# AASHTO TAM Guide Book Club

## Webinar 5

# Managing Risk and Resilience

For today's polls, visit
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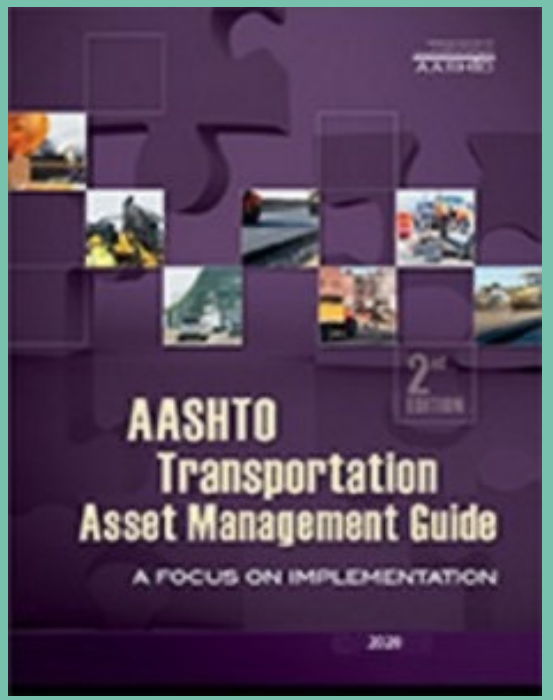



May 27, 2021
**Sponsored by FHWA**

# AASHTO TAM Guide Book Club
## Welcome

- Welcome to the fifth installment of the book club
- The TAM Guide Book Club will be meeting again in next week on **Wednesday 6/2**
  - Topic: Increasing your workforce capacity
- Visit the AASHTO TAM Portal to register and for the complete archive of past webinars


**https://www.tam-portal.com/event-directory/tam-webinars/**

# AASHTO TAM Guide Book Club
## Welcome

FHWA is pleased to sponsor this special TAM Guide Book Club Webinar series

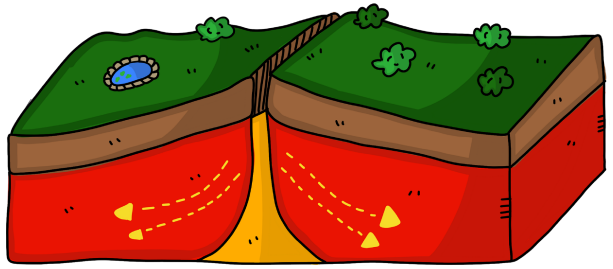
- Sharing knowledge is a critical component of advancing asset management practice
- The AASHTO TAM Guide is a valuable resource for agencies starting to develop their next TAMP
- This series is designed to focus on the areas where agencies will derive the greatest benefit:
  - Eight sessions addressing TAMP Implementation, Life Cycle Planning and Management, Financial Planning, and more

# AASHTO TAM Guide Book Club
## Agenda

| | |
|---|---|
| **2:00 PM** | **Introduction**<br>Matt Hardy, AASHTO and Steve Gaj, FHWA |
| **2:05 PM** | **Agenda & Topic Introduction**<br>Brad Allen, Applied Pavement Technology, Inc. |
| **2:15 PM** | **Use Case Scenarios**<br>Todd Lamphere, Washington State DOT<br>William Johnson, Colorado DOT |
| **2:30 PM** | **Guidance Quests – Breakout Sessions** |
| **3:10 PM** | **Breakout Session Feedback** |
| **3:20 PM** | **Open Discussion and Q&A** |

