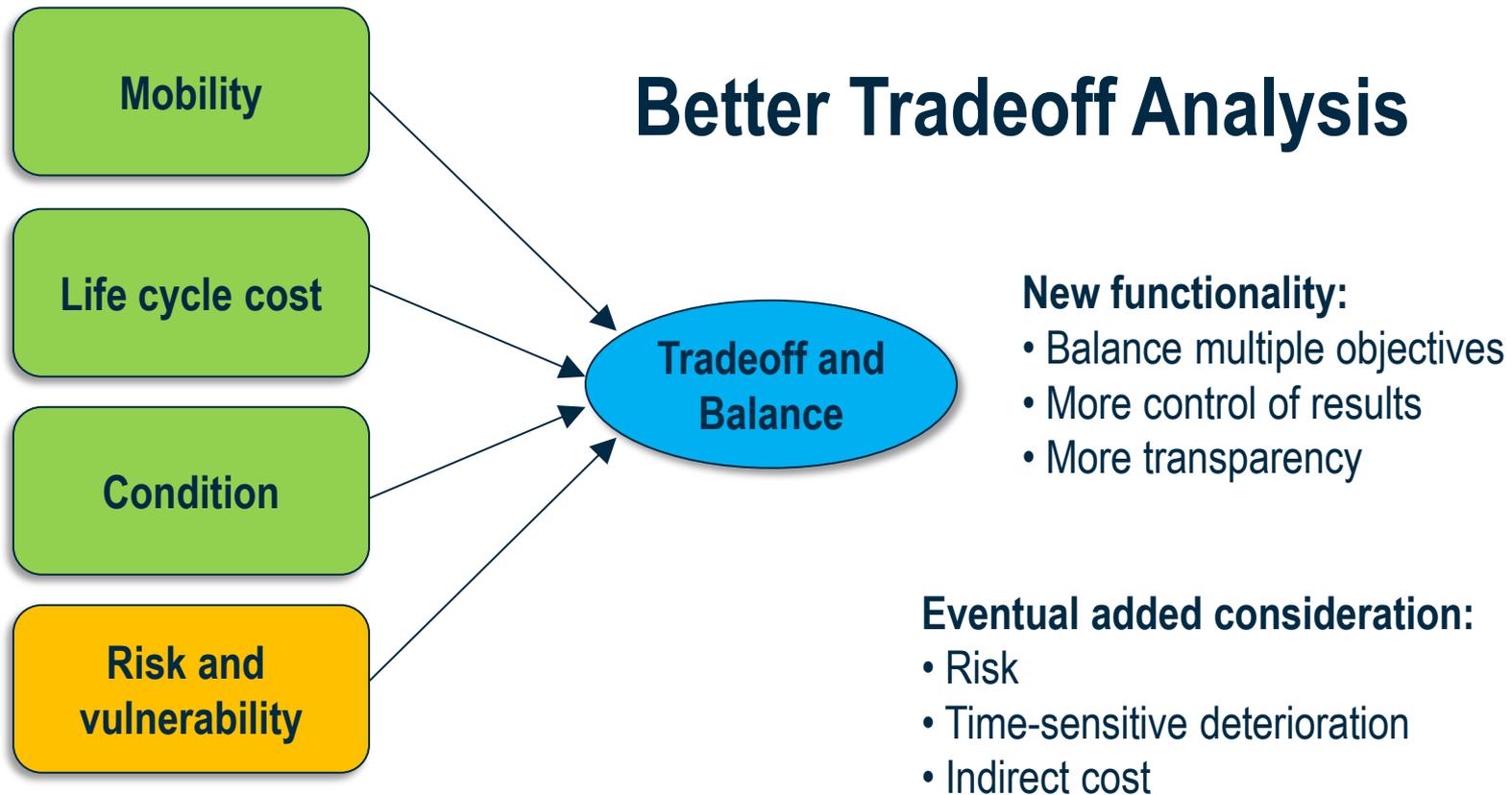
Activities in Selected Event

Flex Action	Element Category	Elements	Quantity	Element Qty	Cost (\$k)	Product	Method	Notes
Repair Deck	Deck	12	1200	1200	30.0	Product/Brand/Model	Model Name	
MW/Fill & Overlay	Deck	13 & 26	800	800	20.0	Product/Brand/Model	Model Name	
Repair Deck	Deck	14	1500	1500	32.0	Product/Brand/Model	Model Name	

3 Activities

Notes about the selected event.

