

# 5.2.2 AASHTO Bridge Management Design and Overview



- Josh Lang
- Chris Meredith
- Jeremy Shaffer

*Formerly*

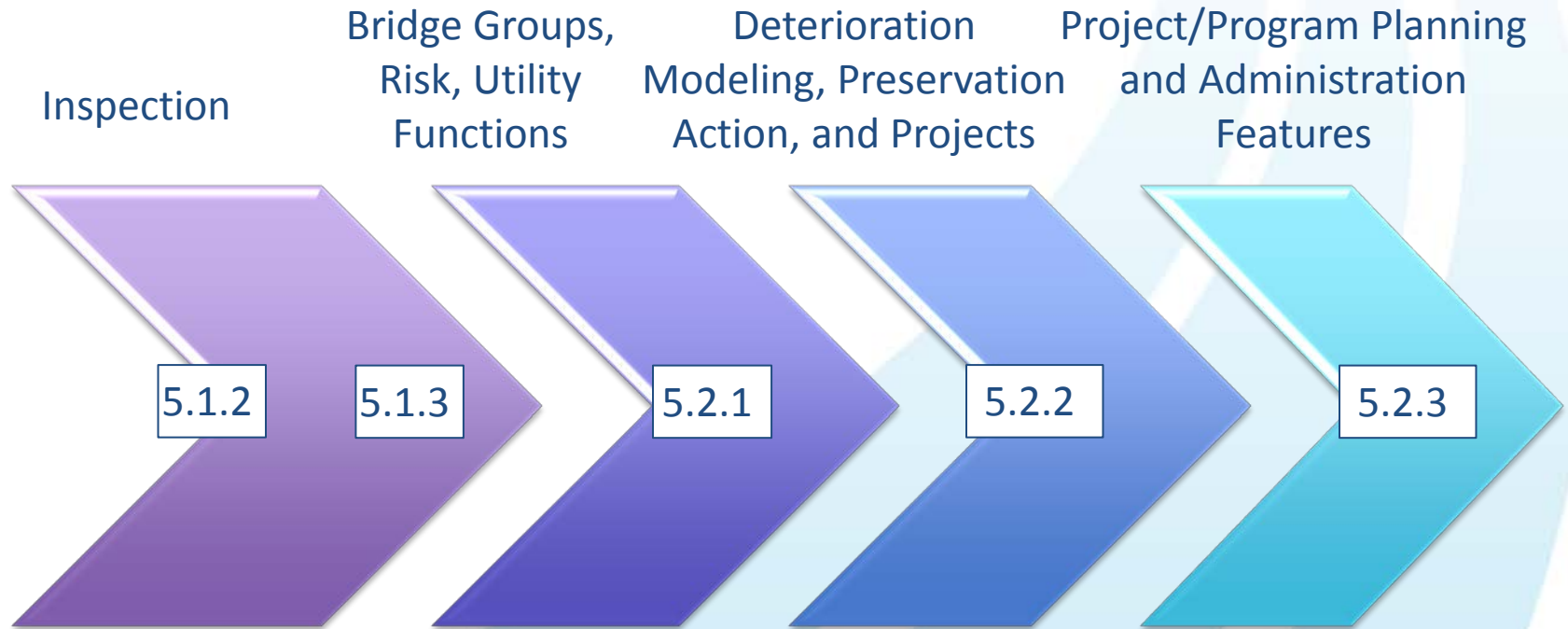


# Outline of 5.X Presentations

- Presentation/Demonstration of 5.1.3
  - Support for AASHTO Elements
  - Currently Available!
- Presentation/Demonstration of 5.2.1
  - In last stage of updates and alpha testing
  - Onsite beta testing next month
- Presentation on next steps 5.2.2 / 5.2.3



# Pontis 5.2 Stages



## 5.2.1 Demo Part 2

- Dynamic filters, quick filters, and edit SQL filters
- New Layouts
- Bridge Analysis Groups (wizard or manual)
- GIS
- How to create/edit an action and benefit group



# GIS Requests

- Users already had the ability to generate filters (searches) and view results in a tabular grid format
- Users want to be able to easily visualize bridge information on a map
- Several other specific use cases were developed in which a map would provide assistance



# GIS Approach

- AASHTO Task Force and Bentley evaluated various options to meet user requests
- Main factors: web based, easy and intuitive to use, open API for integration, flexible licensing
- Variety of products identified
- Integrated Google Maps into the BrM product, allowing users to have a GIS system integrated into their existing Bridge Management product
- Ability to export to KML format



# Embedded dual view capability

- Displaying standard Google Maps view, as well as Google Maps Satellite view, this allows users to better determine location of bridges

The screenshot displays the AASHTOWare Bridge Management software interface. At the top left is the 'customer LOGO'. The top right corner features the 'BRM Bridge Management' logo, a welcome message for 'Pontis Pontis' with a 'Database: BRM Sample', and links for 'Help?', 'Account', and 'LogOut'. Below the logo is a navigation menu with options: 'Menu', 'Bridges', 'Reports', 'Admin', 'Inspection', 'Gateway', and 'Analysis'. The 'Menu' sidebar on the left includes: 'View List', 'Manage Layouts', 'Manage Filters', 'New Inspection', 'Suff Rate', 'Validate', 'Create Struct', 'Copy Struct', 'Remove Struct', 'Manage Bridge Analysis Groups', and 'Mapping' (with a sub-option for 'GIS').

The main content area is titled 'GEOGRAPHIC INFORMATION SYSTEM OF SELECTED BRIDGES'. It features a dual-view map of Springfield, Oregon. The left side shows a standard Google Maps satellite view with a red location pin and a yellow bridge icon. The right side shows a Street View image of '550 Mill Street, Springfield, Oregon', with a note that the address is approximate. The interface includes map controls such as a compass, zoom in/out buttons, and a 'Show satellite imagery' checkbox. At the bottom right of the map area are 'Save' and 'Print' buttons.



# StreetView

- Allows users to use streetview to view the area surrounding a bridge

The screenshot displays the AASHTOWare Bridge Management software interface. At the top, there is a navigation menu with options: Bridges, Reports, Admin, Inspection, Gateway, and Analysis. A sidebar on the left contains a 'Menu' section with various actions like 'View List', 'Manage Layouts', 'Manage Filters', 'New Inspection', 'Suff Rate', 'Validate', 'Create Struct', 'Copy Struct', 'Remove Struct', 'Manage Bridge Analysis Groups', and 'Mapping' (with a sub-option for 'GIS').

The main content area is titled 'GEOGRAPHIC INFORMATION SYSTEM OF SELECTED BRIDGES'. It features a map on the left showing a route along Pacific Highway (99) near Myrtle Creek. A red Pegman icon is positioned on the map, indicating the location for the StreetView. To the right of the map is a StreetView image showing a road with guardrails, trees, and hills. A text box above the image reads 'Pacific Highway, Oregon' and 'Address is approximate'. Below the image, there are navigation arrows and the text 'Pacific Highway'. At the bottom right of the StreetView image, there are 'Save' and 'Print' buttons.

The top right corner of the interface shows a 'Welcome' message for 'Pontis Pontis' with a 'Database: BrM Sample' and links for 'Help?', 'Account', and 'LogOut'. The AASHTOWare Bridge Management logo is also present.



