Transportation Asset Management Webinar Series

Webinar 58

The 2022 TAMPs & BIL Requirements

Sponsored by FHWA and AASHTO

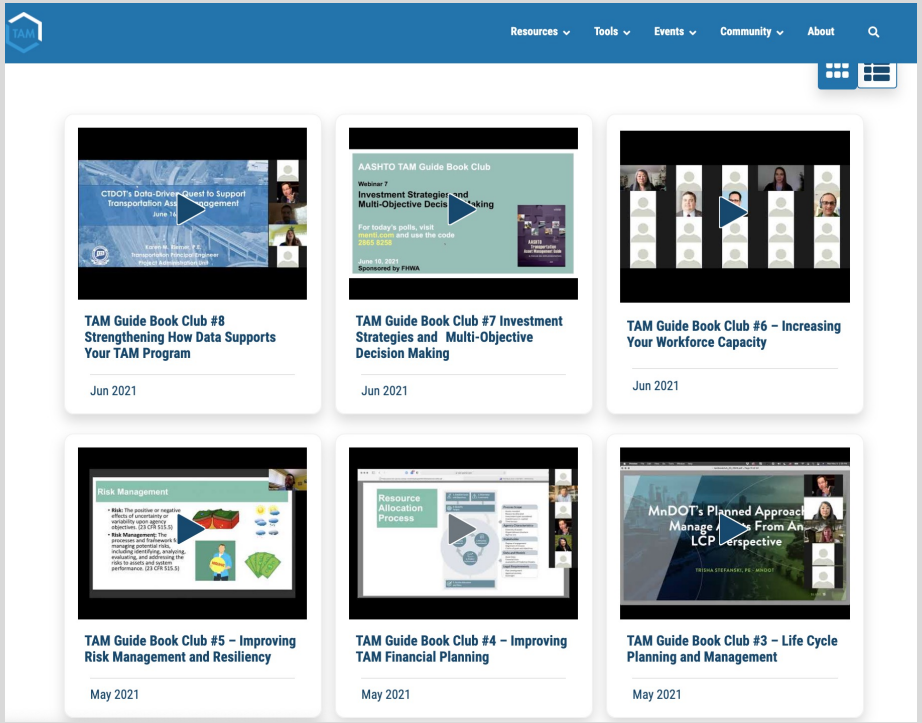
U.S. Department of Transportation
Federal Highway Administration

AASHTO
The Voice of Transportation

August 17, 2022

FHWA/AASHTO Asset Management Webinar Series

- This is the 58th 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

- Raise awareness of the BIL's implications for US transportation agencies' TAMPs and TAM practice
- Understand some of the approaches agencies are taking to plan and prepare their BIL-compliant 2022 TAMPs
- To hear from the TAM community

Webinar Agenda

2:00 **Welcome and Introduction**
Tashia Clemons, FHWA, Matt Hardy, AASHTO, and Hyun-A Park, Spy Pond Partners

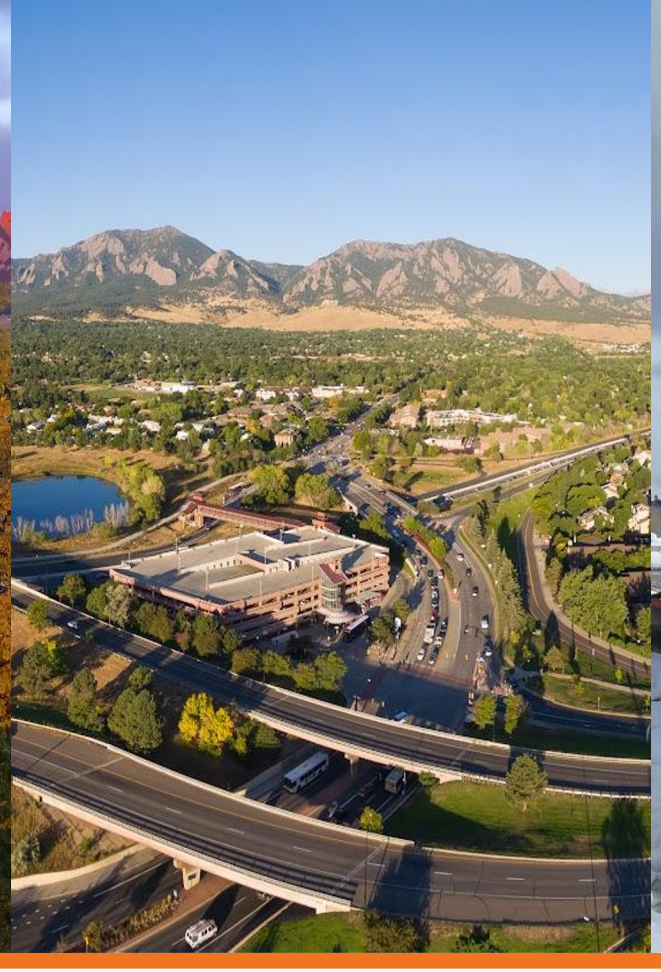
2:10 **Colorado Perspective – TAMP and BIL Requirements**
William Johnson, Colorado DOT

2:25 **Washington State's Approach to IIJA/BIL Compliance for the TAMP**
Todd Lamphere and Jon Fok, Washington State DOT

2:40 **Incorporating Climate Resiliency into The TAMP**
Mike Johnson, Caltrans

2:55 **Polls, Q&A and Discussion**
Matt Hardy

3:30 **Wrap-up**
Matt Hardy

COLORADO
Department of Transportation

TAMP and BIL Requirements

August 2022

William Johnson
Performance and Asset Management Branch

Federal Performance Measures

Pavement

INTERSTATE NHS

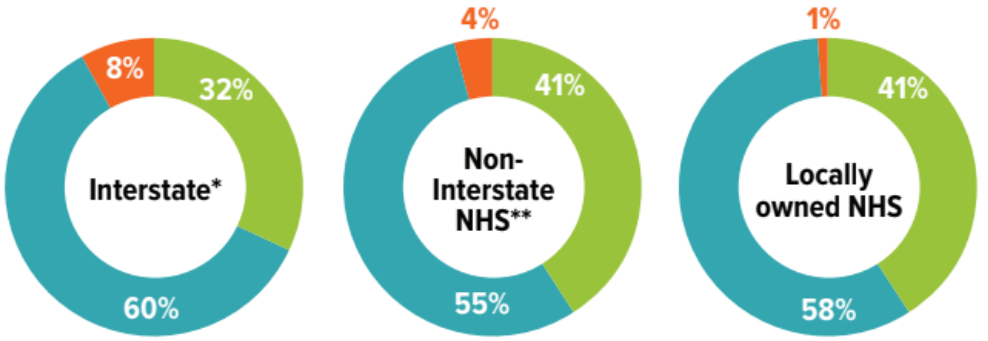
National Performance Measures
2020 Condition

NON-INTERSTATE NHS

National Performance Measures
2020 Condition

% High and Moderate DL

Bridge



Bridges / Deck Area	Bridges / Deck Area	Bridges / Deck Area
387 / 4,827,109 sqft.	464 / 5,005,935 sqft.	164 / 2,266,675 sqft.
679 / 8,843,293 sqft.	705 / 6,621,101 sqft.	278 / 3,206,147 sqft.
52 / 1,129,959 sqft.	47 / 435,979 sqft.	8 / 80,193 sqft.

BIL Requirements

TAMP requirements were amended by the Bipartisan Infrastructure Law (BIL) (§ 11105) to **require that States take into consideration extreme weather and resilience within their lifecycle cost and risk management analysis**. These BIL amendments took effect on October 1, 2021 (§ 10003). As a result, State DOTs are required to consider extreme weather and resilience as part of the lifecycle cost and risk management analyses within a State TAMP (23 U.S.C. 119(e)(4)(D)). State DOTs should be aware of this new requirement and working to update their processes and TAMPs accordingly.

https://www.fhwa.dot.gov/asset/guidance/consistency.pdf

TAMP Deadline Flexibility to Address BIL Amendment

U.S. Department of Transportation
Federal Highway Administration

Memorandum

Subject: **INFORMATION:** State Asset Management Plan Under BIL

Date: May 5, 2022

From: Hari Kalla
Associate Administrator for Infrastructure

HARI KALLA Digitally signed by HARI KALLA Date: 2022.05.05 10:25:30 -04'00'

