

Data: the Oxygen for the National Bridge Investment Analysis System (NBIAS)

Prepared for the:
2015 U.S. DOT Datapalooza

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June 17, 2015

Topics

- NBIAS overview
- NBIAS data
 - National Bridge Inventory (NBI)
 - Other data sources
- Use of NBIAS for developing the C&P Report
- Future directions for NBIAS
 - Recent and ongoing enhancements
 - New data sources
 - Future uses of the system

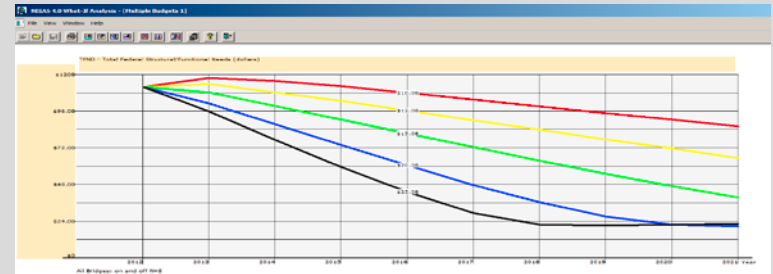


NBIAS Overview

- NBIAS is the analysis system used by FHWA to predict future bridge investment needs and performance
- The system predicts conditions and performance of each of the >600,000 highway bridges in the NBI
- Example questions NBIAS can help answer:
 - What is the size of the maintenance, repair and rehabilitation backlog for the bridges on the National Highway System?
 - What level of spending is required annually to maintain current bridge conditions over the next 20 years?
 - What user benefits might be achieved through addressing current bridge functional improvement needs?

NBIAS Key Features

- Uses a modeling approach adapted from Pontis
- Needs considered
 - Maintenance, repair and rehabilitation (MR&R)
 - Widening existing lanes and shoulders
 - Strengthening
 - Raising
- Performs a parameterized analysis with analysis steps varying by
 - Budget
 - Cutoff benefit/cost ratio
 - Budget growth rate
- Includes a what-if analysis module for dynamically viewing analysis results

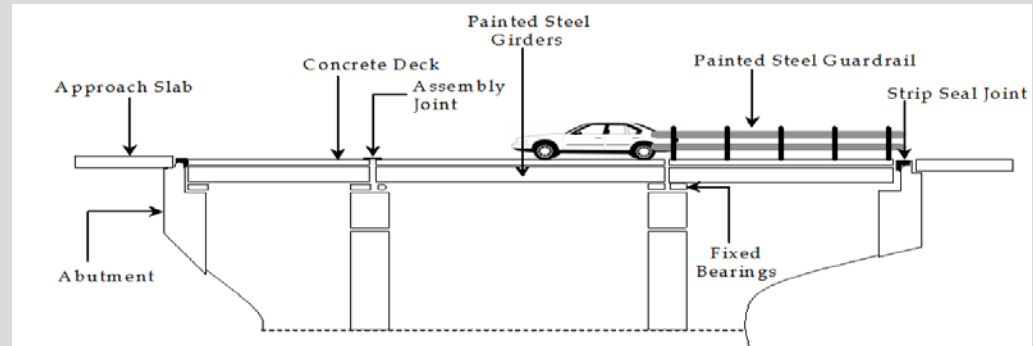


NBIAS Measures of Effectiveness

- Investment needs (\$, bridges)
- Money spent
- Work performed
- Backlog of needs (\$, bridges)
- User benefits (potential, obtained)
- Distribution of deck, superstructure, substructure ratings
- Structurally deficient bridges
- Bridge health index

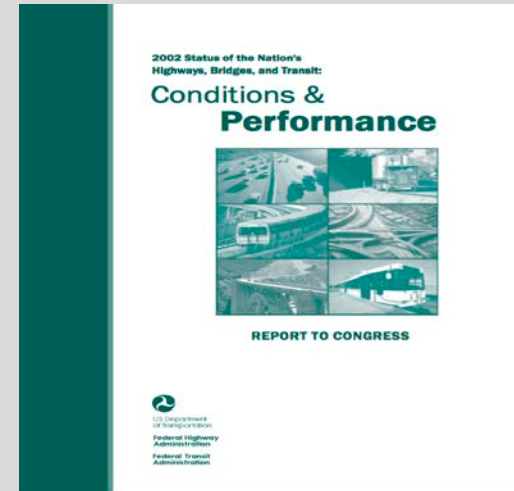
NBIAS Data

- Core data comes from the NBI
 - Bridge inventory
 - Deck, superstructure and substructure conditions
- Element level data can be imported or predicted from a set of synthesis, quantity and condition (SQC) models
- Other data
 - Cost data reported to FHWA
 - Element models derived from state data
 - User cost parameters from HERS