Improved Decision Making Tools



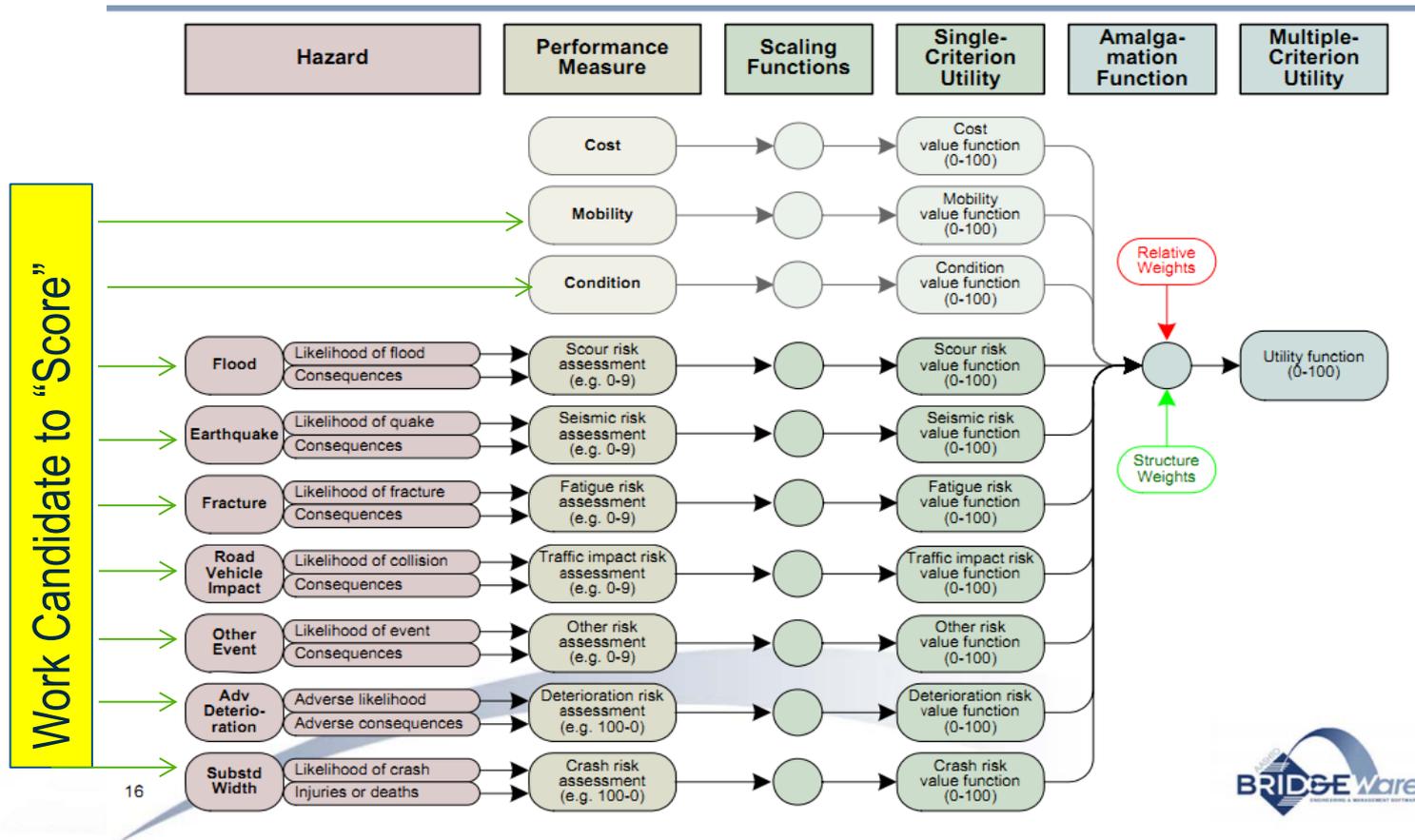
Better fit for agency workflow and business processes

Implementing Utility Functions

- Create a multi-objective framework that can be used to show the value (utility) of an action for a bridge
- Utility will also be shown for each sub-area
 - Mobility
 - Lifecycle cost
 - Condition
 - Risk items
- Work candidates are evaluated for how they contribute to mobility, lifecycle cost, condition and risk weightings

Multi-Objective Analysis Framework

- The model will score each work candidate identified.