In Reply Refer To: HISM-30

To: Division Administrators
Directors of Field Services

2022 Process Recertifications

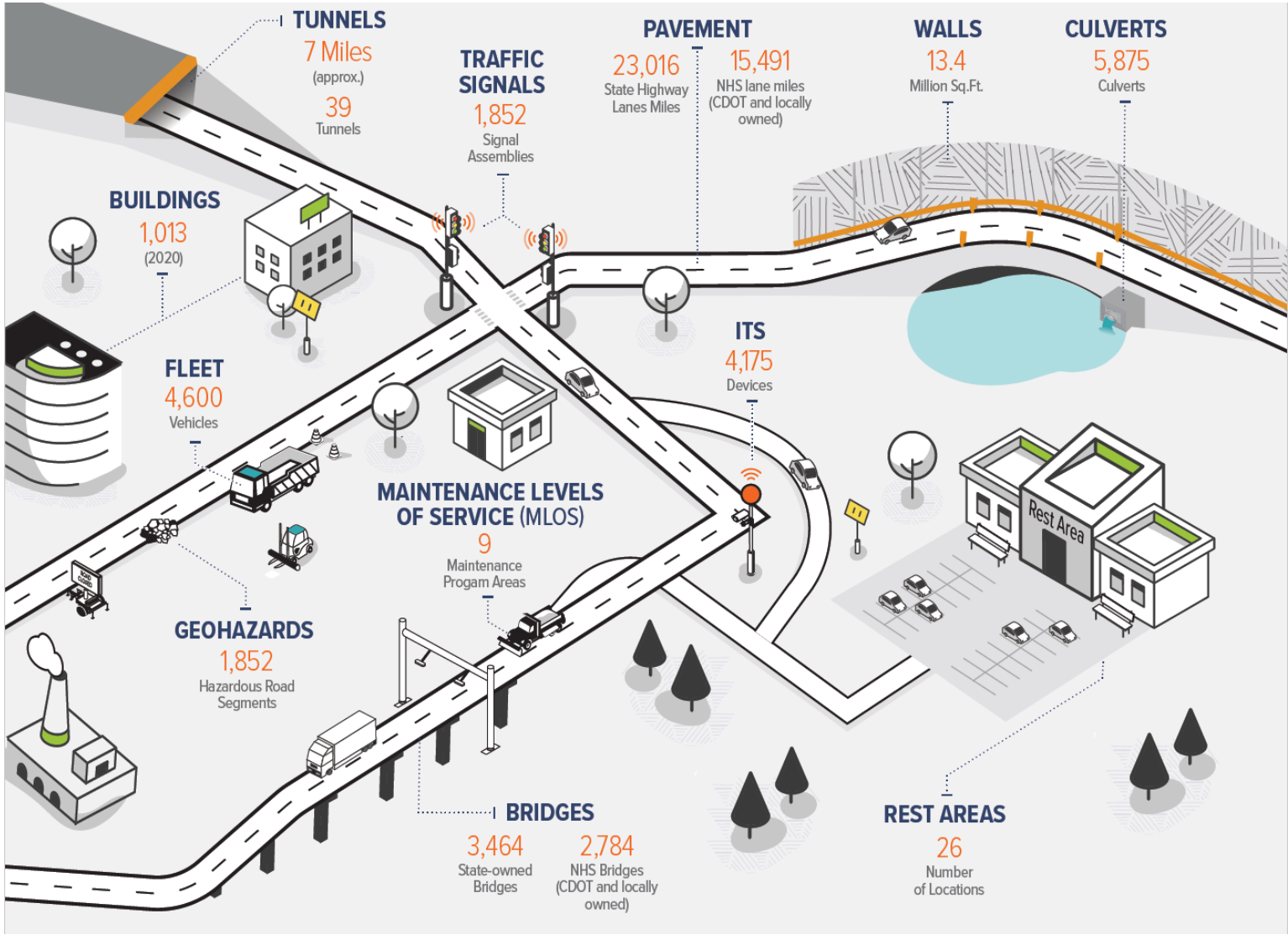
Pursuant to BIL, all State DOTs must have TAMP development processes and TAMP evaluations that include consideration of extreme weather and resilience in life-cycle planning and risk management. Most State DOTs are scheduled for their 4-year process recertification in 2022, with deadlines that range from March 2022 through December 2022. Understanding that State DOTs need a reasonable amount of time to fully incorporate the requirements of the BIL amendment, all State DOTs will have until **December 31, 2022**, to fully address the BIL amendment in their TAMP development processes and TAMP analyses. This flexibility applies only to the incorporation of extreme weather and resilience into their life-cycle planning and risk management processes and related analyses.

State DOTs are already encouraged to consider "extreme weather events" in the development of their life-cycle planning processes (23 CFR 515.7(b)) and as a risk associated with current and future environmental conditions in their risk management plans (23 CFR 515.7(c)(1)). This flexibility in timing should better enable States to fully consider resilience in their life-cycle planning and risk management processes and related analyses, and potentially additional factors related to extreme weather.

The existing recertification deadlines remain in effect for all other purposes. State DOTs with recertifications due in 2022 are expected to submit their TAMP development processes, excluding only revisions to comply with the BIL amendment, by their established deadlines (for list of deadlines, see attachment to this memo).

CDOT's Asset Classes

- Colorado's size, topography and climate make it one of the more challenging states to maintain a "state of good repair" for our assets.
- However, CDOT has over many years developed a sophisticated, performance-based approach to this work:
  - Assets are divided into 12 classes. Asset classes are determined by the Commission. Rest areas were the most recent addition in 2019
  - Each asset class is separately tracked for performance and provided dedicated, annual funding.
  - The budget for assets (~$764M/yr) is the largest component of the CDOT budget.
  - CDOT also has a complex multi-asset model that forecasts future asset condition based on what levels of funding are provided.



Importance of Resilience in Colorado

SPOTLIGHT AP

The 15 states with the most extreme weather

Filterbuy, LatticePublishing.com Dec 30, 2020 Updated Mar 19, 2021 0

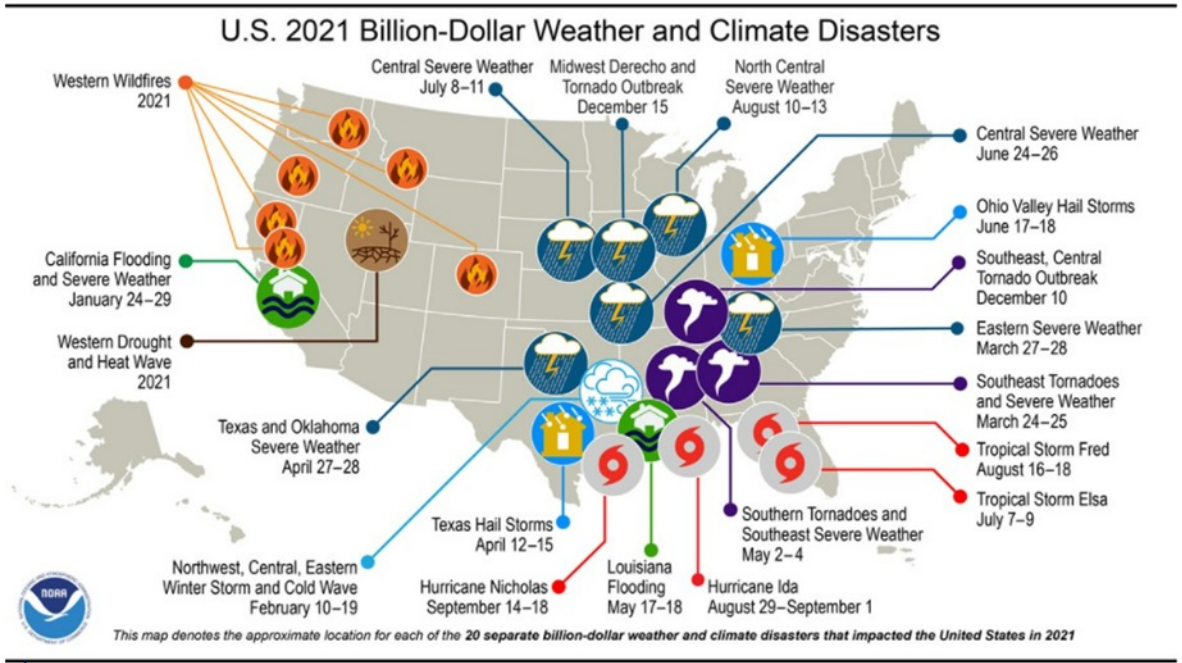
4. Colorado

- **Extreme weather score:** 67.0
- **All-time maximum temperature:** 115°F
- **All-time minimum temperature:** -61°F
- **All-time greatest 24-hour precipitation:** 11.9 inches
- **All-time maximum 24-hour snowfall:** 75.8 inches
- **Annual tornadoes per 10k square miles:** 5.1 per 10k square miles

https://filterbuy.com/resources/cities-with-most-extreme-weather/

Source: National Centers for Environmental Information's State Climate Extremes Committee Records

In 2021, there were 20 Billion-dollar natural disasters in the United States, and 5 of them affected Colorado. According to NOAA National Center for Environmental Information, Colorado has been affected by Billion-dollar natural disasters for 14 straight years. Even more worrisome, since 1980, Colorado has been affected by 57 Billion-dollar natural disasters.



Credit: NOAA

2021 U.S. billion dollar disaster map

CDOT TAMP Approach

#1 Leverage existing Resilience Program

6.2 RISK AND RESILIENCE AT CDOT

CDOT's risk management approach focuses on planning and managing vulnerabilities; CDOT's resilience approach focuses on recovery and adaptation.

In November 2018, CDOT's Transportation Commission adopted Policy Directive 1905.0, Building Resilience into Transportation Infrastructure and Operations. The directive established the CDOT Resilience Program and directed CDOT to incorporate resilience into strategic decisions about transportation assets and operations. This has positioned CDOT well to meet federal requirements to consider extreme weather and resilience as part of life-cycle cost and risk management, as defined by 23 U.S.C. 119(e)(4)(D).

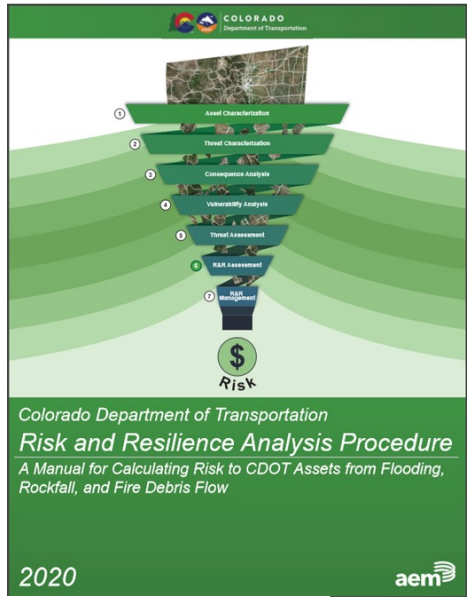
https://www.codot.gov/programs/planning/cdot-resilience-program

COLORADO DEPARTMENT OF TRANSPORTATION	■ POLICY DIRECTIVE □ PROCEDURAL DIRECTIVE	
Subject **Building Resilience into Transportation Infrastructure and Operations**		Number **1905.0**
Effective **11/15/18**	Supersedes **New**	Originating Office **Division of Transportation Development**

I. PURPOSE

The purpose of this Policy Directive is to implement the principles of resilience into Colorado's transportation system practices. This will enable the Colorado Department of Transportation to proactively manage risks, minimize disruptions and adapt to changing conditions in order to provide continuous transportation service in Colorado. Colorado's transportation infrastructure directly or indirectly affects the lives of all people living in the state, and provides the essential services that underpin the state's economy and the movement of people, goods, and information. Maintaining a secure, functioning, and resilient infrastructure is critical to the state's safety, prosperity, and well-being.

The benefits or resilience are widespread, including fiscal benefits by saving the state money, social and economic benefits, by saving the public time and ensuring timely access to markets for businesses, and safety benefits, by taking action before a disruption becomes disastrous.

