Transportation Asset Management Webinar Series
Webinar 61

TAM Innovations

Sponsored by FHWA and AASHTO

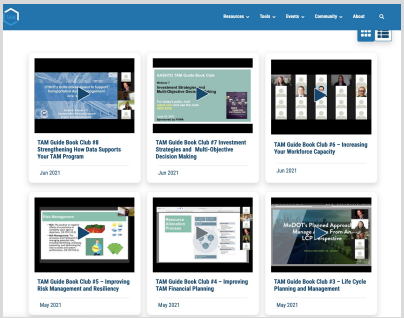
U.S. Department of Transportation Federal Highway Administration

AASHTO THE VOICE OF TRANSPORTATION

February 15, 2023

FHWA/AASHTO Asset Management Webinar Series

- This is the 61st in a webinar series that has been running since 2012
- Webinars are held every two months, on topics such as off-system assets, asset management plans, asset management and risk management, and more
  - 3rd Wednesdays, 2PM Eastern
- We welcome ideas for future webinar topics and presentations
- Submit your questions using the webinar's Q&A feature



Welcome

FHWA and the AASHTO Sub-Committee on Asset Management are pleased to sponsor this webinar series

- Sharing knowledge is a critical component of advancing asset management practice

Webinar Objectives

- Highlight TAM Innovations at DOTs
- Exchange innovative TAM practices and foster a dialogue so that agencies can learn from each other
- Raise awareness about how innovation can be a catalyst for unlocking TAM advancements at your organization

Webinar Agenda

2:00 **AASHTO Welcome and Overview**
Matt Hardy, AASHTO

2:05 **FHWA Welcome and Perspective**
Tashia Clemmons, FHWA

2:10 **Agenda Introduction**
Hyun-A Park, Spy Pond Partners

2:15 **PennDOT's Opensource Asset Management Systems**
Justin Bruner, Pennsylvania DOT

2:30 **MnDOT's TAM Strategic Action Plan**
Trisha Stefanski, Minnesota DOT

2:45 **UDOT's Use of the TAM Data Assistant to Advance**
Chris Whipple, Utah DOT

3:00 **Caltrans Application of PM in Safety**
Mike Johnson, California DOT (Caltrans)

3:15 **Discussion and Next Steps**
Matt Hardy, AASHTO

pennsylvania
DEPARTMENT OF TRANSPORTATION

TAM Innovations

Justin Bruner, P.E.
Asset Management Engineer
PennDOT Asset Management Division

TAM INNOVATIONS

Necessity the mother of innovation…

DOT Needs:

- Accurate and reliable prediction of future **funding** needs
- Connect federal performance metrics to asset **investment** levels
- Align project scopes with metrics, safety, engineering and **fiscal** needs
- Create smarter projects that combine needs, create less disruption and are more **financially efficient**

TAM INNOVATIONS

How do we address these needs?

By breaking down the silos of *management* and *information*, providing **Actionable Intelligence** for business leaders.

TAM INNOVATIONS

Actionable intelligence benefits**:**

- Accurate funding assessments– transparent external conversation
- Accurate condition forecasts- ensuring compliance
- Optimized project recommendations- achieving lower long-term costs
- Meaningful metrics- KPI's- better business management

TAM INNOVATIONS

How do we achieve **Actionable Intelligence?**

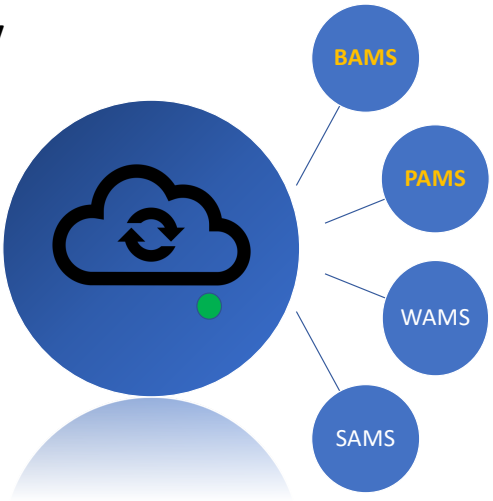
By operating business management systems from an **open-source ecosystem** that can be completely customized to the end user's needs.

PENNDOT OSS

One software core, many applications:

PennDOT

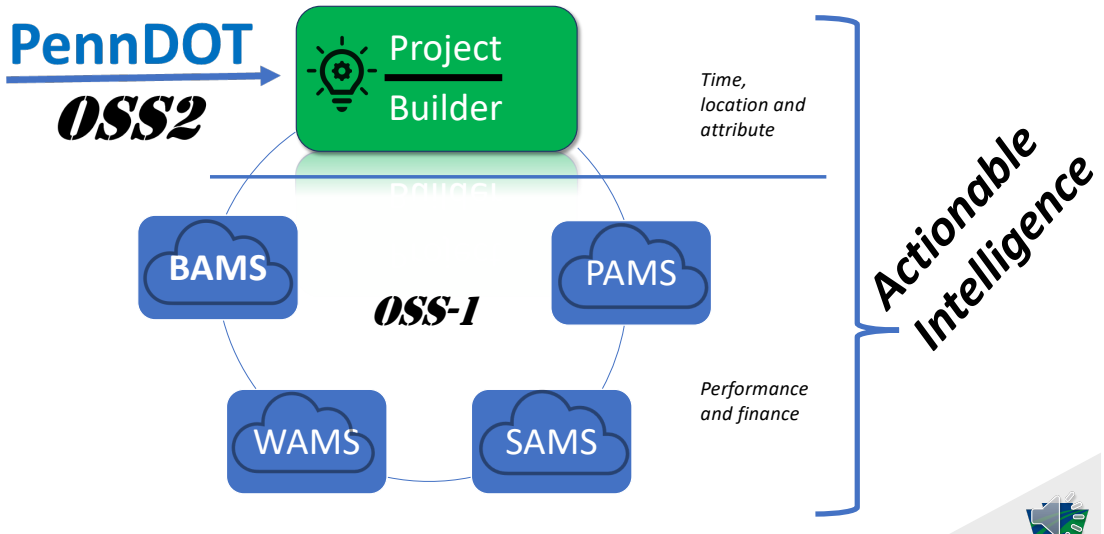
OSS-1



PENNDOT OSS

PennDOT

OSS2



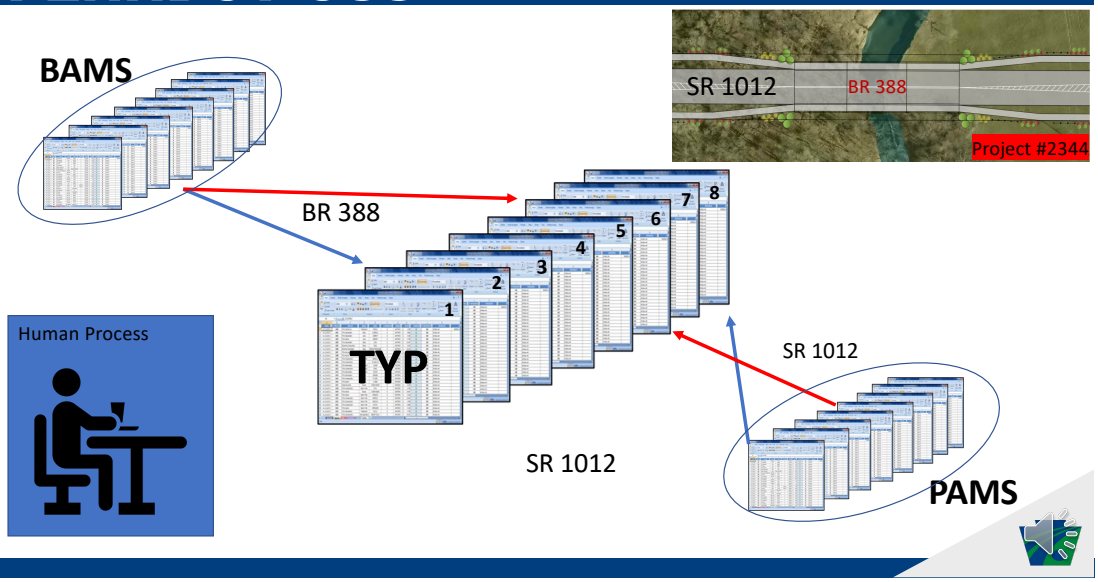
PENNDOT OSS

*Answers the question: How do I optimize within my **asset class**?*

PennDOT OSS-1:

- Multiple optimization options- LLCC, targets, etc.
- Future condition and need forecasts
- Constrained and unconstrained finance models
- **OUTPUT: Treatment per asset, per year**
- Systems: BAMS, PAMS, etc.

PENNDOT OSS



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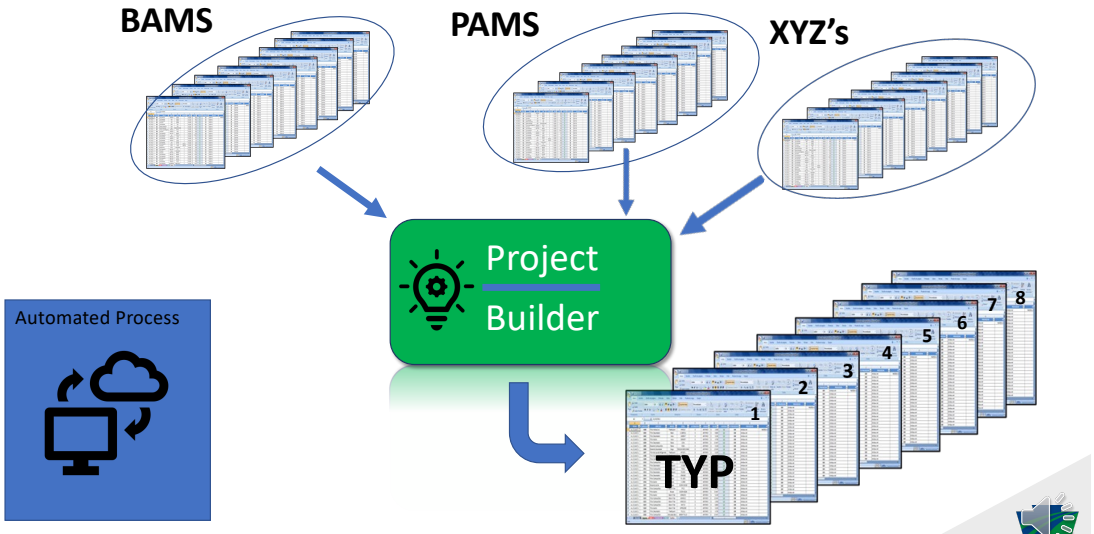