# Correct placement of bridges

- Allows users to relocate the associated GPS coordinates of a bridge, ensuring better accuracy

The screenshot displays the AASHTOWare Bridge Management software interface. At the top left is the 'customer LOGO'. The top right corner shows the 'BrM AASHTOWare Bridge Management' logo, a welcome message for 'Pontis Pontis' with a 'Database: BrM Sample', and links for 'Help?', 'Account', and 'LogOut'. Below the logo is a 'Menu' sidebar with options: View List, Manage Layouts, Manage Filters, New Inspection, Suff Rate, Validate, Create Struct, Copy Struct, Remove Struct, Manage Bridge Analysis Groups, and Mapping GIS. The main content area is titled 'GEOGRAPHIC INFORMATION SYSTEM OF SELECTED BRIDGES' and features a map and a street view. The map shows a route along Pacific Highway (99) and Myrtle Creek, with a bridge icon and a location marker for 'On the River Golf and RV Resort'. The street view shows a perspective of Pacific Highway, Oregon, with a text box indicating 'Address is approximate'. Navigation controls like zoom in/out and a compass are visible on both the map and street view. At the bottom right of the map area are 'Save' and 'Print' buttons.



# Easily locate new bridges

- Plots many bridges at a time, allowing agencies to plot groups of bridges at a time, and to print out the results

The screenshot displays the AASHTOWare Bridge Management software interface. At the top, there is a navigation bar with tabs for **Bridges**, **Reports**, **Admin**, **Inspection**, **Gateway**, and **Analysis**. A sidebar on the left contains a **Menu** with options such as **View List**, **Manage Layouts**, **Manage Filters**, **New Inspection**, **Suff Rate**, **Validate**, **Create Struct**, **Copy Struct**, **Remove Struct**, **Manage Bridge Analysis Groups**, and **Mapping** (with a sub-option for **GIS**). The main content area is titled **GEOGRAPHIC INFORMATION SYSTEM OF SELECTED BRIDGES** and features a Google Maps interface. The map shows a region in Oregon with several red location pins. One pin is highlighted with a yellow circle, and a street view window is open for **550 Mill Street, Springfield, Oregon**. The street view shows a road labeled **Mill Street** with a white arrow pointing forward. The interface includes standard map controls like zoom in/out, pan, and a compass. At the bottom right of the map area, there are **Save** and **Print** buttons. The top right corner of the software window shows a **BrM** logo, the text **AASHTOWare Bridge Management**, and user information: **Welcome: Pontis Pontis**, **Database: BrM Sample**, and links for **Help ?**, **Account**, and **LogOut**.

# Verification


- Allows agencies to view bridges that have invalid coordinates, and to map them appropriately

The screenshot displays the AASHTOWare Bridge Management software interface. At the top, there is a header with a "customer LOGO" on the left, the "AASHTOWare Bridge Management" logo in the center, and a welcome message on the right: "Welcome: Pontis Pontis Database: BrM Sample Help ? Account LogOut". Below the header is a navigation menu with options: "Menu", "Bridges", "Reports", "Admin", "Inspection", "Gateway", and "Analysis". The main content area is titled "GEOGRAPHIC INFORMATION SYSTEM OF SELECTED BRIDGES" and features a map of Pacific Highway, Oregon. The map shows a red bridge icon on the highway, with a satellite view inset on the right. The inset view shows a road labeled "Pacific Highway" with the text "Address is approximate". Below the map is a table titled "UNMAPPED BRIDGES" with the following data:

BrKey	Facility	Location
00060700000000	NORTH 8TH STREET	BARTON HEIGHTS/JOSEPH



# Excel/PDF Outputs



## PONTIS BRIDGE MANAGEMENT SYSTEM

Welcome: **Pontis User**  
 Database: **SampleP512**  
[Help ?](#) [Account](#) [LogOut](#)

**Menu**

- [View List](#)
- [Select All](#)
- [Unselect All](#)
- [Select Page](#)
- [Unselect Page](#)
- [Just Selected](#)
- [Apply Grid Settings](#)
- [Reset Grid Settings](#)
- [Printable View](#)
- [Manage Layouts](#)
- [Manage Filters](#)
- [New Inspection](#)
- [Suff Rate](#)
- [Validate](#)
- [Create Struct](#)
- [Copy Struct](#)
- [Remove Struct](#)
- [Manage Corridors](#)

Apply

Layout: Default

Filter: none

Jump to Bridge:

	Bridge ID	District	County	Facility Carried	Feature Intersected	Own	Maint	Built
<input type="checkbox"/>	04 07598	District 2	Maricopa	JESSE OWENS PKWY	WESTERN CANAL	City/Municipal Hwy Agenc	City/Municipal Hwy Agenc	1988
<input type="checkbox"/>	04 07603	District 2	Maricopa	7TH STREET	DRY WASH	City/Municipal Hwy Agenc	City/Municipal Hwy Agenc	1988
<input type="checkbox"/>	04 07878	District 2	Maricopa	DESERT FOOTHILLS	WASH	City/Municipal Hwy Agenc	City/Municipal Hwy Agenc	1988
<input type="checkbox"/>	04 07935	District 2	Maricopa	ELLIOT ROAD & 48TH	WASH	City/Municipal Hwy Agenc	City/Municipal Hwy Agenc	1973
<input type="checkbox"/>	04 08003	District 2	Maricopa	75th Ave	RID Canal	City/Municipal Hwy Agenc	City/Municipal Hwy Agenc	1975
<input type="checkbox"/>	04 08508	District 2	Maricopa	25TH AVENUE	ARIZONA CANAL	City/Municipal Hwy Agenc	City/Municipal Hwy Agenc	1979
<input type="checkbox"/>	04 08511	District 2	Maricopa	CENTER FLYOVER	SKY HARBOR BLVD E & W	City/Municipal Hwy Agenc	City/Municipal Hwy Agenc	1979
<input type="checkbox"/>	04 08529	District 2	Maricopa	PARKING ENT&EXITS	SKY HARBOR BLVD EAST	City/Municipal Hwy Agenc	City/Municipal Hwy Agenc	1979
<input type="checkbox"/>	04 08530	District 2	Maricopa	PARKING ENT&EXIT	Sky Harbor Blvd West	City/Municipal Hwy Agenc	City/Municipal Hwy Agenc	1979
<input type="checkbox"/>	04 09175	District 2	Maricopa	19TH AVE	GRAND CANAL	City/Municipal Hwy Agenc	City/Municipal Hwy Agenc	1946
<input type="checkbox"/>	04 09192	District 2	Maricopa	16TH STREET	GRAND CANAL	City/Municipal Hwy Agenc	City/Municipal Hwy Agenc	1952
<input type="checkbox"/>	04 09208	District 2	Maricopa	THUNDERBIRD RD	CAVE CREEK WASH	City/Municipal Hwy Agenc	City/Municipal Hwy Agenc	1965
<input type="checkbox"/>	04 09320	District 2	Maricopa	PEORIA AVE	CAVE CREEK WASH	City/Municipal Hwy Agenc	City/Municipal Hwy Agenc	1974

Page 1 of 5 (55 items)
[1] 2 3 4 5
Total Bridges: 55
Matching Filter: 55
Selected: 0



# Needs List

Bridges
Inspection
Analysis
Reports
Gateway
Admin

Work Candidates

Needs List

Bridge Analysis

Setup Projects

Projects

Programs

Scenarios

Work Candidate Filter: Bridge 0407598 Apply Filter

**Work Candidate Filter**

Flex Action: Deck Repairs
 Share
Save as: Name of the filter Save

**Work Candidate Characteristics**

Review Status: Under Review

Flex Action: Repair Deck

Project Category: Deck Maintenance

Years: 2012 to 2013

Cost at Least (\$k): 25.5

Benefit/Cost at Least: 1.0

**Bridge Characteristics**

Use Desktop Filter:  Other: On System Bridges

District: Metro District

Admin Area: Forest Lawn

County: Calaveras

Owner: State Highway Agency

Custodian: State Highway Agency

On/Off State System: On System

NHS Status: On NHS

Bridge Group: My custom bridge group

Functional Class: 11 - Urban Interstate

Bridge ID	Facility	Flex Action	Cost (\$k)	Year	Benefit/Cost
04 07598	Interstate 25	Repair Deck	30.0	2012	1.34
04 07598	Interstate 25	Spot Paint	30.0	2012	1.34
04 07640	US 285	Repair Deck	30.0	2013	1.34
04 08923	US 285	Spot Paint	30.0	2013	1.34
04 13987	Main Street	Repair Deck	30.0	2012	1.34
04 28653	Wilber Way	Do nothing	30.0	2012	1.34