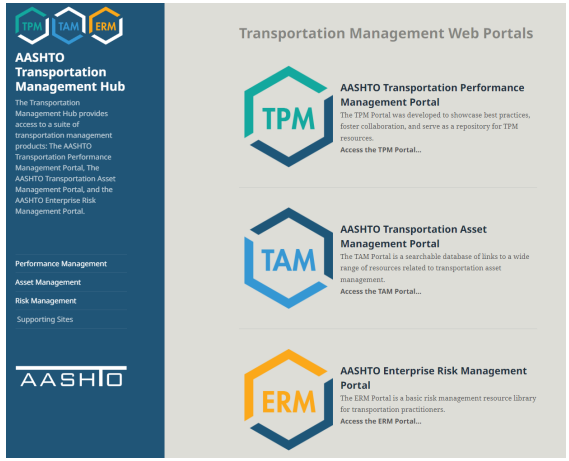


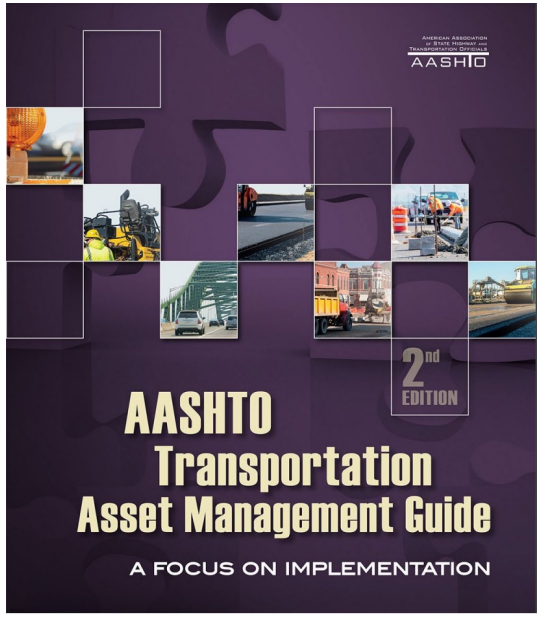
Tool	Tutorial Link (if applicable)
Risk and Resilience Analysis Procedure: A Manual for Calculating Risk to CDOT Assets from Flooding, Rockfall, and Fire Debris Flow	
Risk and Resilience Excel Spreadsheet Tool	Tutorial Video for Risk and Resilience Excel Spreadsheet Tool
Asset Criticality Model for System Resilience	
Risk and Resiliency Project Scoring Tool	Tutorial Video for Risk and Resiliency Project Scoring Tool
4 R Framework for Identifying and Evaluating Resiliency in Transportation System Assets and Organizations	
CDOT Detour Identification Tool	Tutorial Video for CDOT Detour Identification Tool
CDOT Asset Resiliency Mapping Application	Tutorial Video for CDOT Asset Resiliency Mapping Application

CDOT TAMP Approach

#2 Used existing knowledge

- AASHTO Transportation Management HUB - https://www.transportationmanagement.us/
- AASHTO ERM Guide
  - NEW - Implementation Guide - https://www.trb.org/Policy/Blurbs/182681.aspx
- TAM Guide - https://www.tamguide.com/subsection/1-2-3-ways-to-use-this-guide/
- ISO:3100X - https://www.iso.org/iso-31000-risk-management.html



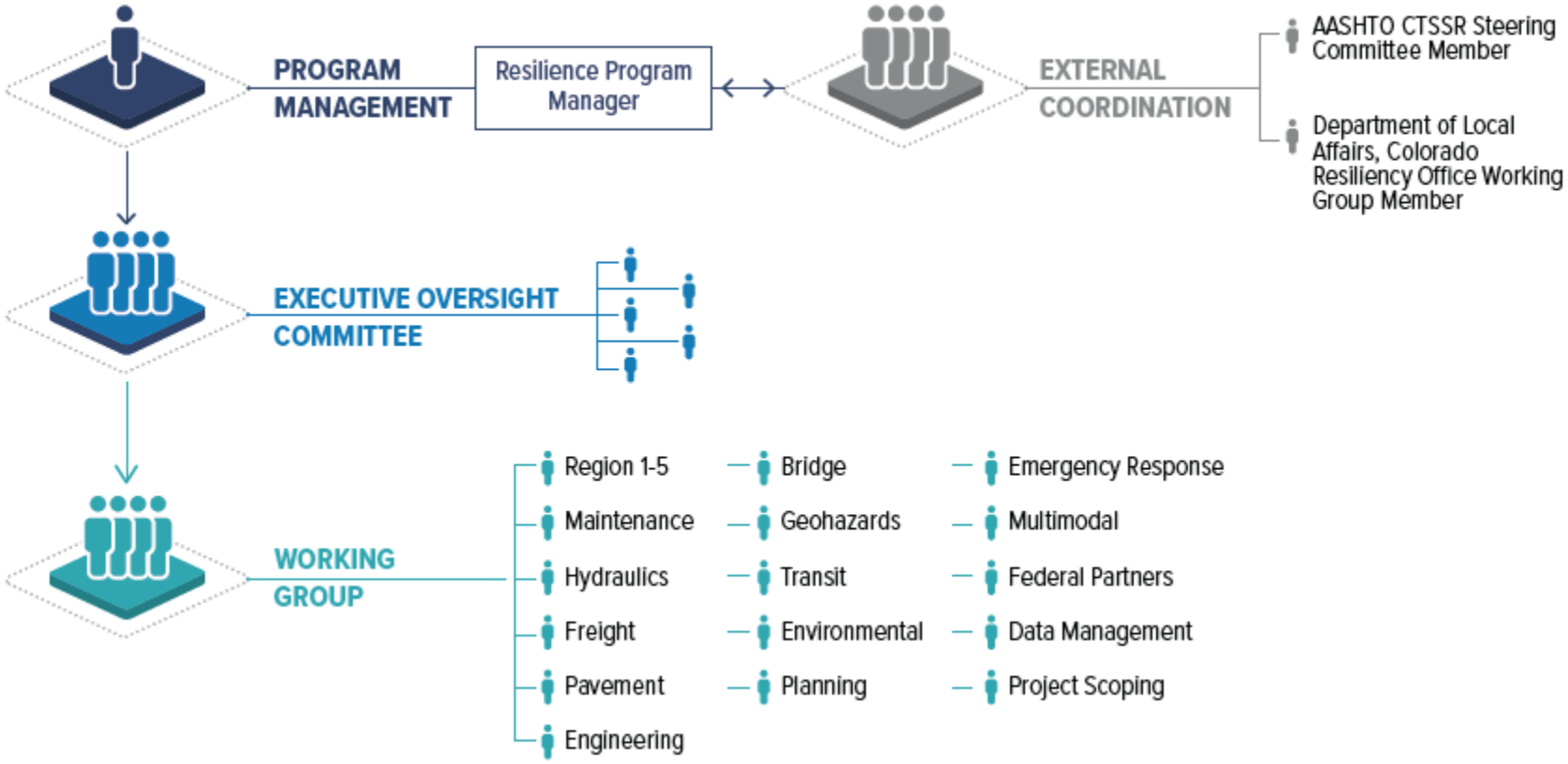


- **Enterprise (Strategic, Corporate)**—Threats that affect mission, vision, and overall results of the asset-management program. Examples include politics, public perception, reputation, and levels of available revenue.
- **Program (Business Line)**—Threats that affect CDOT's ability to deliver projects and meet targets within a program. These may include organizational and systemic issues as well as revenue and economic uncertainties that cause delays. These causes are not related to any specific projects. Examples include project-delivery threats, revenue uncertainties, cost-estimating processes, revenue and inflation projection inaccuracies, construction cost variations, materials price volatility, data quality, and employee retirements.
- **Project**—Threats that affect the cost and schedule to deliver projects throughout the agency. Examples include shortages in material supplies that cause a delay in the project schedule, and unexpected increases in materials costs that increase the overall project budget.
- **Activity-Level**—Threats that affect the ability of an asset to perform its function, assessed against the likelihood of the asset failing (asset condition) and the consequence to CDOT and/or users if the asset were to fail (asset criticality). For example, a bridge that is Structurally Deficient has a higher probability of failing than a bridge that is not. And the failure of a signal located at a major interchange could cause major delays to system users.

CDOT TAMP Approach

#3 Codified informal org structure

Figure 27 *Risk and Resilience Program Organization Structure*



CDOT TAMP Approach

#4 Refined risk assessment process

Figure 28 *CDOT Risk Management Process*

CDOT TAMP Approach

#5 Considerations in life cycle planning

Table 15 *CDOT's Risk-Management Levels, Responsible Parties, and Risk Management Initiatives*

Level	Responsibility	CDOT Risk Management Initiatives
Enterprise	Senior Executives, policy makers	**Enterprise Risk Register (Enterprise-wide, Strategic, Corporate Risks)—**Documented list of risks that affect the mission, vision, and overall results of the asset management program. **Climate Change Impacts to CDOT—**CDOT is regularly assessing various impacts to its network based on climate change and extreme weather conditions, including its recent study, "Changing Climate and Extreme Weather Impacts on Geohazards in Colorado," conducted in 2021.
Program	Program Managers	**Enterprise Risk Register (Programmatic, Business Line Risks)—**Documented list of risks that affect CDOT's ability to deliver projects and meet targets within a program (but not related to a specific project). **Changing Climate and Extreme Weather Impacts on Geohazards in Colorado—**An assessment of how extreme weather and climate change may affect geohazard impacts through changes to their frequency and magnitude. **Asset Class-Specific Risk Register—**Documented list of risks that specifically affect one of CDOT's 12 asset classes. **4 R Framework for Identifying and Evaluating Resiliency in Transportation System Assets and Organizations—**Details the "4 R Principle" framework used to evaluate resiliency in transportation systems. The document provides examples of both a resilient organization and asset.
Project	Project Managers	**Colorado Department of Transportation Risk and Resilience Analysis Procedure—**A Manual for Calculating Risk to CDOT Assets from Flooding, Rockfall, and Fire Debris Flow (Pilot)—procedure documenting CDOT's approach to managing risk and resiliency to a specific highway asset from specific threats (developed based on Risk and Resilience I-70 Pilot). **Project Prioritization Score Sheet—**A Microsoft Excel tool that allows users to prioritize projects based on the level of risk mitigation addressed by each project. **CDOT Project Risk Assessment Tool—**A Microsoft Excel tool that describes how risk management will be structured and performed on CDOT projects; it follows the common risk-management approach and a standard risk register format, tailored to CDOT. **Region Engineers' Project Risk Management—**In project delivery CDOT utilizes a Project Risk assessment tool that provides a process and record for risk identification, analysis, response strategy definition, monitoring and control.
Activity	Activity Managers, staff	**CDOT's Damaged-Asset Database—**A database containing past damaged assets, which can be updated as additional assets sustain damage in emergency events. **Asset Criticality Model for System Resilience—**A process for determining asset criticality (impact to CDOT if an asset were to fail). **Asset Resiliency Mapping Application—**A GIS mapping tool that allows users to assess risk as it relates to environmental risk factors, including drought severity and wildfire risk, as well as asset conditions like highway Drivability Life, and social vulnerability documented by Disproportionately Impacted Community Census Block Groups. **Risk and Resiliency Tool—**A Microsoft Excel tool that allows users to calculate the total risk for an asset by inputting pre-mitigation data on each of the six criticality factors and performing a benefit-cost analysis on mitigation tactics.