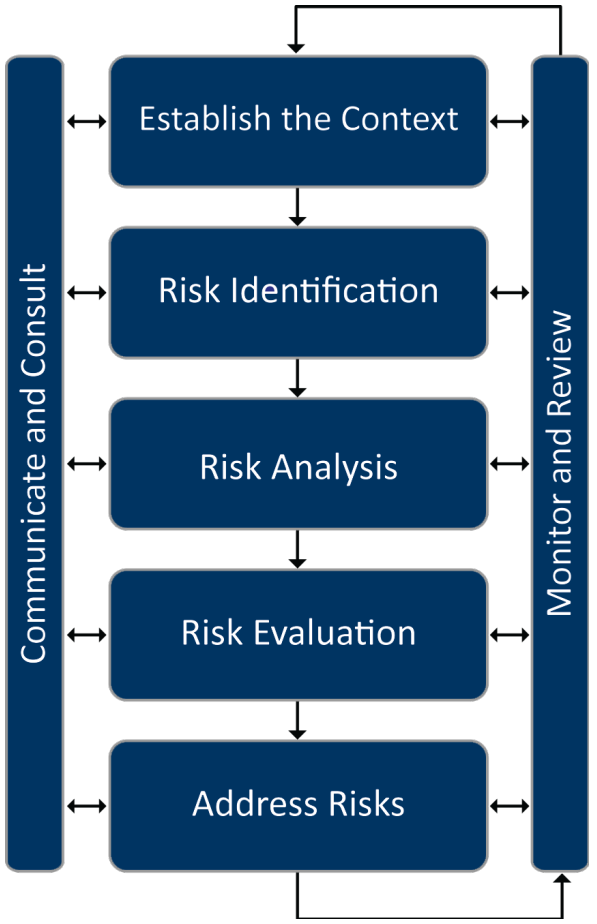
# Risk Management

- **Risk:** The positive or negative effects of uncertainty or variability upon agency objectives. (23 CFR 515.5)
- **Risk Management:** The processes and framework for managing potential risks, including identifying, analyzing, evaluating, and addressing the risks to assets and system performance. (23 CFR 515.5)




# Risk Management Process

- Context
  - What risks will be considered
  - How will risks be rated
- Identification
  - Be inclusive
  - Think Broadly
- Analysis
  - Cause(s), Consequence(s), Likelihood
- Evaluation
  - Prioritization
- Address Risks
  - Implement Mitigations




Source: Adapted from FHWA. 2017. *Incorporating Risk Management into Transportation Asset Management Plans: Final Document.* https://www.fhwa.dot.gov/asset/pubs/incorporating_rm.pdf

# Analysis and Evaluation

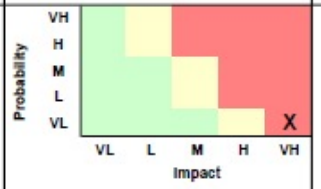
- Likelihood
- Consequence(s)
  - Types of Consequences
  - Threats & Opportunities

| Likelihood | | | | | | |
|---|---|---|---|---|---|---|
| 1 | **Very High** (>1x/Year) | Medium | Medium | High | Very High | Ultra High |
| 2 | **High** (~1x/Year) | Medium | Medium | Medium | High | Very High |
| 3 | **Medium** (1x/3 Years) | Low | Medium | Medium | High | High |
| 4 | **Low** (1x/10 Years) | Very Low | Low | Medium | Medium | High |
| 5 | **Very Low** (<1x/10 Years) | Very Low | Very Low | Low | Medium | Medium |
| | | **Very Low** (Insignificant) | **Low** (Minor) | **Medium** (Moderate) | **High** (Major) | **Very High** (Catastrophic) |
| | | 1 | 2 | 3 | 4 | 5 |