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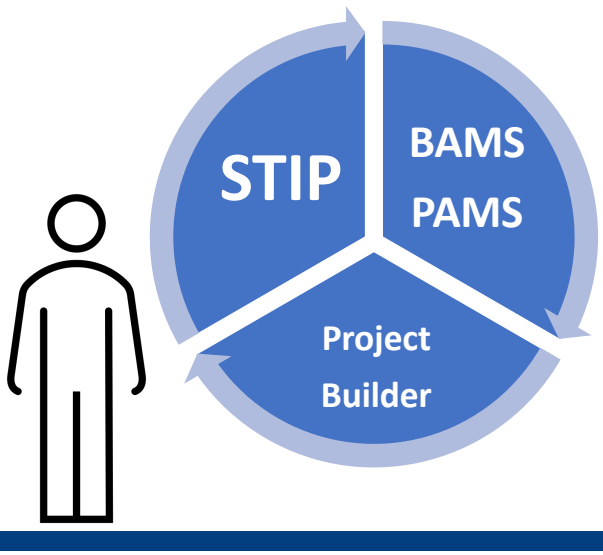
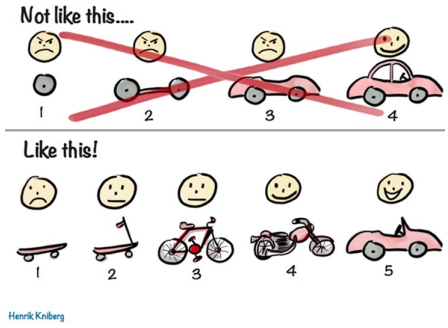


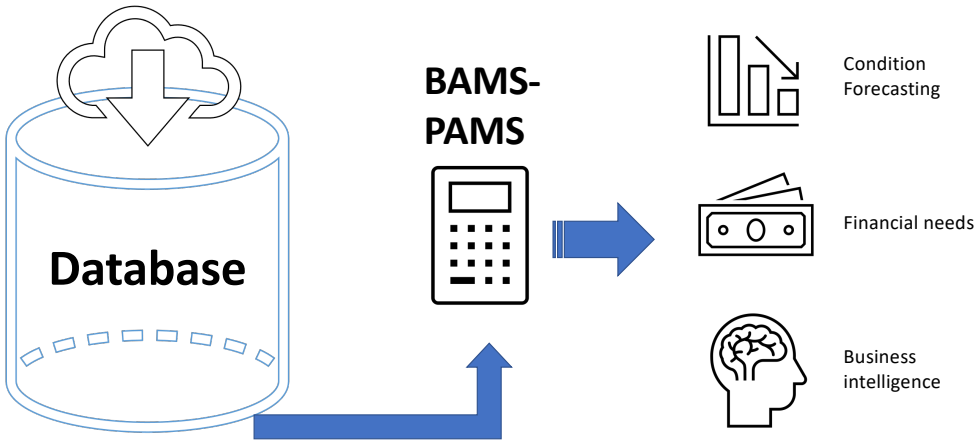


PENNDOT OSS

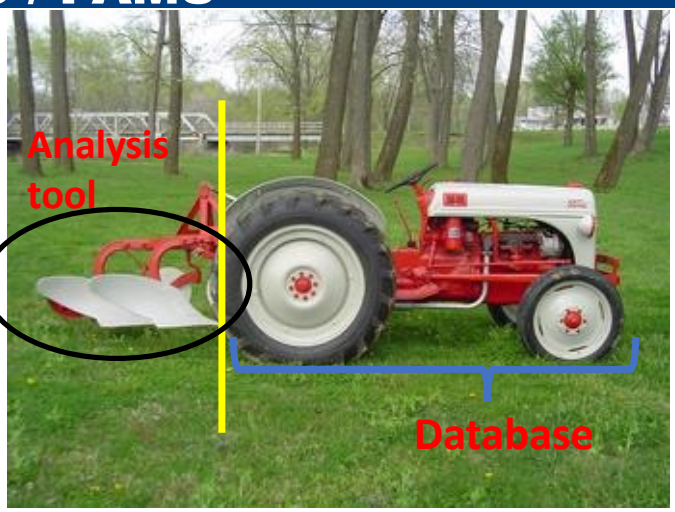
PennDOT Open-Source Software Platforms
(*OSS -1, OSS -2*)

- Current PennDOT BAMS, PAMS, PBJ platforms
- OSS advantages:
  - Fast development and implementation
  - Complete flexibility to adjust as implementation progresses
  - Ability to adapt to evolving tools (bridge, pavement management)
  - Ability to support individual business needs- some areas may be more or less advanced than others

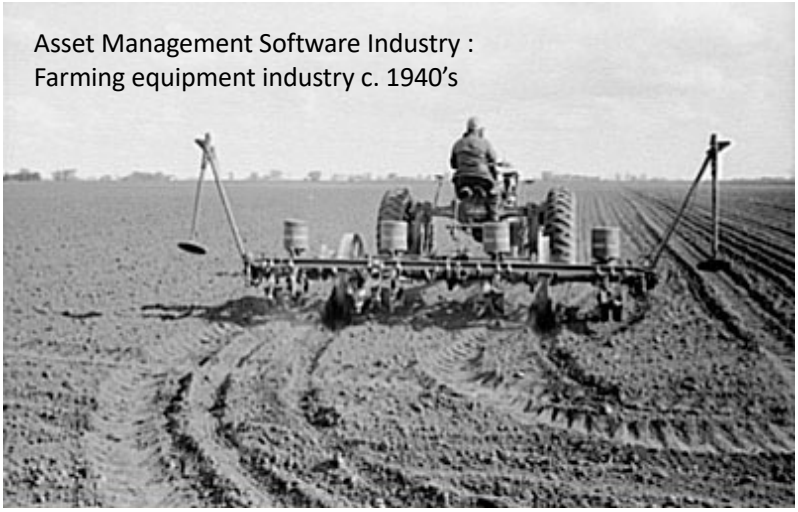
BAMS / PAMS



BAMS / PAMS

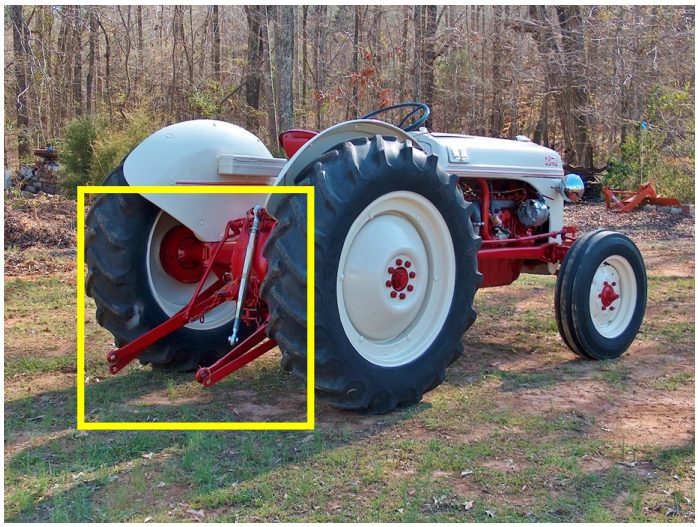


SYSTEM



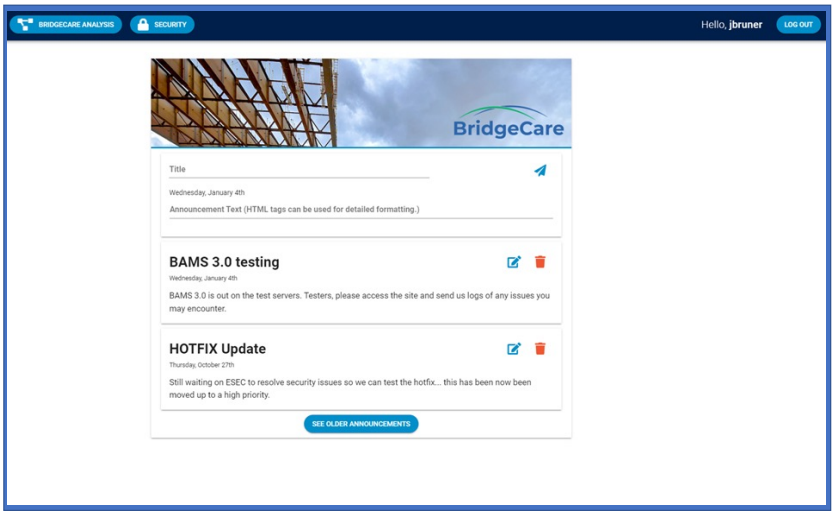
- Component level advancement
- Industry trend for sole-source provider
- "Vendor lock-in"

SYSTEM

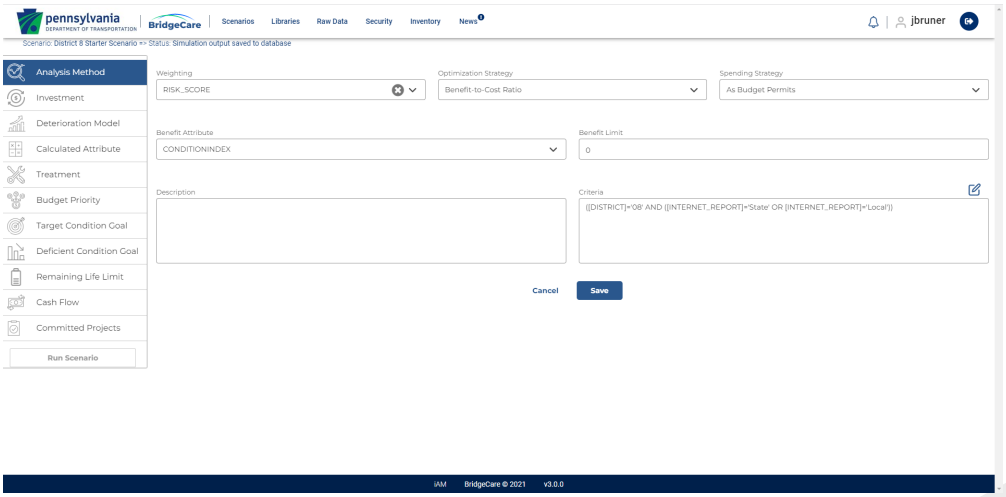


- 1950's- industry explosion due to standardized interface
- Asset Management software output standard:
  - *Recommended treatment per asset, per year*