CDOT TAMP Approach

#6 Considerations in risk management analysis

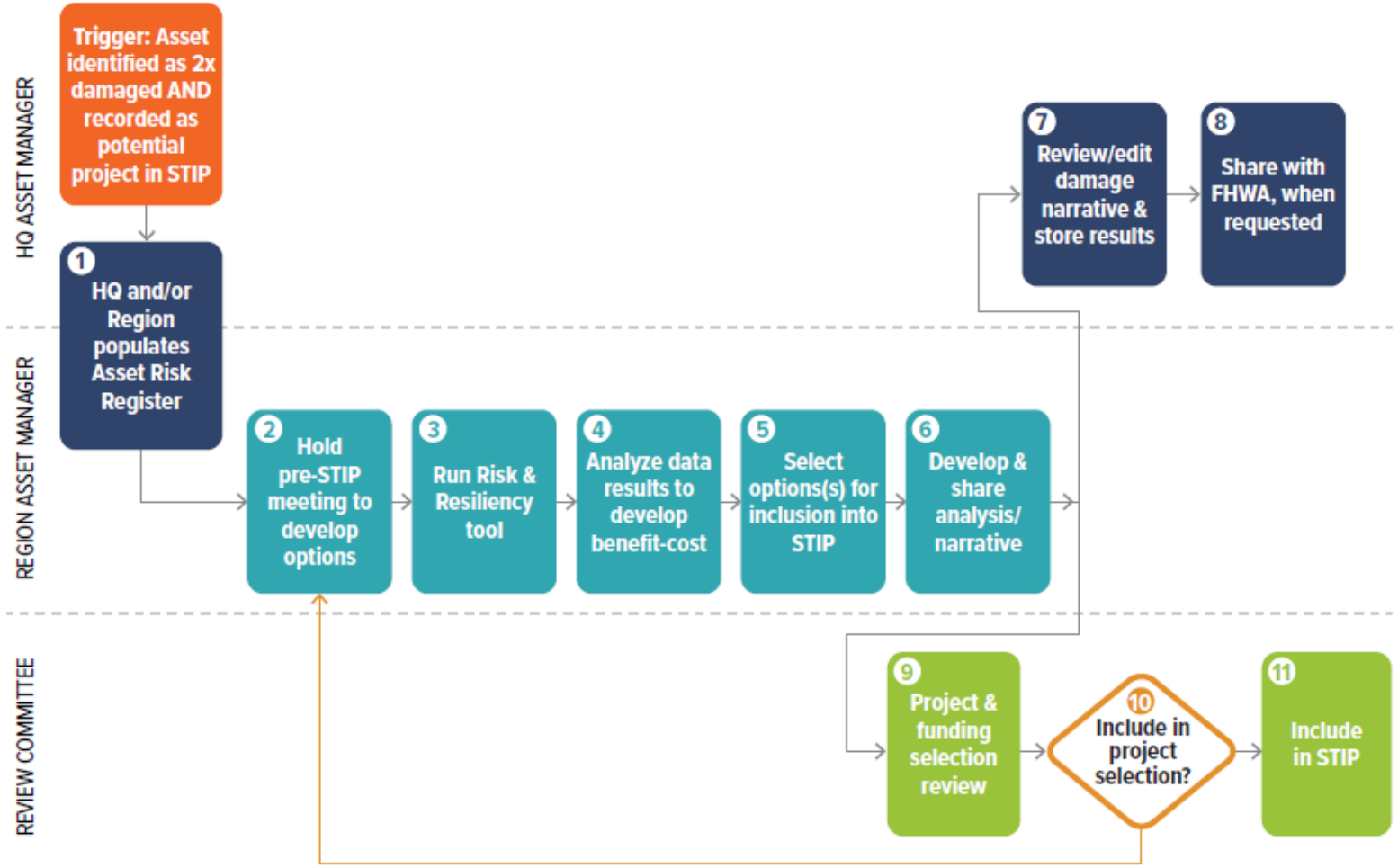
Table 12 *CDOT Enterprise-Level Risk Register*

Threat/ Opportunity	Risk Statement	Risk Score	Risk Management Strategy
Flood	There is a risk that flooding occurs leading to asset/route damage that causes mobility and safety impacts as well as increased asset management cost.	68[6] (T)5 * (C)4.5 * (V)3	Treat by implementing design standards; following agency continuity of operations plan; maintaining incident command center management structure; maintaining an Office of Emergency Management (OEM). Use tools and processes developed under the resilience program to identify high risk assets and corridors for focused analysis.
Post-Fire Debris Flow	There is a risk that post-fire debris flow occurs leading to asset/route damage that causes mobility and safety impacts as well as increased asset management cost.	48 (T)4 * (C)3 * (V)4	Treat by maintaining an office of OEM. Maintenance landscaping, erosion control, jersey barriers and other practices.
Funding Uncertainty (positive and negative)	There is a risk of funding changes leading to increased/reduced investment that causes improved/diminished asset management outcomes.	38 (T)4 * (C)2.4 * (V)4	Tolerate/take advantage of—manage on per event basis.
Geohazards	There is a risk of geotechnical failure that causes mobility and safety impacts as well as increased asset management cost.	33 (T)5 * (C)3.3 * (V)2	Treat by implementing the geohazards management program and robust geohazards-management plan.
Cost Uncertainty	There is a risk that price escalation occurs, leading to unsustainable costs and thereby limiting the ability to deliver organizational objectives.	15 (T)3 * (C)1.65 * (V)3	Treat by bid process (e.g., bid rejection), re-scoping projects, price hedging, and by hedging materials; then tolerate.
Fire	There is a risk that fire occurs, leading to asset/route damage that causes mobility and safety impacts as well as increased asset management cost.	14 (T)4 * (C)1.2 * (V)3	Tolerate in the case of wildfires; and treat by tunnel fire-suppression systems and bridge-design standards, etc. Use tools and processes developed under the resilience program to identify high risk assets and corridors for focused analysis.
Missing Infrastructure Targets for National Performance Measures	There is a risk that CDOT is not able to meet PM2 condition minimum requirements, leading to restricted funding that limits the agency's ability to meet its objectives.	14 (T)3 * (C)2.4 * (V)2	Treat by implementing formal asset management program.
Snow (Avalanche)	There is a risk of avalanche occurring that causes mobility and safety impacts as well as increased asset management cost.	11 (T)4 * (C)2.7 * (V)1	Treat by maintaining a Winter Operations Program. Use tools and processes developed under the resilience program to identify high risk assets and corridors for focused analysis.
Cybersecurity	There is a risk that a cyber-attack occurs, leading to a reduction in CDOT ability/ effectiveness that results in reduced mobility and safety outcomes.	9 (T)5 * (C)1.8 * (V)1	Transfer to Governor's Office of Information Technology. Treat by maintaining firewalls; virus protection software; training employees on cybersecurity.
Staffing: Attrition	There is a risk that CDOT suffers from a shrinking workforce, leading to loss of institutional knowledge that reduces efficiency and effectiveness.	4 (T)4 * (C)1.1 * (V)1	Treat by documenting policies and procedures.