**Impact**

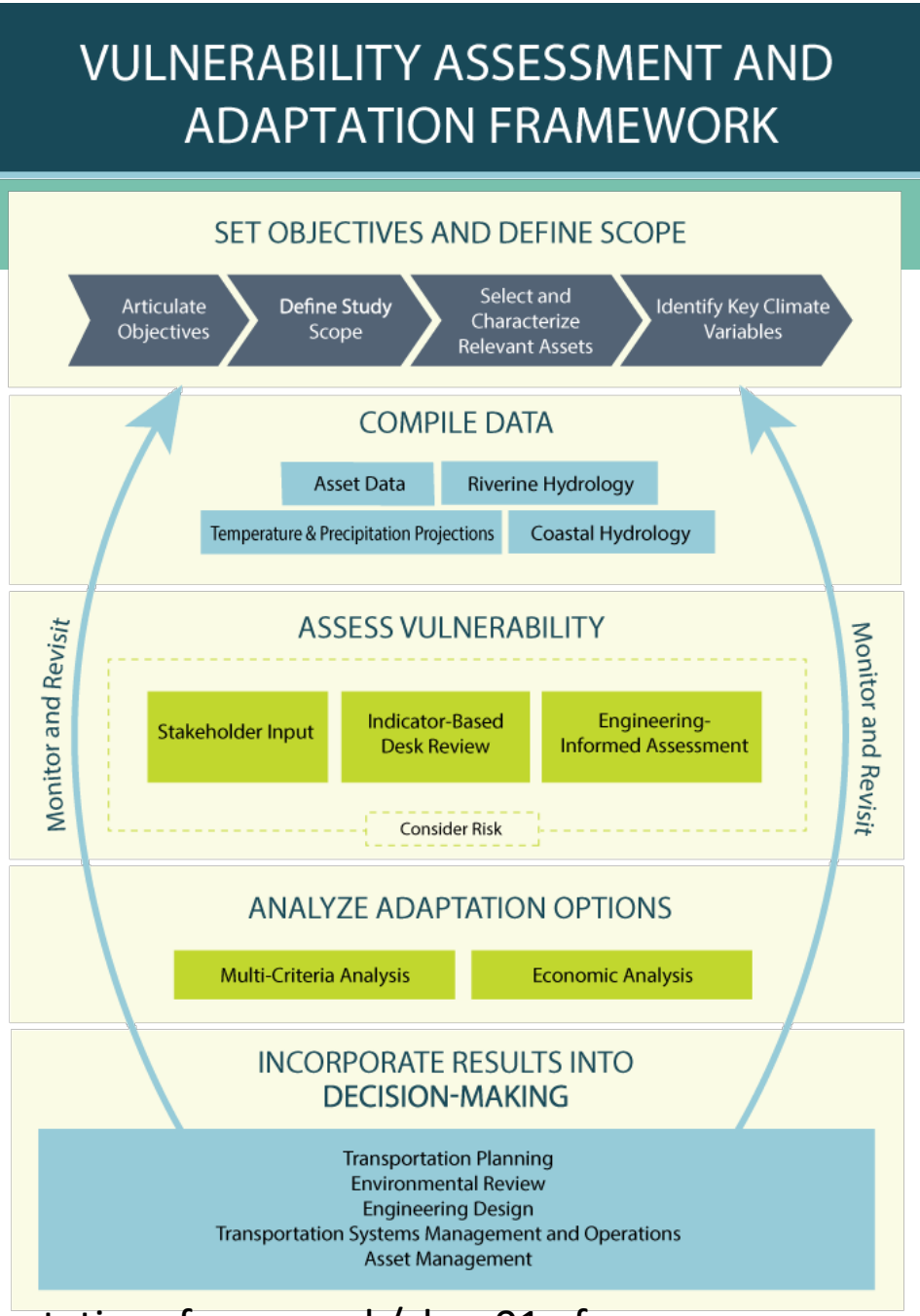
# Risk Register

## TAMP Risk Management Register for HDOT

| Risk Identification | | | | | | | Qualitative Risk Assessment | | | Risk Response Plan | | Monitoring and Control | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | Status | Risk Category | Risk Item | Cause | Effect | Threat or Opportunity | Probability | Impact | Risk Matrix | Response Strategy | Response Actions | Responsible Entity/Lead Office | Monitoring Frequency | Status Update |
| 1 | Active | Hazard | Severe Weather Events, Tropical Storms, Hurricanes, and Tsunamis | Flooding, landslides, bridge failures, and storm drainage capacity | Loss of access | Threat | Moderate | Very High |   | Mitigate | HDOT to review design storm to determine impacts (construction cost, etc.) and then make a decision to adopt change or not | HWY-D | TBD | Ongoing |
| 2 | Active | Hazard | Climate Change: Sea Level Rise | Shoreline erosion, inundation, and flooding | Loss of access | Threat | Moderate | High |   | Accept | HDOT to monitor ongoing data and studies. HDOT to continue to update asset inventory data and to consider SLR for new roadway alignments in long-range plans. HDOT should participate in larger policy discussions with other State/City/County agencies. | HWY-P, -D, -C, -L and other State and City/County agencies | As required, ongoing | Ongoing |
| 3 | Active | Hazard | Earthquakes | Bridge failures, landslides, rockfall, or roadway slope/fill failures | Loss of access | Threat | Very Low | Very High |   | Accept | HDOT to continue to update asset inventory data. HDOT to develop/update emergency response procedures and interagency MOUs. HDOT to continue to bridge seismic retrofit and rockfall programs. | HWY-P, -D, -C, -L | As required, ongoing | Ongoing |