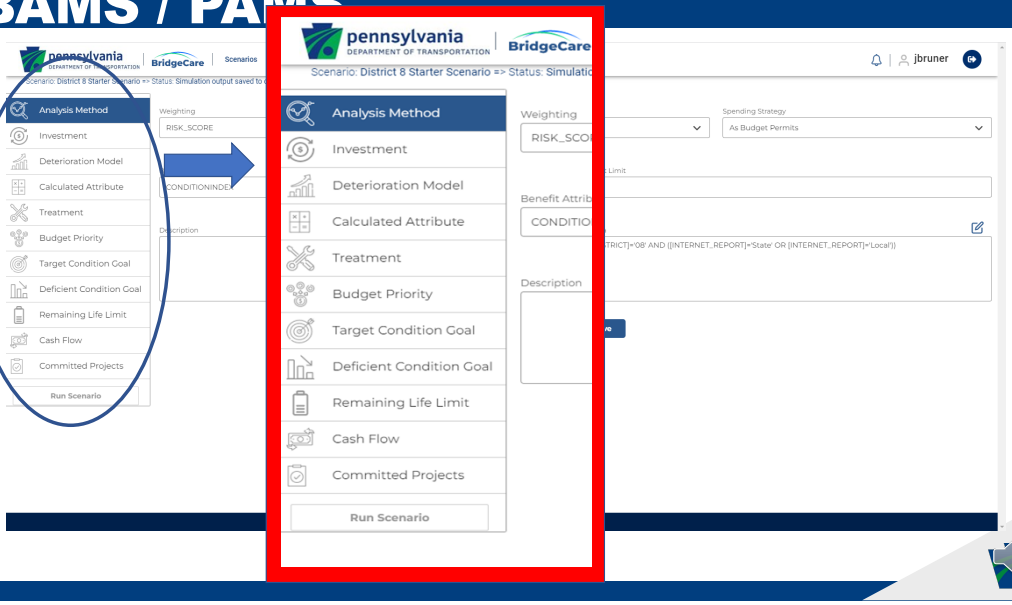
BAMS / PAMS



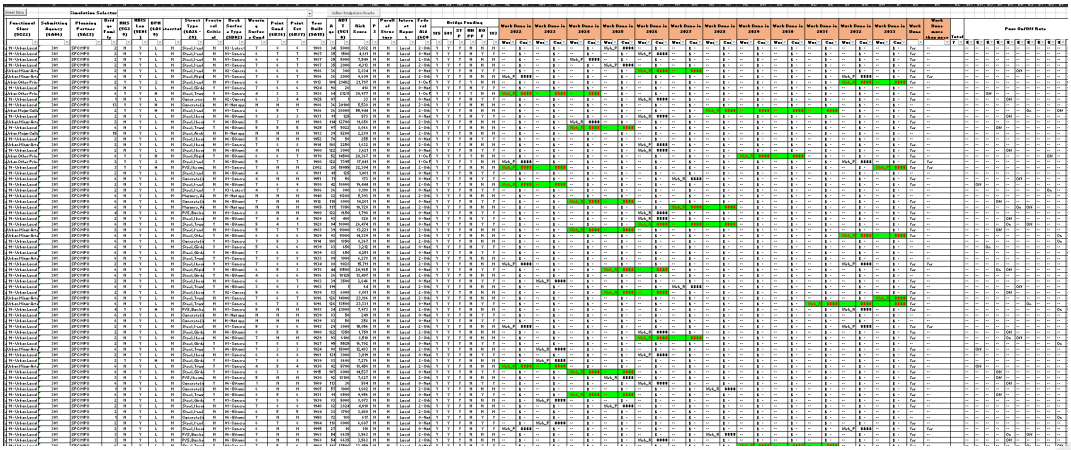
BAMS / PAMS



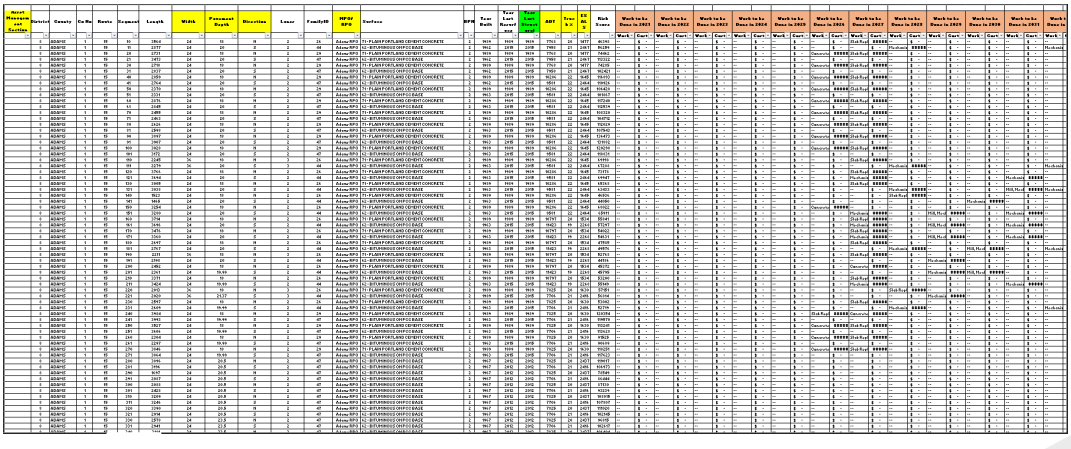
BAMS / PAMS



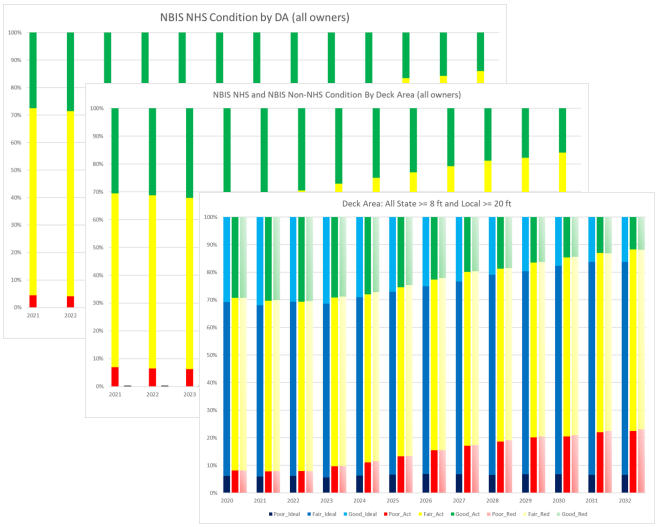
BAMS



PAMS



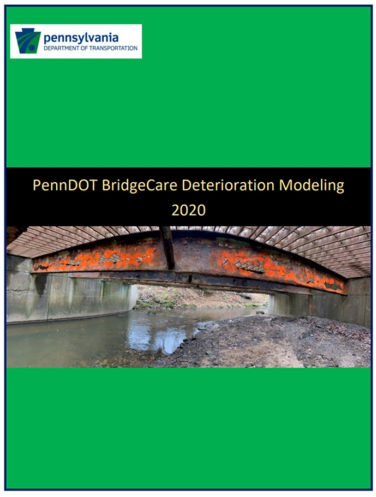
BAMS / PAMS

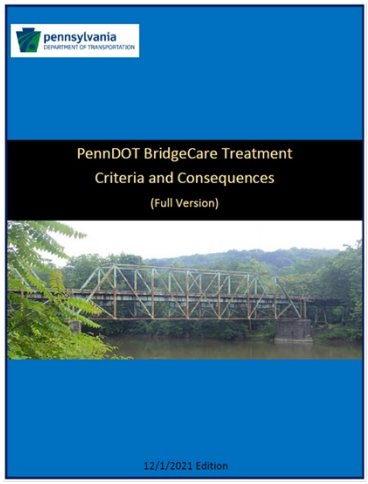


Output file:

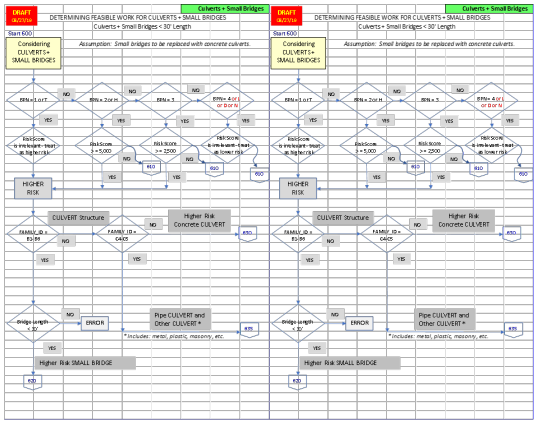
- 22 tabs in total
- 9 unique charts
- 3 financial analysis tabs
- 1 unfunded treatment page

BAMS / PAMS





BAMS / PAMS



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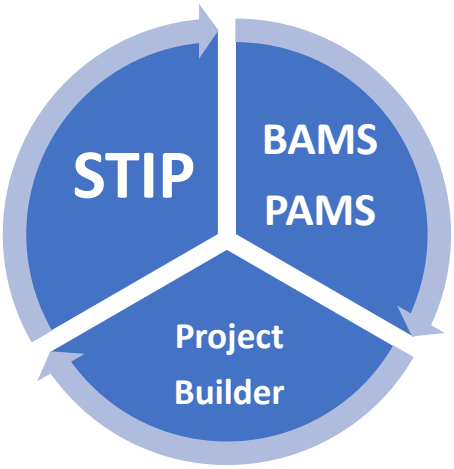
PROJECT BUILDER

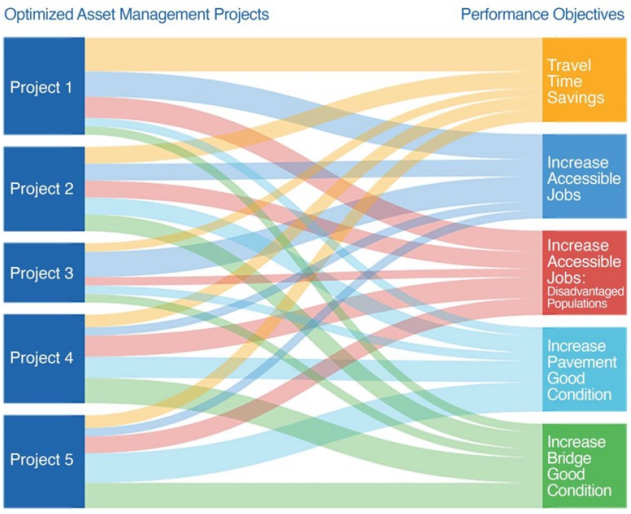
*Answers the question: How do I optimize **the program**?*

PennDOT OSS-2:

- Iterative process
- Incorporates factors for equity, mobility, safety
- **OUTPUT: Draft Projects (85% complete)**
- System: Project Builder

PROJECT BUILDER





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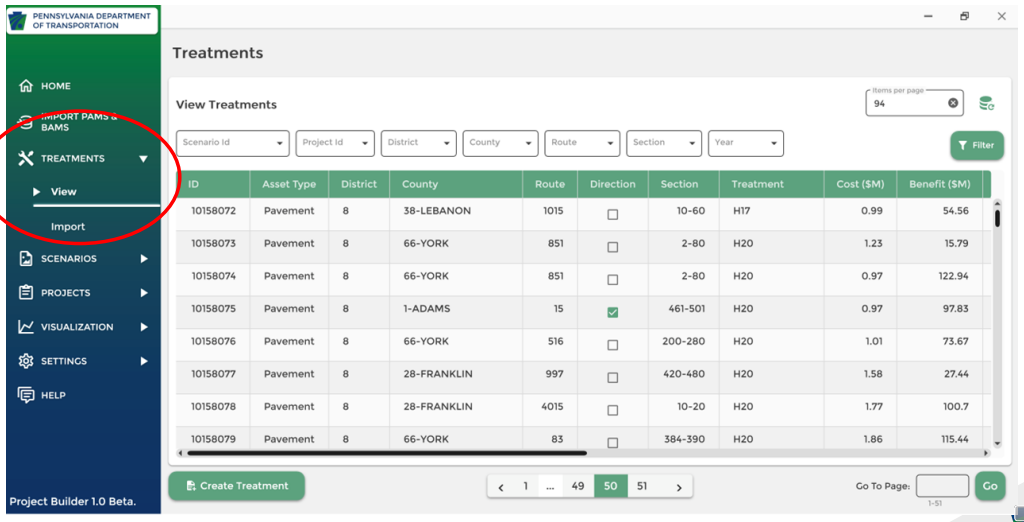