CDOT TAMP Approach

#7 Part 667….and investment decision making process

Figure 29 *DRAFT Process Flow for Assessing and Mitigating Twice-Damaged Assets*



CDOT TAMP Approach

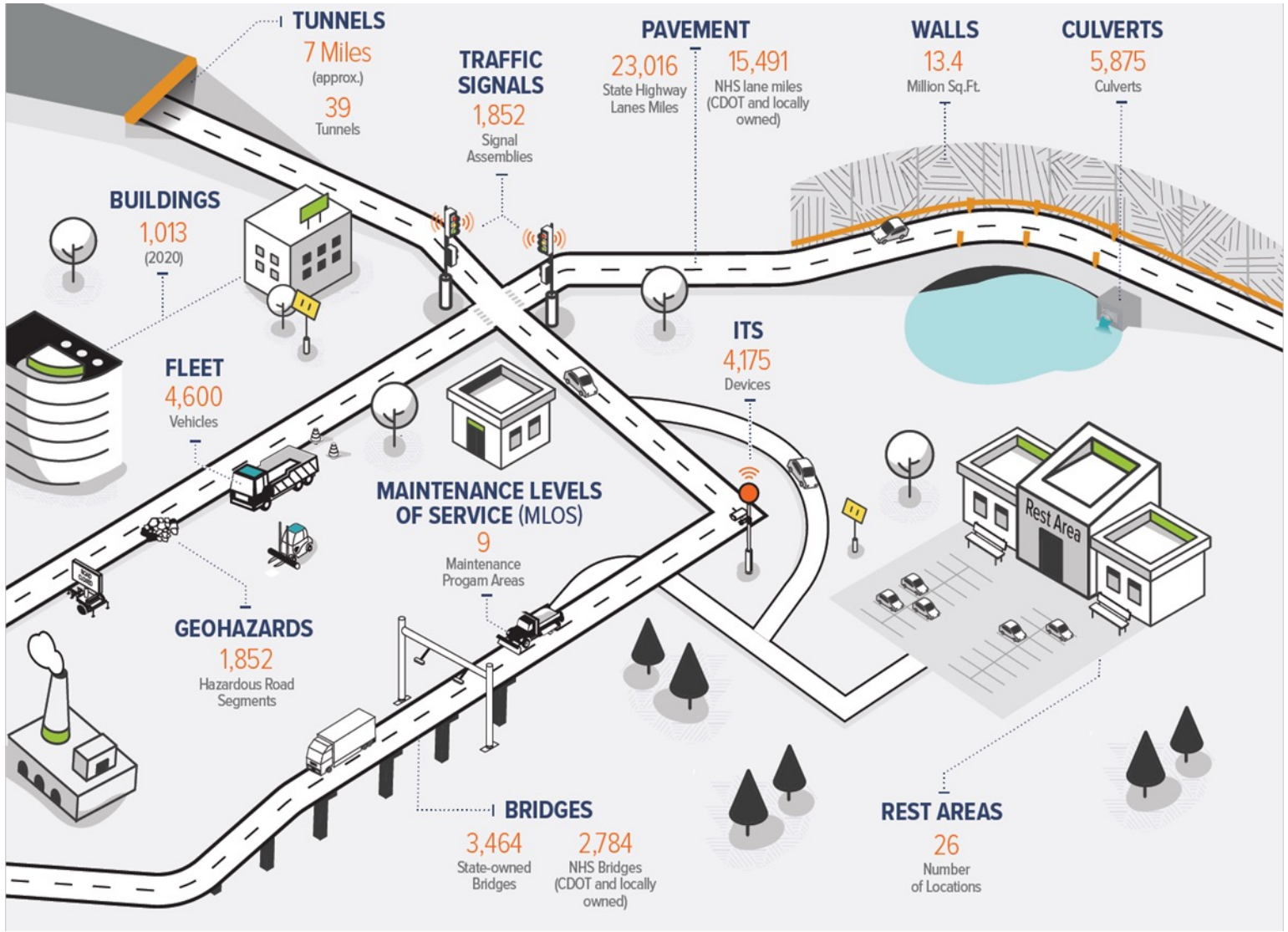
#8 Recognize more work needs to be done

Planned improvements to the TAM program include the following:

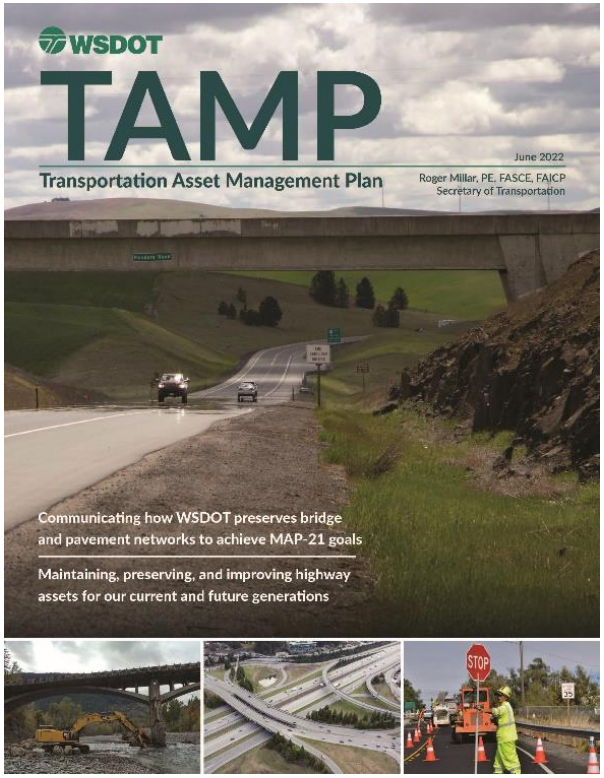
	IMPROVEMENT AREA	OUTCOME ACHIEVED
SHORT TERM	**Treatment-delivery tracking.** Improve ability to track planned asset treatments from planning stage through project delivery, ideally through a transportation project-management system such as PM Web.	Improves understanding of the link between asset-management treatment selections and STIP project delivery.
SHORT TERM	**Risk integration.** Integrate Risk and Resilience Program within the Performance and Asset Management Branch and continue to implement risk practices across the Department.	Improves risk and resilience communication and practices. Leads to more proactive management of threats.
SHORT TERM	**Process documentation.** Build on the recent Policy Directive 1609.0, which documents core asset-management practices, with a new procedural directive and other documentation.	Manages risks from staff turnover and provides a starting point for further enhancement.
SHORT TERM	**Bridge and tunnel asset management.** Improve life-cycle planning for these assets and further develop the recently created tunnels portion of the Bridge and Tunnel Enterprise.	Minimizes life-cycle costs and better prioritizes investments.
MID-TERM	**Extreme weather and resilience.** Enhance current approaches for integrating as part of lifecycle cost and risk management analyses.	Improves the ability for infrastructure to handle weather and climate threats.
MID-TERM	**Life-cycle planning.** Continue to enhance analyses from assets' model (AIMS). For example, include a broader range of work types within the model.	Improves ability to estimate future funding needs and to prioritize asset treatments.
LONG TERM	**Tradeoff analyses.** Improve ability to perform multi-objective decision analysis (MODA) and cross-asset optimization for asset management decision making.	Improves understanding of alternative funding strategies.

CDOT TAMP Approach

#9 Request extension



Washington State's Approach to IIJA/BIL Compliance for the TAMP



Todd Lamphere, WSDOT

Jonathan Fok, WSDOT

August 17, 2022

Roger Millar, Secretary of Transportation
Amy Scarton, Deputy Secretary of Transportation

WSDOT's Roadmap for an IIJA/BIL Compliant TAMP

- IIJA/BIL added the requirement that state DOTs shall consider extreme weather and resilience in the lifecycle cost (23 CFR 515.7(b)) and risk analyses (23 CFR 515.7(c)(1))
- WSDOT updated the 2022 TAMP in alignment with the new requirement

- WSDOT submitted to FHWA – Washington Division Office in May 2022
  - Only includes Bridge and Pavement assets
- WSDOT TAMP was recertified by FHWA in June 2022
- WSDOT Annual Consistency Determination Document was approved in July 2022

IIJA/BIL Compliance and Life Cycle Planning

- WSDOT included several instances where extreme weather and resilience were considered with the lifecycle cost analysis
  - Examples highlight existing practices, not new processes because of the new requirement

- WSDOT's Life Cycle Cost Analysis (LCCA) for pavement accounts for extreme weather and resilience in making site specific assumptions about the cost to construct and preserve the asset.

- WSDOT identifies activities to reduce risk from extreme weather and other influences to structures through scour mitigation and seismic retrofit in bridge life cycle planning strategies.

IIJA/BIL Compliance and Risk Management

- WSDOT made improvements in the risk workshops to consider resiliency and extreme weather
  - Updated the multidisciplinary team of scoring members to include members of the WSDOT Resiliency Workgroup Steering Committee
  - Included risk statements related to extreme weather and resilience
  - Provided examples for both pavements and bridges on how extreme weather and resilience is considered in the results and risk treatment planning
    - E.g., Pavement Type Selection, All Weather Roads, Bridge Seismic Retrofit Program, Bridge Scour Mitigation Program

IIJA/BIL Compliance and Risk Management, cont.

- WSDOT incorporated the annual analysis and results report identifying assets repeatedly damaged by emergency events on the NHS (23 CFR Part 667)
  - Highlighted certain areas necessary to address on the Washington State transportation network
  - Coordinated with WSDOT Multimodal Planning Division and FHWA – Washington Division Office

WSDOT's Resiliency Workgroup Steering Committee

- Purpose is to coordinate and coordinate across programs to ensure a resilient system is prepared for, and adaptable to, changing conditions and able to withstand and recover rapidly from disruptions
- Committee is comprised of diverse members representing many areas and divisions throughout WSDOT
- Committee reports to the Asset Management Executive Steering Committees and brings recommendations to the executive level for decision-making

WSDOT's Resiliency Workgroup Steering Committee Members

- Maintenance Division
- Multimodal Planning Division
- Development Division
  - Bridge Office, Environmental Services
- Construction Division
- Aviation Division
- Rail, Freight & Ports Division
- Washington State Ferries
  - Terminal Engineering
  - Operations/Safety Management System
- Program Management
  - Statewide Asset Management
- WSDOT Region Offices
- Safety and Enterprise Risk Office
- Information Technology Division
- Toll Division
- Human Resources
- Traffic Division

IIJA/BIL Compliance and Future Action Items

- Adding Resilience as one of WSDOT's Strategic Plan goals
- Continuing to improve the resilience and extreme weather content in the TAMP

Questions?

2022 Washington State DOT TAMP

Todd Lamphere, WSDOT
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Jonathan Fok, WSDOT
fokjona@wsdot.wa.gov

Appendix

IIJA/BIL Compliance and Risk Management Examples (Pavement)

- Pavement Type Selection
  - Identifies and selects the most durable, cost-effective, highest-performing pavement structure for a new roadway. The goal is to select the best pavement type at the greatest overall value to the taxpayer and with a service life which provides the maximum return on the public's investment.

- All Weather Roads
  - WSDOT designs its pavements to withstand all weather circumstances and incorporate the localized climate and certain extreme weather circumstances such as heat and cold fluctuations. We routinely review the criteria for adjustment to incorporate an increase or decrease in temperature fluctuations. WSDOT is considering adjusting binder grades in pavement based on potential increases in temperature.

IIJA/BIL Compliance and Risk Management Examples (Bridge)

- Bridge Seismic Retrofit Program
  - WSDOT's Bridge Seismic Retrofit Program evaluates and mitigates potential risks with bridge structures related to seismic activity. WSDOT seeks to minimize and avoid catastrophic bridge failure by improving the resiliency of bridges and structures from future earthquakes

- Bridge Scour Mitigation Program
  - WSDOT's Bridge Scour Mitigation Program is responsible for identifying bridges at risk for scour, then monitors, prioritizes and applies mitigation strategies to bridges that have the highest level of scour deficiencies. Addressing scour is a priority at WSDOT in order to preserve and maintain bridge structures.

Incorporating Climate Resiliency Into the TAMP

Michael Johnson P.E.