Use of NBIAS for the C&P Report

- NBIAS was first referenced in the 1999 C&P Report and first used in the 2002 report
- Essentially the system is used to determine the 20-year cost for highway bridges for two scenarios
 - Maintain C&P
 - Improve C&P
- Also has been used for supplemental analyses (e.g., interstates, NHS)



Recent Enhancements to NBIAS

- Improved installer
- Sensitivity analysis
 - System previously supported varying the discount rates
 - Value of life, time were incorporated into various parameters
 - Now can edit value of life, time up front
- Parameterization by growth rate
 - Adds a new approach to performing an analysis (see next slide)

Federal Highway Administration National Bridge Investment Allocation System (NBIAS) version 4.0

Log in Database | Import Elements | MR&R Model | Replacement Rules | Scenario | Editor | Settings |

Database: NBIAS 4.0 2013 NHS ON MSS

Import Options
NBI File: C:\ProgramData\NBIAS 4.0.1\NBIusa_2010\preproc.nbi [Browse...]
 Keep state-specified improvement costs in the NBI data

Bridge screening parameters
 Apply Screening Structurally Deficient
 Functionality Obsolete NHS On Off

Threshold ratings
Deck: 0-2 Substructure: 0-2
Superstructure: 0-2

ADT Threshold: 0
Length of benefits stream: 20
B/C Ratio Threshold: 0

Functional Classes: []

Analysis Parameters
Discount Rate: 7
Value of Life: 9000000
Personal of Time (\$/hr): 20
Business of Time (\$/hr): 35
Equivalent Factor: 0.934579
Default Value of Life: []
Default Personal Value of Time (\$/hr): []
Default Business Value of Time (\$/hr): []

[Bridge Viewer] [Refresh Snapshot] [Generate Snapshot] [Exit] [Help]

Parameterization by Growth Rate

- Select parameterization by growth rate
- Enter number of steps
- Enter min and max rates