6 work candidates, 1 selected (\$30K) Delete Selected

**Details about Selected Work Candidate:**

Bridge ID: 04 08923

Flex Action: Bridge Replacement

Was Customized: Yes

Insp Work Request: 2012 - Spot Paint

Deck Structure Type: 1 - Concrete-Cast-Set-in-Place

Deck Surface Type: 6 - Bituminous

Deck Protection: 1 - Epoxy Coating Reinforcing

Deck Membrane: 1 - Built up



## 5.2.2+ Highlights

- Database overhaul
- API integration and cross browser compatibility
- Deterioration Modeling
- Support for Preservation Actions/Benefits
- Project Planning



# Database overhaul for New NBEs

- The database overhaul will help to normalize the BrM database, increase performance and allow for full integration of new NBEs.
- Full integration of the new NBEs, as well as their associated support and handling with modeling
  - Element Categories
  - Element Classes
  - Element Inventory
  - Standardize condition data in database (quantities, calculated percents)
  - Standardize and streamline database tables
  - **Convert agency usage to views to retrieve data (rather than direct tables)**



# Identifying and Recording Elements

- Standardized numbering
- Standard element classes
  - NBE, BME, ADE
- Standard element major categories
  - Superstructure, substructure, etc.
- Standard element categories
- History of element inventory
- Ongoing inspection of element condition





# Database Normalization

- Store only state quantities, calculate state percentages
  - Provide off the shelf view that will calculate percentages, to allow easier to digest information for users reliant on this feed.
- Store overall element quantity as element inventory item

# Element Inventory

- Element inventory table will track bridge element changes over time.
  - Changes related to any element attributes will create a new historical inventory record in the inventory table. For example:
    - Total Quantity
    - Structure Unit
    - Environment
    - Element Number



# 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
  - Condition
  - Risk
  - Life Cycle Cost (5.2.2 / deterioration models needed)
- Work candidates are evaluated for how they contribute to mobility, lifecycle cost, condition and risk weightings



# Table Standardizations

- Virtually all tables have GUID primary key
  - Not attributes
  - Globally unique
  - Support replication (field inspection)
  - Single primary key / foreign key joins
    - Multi-part key joins largely removed
- Views will be created that will provide a more seamless transition for existing feeds and reports



# Example Definitional Table

[-]	[+]	dbo.PON_ELEM_CATEGORY_DEFS
[-]	[+]	Columns
	[+]	🔑 ELEMENT_CATEGORY_KEY (PK, varchar(36), not null)
	[+]	[+] ELEMENT_CATEGORY_ID (varchar(32), not null)
	[+]	[+] ELEMENT_CATEGORY_NAME (varchar(32), not null)
	[+]	[+] ELEMENT_CATEGORY_LABEL (varchar(128), not null)
	[+]	🔑 ELEMENT_MAJOR_CATEGORY_KEY (FK, varchar(36), not null)
	[+]	[+] CREATE_DATETIME (datetime2(7), not null)
	[+]	[+] CREATE_USERKEY (numeric(4,0), not null)
	[+]	[+] MOD_DATETIME (datetime2(7), null)
	[+]	[+] MOD_USERKEY (numeric(4,0), null)
	[+]	[+] ELEMENT_CAT_SHORT_DESCR (varchar(255), not null)
	[+]	[+] ELEMENT_CAT_LONG_DESCR (varchar(4000), null)
	[+]	[+] ELEMENT_CATEGORY_COMMENTS (varchar(4000), null)
	[+]	[+] CHANGE_LOG (varchar(4000), not null)

# API Integration

- Creating API to allow BrM to interface with external agency software
  - Reduce reliance on direct database calls.
  - Reduce risk of BrM internal structure changes breaking custom agency forms, reports, and data feeds.
  - Allow re-use of BrM built-in functionality pieces
  - Integration into Bentley or 3<sup>rd</sup> party plug-ins.



# Cross browser compatibility

- Support for all major browsers
  - IE 8,9,10+
  - Chrome
  - Firefox
  - Safari
- Stabilize BrM interface as new browsers and versions are released and legacy browsers lose support
- Allow for newer technologies to be integrated in the future (e.g. HTML5)



# Actions

- Default Actions supplied by TRT
- Apply element costs to actions
- Attach actions to benefit groups

The screenshot displays the 'Action Defs' configuration screen in the AASHTOWare Bridge Management software. The interface includes a top navigation bar with 'Bridges', 'Reports', 'Admin', 'Inspection', 'Gateway', and 'Analysis' tabs. A left sidebar contains a 'Menu' with various options like 'Security', 'Parameters', 'Element Spec', 'Definitions', 'Actions', 'Options', 'Cost Index', 'Formulas', 'Export Options', 'Data Dict.', 'Checked Out Bridges', 'Renumbr Brkey', 'Logging', 'Navigation & Field Security', 'Sync Mapping', and 'Utility'. The main content area shows a table of 'Action Defs' with columns for ID, Name, Description, Notes, and Sort Order. Below this is a form for 'Associated Benefit Group' with a dropdown menu and a table for 'Selected Benefit' with columns for ID, Element Name, Cost Per Unit, and Unit.

ID	Name	Description	Notes	Sort Order
26	Channel-Regrde Channel	Channel-Regrade Channel Under Bri		-1
27	Channel-Remove Debris	Channel-Remove Debris		-1
28	Channel-Repair Washout	Channel-Repair Washouts / Erosion		-1
29	Deck-Install Protection Sy	Deck-Install Protection System		-1
30	Dck-Ptch spls->Dck-Repr	Deck-Patch spalls->Deck-Repair (Po		-1
31	Deck-Place Overlay	Deck-Place Overlay		-1
32	Deck-Rehab	Deck-Rehab		-1