| 4 | Active | Hazard | Lava Flows | Volcanic Activity; lava crossing roadways | Loss of access | Threat | Low | High |   | Accept | HDOT to continue interagency MOUs and emergency response procedures. Look for alternate routes in active lava zones. | HWY-P, -D, -C, -L | As required, ongoing | Ongoing |

# Resilience

- The capacity to recover quickly from difficulties
  - Toughness
  - Hardiness
  - Strength
  - Durability
  - Adaptability




https://languages.oup.com/google-dictionary-en

https://www.fhwa.dot.gov/environment/sustainability/resilience/adaptation_framework/chap01.cfm

# AASHTO TAM Guide Book Club
## Today's Speakers

- William Johnson
  - Colorado DOT
  - Performance and Asset Management Branch Manager

- Todd Lamphere
  - Washington State DOT
  - Statewide Transportation Asset Management Program Manager

# Colorado DOT Risk Analysis


## William Johnson

will.johnson@state.co.us

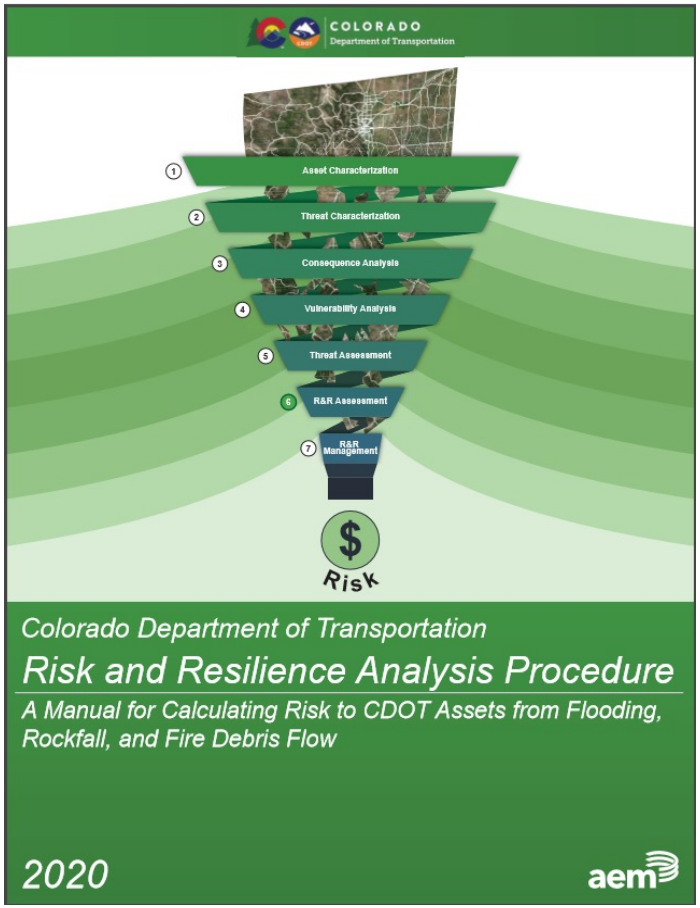

COLORADO
Department of Transportation

# RnR Procedure

- Published August 2020 -- https://www.codot.gov/programs/planning/cdot-resilience-program

- Refines and Standardizes the data, assumptions, and methodology for conducting risk assessment

- Step by step "Cookbook" on how to calculate risk
  - Flood
  - Rockfall
  - Fire / Debris flow



# Criticality

Criticality – A measure of the importance of an asset to the resilience of an overall system.