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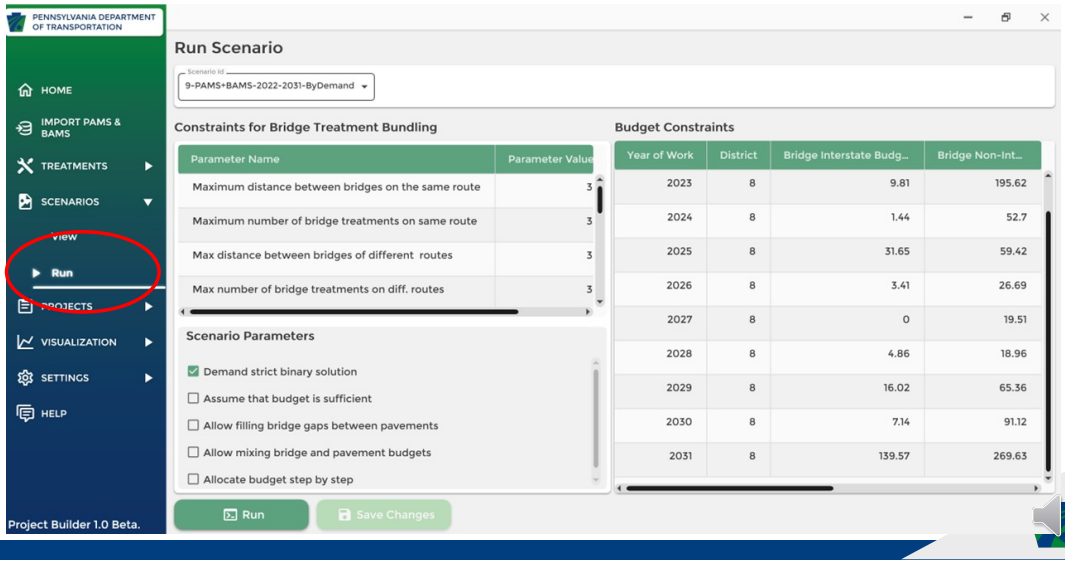

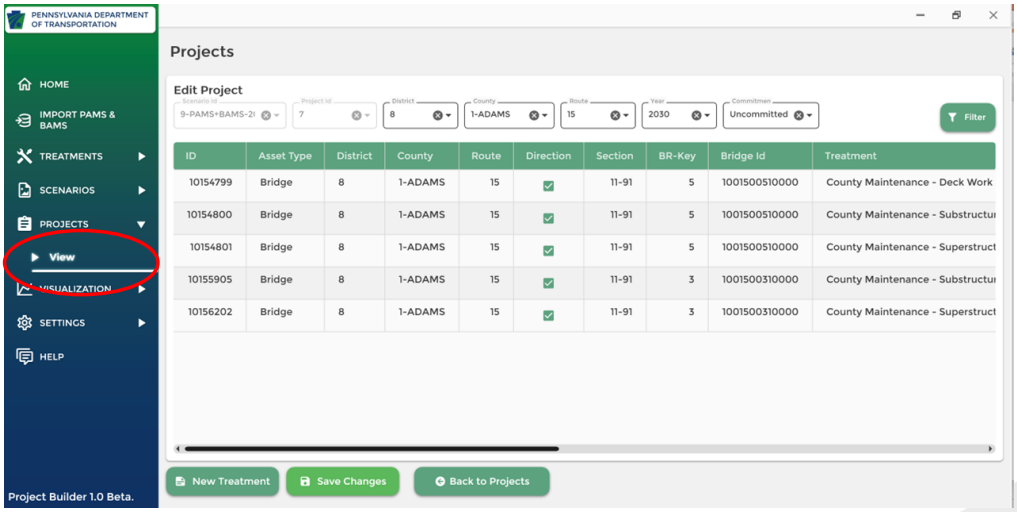
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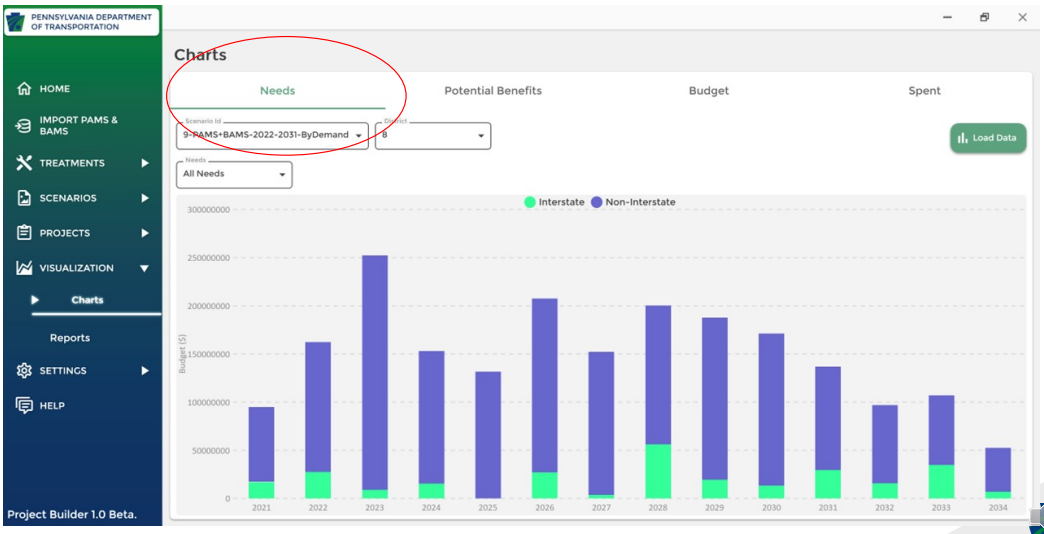
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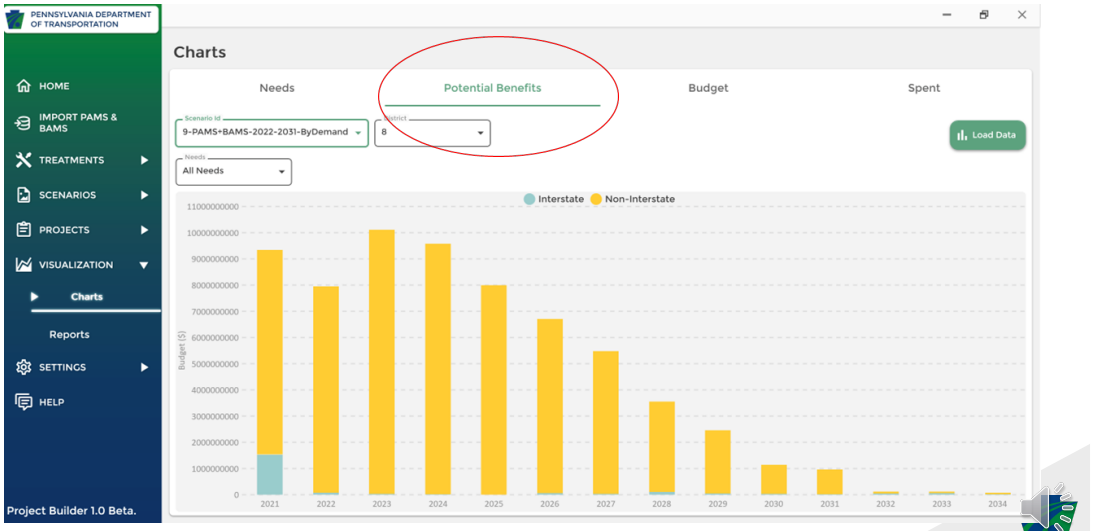
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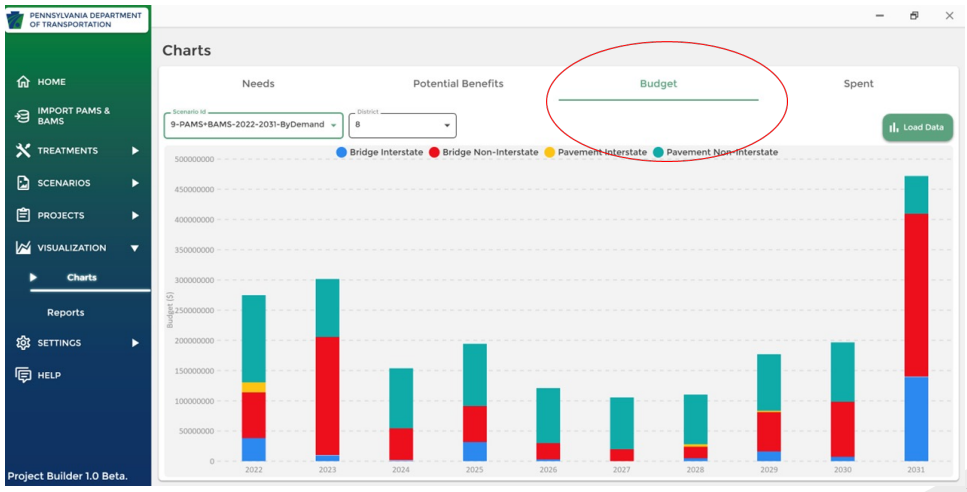
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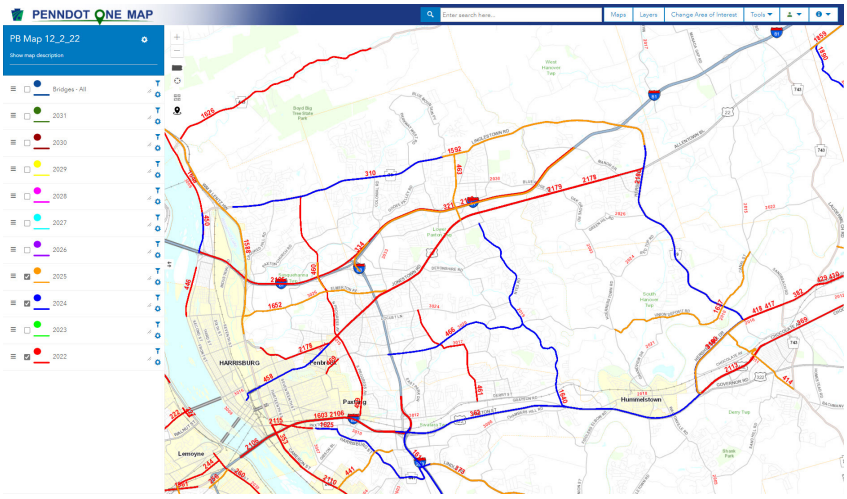
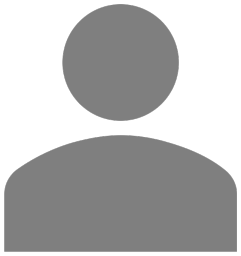
SYSTEM

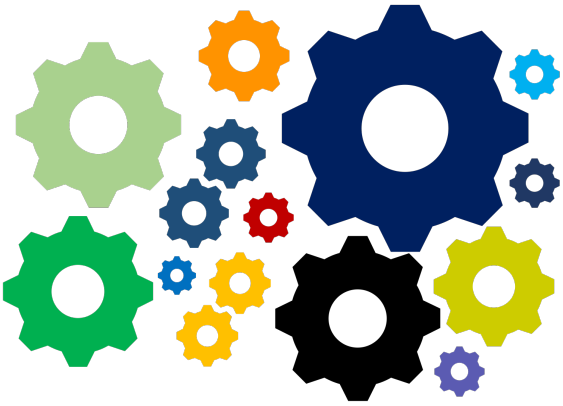


IMPLEMENTATION STATUS

- BAMS/PAMS
  - Systems are in production
  - Now making enhancements and model updates
- Project Builder
  - Initial desktop version of the system developed in 2022
  - Now developing a web based version of the system
  - Also improving map interface
- Updated versions of all three systems will be in production in June to support PennDOT's next TIP/TYP update

CLOSING





And a big shout out to:

LARRY SHFFLET,
Deputy Secretary for Planning at PennDOT.