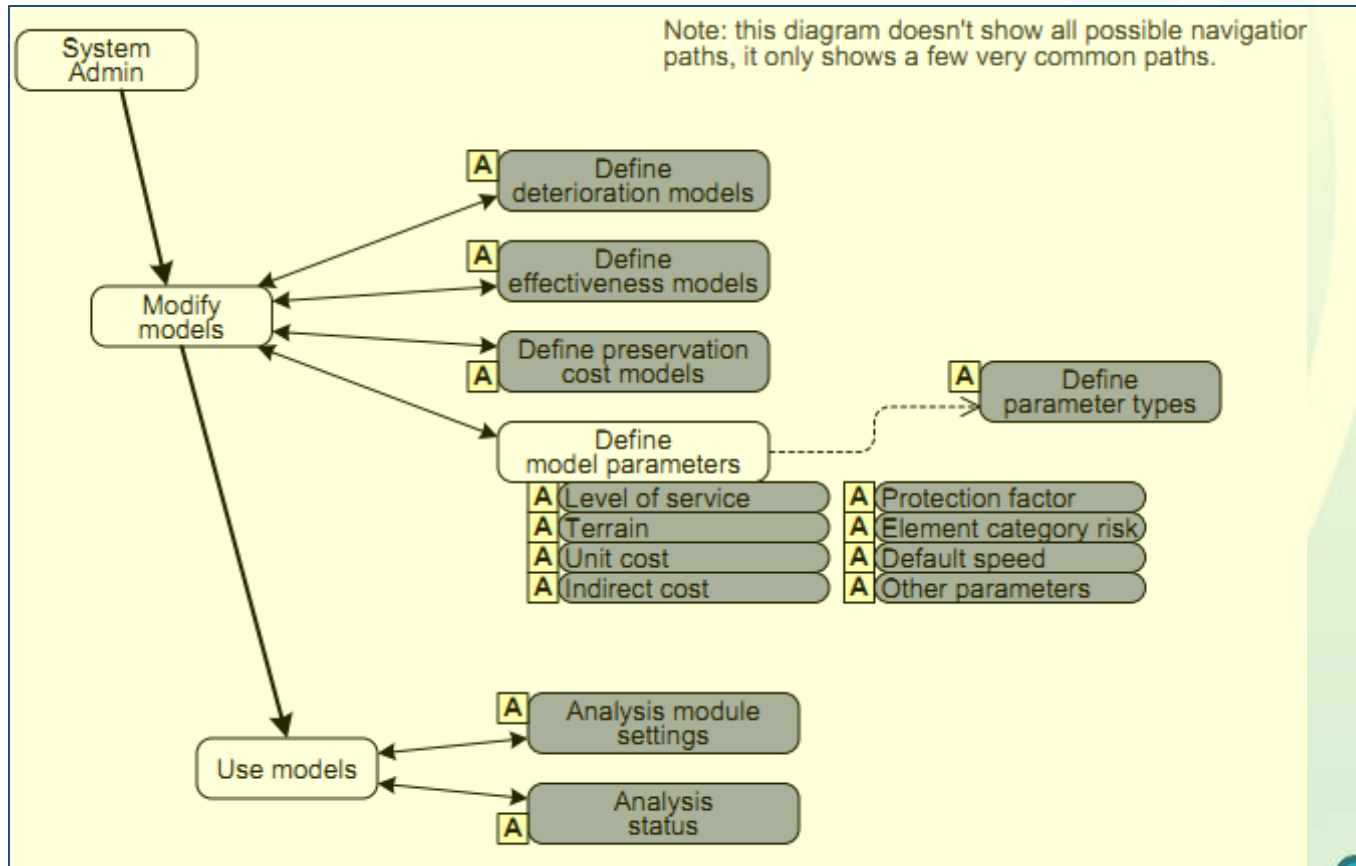
ID	Element Name	Cost Per Unit	Unit
12	Concrete Deck	\$ 74.32	sq.ft
38	Concrete Slab	\$ 74.32	sq.ft



# Deterioration Modeling

- Implement new deterioration model logic
  - Weibull approach to include time factor
- Easy to construct/new elicitation process
- Utilize AASHTO Elements
  - Protective Systems
  - Defect Flags
- Allow for Multi-path deterioration

# Deterioration Modeling



# Deterioration Modeling

**PONTIS BRIDGE MANAGEMENT SYSTEM**

Welcome: Pontis User Database: Pontis51 MSSQL Sample Help? Account Logout

Menu: Bridges Inspection Analysis Reports Gateway Admin

**Deterioration Models**

Add new deterioration model

Deterioration model	User	Pct complete	Final
Fred's elicitation	Fred Flintstone	100	no
Wilma's elicitation	Wilma Flintstone	100	no
Barney paint only	Barney Rubble	25	no
Betty decks only	Betty Rubble	30	no
<b>Official model</b>	<b>Hanna Barbara</b>	<b>10</b>	<b>yes</b>

Name: Official model  
Final:   
Weight: 12  
Description: Official model for use in scenarios

5 deterioration models  
Selected items: Duplicate Delete

Select elements/models to be listed

Elements: all  
Models: all  
Match selected element

Categories: 6 Decks/Slabs  
Types: all  
Materials: all

ID	Element	Cat	Type	Matl	Source	Shape	Prot	Median years to transition	Com- plete	Weight			
12	Bare Concrete Deck	6	06	7	Inspections	4	1.0	20.0	15.0	10.0	10.0	yes	30
12	Bare Concrete Deck	6	06	7	Fred's elicitation	4	1.0	19.0	15.0	10.0	10.0	yes	30
12	Bare Concrete Deck	6	06	7	Wilma's elicitation	4	1.0	25.0	15.0	10.0	10.0	yes	30
12	Bare Concrete Deck	6	06	7	Betty decks only	4	1.0	18.5	15.0	10.0	10.0	yes	30
12	<b>Bare Concrete Deck</b>	6	06	7	<b>Official model</b>	4	1.0	18.5	15.0	10.0	10.0	yes	30
13	Unp Conc Deck/AC Ovl							5.0	10.0	10.0	10.0	yes	30
13	Unp Conc Deck/AC Ovl							5.0	10.0	10.0	10.0	yes	30
13	Unp Conc Deck/AC Ovl							5.0	10.0	10.0	10.0	yes	30
13	Unp Conc Deck/AC Ovl							5.0	10.0	10.0	10.0	yes	30
14	P Conc Deck/AC Ovl							5.0	10.0	10.0	10.0	yes	30
14	P Conc Deck/AC Ovl							5.0	10.0	10.0	10.0	yes	30
14	P Conc Deck/AC Ovl							5.0	10.0	10.0	10.0	yes	30
14	P Conc Deck/AC Ovl							5.0	10.0	10.0	10.0	yes	30
14	P Conc Deck/AC Ovl	6	06	7	Official model	4	1.0	21.1	15.0	10.0	10.0	yes	30

50 element deterioration models

Reset weights

Calculate selected model

Model: Official model

Calculate model from:

Selected model Weight: 134 134

All other models listed

All other models available

Shaping parameter: 4 4

Protection factor: 1.0 1.0

Median years to transition out of:

Selected element State 1: 21.1 15.0

All other elements listed State 2: 15.0 15.0

Include different units State 3: 10.0 10.0

Different no. of states State 4: 10.0 10.0

Fill the Enter column

Apply to all elements listed

Calculate Apply

Health Index vs Forecast Year graph

Health Index: 0 to 100  
Forecast Year: 10 to 110

Legend: Calculated (dotted line), Entered (solid line)

Text boxes:  
 - Select a model at left, then set the attributes at right. If a model is marked "Final" it will appear in the pick list to be selected for a scenario. Elicitation models should not be marked final.  
 - This listing is meant to be used as the universe of models - historical inspection models and elicitation models - from which the new model is to be calculated.  
 - Inspection models are calculated by the software when needed, and not stored in the database. Their weight is the number of bridge elements contributing to the model.  
 - The user can modify the weight given to each element model, for the purpose of calculating the new model. This permits fine-tuning of which elements and models contribute to the Bayesian updating procedure.  
 - Only complete models contribute to updating. These are models whose input data are all filled in.

Buttons: BACK, Save, Printable View

Footnote: This page is used for both expert elicitation and for updating of the deterioration model. Consistent with Mini Study 1, deterioration models are entered and stored in the form of Median Years to Transition. These are then converted to transition probabilities when the model is actually applied to specific bridges. The page is designed to let the user select a model to edit, then select the elements to edit. Operations can be applied to a whole group of elements. For example, a model can draw on all the past inspections for all decks. Use expert elicitation for any or all decks, and copy the results to all decks. This will greatly reduce data entry time.