**EXHIBIT 2.2 CRITICALITY FACTOR QUANTILES**

| Criteria | 1 Very Low | 2 Low | 3 Moderate | 4 High | 5 Very High |
|---|---|---|---|---|---|
| AADT | ≤ 720 | 721 - 1,900 | 1,901 - 4,600 | 4,601 - 15,000 | ≥ 15,000 |
| AASHTO Functional Class | Minor Collectors | Major Collectors | Minor Arterial | Principal Arterial | Interstate Freeway Expressway |
| Freight ($ Millions) | ≤ 4,422 | 6,423 - 6,513 | 6,514 - 6,685 | 6,686, - 8,806 | ≥ 8,806 |
| Tourism ($ Millions) | ≤ 152 | 153 - 479 | 480 - 1,050 | 1,051 - 3,414 | ≥ 3,414 |
| SoVI® | ≤ (-2.93) | (-2.92) - (-1.24) | (-1.23) - 0.67 | 0.68 - 2.51 | ≥ 2.52 |
| Redundancy | ≥ 4.5 | 3.01 - 4.5 | 2.01 - 3 | 1.51 - 2.0 | ≤ 1.0 |

SoVI is a measure that helps emergency response planners and public health officials identify, map, and plan support for communities that will most likely need support before, during, and after a public health emergency.

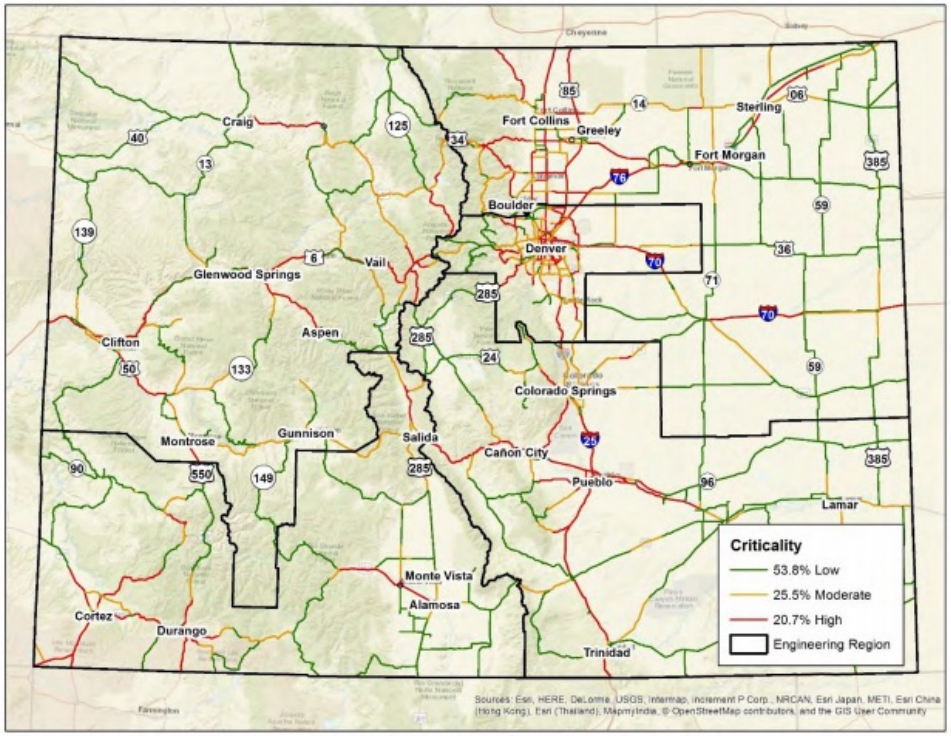
**EXHIBIT 2.3 CRITICALITY LEVEL ASSESSMENT**

| Criticality Level | Score Range |
|---|---|
| Low | 6 to 20 |
| Moderate | 21 to 22 |
| High | 23 to 30 |

# Criticality cont.

## CDOT Highway Criticality Map

**EXHIBIT 2.4**
**CRITICALITY MAP FOR CDOT SYSTEM OPERATIONS**




Sources: Spatial data for highways were downloaded for CDOT's Online Transportation Information System (OTIS).