Larry saw my vision, believes in my team, and this would not have happened without him!

Jbruner@pa.gov

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DEPARTMENT OF TRANSPORTATION

The Journey Begins

MAP – 21 Requires Action - "Implementation"

2015 Asset Management Program Office Created

- Resource Investment Committee Proposal
- Planning Division
- 7 MnDOT
- 3 MnIT

2019 TAMP Workshop

- Long-range planning
- TAMP Assets
- PM Barriers
- Resource Concerns
- Responsibilities
- Use of Data

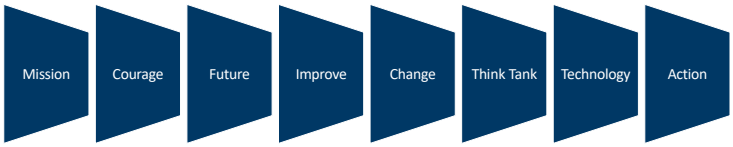
2020 MN State Statute

"Commissioner must maintain an inventory of transportation asset, including but not limited to bridge, pavement, geotechnical, pedestrian, bicycle, and transit asset categories."!

Engage The Dream Team

- Tim Henkel, Jean Wallace, Dave Solsrud
- Spy Pond Partners
- Applied Pavement Technology
- MnDOT Managers/Leaders = Team Members
- Asset Management Program Office Support

Expect Good Things!



Create A Strong Vision

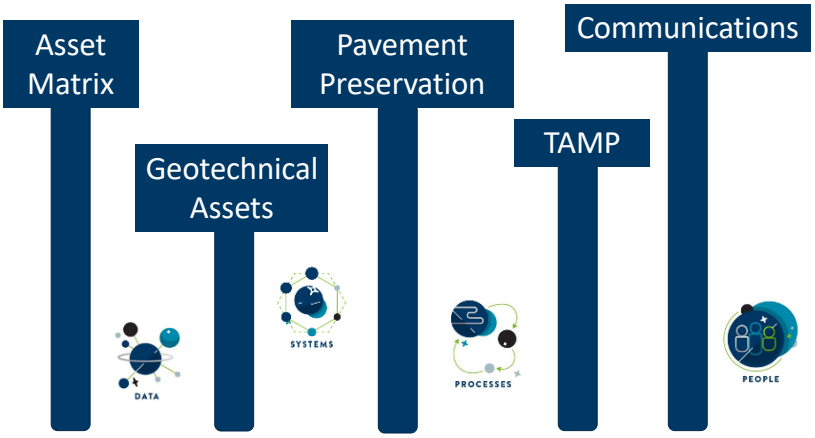
At MnDOT, transportation assets are managed effectively based on risk and return on investment, using the best available information and tools. (April 2020)

Use Data Effectively | Improve Trade-off Evaluation | Integrate AM into MnDOT's Culture

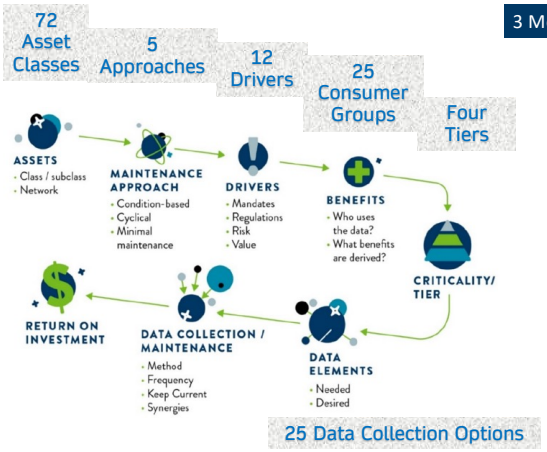
The three strategic objectives led to the development of the five work groups:

1. *Use data effectively to strategically manage investments and assets, within available resources, in a proactive and wholistic way to reduce life-cycle costs and maintain the value of our most critical assets.*
2. *Improve the ability to evaluate trade-offs between investment options in a consistent and transparent way that maximizes system performance.*
3. *Integrate asset management into MnDOT's culture through effective communication and a workforce with the skills needed to successfully fulfill their asset management duties and responsibilities.*

Develop Pillars of Excellence



Asset Matrix
Process Was Innovative!



3 Months of Engagement

12 Team Meetings

16 Team Members

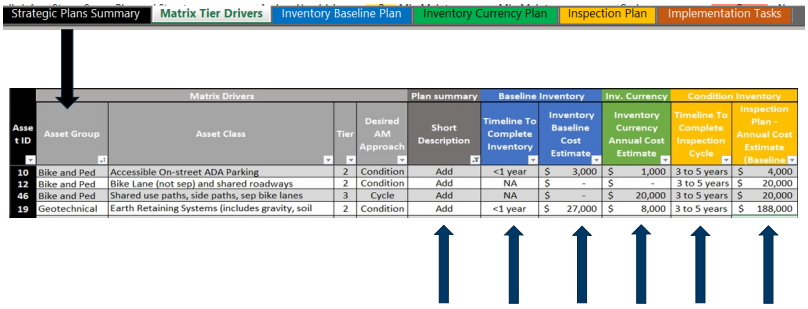
Baseline Method Description
Utilize Design Data
Field Walks
Mobile Imagery
Mobile LiDAR
Internal Knowledge (MnDOT Crowd Sourcing)
Satellite

Currency Method Description
SRC As-Builts
Utilize Design Data & As-Builts
Utilize Design Data & Construction As-Builts & Annual LiDAR Survey
Annual Imagery*
MnDOT Forces During Construction projects
AVL and/or Data Logging System
Linear Referencing Systems

* Maplewood Van Option

Inspection Method Description
Visual Inspection (VT)
Physical Field Device Inspection
MnDOT Pavement Van Sensors
Satellite or Aerial Imagery
Drone Inspection
Mobile Lidar

Asset Matrix
"Super" Spreadsheet



	Matrix Drivers				Plan summary	Baseline Inventory		Inv. Currency	Condition Inventory	
Asset ID	Asset Group	Asset Class	Tier	Desired AM Approach	Short Description	Timeline To Complete Inventory	Inventory Baseline Cost Estimate	Inventory Currency Annual Cost Estimate	Timeline To Complete Inspection Cycle	Inspection Plan - Annual Cost Estimate (Baseline
10	Bike and Ped	Accessible On-street ADA Parking	2	Condition	Add	<1 year	$ 3,000	$ 1,000	3 to 5 years	$ 4,000
12	Bike and Ped	Bike Lane (not sep) and shared roadways	2	Condition	Add	NA	$ -	$ -	3 to 5 years	$ 20,000
46	Bike and Ped	Shared use paths, side paths, sep bike lanes	3	Cycle	Add	NA	$ -	$ 20,000	3 to 5 years	$ 20,000
19	Geotechnical	Earth Retaining Systems (includes gravity, soil	2	Condition	Add	<1 year	$ 27,000	$ 8,000	3 to 5 years	$ 188,000

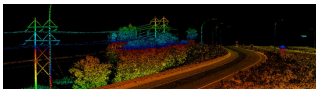
Data Plan of Action: What, How, When, and Cost!

And… What Asset Data is NOT going to be collected!

Asset Matrix
Priority Outcomes

- Over the next 5 years, focus on side and mainline culvert data collection efforts.
- Execute an **Innovative Remote Sensing Project** to refresh ½ state sign inventory, obtain baseline inventory for several asset classes, fill gaps in digital as-built asset data.
- Execute Annual Remote Sensing Projects to Update Above Ground Assets
- Connect The Dot's - Move to Building/Asset Information Modeling

Return on Investment Analysis yielded net present value of $23K with 7-year payback period.



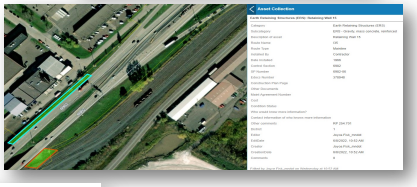
Annual cyclical collection using lidar is ~½ the cost of GPS field collection.

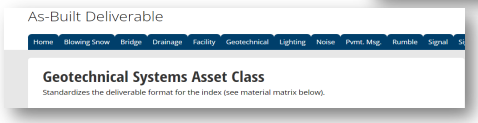
MnDOT efficiency report documented staff time savings of $19k/year using inventory data for design.

Geotechnical Asset Innovations

- Asset Classification
- Desired Management Approach
  - What Data is Needed?
- Geotechnical GIS Crowdsourcing Tool
- Design Plan Extraction
- As-Built Specs for inventory
- TAMS Configuration

- Earth Retaining Structures (ERS)
- Slopes
- Embankments
- Subgrade
- Special Drainage
- Instrumentation
- Natural Hazard Locations

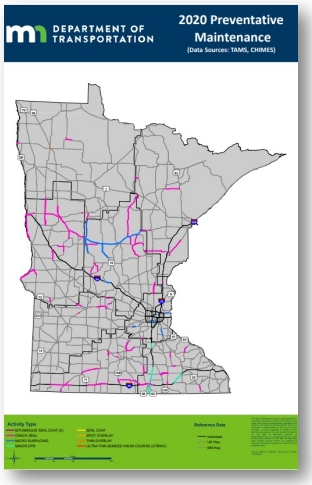




Pavement Preservation Innovations

What Are Barriers? => What Are Solutions?

1. Performance Measures
   - Crack Treatments, Thin Surface Treatments, Concrete Light CPR, Seal Joint
2. Formalize PM Programming Process
   - Utilize Management Systems Outputs to support District Planning efforts
   - Include in STIP development guidance in future years
   - Integrate Maintenance and Capital investments
3. Web Portal Policy/Guidance
   - Dashboard - needed, planned, and actual PM investments and accomplishments for each district.