Utility Function Admin Page

- Easily able to graphically create and edit utility functions
- No “black box” mystery of how things work

The screenshot displays the 'Admin' tab of the Utility Function Admin Page. It features a navigation menu on the left with options like Condition, Assessments, Appraisal, Inventory, Schedule, Work, Utility, and Multimedia. The main area is divided into two tiers of utility criteria:

- Tier 2 Utility Criterion:** Includes Scour, Seismic, Fatigue, Bridge Health Index (highlighted), Deck Condition, Culvert Condition, ADT, and Utility Criterion 1. Each criterion has 'S' (Scale) and 'W' (Weight) buttons.
- Tier 1 Utility Criterion:** Includes Risk / Assessment, Condition, Mobility, and Life Cycle Cost. Each criterion also has 'S' and 'W' buttons.

A 'TOTAL UTILITY' box is shown on the right, connected to the Tier 1 criteria. The interface is in 'View / Edit Mode'.

Utility Criterion Properties:

Name: Description:

Formula:

When Excluded:

Assigned Weight:

Scaling:

The scaling section includes a graph of Scaled Utility Value vs. Criterion Rating and a table of values.

Original Value	Scaled Value
1	12
2	22
3	24
4	24
5	30
6	40
7	51
8	75
9	84
10	100

Below the graph, there are radio buttons for 'Auto-Generated Utility Scaling Equation' (selected) and 'Manual Utility Scaling Equation'. At the bottom, there are 'Save', 'Clear Recent Changes', and 'Delete Criterion' buttons.

Utility Rating View

- When rating calculated on an individual bridge the user can see exactly how it was calculated
- Each component of the formula, its weight, and its score that it contributed are shown

Bridges
Inspection
Analysis
Reports
Gateway
Admin

- Work Candidates
- Needs List
- Bridge Analysis
- Setup Projects
- Projects
- Programs
- Scenarios
- Utility

Bridge:
Facility Carried: Jesse Ownes Pkwy

Overall Utility Rating:

Condition: _____

Condition	Base Value	Scaled Value	Weight	Adjusted Value
Bridge Health Index	75	90	.8	72
Deck Rating	6	50	.1	5
Culvert Rating	N	0	1	0

Adjusted Condition Value: x Weight: = Final Condition Value:

Risk / Assessment: _____

Assessment	Base Value	Scaled Value	Weight	Adjusted Value
Scour	5	60	.5	30
Seismic	7	90	.2	18
Fatigue	3	40	.3	12

Adjusted Risk Value: x Weight: = Final Assessment Value:

Mobility: _____

Adjusted Mobility Value: x Weight: = Final Mobility Value:

Life Cycle Cost: _____

Adjusted LCC Value: x Weight: = Final LCC Value:

Phase II (5.2.2)

- New and easy to use Deterioration Models
- Complete Bridge Analysis Module
 - Bridge Analysis Dashboard
 - Work Candidate Dashboard
 - Replacement Bridge/Culvert page
- Completion of Multi-Objective Analysis

Bridge Analysis Dashboard

- All bridge information shown in one place
- Ability to see the effect of work candidates / actions on the condition of the bridge
- Shows current and future effects with deterioration model integration

Bridges
Inspection
Analysis
Reports
Gateway
Admin

- Work Candidates
- Needs List
- Bridge Analysis
- Setup Projects
- Projects
- Programs
- Scenarios

Bridge:

Name: Plum Creek Bridge

Facility: I-25

Feature: East Fork Plum Creek

Route: 00025 Milepoint: 181.50

District: 1 - Metro County: Douglas

Func: 11 - Urban Interstate Area: 23 - Castle Rock

Owner: 1 - State hwy agency Resp: 1 - State hwy

Material: 6 - P/S Continuous Design: 05 - Multiple Box Beam

Scour: 7 Countermeasures

History - Geometry
 Built: 1968
 Reconstr: 1995
 Length: 160 ft.
 Width: 60 ft.
 Span: 100 ft.