State Asset Management Engineer

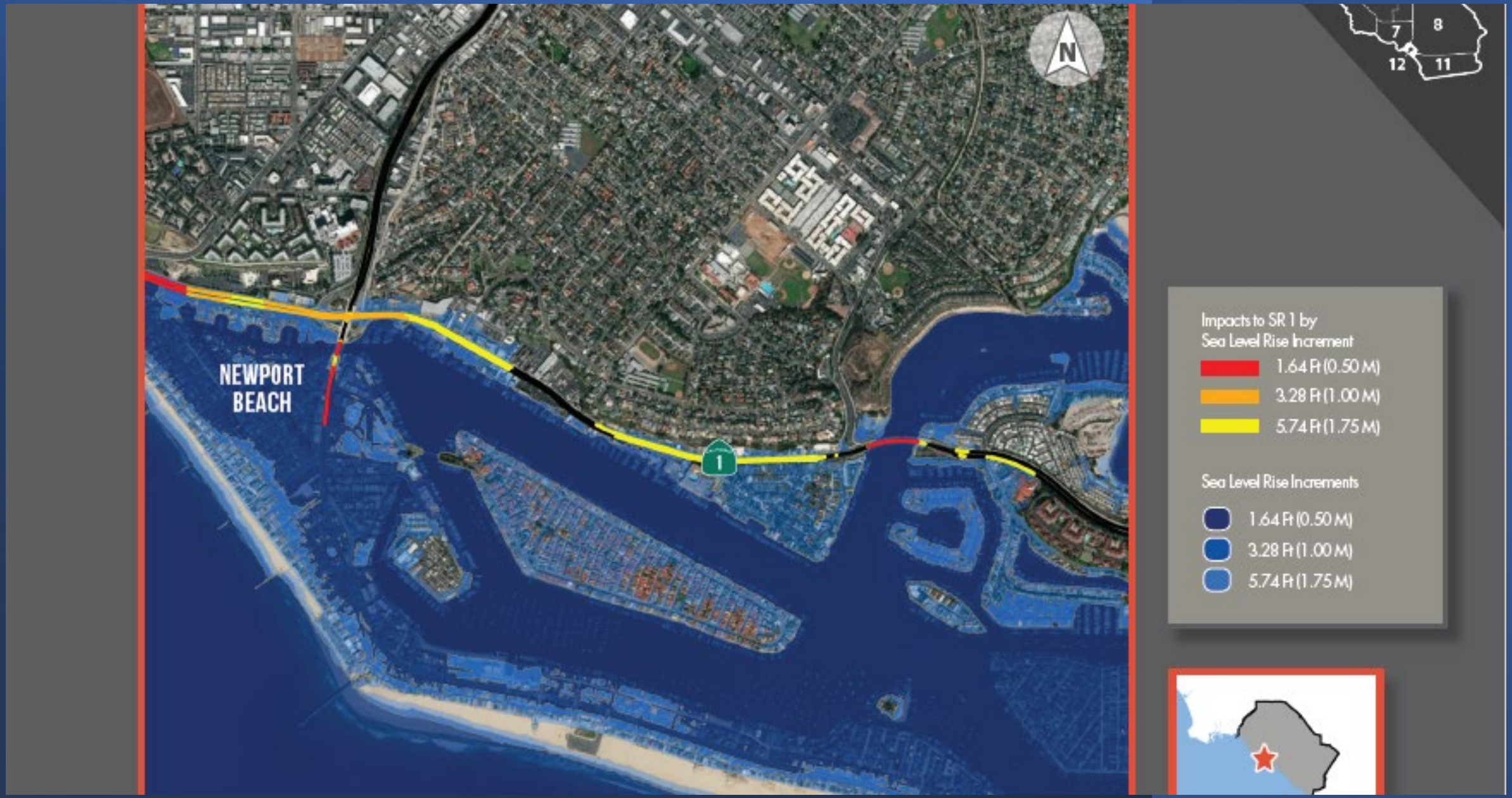
California Department of Transportation

TAM Webinar – August 2022

Transportation asset management involves balancing costs, service level, and risks across different infrastructure investments over the life cycle of the assets.

Start with an Assessments of System Risks

ows the massive landslide that, in an instant, wiped out all traces of a section of Highway 1, and
scape along the Big Sur coast. Recognizing the highway's importance, Caltrans almost immediately b


NEWPORT BEACH
1
N
7
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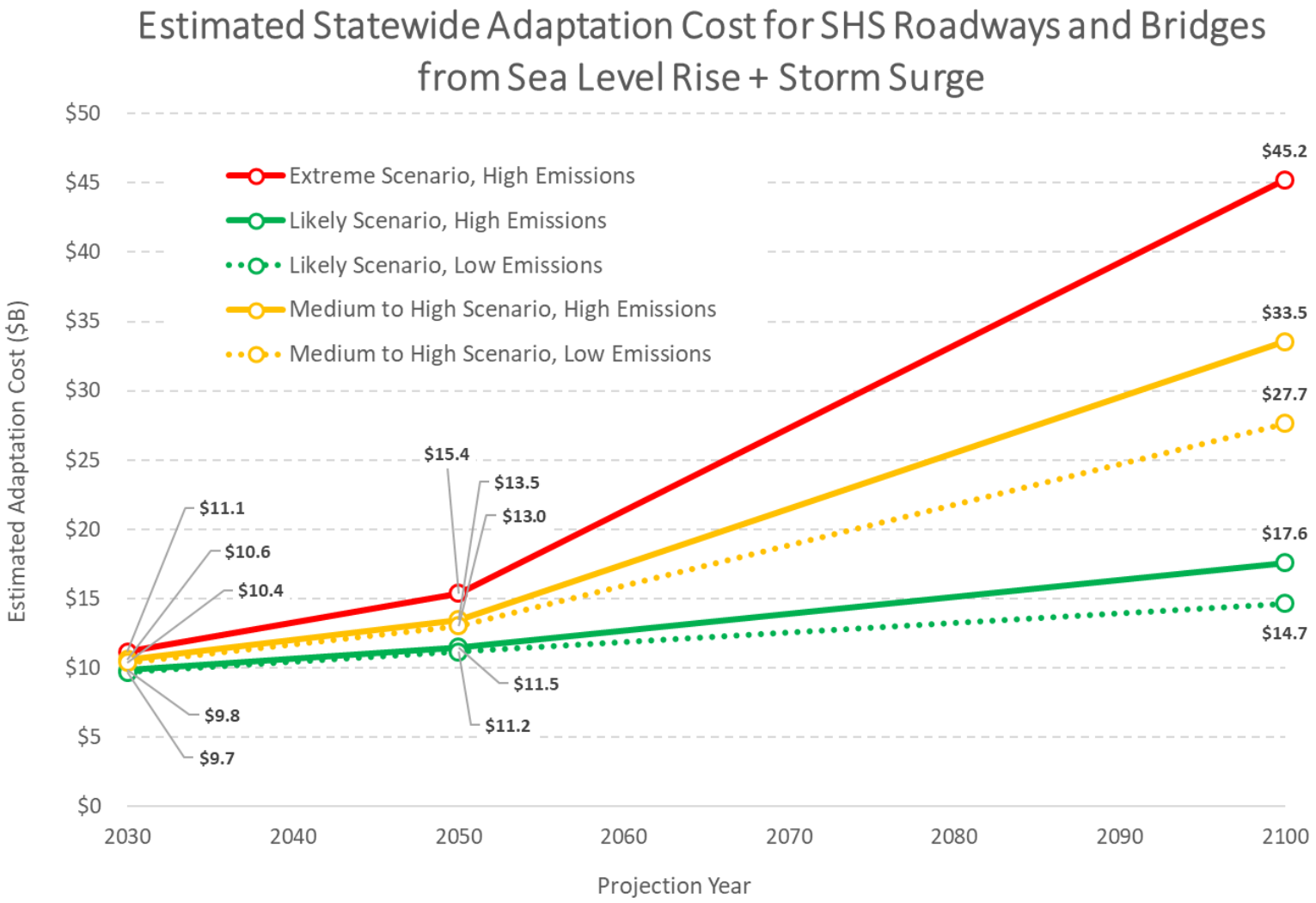
Impacts to SR 1 by Sea Level Rise Increment
1.64 Ft (0.50 M)
3.28 Ft (1.00 M)
5.74 Ft (1.75 M)
Sea Level Rise Increments
1.64 Ft (0.50 M)
3.28 Ft (1.00 M)
5.74 Ft (1.75 M)

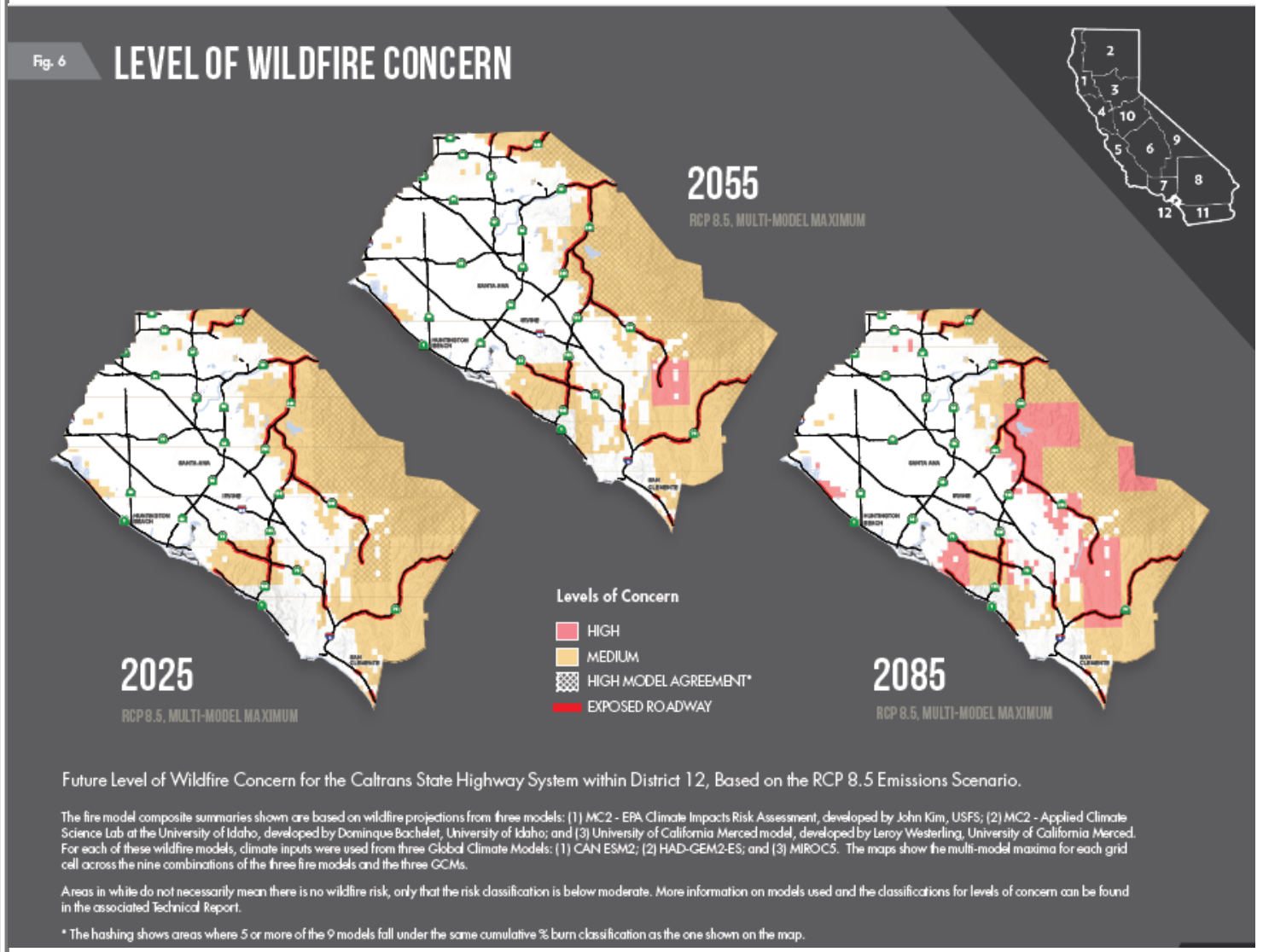
Sea Level Rise Models – What will it cost in the TAMP?