Parameterization

Fixed Budget Sim Only

Parameter

Budget

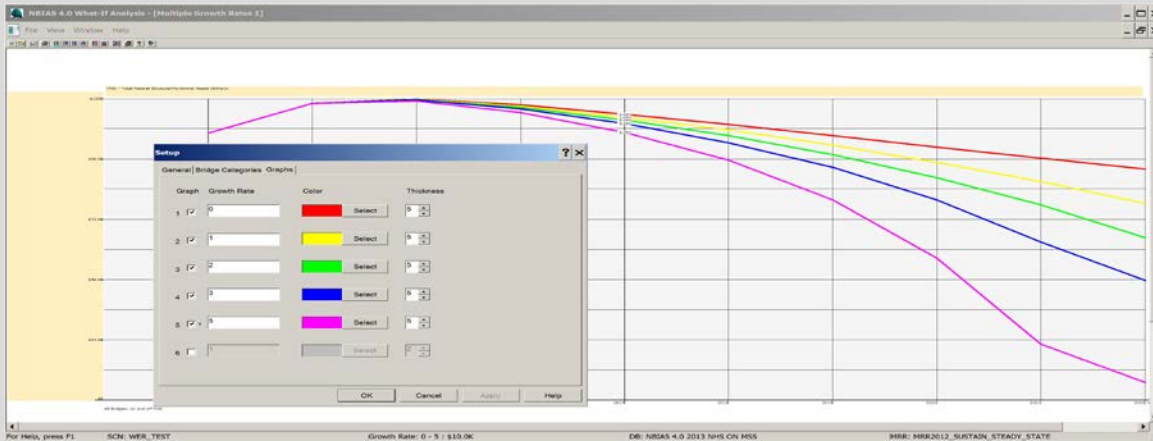
Cutoff B/C

Growth Rate

Parametric Steps

Min Rate

Max Rate

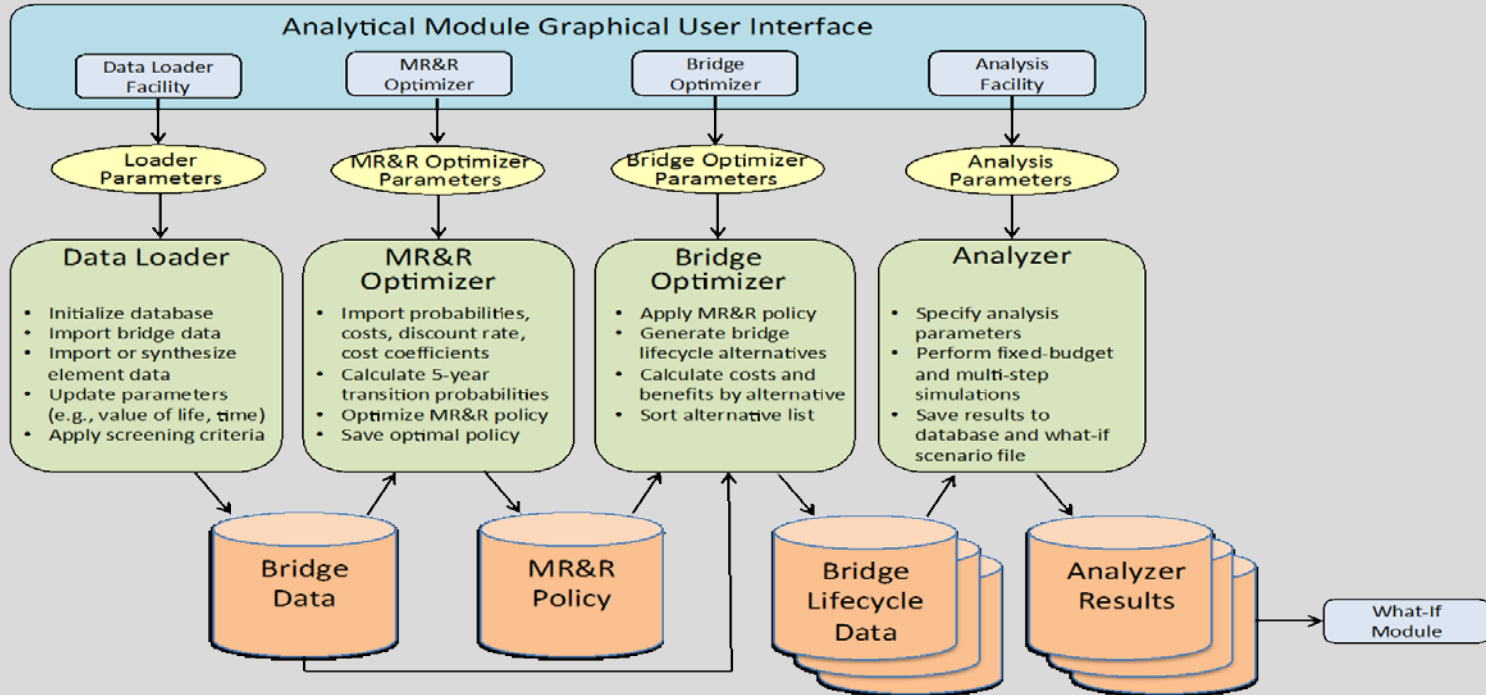


- System will use base year and budget for fixed budget step
- What-if views show rates rather than budgets

NBIAS Enhancements Now Under Development (Version 5.0)

- Budget by Work Type
 - Currently one specifies a single investment budget
 - Enhancement is to allow for specifying budget by work categories such as maintenance, rehabilitation, and replacement of structurally deficient bridges
 - Requires basic changes in how the system prioritizes alternatives
- Improved Targeting
 - System includes a useful but rudimentary targeting view
 - Enhancement is to allow for specifying a specific target value for any measure of effectiveness – the system will then calculate the required budget, B/C cutoff or growth rate needed to hit the target

NBIAS 5.0 Architecture



Future Directions for NBIAS

- Use of National Bridge Element Data
 - MAP-21 requires this data to be collected and reported for NHS bridges
 - In theory provides a better characterization of bridge condition
 - Could replace synthesized data for NHS bridges
- Use for additional applications
 - Primary focus of the system is support for the C&P Report
 - FHWA makes the system available for other uses, and it has been used for various state and local analyses
 - Additional states may wish to use the system for meeting MAP-21 asset management plan and performance management requirements