Mobility - Safety
 Operating: 53.5
 Inventory: 32.6
 Geometry: 9
 Approach: 8
 Waterway: 6

Condition

NBI	Health Index
Deck: 4	Deck HI: (calculated)
Superstr: 7	Superstr HI: (calculated)
Substr: 5	Substr HI: (calculated)
Culvert: N	Culvert HI: (calculated)
Structure: 4	Structure: (calculated)

Recent Completed Work	Year	Cost (\$k)
→ Deck Overlay	2006	300.0

Current Scaled Performance
 Health: 63.2 Risk: 50.0
 LC Cost: 75.5 Mobility: 100.0

Sufficiency
 Rating: 72.5
 SD/FO: SD

Effect on Scope and Timing:

Work Candidates Existing for the Selected Bridge					
Work Candidate	Utility	Utility Change	Cost	Benefit / Cost (\$k)	
Do Nothing	80.1	-	\$0	0	
Work Candidate 1	83.1	3	\$500	6	
Work Candidate 2	84.1	4	\$1000	4	
Work Candidate 3	82.1	2	\$200	10	
Work Candidate 4	91.5	11.4	\$2000	5.7	

Effects on Each Utility Criterion

	Before WC 3	After WC 3
Scour	4	5
Seismic	3	3
Fatigue	8	8
BHI	72	74
Deck Condition	7	8

Effects on Each Element

Element	Condition	Effect
12 - Bare concrete deck	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>	<div style="width: 100%; height: 10px; background-color: green;"></div>
104 - P/S conc box girder	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>	<div style="width: 100%; height: 10px; background-color: green;"></div>
215 - R/C conc abutment	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>	<div style="width: 100%; height: 10px; background-color: green;"></div>
301 - Pourable joint seal	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>	<div style="width: 100%; height: 10px; background-color: green;"></div>
310 - Elastomeric bearing	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>	<div style="width: 100%; height: 10px; background-color: green;"></div>
321 - R/C conc approach slab	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>	<div style="width: 100%; height: 10px; background-color: green;"></div>
333 - Other bridge railing	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>	<div style="width: 100%; height: 10px; background-color: green;"></div>



Improved Deterioration Models

- Allow for evaluating future condition at the detail and summary level
- Implement new deterioration model logic
 - Weibull approach to include time factor
- Easy to construct/new elicitation process
- Utilize NBE elements
 - Protective systems
 - Defect flags
- Allow for multi-path deterioration

Phase III (5.2.3)

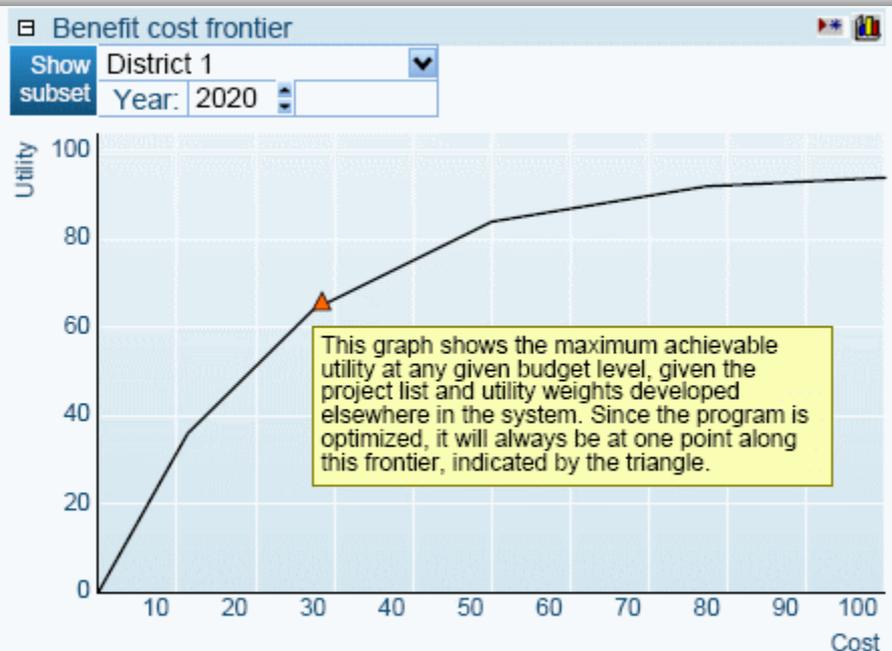
- Completion of full programming module
- Scenario Creation
- Results Browsing/Dashboards
- Additional administration features

Network Level Planning

- Ability to see full effects of all actions across the network
- See current status, target goals, and projected conditions for a variety of key performance metrics



This graph compares the performance of the inventory subsets. If any are underperforming, you can increase their share of the budget to bring them up. Target performance is set on the Tradeoff Analysis Dashboard.