Notes:

- Costs are escalated 8.5 years at 3.2%/year.
- Sea level rise and storm surge projections based on GIS data used in the 2019 Caltrans Vulnerability Assessment Reports.

Wildfire Concerns



How Risks impact your TAMP

- Life Cycle Planning
  - Repeatedly damaged infrastructure (667 requirements)
- Financial Risk
  - Risk will have significant impact on your TAMP analysis
- Variable Local Risk Management Approach
  - Local funding in California is quite variable – Who's risk management plan goes into he TAMP?
- Risk Management impacts TAMP Target Setting
  - Funding allocated to risk mitigation will have impact on condition targets

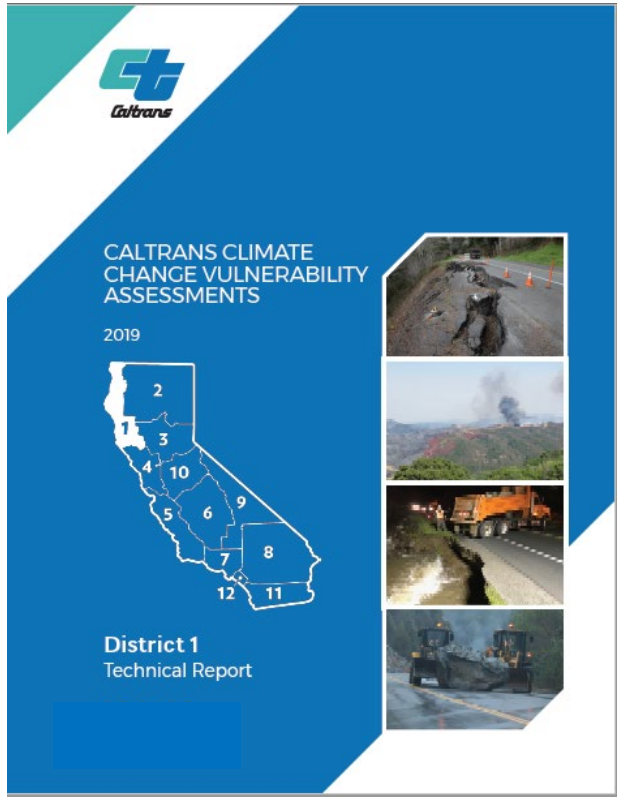
ROCK STRENGTH

SLOPE CLASS	1	2	3
1	0	0	0
2	0	V	VII
3	0	V	VII
4	III	VIII	IX
5	VI	IX	X
6	VII	IX	X
7	VIII	IX	X
8	VIII	IX	X

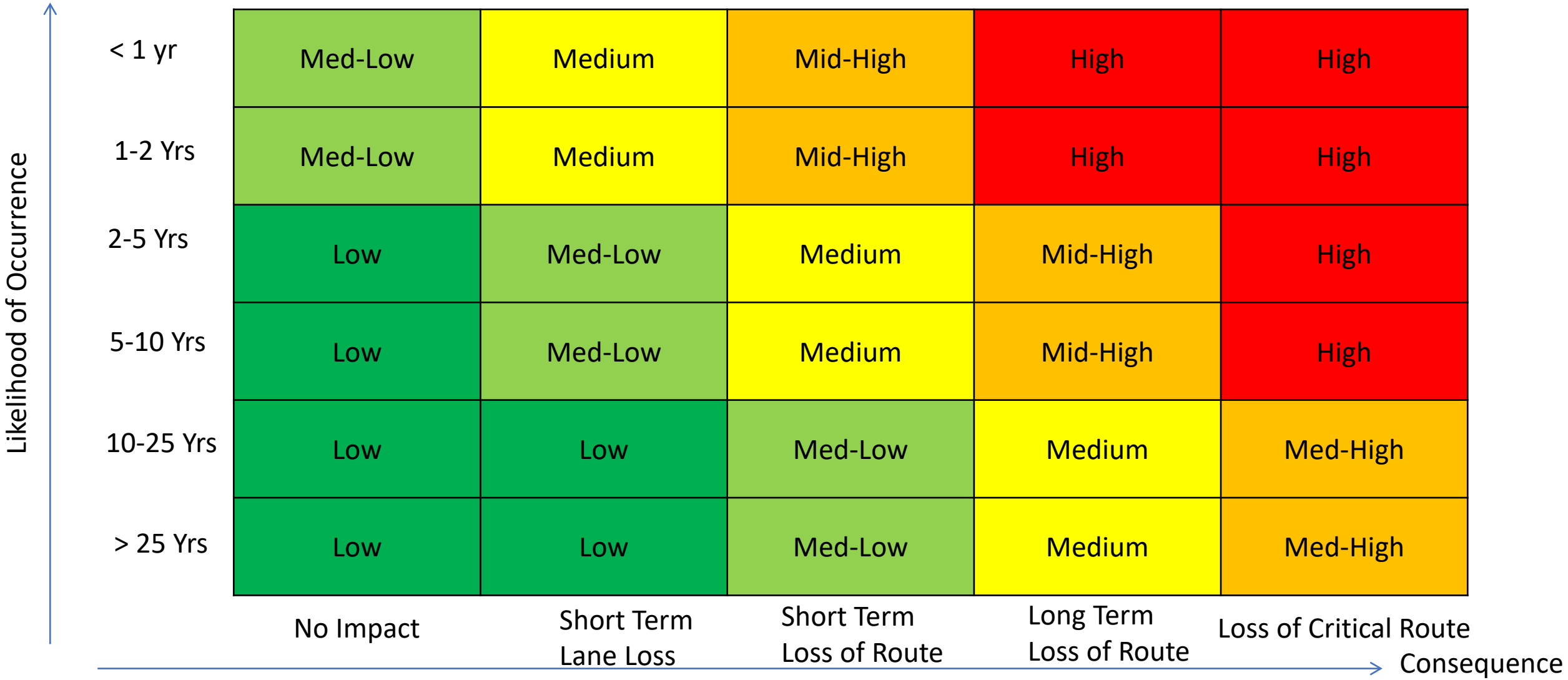
LANDSLIDE SUSCEPTIBILITY CLASSES

Criterion	Attribute	Weight
Hazard	Soil Conditions	33%
	Peak Rock Acceleration	38%
	Seismic Duration	29%
Impact	Average Daily Traffic (ADT) On Structure	28%
	ADT Under/Over Structure	12%
	Detour Length	14%
	Leased Air Space (Residential, Office)	15%
	Leased Air Space (Parking, Storage)	7%
	RTE Type on Bridge	7%
	Critical Utility	10%
	Facility Crossed	7%
Vulnerability	Year Designed	25%
	Hinges (Drop Type Failure)	16.5%
	Outriggers, Shared Columns	22%
	Bent Redundancy	16.5%
	Skew	12%
	Abutment Type	8%