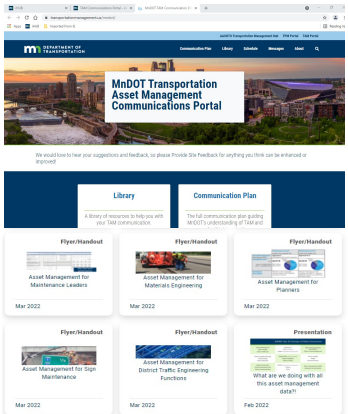
Transportation Asset Management Plan Innovations

1. Implement a Process for Adding Assets to TAMP
2. Identify and Implement Format Changes to improve useability in MnDOT
3. Integrate Maintenance and Capital Expense decisions
4. Communicate TAMP
5. Build Processes to ensure consistency between TAMP and investments

Communication Innovations

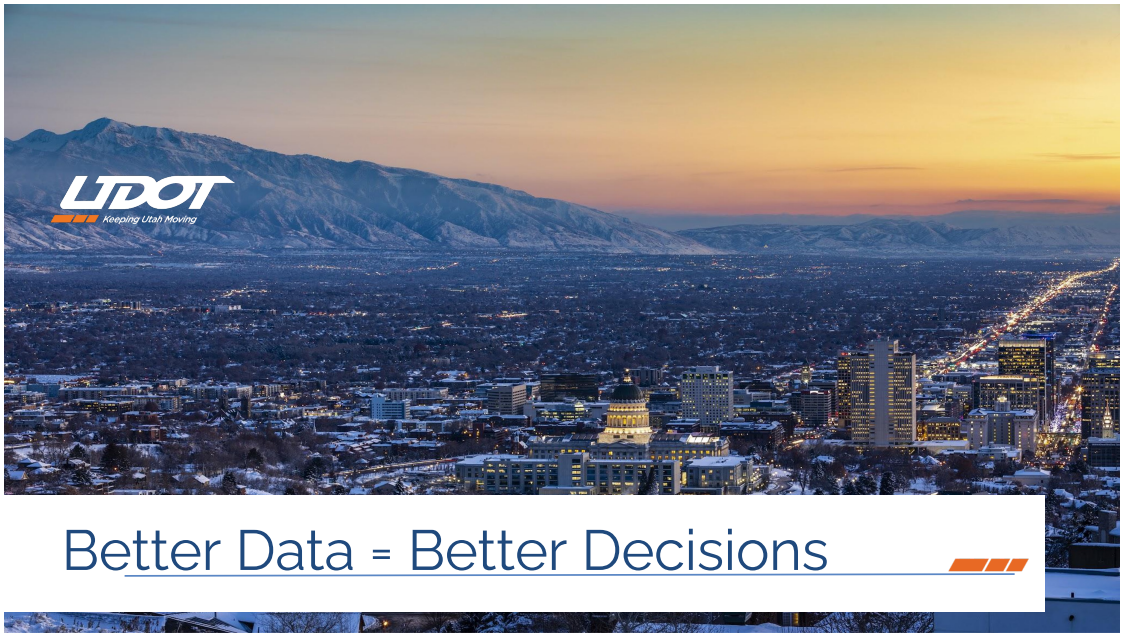
Strategy → Implementation

- Information Needs by Audience/Stakeholder
- Information Needs by Topic area
- Tailored Messages and Materials



Thank You!

Trisha.Stefanski@state.mn.us



Better Data = Better Decisions

the State of Utah

AREA
84,898 SQ. MI.

COLLEGE EDUCATED
44.4%

CAPITAL
Salt Lake City

GDP
$193 Billion

POPULATION
3,205,958

MEDIAN INCOME
$31,958

* US News & World Report Best states of 2021

Nation's fastest growing state (18.37% from 2010 to 2020)

1,700+
Employees

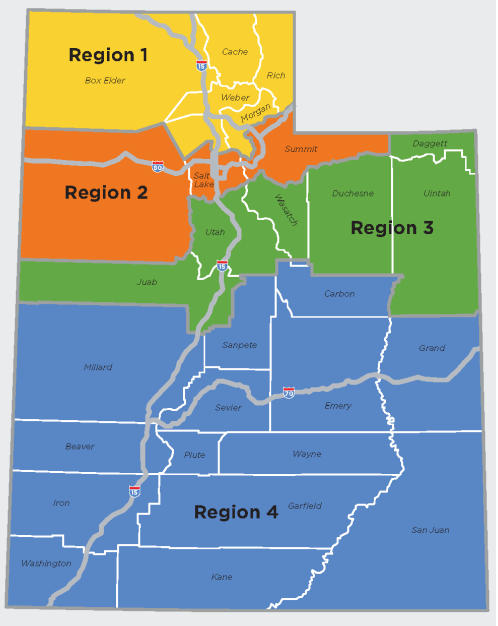
48,908
Lane Miles

$58.5B
Roadway Assets

1,973
Bridges

Source: Annual Statistical Summary – 2022

UDOT Keeping Utah Moving



What is Data Management?

Data Management

[ˈdadə,ˈdādə ‘manijmənt] *noun, verb*

a comprehensive collection of practices, concepts, procedures, processes, and a wide range of accompanying systems that allow for an organization to gain control of its data resources.

- Data Management Association (DAMA) International

What is Data Governance?

Data Governance

[ˈdadə,ˈdādə ˈgəvərnəns] *verb*

the exercise of authority, control and shared decision making (planning, monitoring and enforcement) over the management of data assets.

- Data Management Association (DAMA) International

Data Management vs Data Governance

DATA MANAGEMENT	VS	DATA GOVERNANCE
Logistics or methods of how data is organized	WHAT	Policies, controls, or rules for how data is governed and data quality is achieved
Primarily the responsibility of IT to implement framework to manage data	WHO	Multiple members of an enterprise holistically build a framework (data stewards, data citizens, and more) for data management
An umbrella term, covering all aspects (including data governance) of how an enterprise uses and manages its data	PURPOSE	The first building block of data management, focusing on the framework to achieve business goals and reduce risk
Logistical, focused on technology	GOAL	Philosophical, focused on an overall business strategy

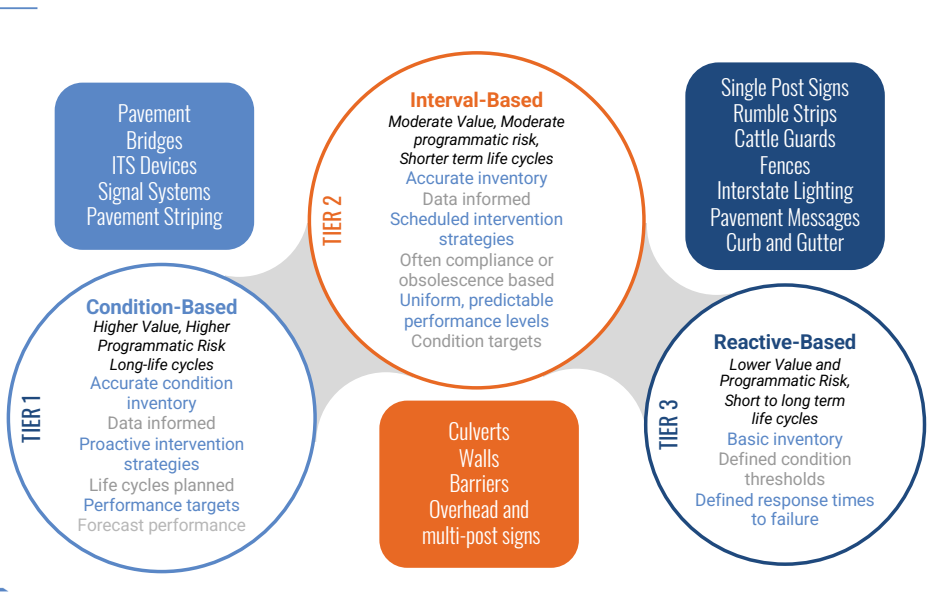
PEERNOVA

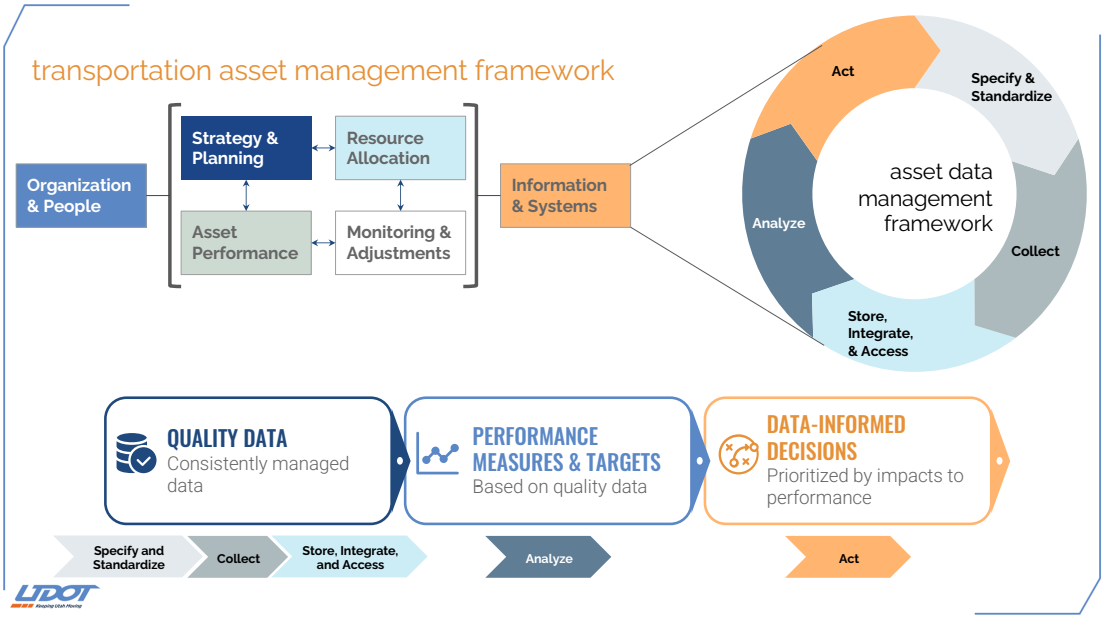
Source: https://resources.peernova.com/data-management-vs-data-governance-what-is-the-difference/

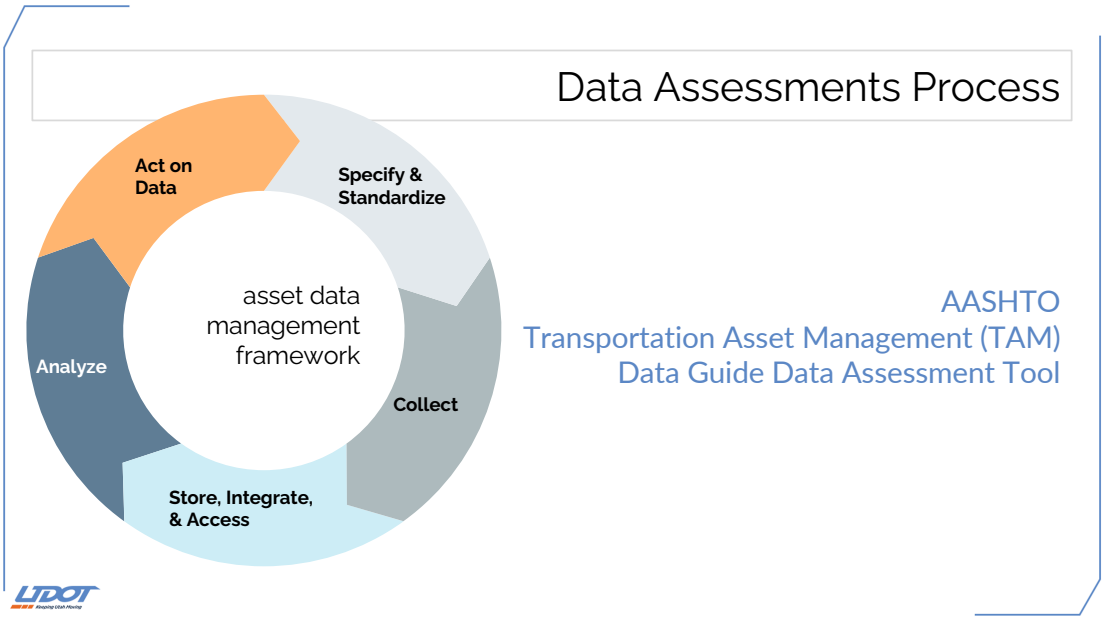
> The goal is to turn data into information, and information into insight."
>
> - Carly Fiorina, former CEO of Hewlett-Packard Co