New Features.... (available now or 5.2.1)

- Advanced filters
- Excel outputs
- Improved interface
 - Less clicks
 - Latest web controls
- Performance/speed improvements
- Hosting/SaaS option
- Coordination with optional Bentley InspectTech modules

Planned Bentley Add-Ons And Services

- AASHTO / Bentley Agreement supports new add-ons in coordination with Task Force
- Able to purchase via new Hosting/Add-On Service Units in new AASHTO Catalog
- Examples of expanded capabilities:
 - Hosting/SaaS
 - Mobile applications
 - 3D interactive inspection models
 - Others as determined by AASHTO Task Force/Bentley

Hosting / SaaS Solutions

- Bentley able to provide reliable and secure hosting environment for Pontis solutions
- Bentley applies all patches and updates needed to Pontis
- Storage, processing and servers tuned for Pontis maximum performance
- Can result in significant cost savings to DOT and performance/satisfaction improvement

Mobile App Version for Pontis Field Usage

Advanced mobility for users of **Pontis:**
InspectTech Collector Mobile

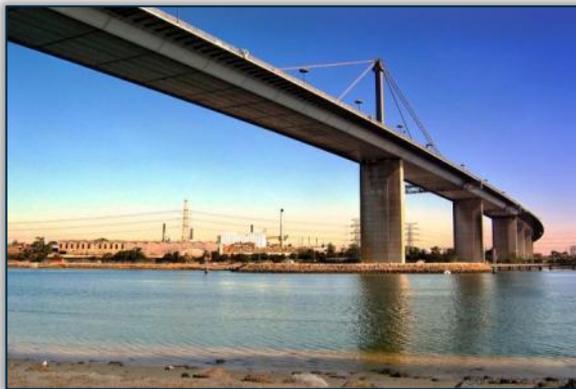


- Sleek, graphical interface
- Capture photos, video, and audio
- FHWA Calculations based on NBI and other codes
- Rapid pinpointing of assets using mapping/GPS
- Cloud service synchronization with SaaS solution
- Full synch with Pontis database



Complex Structure Add-On

- Solution designed to support large assets
- Turns thousands of pages into useful information
- Data can be viewed and linked on interactive 3D model accessible via the Web
- Information directly linked to individual elements
- Interactive dashboards and powerful visuals help to quickly identify problems and needs



3D Models (InspectTech 3D add-on)

- Web-based or field based
- Roll-up individual components on large bridge to element summaries

The screenshot displays the InspectTech 3D add-on interface. At the top, the header includes the Delaware River Port Authority logo, the text "Bridge and Structure Inspection Management System", and the date "Friday, March 11, 2011". The "StructureSuite" logo is on the left, and the "inspecttech" logo is in the center. A navigation menu at the top left contains "Main", "GIS", "Query", "Reports", "Administration", and "Help". A "Quick Select:" dropdown is visible on the right. The main area shows a 3D model of a bridge truss structure with several vertical rods highlighted in red. On the right side, a detailed view of a specific component, "U45-L45 (Main Thru Span > Verticals > North Truss)", is shown. This view includes a "Rating" dropdown set to "6 - Satisfactory Condition (minor deterioration)" and a "Remarks" text area containing the following text: "-Rubber pads attached to all stainless steel retrofit rods are generally cracked, dry and worn. -The northwest retrofit stainless steel rod vibrates more than the others. Also, the 1st retaining U-bolt above the roadway is missing one lock nut. -Truss vertical southeast flange has horizontal gouges throughout the edge of the flange." Below the remarks are three photo thumbnails labeled "Photo: 64", "Photo: 65", and "Photo: 66". The bottom of the interface features a 3D navigation toolbar and a copyright notice "© InspectTech 2010".

Conclusion

- Pontis 5.2 (AASHTOWare Bridge Management 5.2) is rapidly being developed
- BrM will be an easier to use and more powerful tool defining new standard of Bridge Management
- Version 5.1.3 with Migrator Support available now
- Pontis 5.2 will be released in three main phases
- Offered as SaaS solution that provides an anywhere, anytime secure one-stop location for all data
- New AASHTO / Bentley agreement provides greater coordination and new optional features for Pontis users