Footnote: First adjust the filter settings so the listing of elements shows the models and elements you want to display. Adjust the element model weights as needed. Click the one model that you plan to update. In the lower left, you can set some additional constraints on which models are used. Click Calculate to see the preliminary results in the Calc column on the



# Project List

Bridges Inspection **Analysis** Reports Gateway Admin

Project Filter: Project Category  Replacements  Create Project

**Project Characteristics**

Project Name:

Project ID:

Bridge ID:

Project Status:

Review Status:

Assigned to Program: Yes:  No:

Project Category:

Program Category:

Program:

Subset:

Years:  to

Project End Date:  to

Cost at Least (\$k):  Benefit >=:

IBC at Least:  Rank at Least:

**Geographic Location**

Within Distance:  miles of

Corridor:  or

Project:  or

Bridge:

**Bridge Characteristics**

Use Desktop Filter:  Other:

District:

Admin Area:

County:

Owner:

Custodian:

On/Off State System:

NHS Status:

Bridge Group:

Functional Class:

**Advanced Criteria**

Type: Project:  Proto:

Prog Treatment: Schedule:  Ignore:  Complete:

Account for Cost: Yes:  No:

Account for Effect: Yes:  No:

Freeze Category: Yes:  No:

Freeze Program: Yes:  No:

Freeze Year: Yes:  No:

Coverage: Full Bridge:  Pat Bridge:

IBC Level: Green:  Yellow:  Red:

Go to Project:

Project Name	Project ID	Category	Program	Year	Treatment	Status	Cost (\$K)
Replace 123456	003-6543-8970	Replacement	HBRRP	2012	Comp CPY	Proposed	30.5
Replace 123456	003-6543-8970	Replacement	State	2012	Sched CE	Proposed	30.5
Replace 123456	003-6543-8970	Replacement	HBRRP	2012	Comp C	Proposed	36.5
Replace 123456	003-6543-8970	Replacement	State	2013	Ignore	Proposed	21.0
Replace 123456	003-6543-8970	Replacement	State	2012	Comp CPY	Proposed	19.5
Replace 123456	003-6543-8970	Replacement	HBRRP	2012	Comp CE	Proposed	30.5

6 Projects, 1 Selected (\$36.5K)

Selected Project(s)

Delete



# Project Planning and Bridge Level Analysis

- Bridge Level Analysis
  - Show the list of specific needs by bridge and all the associated details and the ability to filter needs by any field and see detailed information. The dashboard will show the basic bridge statistics, information on a bridge's vulnerability/risks and other utility function related items including their weights and combined results.



# Project Planning and Bridge Analysis

1.11 Bridge Analysis Dashboard (PP-1,PP-15,PP-17,PP-20,PP-24,PP-25,PP-26,PP-27,PR-7) 14 October 2009

**PONTIS BRIDGE MANAGEMENT SYSTEM**

Menu: Bridges Inspection Analysis Reports Gateway Admin

Scenario Pick List: **Bridge Analysis Dashboard**

Bridge: 1234567  
 Name: Plum Creek Bridge  
 Facility: I-25  
 Feature: East Fork Plum Creek

Route: 00025 Milepoint: 181.50  
 District: 1 - Metro County: Douglas  
 Fund: 11 - Urban Interstate Area: 23 - Castle Rock  
 Owner: 1 State highway agency Resp: 1 State highway agency  
 Material: 6 RIB Continuous Design: 05 Multiple box beam  
 Scour: 7 Countermeasures

Recent completed work:  
 Deck overlay 2008 300.0

Projects assigned:  
 Heavy maintenance 2011 **Utwarn**

Review status: Recommended

This narrow bridge has a deteriorated deck and a potential scour issue. There is also some spalling and exposed rebar in the abutments.

Store all output

History - Geometry	Mobility - Safety	NBI Condition
Built: 1966	Operating: 53.5	Deck: 4
Reconst: 1995	Inventory: 32.6	Superstr: 7
Length: 180 ft	Geometry: 9	Substr: 5
Width: 80 ft	Approach: 8	Culvert: N
Span: 100 ft	Waterway: 6	Structure: 4

Current Scaled Performance	Sufficiency
Health: 83.2	Risk: 60.0
LC Cost: 75.5	Mobility: 100.0
	Rating: 72.5
	SD/FO: 80

Effect of scope and timing

Work candidate	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Do nothing	57.2	57.2	57.2	57.2	57.2	57.2	57.2	57.2	57.2	57.2
Replacement	93.2	94.5	95.4	94.7	93.5	93.3	92.4	91.2	89.9	88.4
Heavy maint	82.3	83.6	84.4	84.3	83.9	83.2	81.3	80.0	78.9	77.7
Deck overlay	92.5	93.1	93.2	92.5	91.9	90.5	88.2	86.3	83.6	80.4
Repairs	95.1	95.3	95.2	94.9	94.6	94.2	93.5	93.0	92.3	91.4

Bridge forecasts for action(s) and year selected above

Vulnerabilities and deficiencies in 2012	Type	Performance	Scaled	Effect
Scour	4	35	90	
Road width (over)	24 ft	47	100	

Element condition forecast in 2012

Element	Condition	Effect
12 - Bare concrete deck		
104 - RIB concrete box girder		
215 - R/Conc abutment		
301 - Pourable joint seal		
310 - Elastomeric bearing		
321 - R/Conc approach slab		
333 - Other bridge railing		

Effect of scope and timing on performance

Benefit and cost for the action(s) and year selected above

Measure	Base	New	Benefit	Benefit/cost summary
Life cycle cost	75.5	97.2	21.7	Initial cost (\$k): 501.1
Mobility	100.0	100.0	0.0	
Health index	83.2	94.4	31.2	Benefit (utility): 2431.2
Scour	80.0	100.0	20.0	Benefit/cost: 4.552

Follow-up work

Year	Flex action	Cost (\$k)	Benefit	B/C
2024	Deck repair	23.4	45.3	1.94
2024	Joint repair	43.3	54.6	1.26




# Project Planning and Bridge Level Analysis

- Project Planning
  - Ability to create and view projects .
  - Define projects by grouping together work items and bridges
  - Determine cost and effectiveness of projects and the end result of performing the selected work on the selected bridges.
  - Dashboards to view higher level numbers and effects, while also being able to drill down to specific results and details

# Project Planning and Bridge Analysis

2.01 Project List (PP-3,PP-13,PP-14,PR-15) 14 October 2009



## PONTIS BRIDGE MANAGEMENT SYSTEM

Welcome: Pontis User  
 Database: Pontis51 MSSQL Sample  
[Help ?](#) [Account](#) [LogOut](#)

**Menu** Bridges Inspection Analysis Reports Gateway Admin

**Scenario Pick List** **Project List**

**Work Candidates** Project filter:  Project cat:  Replacements

Go to project:

Type a Project ID or Name in the box to scroll directly there (PP-8).

Project name	Project ID	Category	Program	Year	Treatment	Status	Cost (\$k)	IBC
→ Replace 12345	003-8543-8907	Replacement	→ HBRRP	→ 2012	Comp CPY	Proposed	30.5	2.85
→ Replace 12345	003-8543-8907	Replacement	→ State	→ 2012	Sched CE	Proposed	30.5	2.54
→ Replace 12345	003-8543-8907	Replacement	→ HBRRP	→ 2012	Comp C	Proposed	30.5	1.99
→ Replace 12345	003-8543-8907	Replacement	→ HBRRP	→ 2012	Comp C	Proposed	30.5	1.58
→ Replace 12345	003-8543-8907	Replacement	→ HBRRP	→ 2012	Comp CP	Proposed	30.5	1.51
→ Replace 12345	003-8543-8907	Replacement	→ HBRRP	→ 2012	Comp CPY	Proposed	30.5	1.42
→ Replace 12345	003-8543-8907	Replacement	→ State	→ 2012	Ignore	Proposed	30.5	1.33
→ Replace 12345	003-8543-8907	Replacement	→ State	→ 2012	Comp CPY	Proposed	30.5	1.06

The green link icons navigate to the Project Level Dashboard, the Program Planning Dashboard, and the Priority List pages, respectively.

9 projects, 2 selected (\$81k)

**Selected projects**

Assign to program:

Assign to year:

Set status:

Set review status:

Program treatment:

Freeze:  Category  Program  Year

Program treatment plays a very important role here, as it indicates how much of the decision-making process is defaulted to the Pontis models, vs decisions made by the engineer. The defaulted decisions are considered to be more tentative, subject to later review as details are pinned down.