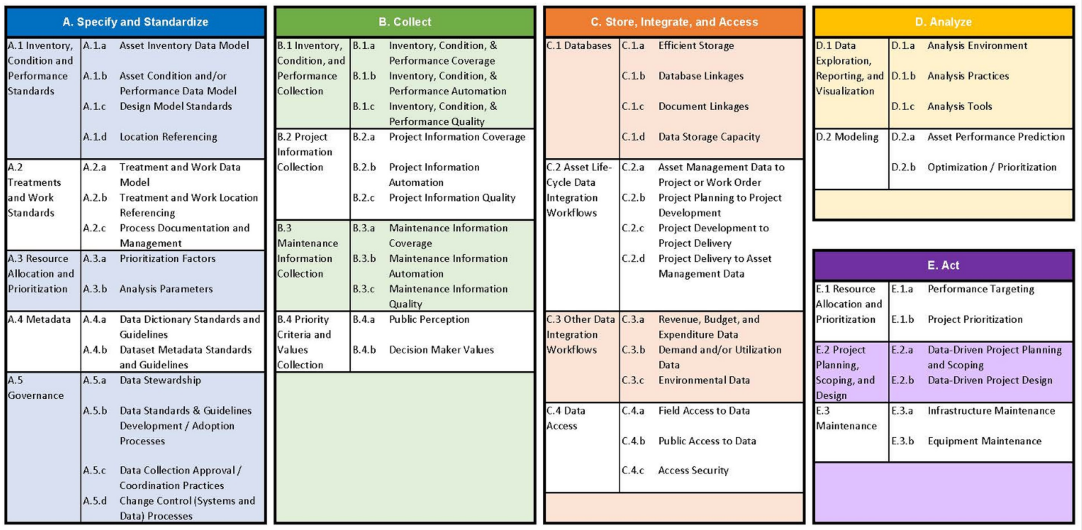
data management comes down to

TRUST




transportation asset management framework
Organization & People
Strategy & Planning
Resource Allocation
Asset Performance
Monitoring & Adjustments
Information & Systems
Act
Specify & Standardize
Analyze
Collect
Store, Integrate, & Access
asset data management framework
QUALITY DATA
Consistently managed data
PERFORMANCE MEASURES & TARGETS
Based on quality data
DATA-INFORMED DECISIONS
Prioritized by impacts to performance
Specify and Standardize
Collect
Store, Integrate, and Access
Analyze
Act


Data Assessments Process
Act on Data
Specify & Standardize
Analyze
Collect
Store, Integrate, & Access
asset data management framework
AASHTO
Transportation Asset Management (TAM)
Data Guide Data Assessment Tool



A. Specify and Standardize		
A.1 Inventory, Condition and Performance Standards	A.1.a	Asset Inventory Data Model
	A.1.b	Asset Condition and/or Performance Data Model
	A.1.c	Design Model Standards
	A.1.d	Location Referencing
A.2 Treatments and Work Standards	A.2.a	Treatment and Work Data Model
	A.2.b	Treatment and Work Location Referencing
	A.2.c	Process Documentation and Management
A.3 Resource Allocation and Prioritization	A.3.a	Prioritization Factors
	A.3.b	Analysis Parameters
A.4 Metadata	A.4.a	Data Dictionary Standards and Guidelines
	A.4.b	Dataset Metadata Standards and Guidelines
A.5 Governance	A.5.a	Data Stewardship
	A.5.b	Data Standards & Guidelines Development / Adoption Processes
	A.5.c	Data Collection Approval / Coordination Practices
	A.5.d	Change Control (Systems and Data) Processes

B. Collect		
B.1 Inventory, Condition, and Performance Collection	B.1.a	Inventory, Condition, & Performance Coverage
	B.1.b	Inventory, Condition, & Performance Automation
	B.1.c	Inventory, Condition, & Performance Quality
B.2 Project Information Collection	B.2.a	Project Information Coverage
	B.2.b	Project Information Automation
	B.2.c	Project Information Quality
B.3 Maintenance Information Collection	B.3.a	Maintenance Information Coverage
	B.3.b	Maintenance Information Automation
	B.3.c	Maintenance Information Quality
B.4 Priority Criteria and Values Collection	B.4.a	Public Perception
	B.4.b	Decision Maker Values

C. Store, Integrate, and Access		
C.1 Databases	C.1.a	Efficient Storage
	C.1.b	Database Linkages
	C.1.c	Document Linkages
	C.1.d	Data Storage Capacity
C.2 Asset Life-Cycle Data Integration Workflows	C.2.a	Asset Management Data to Project or Work Order
	C.2.b	Project Planning to Project Development
	C.2.c	Project Development to Project Delivery
	C.2.d	Project Delivery to Asset Management Data
C.3 Other Data Integration Workflows	C.3.a	Revenue, Budget, and Expenditure Data
	C.3.b	Demand and/or Utilization Data
	C.3.c	Environmental Data
C.4 Data Access	C.4.a	Field Access to Data
	C.4.b	Public Access to Data
	C.4.c	Access Security

D. Analyze		
D.1 Data Exploration, Reporting, and Visualization	D.1.a	Analysis Environment
	D.1.b	Analysis Practices
	D.1.c	Analysis Tools
D.2 Modeling	D.2.a	Asset Performance Prediction
	D.2.b	Optimization / Prioritization

E. Act		
E.1 Resource Allocation and Prioritization	E.1.a	Performance Targeting
	E.1.b	Project Prioritization
E.2 Project Planning, Scoping, and Design	E.2.a	Data-Driven Project Planning and Scoping
	E.2.b	Data-Driven Project Design
E.3 Maintenance	E.3.a	Infrastructure Maintenance
	E.3.b	Equipment Maintenance

A.1.a Asset Inventory Data Model

Standardized asset categories, component breakdowns and core attributes, providing the foundation for asset inventory information tracking, integration, summary, and reporting.

Benchmark Practice Level Description	Current Level	Desired Level	Improvement 1
The agency has not defined any consistent definitions or methodologies for tracking inventory information for a given asset or asset type.	0	0	Define the "asset" and determine how the asset inventory should be recorded to support current/desired practice.
The asset has been defined, and the approach for asset inventory has been established – e.g. sampling versus full inventory; itemize each asset versus counts.	1	1	Develop the "asset breakdown structure", providing clear criteria for identifying various asset "sub-types" and "components".
An asset breakdown structure has been established to define various asset subtypes and components. There are clear criteria for assigning sub-types and identifying components.	2	2	Specify detailed inventory data elements for each asset, sub-type, and component. Set required, recommended, and optional inventory data.
A minimum set of required inventory attributes have been identified (e.g. unique identifier, location, install date, asset subtype, size/measure). Additional recommended and optional data elements have been identified. The desired extent of collection has been established.	3	3	Document a detailed asset information model facilitating direct integration of asset inventory with maintenance work orders and project files. **Selected**
A detailed asset information model has been defined that supports direct integration with project and maintenance information, contracts and/or design files.	4	4	**Assessment Stats:** # of Selected Improvements: 27

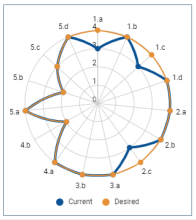
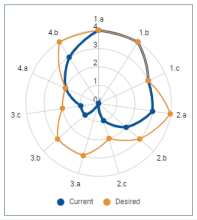
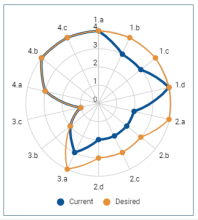
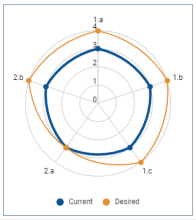
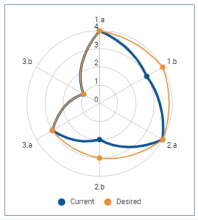
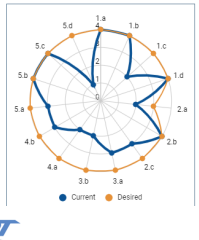
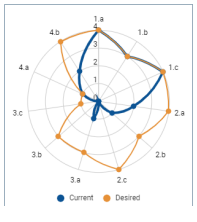
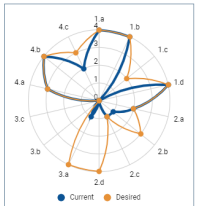
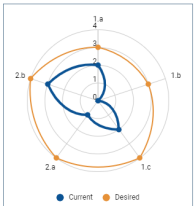
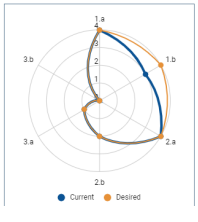
Benchmark Level Notes

Initial Improvement Notes

						Significant Challenges								
		Pavement IMPROVEMENTS				None	Time	Resources	Expertise	Coordination	Change	Other		
Element	**Improvement Name**	**Improvement Description**	**Impact**	**Effort**	**Priority**								**Initial Improvement Notes**	**Improvement Evaluation Notes**
A. Specify and Standardize Data														
A.1.a	Document Asset Information Model	Document a detailed asset information model facilitating direct integration of asset inventory with maintenance work orders and project files.	medium	low	high					X			Improve on reporting and automation of mining data from construction and maintenance. Is there a case to obtain subgrade structure information?	We have integration with Project Files, need a way to integrate Maintenance and Permit work. Is that ATOM Phase 2? The primary way to improve is to coordinate. Can we automate this process to standardize how Pavement consumes the data?
A.2.a	Incorporate Other Assets in Work Data Model	Evaluate other assets and project types, identifying where these impact the asset. Update these treatment and work data models to capture information needed for the assessed asset.	low	high	low					X			Determine methods to capture and connect maintenance and permit impacts to pavements. Document the process to do so.	Need procurement projects to follow same pattern as the asset inventory model.
A.2.c	Define Data Exchange Protocols	Define detailed exchange protocol facilitating automation of asset data updates based on capture of work accomplishment information.	low	high	low		X	X						
A.4.b	Align Dataset Metadata with Needs	Ensure metadata standards meet business and IT needs. Consider need to identify data and maintain IT application, data integrations, and BI tools.	low	low	low			X	X	X			Coordinate data collection, metadata standards with mobile lidar collection efforts (Mike Butler).	Need to coordinate with consultants who supply the metadata standards to document those. Need to comply with Enterprise data standards once they are established and documented (Data Governance Board).
A.4.b	Create Dataset Metadata Repository	Develop requirements for and implement a standardized metadata repository to store, manage, and provide access to agency metadata.	low	low	low					X			Coordinate data collection, metadata standards with mobile lidar collection efforts (Mike Butler).	Need to coordinate with Data Mesh efforts of Tech and Innovations group.
A.4.b	Develop Dataset Metadata SOP	Develop metadata standard operating procedures, raise awareness, and provide training.	low	low	low					X			Coordinate data collection, metadata standards with mobile lidar collection efforts (Mike Butler).	