Varied Assessment Criterion



Putting Risks on Common Scale



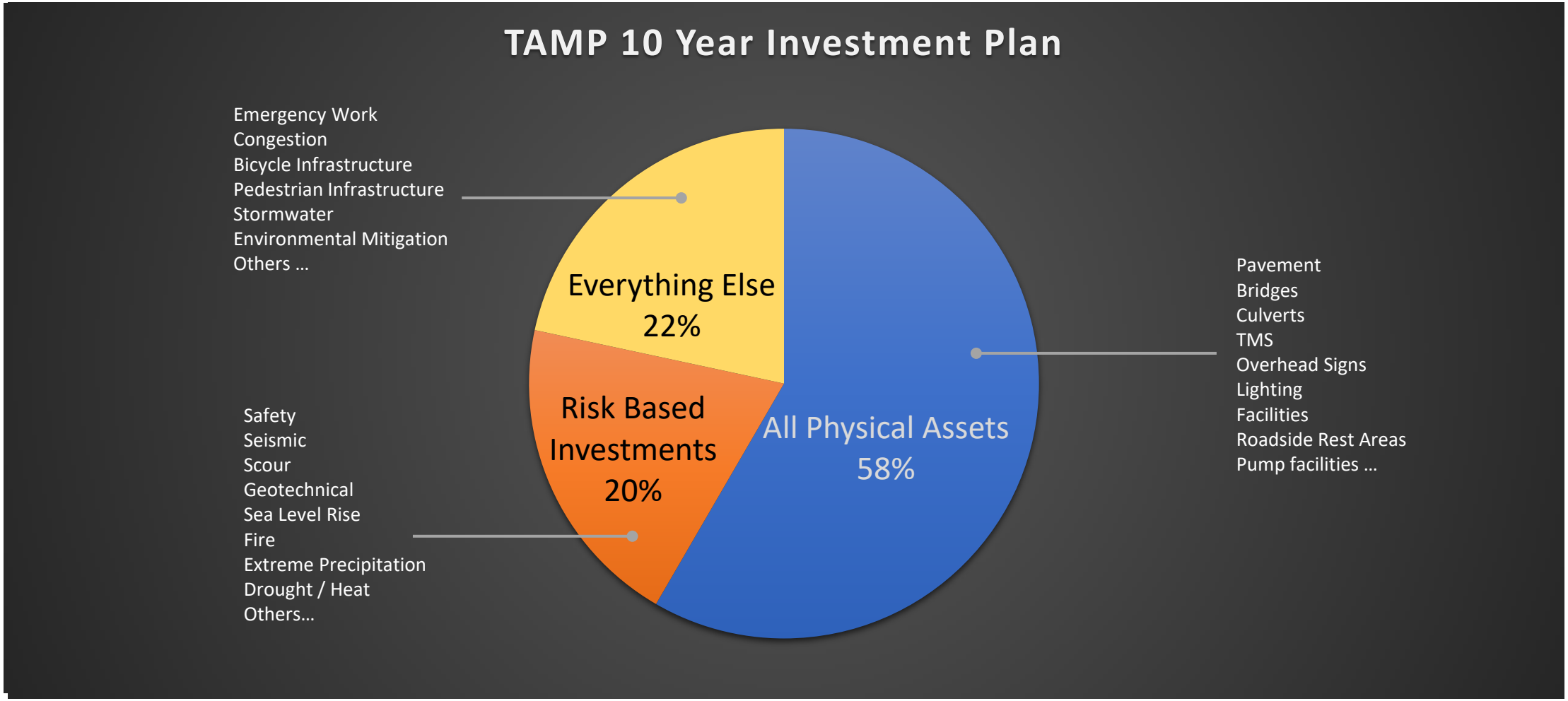
CALTRANS CLIMATE CHANGE ADAPTATION STRATEGY REPORT

Integrating Climate Adaptation into Caltrans Business Operations

Division of Transportation Planning
California Department of Transportation

May 18, 2020

Investment Plan – Funding Breakdown



California DOT Investment Strategies Tool – No Risk Incl.

Estimated Investment (Expected Annual Funding)

Use Default or Override Parameters? **Default**

Annual Funding by Work Type	Initial Const.	Maint.	Preser/Rehab	Reconstruction	Total
Default	$ 233,714	$ 742,750	$ 1,235,298	$ 2,537,903	$ 4,749,670
Override	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 4,000,000
% on Risk Mitigation			0%	0%	-
$ on Risk Mitigation			$ -	$ -	$ -

% Spending on Fair to Good	13.0%
% Spending on Poor to Good	66.4%
% Spending on Adding New	4.9%
% Spending on Risk Mitigation	0.0%
% Spending on Maint. Investment	15.6%

Asset Condition

Condition	Current		Do Nothing: 10Y End		Invested: 10Y End		Invested: 4Y End		10Y TAMP Target	
	Lane Miles	%	Lane Miles	%	Lane Miles	%	Lane Miles	%	Lane Miles	%
Good/New	2.0	0.8%	0.1	0.1%	32.5	**12.7%**	14.1	**5.5%**	33.3	13.0%
Fair	231.2	90.8%	205.3	80.7%	200.0	**78.1%**		**85.7%**	203.4	79.4%
Poor	21.3	8.4%	49.1	19.3%	23.7	**9.3%**	22.3	**8.7%**	19.5	7.6%

10Y Performance Gap Analysis

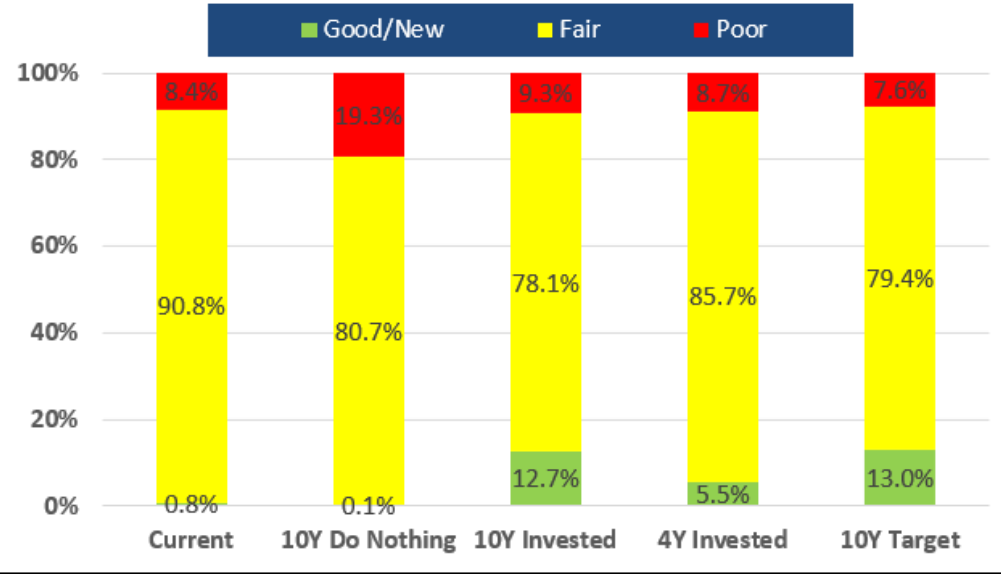
Condition	Gap (10Y Invested - Target)	
	Lane Miles	%
Good/New	(0.8)	-0.3%
Fair	(3.4)	-1.3%
Poor	4.3	1.7%

10Y Needs Assessment

Total Cost of Work

Treatment	Invested	Cost Gap	Total
Fix Fair to Good	$ 6,176,489	$ -	$ 6,176,489
Fix Poor to Good	$ 31,555,515	$ 5,296,493	$ 36,852,008
Add New	$ 2,337,141	$ -	$ 2,337,141
Risk Mitigation	$ -	$ -	$ -
Maintenance	$ 7,427,558	$ -	$ 7,427,558
Total	$ 47,496,703	**$ 5,296,493**	$ 52,793,196

Asset Condition Comparison Chart



Caltrans Investment Strategies Tool – Risk Investment

Estimated Investment (Expected Annual Funding)

Use Default or Override Parameters? **Override**

Annual Funding by Work Type	Initial Const.	Maint.	Preser/Rehab	Reconstruction	Total
Default	$ 233,714	$ 742,756	$ 1,235,298	$ 2,537,903	$ 4,749,670
Override	$ 233,714	$ 742,756	$ 1,235,298	$ 2,537,903	$ 4,749,671
% on Risk Mitigation			10%	20%	
$ on Risk Mitigation			$ 123,530	$ 507,581	$ 631,110

% Spending on Fair to Good	11.7%
% Spending on Poor to Good	54.5%
% Spending on Adding New	4.9%
% Spending on Risk Mitigation	13.3%
% Spending on Maint. Investment	15.6%

Asset Condition

Condition	Current		Do Nothing: 10Y End		Invested: 10Y End		Invested: 4Y End		10Y TAMP Target	
	Lane Miles	%	Lane Miles	%	Lane Miles	%	Lane Miles	%	Lane Miles	%
Good/New	2.0	0.8%	0.1	0.1%	27.3	10.7%	12.1	4.7%	33.3	13.0%
Fair	231.2	90.8%	205.3	80.7%	200.5	78.3%	219.8	85.8%	203.4	79.4%
Poor	21.3	8.4%	49.1	19.3%	28.3	11.0%	24.1	9.5%	19.5	7.6%

10Y Performance Gap Analysis

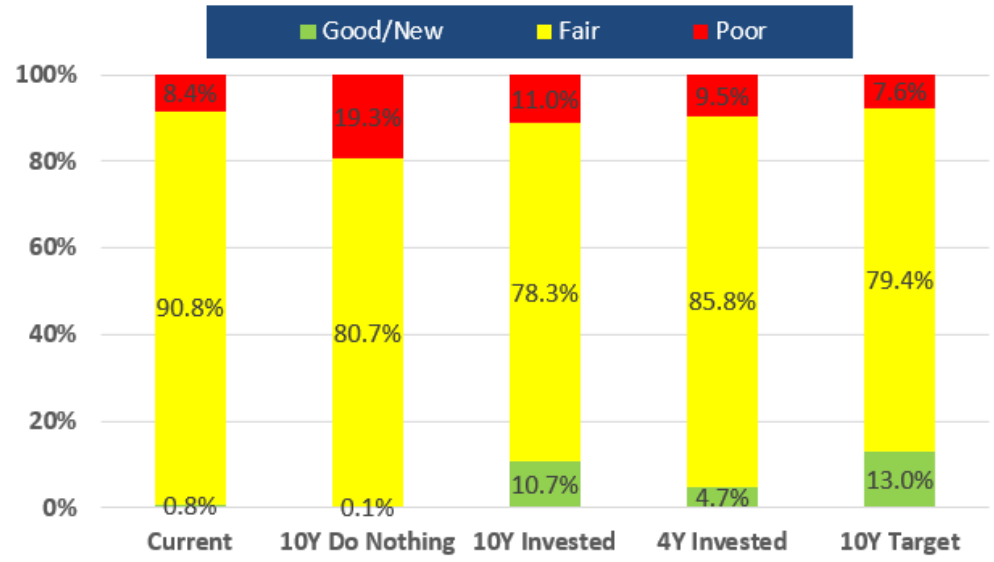
Condition	Gap (10Y Invested - Target)	
	Lane Miles	%
Good/New	(6.0)	-2.3%
Fair	(2.9)	-1.1%
Poor	8.8	3.4%

10Y Needs Assessment

Total Cost of Work

Treatment	Invested	Cost Gap	Total
Fix Fair to Good	$ 5,558,841	$ -	$ 5,558,841
Fix Poor to Good	$ 25,862,065	$ 10,989,943	$ 36,852,008
Add New	$ 2,337,140	$ -	$ 2,337,140
Risk Mitigation	$ 6,311,104	$ -	$ 6,311,104
Maintenance	$ 7,427,560	$ -	$ 7,427,560
Total	$ 47,496,710	$ 10,989,943	$ 58,486,653

Asset Condition Comparison Chart



Conclusion

- Understanding resiliency risks is the starting point
- Varied risk assessments methods can be placed on a common risk scale to help inform investment decision making
- Risks should be considered in your TAMP Financial Planning, Life Cycle Planning, Investment Strategies and may impact condition targets
- Caltrans is working to time resiliency mitigation at end of physical asset useful life.

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(NCHRP Project 23-08)

Wednesday, December 21, 2022– 2:00 PM EST
TAM and Resiliency Building

More to follow!

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