In the treatment column, "Comp" means that the project is free to complete, and the initials indicate what is frozen: Category, Program, or Year. "Sched" means the user has decided to go ahead and schedule the project in a specific Category, Program, and Year, and does not want other alternatives to be considered. The initials indicate what aspects of the project participate in the analysis: Cost or Effect. (PR-18)

Incremental Benefit/Cost (IBC) is color-coded to indicate likelihood that the project will be funded. See page 2.00 for information on the computation and display of IBC.

This page supports a variety of batch operations on projects. For users that are already familiar with the projects on the list, it is possible to complete most status and programming changes on this page very quickly without having to view the detail about each project. Simply ctrl-click the projects to select them, then click the desired button in the bottom pane to operate on all of the selected projects at once. (PP-10,PP-13,PP-14)

The "Schedule as shown" button changes the program treatment to "Sched CE" for all selected projects. The treatment box at lower right gives a finer level of control over program treatment.






# Phase III (5.2.3)

- Completion of programming module
  - Projects
  - Programs
- Scenario Creation
- Results Browsing/Dashboards
- Additional administration features
- Complete Project Planning module



# Bridge Level Screens – Supporting Future Years



PONTIS BRIDGE MANAGEMENT SYSTEM

Welcome: **Pontis User**

51 MSSQL Sample

Account LogOut

**Menu**

Scenario Pick List

Work Candidates

Needs List

Bridge Analysis

Setup Projects

Projects

Programs

Scenarios

Save

Printable View

**Bridges Inspection Analysis Reports Gateway Admin**

*Work Candidate Dashboard*

Year:  Work candidate:

Type: Initial Full-Bridge

Custom: yes Warranted: yes

Project: Rehab bridge 1234567 Status: CPY

The "Unassign project" button changes to "Assign a project" if no project is currently assigned to this bridge. The status codes indicate what aspects of the project are currently frozen: Category, Program, or Year. See data model for more info on status flags.

Bridge ID: 1234567  
 Name: Plum Creek Bridge  
 Facility: I-25  
 Feature: East Fork Plum Creek

LxWxSp: 160x60x100 ft      Deck: 6000 sq.ft  
 NBI cond: 4-7-5-N Suff 72.5 SD      Oper/Inv: 53.5/32.6 tons

**Scaled performance**

Measure	Base	New	Benefit
Life cycle cost	75.5	97.2	21.7
Mobility	100.0	100.0	0.0
Health index	63.2	94.4	31.2
Scour	80.0	100.0	20.0

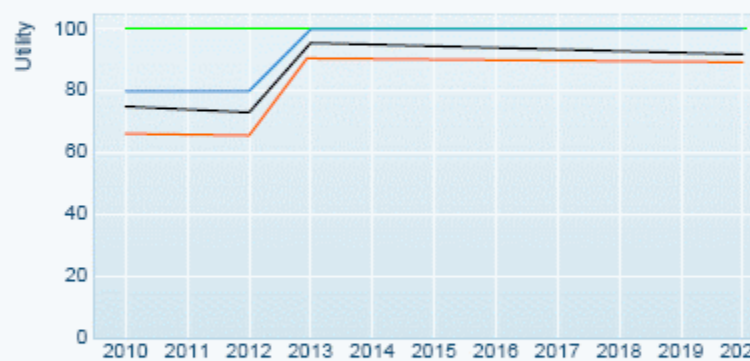
Performance is shown for all measures having non-zero utility weights.

**Benefit/cost summary**

Quantity adj: 1.0  
 Cost adjust: 1.0  
 Benefit adjust: 1.0  
 Direct cost (\$k): 501.1  
 Benefit (utility): 2431.2  
 Benefit/cost: 4.852

**Deferment period (years)**  
 Before: 6    After: 10

**Forecast performance**



Check boxes indicate which measures appear in the graph. If scaled, multiple measures can be checked. Change from radio buttons to checkboxes if scaled.

**Forecast performance**  Scaled

Performance measure	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<input checked="" type="checkbox"/> Life cycle cost	77.9	77.1	76.2	97.2	96.9	96.7	96.4	95.9	95.4	94.7
<input checked="" type="checkbox"/> Mobility	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<input checked="" type="checkbox"/> Health index	66.9	65.7	64.4	94.4	94.4	94.3	94.2	94.1	94.0	93.9
<input checked="" type="checkbox"/> Scour	80.0	80.0	80.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

For Phase 1C – look only at effect of action in current year. Can do future years with deterioration model

- Scenario Pick List ▾
- Work Candidates ▶
- Needs List
- Bridge Analysis
- Setup Projects
- Projects ▶
- Programs ▶
- Scenarios ▶
- Save**
- Printable View

## Work Candidate Dashboard

Year: **2012** Work candidate: **My Custom**

Bridge ID: 1234567  
 Name: Plum Creek Bridge  
 Facility: I-25  
 Feature: East Fork Plum Creek

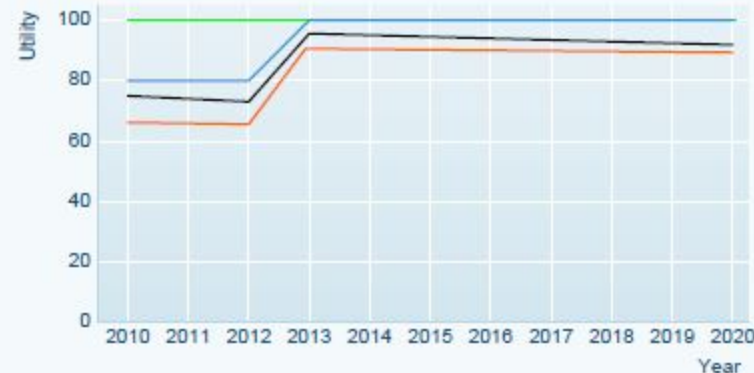
LxWxSp: 160x60x100 ft Deck: 6000 sq.ft  
 NBI cond: 4-7-5-N Suff 72.5 SD Oper/Inv: 53.5/32.6 tons

Type: Initial Full-Bridge  Unassign project  
 Custom: yes Warranted: yes  
 Project: Rehab bridge 1234567 Status: CPY

### Scaled performance

Measure	Base	New	Benefit	Benefit/cost summary	
Life cycle cost	75.5	97.2	21.7	Quantity adj:	1.0
Mobility	100.0	100.0	0.0	Cost adjust:	1.0
Health index	63.2	94.4	31.2	Benefit adjust:	1.0
Scour	80.0	100.0	20.0	Direct cost (\$k):	501.1
				Benefit (utility):	2431.2
				Benefit/cost:	4.852

### Forecast performance



Deferment period (years)  
 Before: 6 After: 10

Forecast performance  Scaled

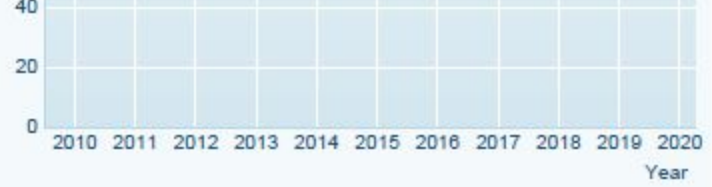
Performance measure	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<input checked="" type="checkbox"/> Life cycle cost	77.9	77.1	76.2	97.2	96.9	96.7	96.4	95.9	95.4	94.7
<input checked="" type="checkbox"/> Mobility	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<input checked="" type="checkbox"/> Health index	66.9	65.7	64.4	94.4	94.4	94.3	94.2	94.1	94.0	93.9
<input checked="" type="checkbox"/> Scour	80.0	80.0	80.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Check boxes indicate which measures appear in the graph. If scaled, multiple measures can be checked.