Assessment Results

Assessment Results

	A. Specify and Standardize Data	B. Collect Data	C. Store, Integrate, and Access Data	D. Analyze Data	E. Act Informed by Data
Pavement					
Bridge					

Assessment Results Summary - Data

Gap (Desired - Current): 0 1 2 3 4

			TIER 1										TIER 2							
			Pavement		Bridge		ITS		Signals		Striping		Barriers		Overhead and Multi-post Sign		Culverts		Walls	
			Current	Desired	Current	Desired	Current	Desired	Current	Desired	Current	Desired	Current	Desired	Current	Desired	Current	Desired	Current	Desired
A. Specify and Standardize Data																				
A.1 Inventory, Condition, and Performance Standards	A.1.a	Asset Inventory Data Model	3	4	4	4	3	4	3	4	3	4	3	4	0	3	1	3	0	4
	A.1.b	Asset Condition and/or Performance Data Model	4	4	4	4	1	4	3	4	4	4	0	1	0	2	2	4	0	4
	A.1.c	Design Model Standards	3	4	2	4	0	0	0	0	2	4	1	4	0	3	3	4	1	3
	A.1.d	Location Referencing	4	4	4	4	2	4	2	4	3	3	4	4	0	3	3	3	1	4
A.2 Treatments and Work Standards	A.2.a	Treatment and Work Data Model	4	4	2	3	2	3	2	3	3	4	0	3	0	4	2	3	0	0
	A.2.b	Treatment and Work Location Referencing	4	4	4	4	2	4	2	4	4	4	4	4	1	3	4	4	2	3
	A.2.c	Process Documentation and Management	3	4	3	4	1	3	1	3	2	4	0	4	0	3	1	3	0	3
A.3 Resource Allocation and Prioritization	A.3.a	Prioritization Factors	4	4	3	4	1	4	1	4	1	4	3	4	0	3	2	4	0	4
	A.3.b	Analysis Parameters	4	4	2	4	1	3	1	3	3	4	1	3	0	1	0	4	0	1
A.4 Metadata	A.4.a	Data Dictionary Standards and Guidelines	4	4	2	4	2	4	2	4	3	3	2	3	0	2	1	3	2	4
	A.4.b	Dataset Metadata Standards and Guidelines	2	2	3	4	1	3	1	3	2	3	1	3	0	2	1	3	0	4
A.5 Governance	A.5.a	Data Stewardship	4	4	3	4	1	4	1	4	2	4	2	4	0	4	0	4	0	4
	A.5.b	Data Standards and Guidelines Development Adoption Processes	2	2	4	4	0	3	0	3	1	4	2	4	0	0	0	4	0	4
	A.5.c	Data Collection Approval/Coordination Practices	3	3	4	4	1	4	1	4	2	4	2	4	0	1	0	4	0	4
	A.5.d	Change Control (Systems and Data) Processes	4	4	1	4	1	3	1	3	1	3	1	3	0	1	0	4	1	4

Assessment Results

Assessment Results

	Assets	Inventory	Condition	Deterioration Curve or Life Cycle	Performance/ Condition Target	Cost to Maintain Asset	Performance Forecasting
TIER 1	Pavements	98%	84%	83%	91%	78%	88%
	Bridges / Box Culverts	71%	76%	54%	93%	77%	50%
	ITS Devices	43%	50%	38%	In Progress	In Progress	In Progress
	Traffic Signals	44%	53%	38%	In Progress	In Progress	In Progress
	Pavement Striping	66%	67%	50%	Advanced	Advanced	In Progress
TIER 2	Barriers	56%	44%	63%	Needed		
	Overhead/ Multi-Post Signs	52%	31%	50%	In Progress		
	Culverts	31%	50%	25%	In Progress		
	Walls	20%	50%	38%	Needed		
TIER 3	Interstate Lighting	In Progress	Needed				
	Catch Basins	Advanced	Needed				
	Rumble Strips	Advanced	Needed				
	Single Post Signs	Advanced	In Progress				
	Pavement Messages	Advanced	Needed				
	Fences	In Progress	Needed				
	Cattle Guards	Advanced	Needed				
	Curb & Gutter	In Progress	Needed				
	Detention/ Retention Ponds	In Progress	Needed				

Advanced (>66% Complete)

In Progress (33-66% Complete)

Needed (<33% Complete)

Notes:

1. Cells without percentages are the original risk-based assessment results peformed in 2021.

2. A full data assessment was only performed for Pavements and Bridges. All other Tier 1 and 2 Assets were assessed for the first 2 of 5 stages of the AASHTO Data Management Framework.

3. Tier 3 Assets were not assessed using the AASHTO Data Assessment.

Insights Gained

The largest **gaps** in data management maturity are

- Governance
- Integration/access
- Analysis
- Data-informed decision-making

With increased regulation comes dedicated funding that improves the ability to improve data management.

- The solutions need to be independent of legislative mandates and dedicated funding
- Management knowledge and support is critical

Find a method to connect the data to risk management. Associate the assets with how their data and risk is managed.

Next Steps

Data Management and Governance

Establish a data governance framework, beginning with assets

Quantify resources necessary to close data management gaps

Support each asset steward to form a cohesive and consistent data management approach for all assets

Convey processes, recommendations, and benefits of improved data management to executive leadership, asset stewards, and department staff

“Our goals can only be reached through a vehicle of a plan, in which we must fervently believe, and upon which we must vigorously act. There is no other route to success.”

- Stephen A. Brennan

UDOT Keeping Utah Moving

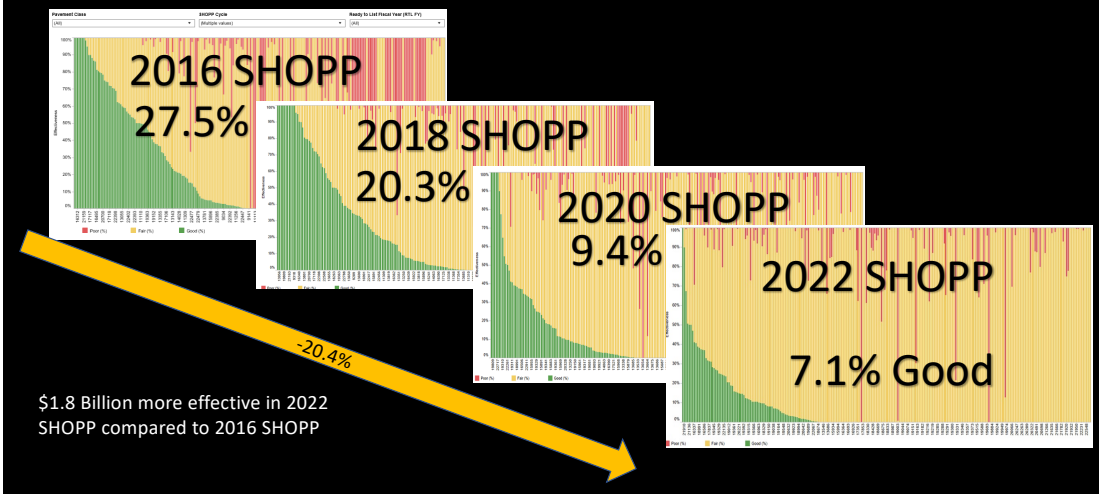
Utilizing Asset Management Principles to Improve Safety

Michael Johnson P.E.
State Asset Management Engineer
Feb 2023

Principle of Performance Management

Cost to Achieve Target = Performance Gap x Unit Cost

Pavement Example



$1.8 Billion more effective in 2022 SHOPP compared to 2016 SHOPP

Focus on Performance to Improve Safety Outcomes

What are the best investments to lower fatalities and injury?

Where to work to get the best safety outcomes?

Are we investing enough to improve safety?

Maximize Performance with Lower Cost High Benefit Safety Treatments

Rumble Strips

Center Line Rumble Strips

44-64%

reduction in head-on fatal and injury crashes on two-lane rural roads [3]

Shoulder Rumble Strips

13-51%

reduction in single vehicle, run-off-road fatal and injury crashes on two-lane rural roads [4]

High-visibility Crosswalk

High-visibility crosswalks can reduce pedestrian injury crashes up to

40%

Advance yield or stop markings and signs can reduce pedestrian crashes up to

25%

Pedestrian Hybrid Beacon

55%

reduction in pedestrian crashes.

29%

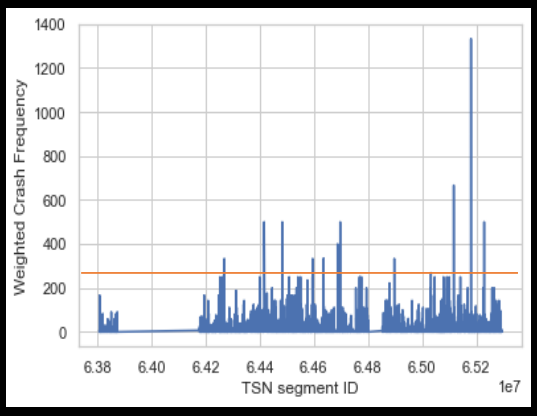
reduction in total crashes.

15%

reduction in serious injury and fatal crashes. [5]

83

Work where we get the best safety outcomes?



Utilize machine learning to identify high value segments for safety improvements.

Maximize F+SI reductions by focusing on high “value highway” segments

17% of segments account for over 50% of all fatal and serious injury crashes.

Work where we get the best safety outcomes?

Are we investing enough to achieve our performance targets?

- It depends on where we work on the system
- It depends on what treatments we put in place
- It depends on how much enforcement and education curb behaviors

- Using Asset Management to develop the relationship between investment and outcomes is critical to right size the investment.

Combining Asset Management and Safety

Caltrans Performance Driven Safety Approach

1. Establish a unique F+SI reduction target for each District
2. Provide funding to achieve targets with cost effective treatments
3. Objectively quantify how much benefit each project will impart
4. Sum safety accomplishments across all projects
5. Require each District to achieve the reduction targets set by AM

Project Level Safety Benefit Tool

Proactive Safety Performance Measure	
Date Calculated	1/7/2022
District	2
Average Fatal Collision Rate	0.003
Average Fatal + Injury Collision Rate	0.080
Traffic Volume (MV or MVM)	20.250
SI% of All Injuries	15.77%
Number of Fatal	0.06
Number of Injuries	1.56
Number of Serious Injuries	0.25
Number of F+SI	0.31
Years of Data	5
F+SI Per Year	0.06
Countermeasure	Shoulder/Edgeline Rumble Strips
F+SI Crash Reduction Factor	0.25
Annual F+SI Collisions Reduction	**0.02**
Life of Project (# Years)	10
F+SI Collisions reduced for life	**0.20**

*Grey shaded cells are automatically populated.

Instructions

1. Grey shaded cells are automatically populated
2. Provide input only in the white cells.
3. Select "Countermeaure" from the drop-down list

Caltrans Performance Driven Safety Approach - Example

- Bridge rail upgrade example

- Cost $27 Million
- Benefit = 0.1 F+SI avoided/year

Can we get better safety performance for the $27 million?

We could install miles of shoulder rumble strips for this cost that could have higher total safety benefit

Conclusion

- We are changing the safety culture to focus on performance outcomes
- Focus on safety performance has guided safety decision toward high benefit lower cost safety treatments
- Focus on safety performance has driven projects to high value locations on the system
- As safety improvement costs come down, we can get more performance with the same dollars

Thank You!

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