### Add work task

Flex action	Warrant	Performance		Utility Benefit	Direct Cost (\$k)	B/C	Template
		After	Base				
<input checked="" type="checkbox"/> Replace wearing surf	yes			538.34	156.5	3.44	
<input checked="" type="checkbox"/> 12 - Bare concrete deck (6000 sq.ft)	yes						
<input checked="" type="checkbox"/> 321 - R/Conc approach slab (2 ea)	no						
Health index		100	65				
<input checked="" type="checkbox"/> Concrete repair	yes			23.3	34.3	0.68	
<input checked="" type="checkbox"/> 104 - P/S conc box girder (1120 lf)	yes						
State 1: Do nothing		700	0				
State 2: Batch concrete		300	120				

Health index	63.2	94.4	31.2	Benefit adjust:	1.0
Scour	80.0	100.0	20.0	Direct cost (\$k):	501.1
				Benefit (utility):	2431.2
				Benefit/cost:	4.852



Deferment period (years)  
Before: 6 After: 10

Forecast performance	<input checked="" type="checkbox"/> Scaled									
Performance measure	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<input checked="" type="checkbox"/> Life cycle cost	77.9	77.1	76.2	97.2	96.9	96.7	96.4	95.9	95.4	94.7
<input checked="" type="checkbox"/> Mobility	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<input checked="" type="checkbox"/> Health index	66.9	65.7	64.4	94.4	94.4	94.3	94.2	94.1	94.0	93.9
<input checked="" type="checkbox"/> Scour	80.0	80.0	80.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Check boxes indicate which measures appear in the graph. If scaled, multiple measures can be checked.

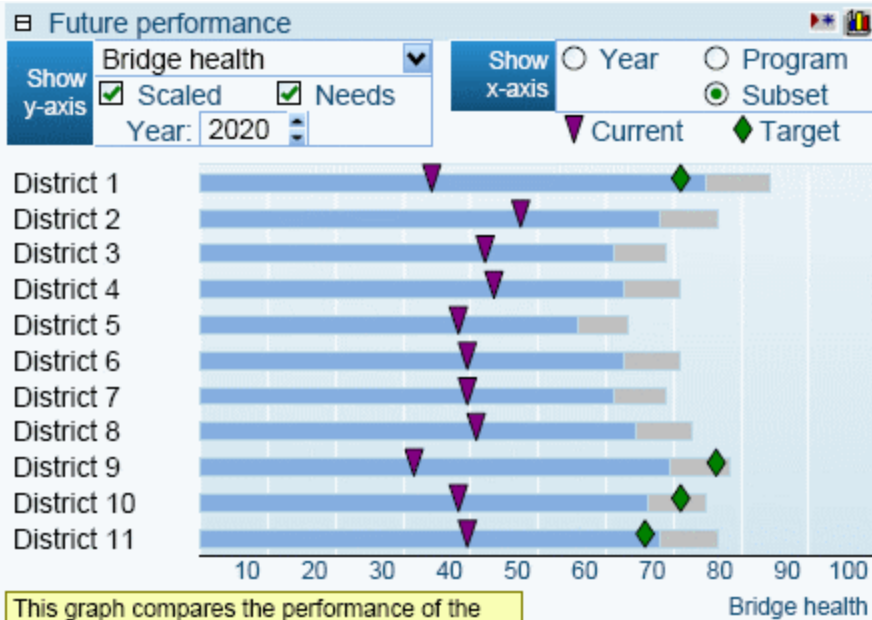
Add work task

Flex action	Warrant	Performance		Utility Benefit	Direct Cost (\$k)	B/C	Template
		After	Base				
<input checked="" type="checkbox"/> Replace wearing surf	yes			538.34	156.5	3.44	
<input checked="" type="checkbox"/> 12 - Bare concrete deck (6000 sq.ft)	yes						
<input checked="" type="checkbox"/> 321 - R/Conc approach slab (2 ea)	no						
Health index		100	65				
<input checked="" type="checkbox"/> Concrete repair	yes			23.3	34.3	0.68	
<input checked="" type="checkbox"/> 104 - P/S conc box girder (1120 lf)	yes						
State 1: Do nothing		700	0				
State 2: Patch concrete		300	120				
State 3: Clean steel and patch		120	200				
State 4: Clean steel and patch	yes	0	800				
<input checked="" type="checkbox"/> 215 - R/Conc abutment (120 lf)							
Health index	yes	95	72				
<input checked="" type="checkbox"/> Reseal joint	no			9.0	9.4	0.96	
<input checked="" type="checkbox"/> 301 - Pourable joint seal (120 lf)	no						
State 1: Do nothing		70	70				
State 2: Replace seal		30	30				
State 3: Replace seal	no	20	20				
Health index		81	81				
<input checked="" type="checkbox"/> Place rip rap (400 tons)				83.6	25.5	3.28	
Scour assessment	yes	7	6				
<input checked="" type="checkbox"/> Widen structure (14 ft)				1776.3	275.4	6.45	Widening in-kind
Accident risk (AAMDV)	yes	81	120				

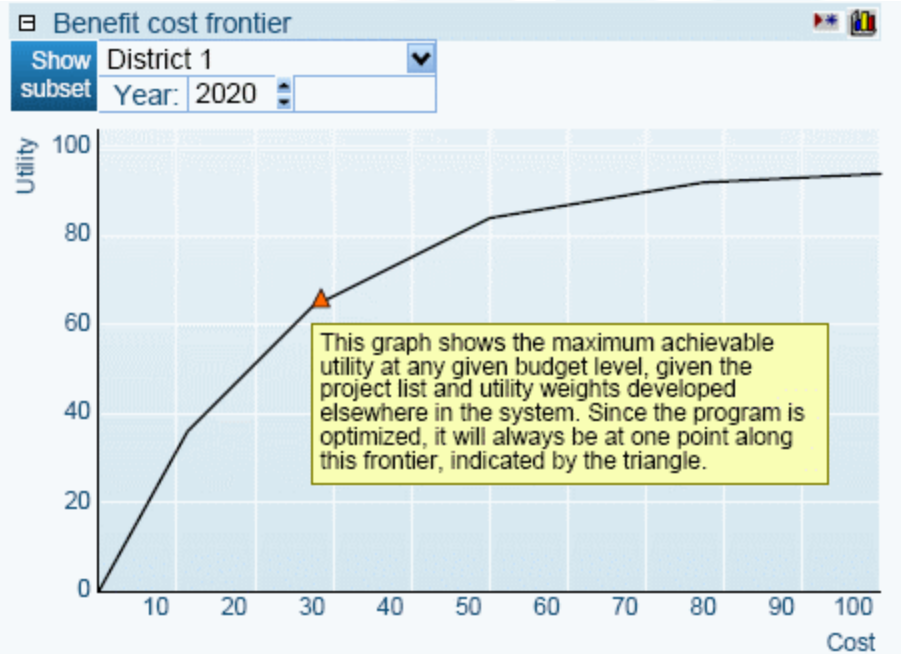
Selected work task: Duplicate Delete




# Network Level Planning



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.



# Program Level Planning



## PONTIS BRIDGE MANAGEMENT SYSTEM

Welcome: **Pontis User**  
 Database: **Pontis51 MSSQL Sample**  
[Help ?](#) [Account](#) [LogOut](#)

Menu
Bridges
Inspection
Analysis
Reports
Gateway
Admin

### Funding Allocation Dashboard

Scenario Pick List

Work Candidates

Projects

Programs

Program List

Program Planning

Funding Allocation

Tradeoff Analysis

Scenarios

Save

Printable View

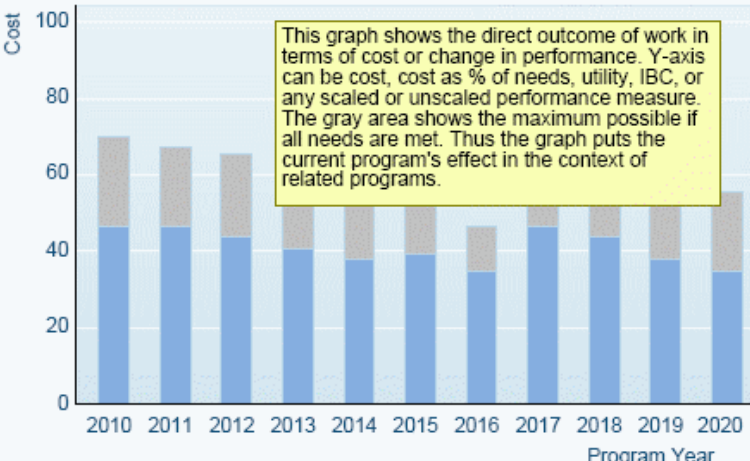
Program: HBRRP

Annual effect of work

Show Cost  Utility  IBC  Other

Show y-axis  Scaled  Needs

Show x-axis  Year  Program  Subset

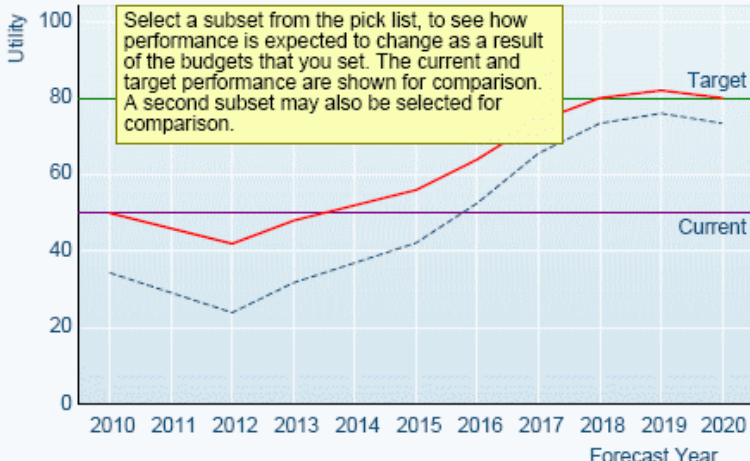


This graph shows the direct outcome of work in terms of cost or change in performance. Y-axis can be cost, cost as % of needs, utility, IBC, or any scaled or unscaled performance measure. The gray area shows the maximum possible if all needs are met. Thus the graph puts the current program's effect in the context of related programs.

Performance forecast

Show District 1  Compare: Statewide

Show subset



Select a subset from the pick list, to see how performance is expected to change as a result of the budgets that you set. The current and target performance are shown for comparison. A second subset may also be selected for comparison.



# Planned Bentley Add-Ons And Services

- AASHTO / Bentley Agreement supports new add-ons in coordination with Task Force:
  - Hosting/SaaS
  - Mobile applications
  - Workflow
  - 3D interactive inspection models
  - ProjectWise linkage
  - User credentialing

....



# Hosting / SaaS Solutions

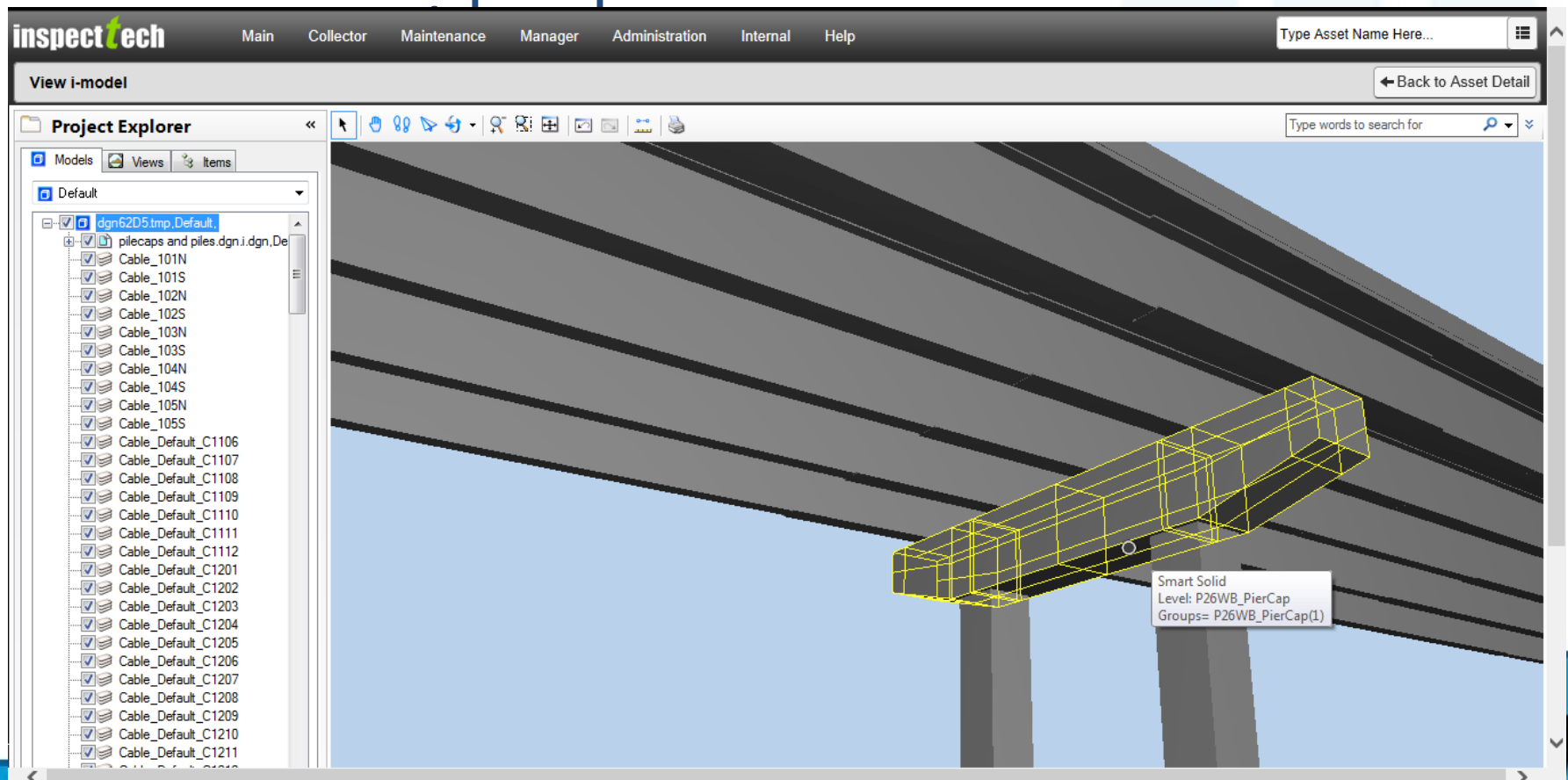
- Bentley able to provide reliable and secure hosting environment for Pontis solutions
- Bentley applies all patches and updates needed to Pontis
- Storage, processing and servers tuned for Pontis maximum performance
- Can result in significant cost savings to DOT and performance/satisfaction improvement





# Interactive Inspections

- Collect and report condition data at the



# Current Activities

- Bi-weekly Task Force Meetings (webinar)
- Quarterly Task Force Meetings (in person)
- Development of Phase 1C – Utility Functions
- Coordinate with TRT
- Incorporate any TAG feedback on 5.1.3
- Launch Phase 2
- Continue update webinars to the user community
- Expanding overall team



# Questions?



**AASHTOWare Bridge Management**

[www.AASHTOWareBridge.com](http://www.AASHTOWareBridge.com)