Criticality Factors

1) AADT
2) AASHTO Functional Class
3) Freight Revenue
4) Tourist Revenue
5) SoVI Index
6) Redundancy

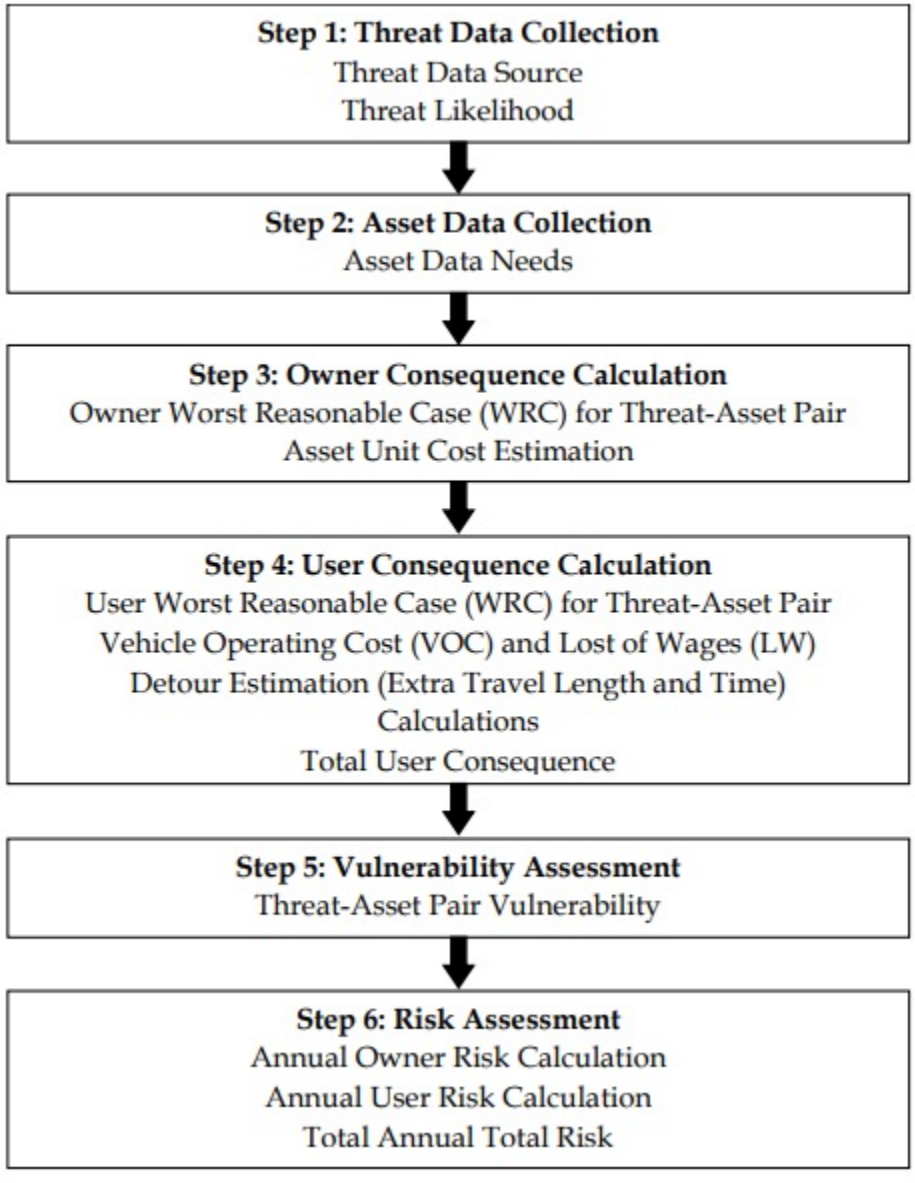
**Criticality Level Example Problem**

In this example, data has been collected for a fictional asset to demonstrate how to estimate an asset's Criticality. The example asset has the following characteristics:

- AADT – 2,050 vehicles per day
- AASHTO Functional Class – *Major Collector*
- Annual Freight Revenue Within County – $7,000,000
- Annual Tourism Dollars Generated Within County – $350,000,000
- SoVI® Score – 0.7
- Redundancy Score – 2.2

# RnR Procedure

EXHIBIT 3.1
RISK
CALCULATION
METHODOLOGY



# Step 1: Threat Data Collection
## Threat Data Source
## Threat Likelihood

EXHIBIT 3.2
THREAT DATA
SOURCES

| Threat | Layer | Source |
|---|---|---|
| Flood/Scour | Floodplain | FEMA |
| Rockfall | Runout Zone | Software*** |
| Post-fire Debris Flow* | Runout Zone | CGS, CWCB, Software*** |
| Post-fire Debris Flow** | Volume/Volume Probability | USGS (BAER) |
| Post-fire Debris Flow** | Burn Scar | USGS (BAER) |

*Colorado Water Conservation Board (CWCB) data only available for Boulder County as of June 2019. The Colorado Geological Survey (CGS) provides debris flow maps for El Paso, Jefferson and Larimer Counties. Flow-R or other software can be used to generate debris flow runout zones for other areas.

**USGS Burned Area Emergency Response (BAER) data is spatial data that includes projections of estimated debris flow likelihoods and debris flow volumes for a watershed that has recently burned.

***Examples of software modeling tools include Flow-R (https://www.flow-r.org/) and Rocky3D (http://www.ecorisq.org/images/ecorisq/services/Window_Rockyfor3D.jpg).

Annual rockfall probability has been established by the CDOT Geohazard Program for specific magnitudes of rockfall for the I-70 corridor within Glenwood Canyon as shown in Exhibit 3.7. Note that this information is specific to I-70 and the user is encouraged to engage with the CDOT Geohazard Program Staff to determine the annual threat likelihood and relevant magnitudes for corridors other than I-70 in Glenwood Canyon.

EXHIBIT 3.7
ROCKFALL EVENT
THREAT
LIKELIHOOD

| Rockfall Event Magnitude | Volume (cu yds) | Annual Threat Likelihood |
|---|---|---|
| Small | ≤ 100 | 1 |
| Medium | 100 – 499 | 1/6 |
| Large | ≥ 500 | 1/20 |

# Step 2: Asset Data Collection
## Asset Data Needs

**EXHIBIT 4.1.1.4**
**DATA NEEDS FOR ROCKFALL-PTCS RISK ANALYSIS**

| | Data Needs | Data Source |
|---|---|---|
| Asset Replacement Cost | **Milepost (beginning and end)** | Highway Data-OTIS http://dtdapps.coloradodot.info/otis |
| | **Site Length** | 500 ft (recommended length) |
| | **Roadway Geometry** | Highway Data-OTIS http://dtdapps.coloradodot.info/otis |
| Vulnerability | **Rockfall Mitigation** | CDOT Geotechnical |
| | **Slope Type and Lithology** | CDOT Geotechnical |
| | **Roadway (rockfall) Ditch** | CDOT Geotechnical |
| User Consequences | **AADT Vehicles** | Highway Data-OTIS http://dtdapps.coloradodot.info/otis |
| | **AADT Trucks** | Highway Data-OTIS http://dtdapps.coloradodot.info/otis |
| | **Speed on Roadway Damaged** | Highway Data-OTIS http://dtdapps.coloradodot.info/otis |
| | **Speed on Detour** | Highway Data-OTIS http://dtdapps.coloradodot.info/otis |
| | **Detour Distance** | CDOT Operations |
| | **Detour Time** | CDOT Operations |
| | **Number of Closure Days** | See Exhibit 4.1.1.9 |
| | **Number of Partial Closure Days** | See Exhibit 4.1.1.9 |
| | **Average Vehicle Occupancy** | FHWA https://www.fhwa.dot.gov/tpm/guidance/avo_factors.pdf |
| | **Car Running Costs** | (RITA)/Texas A&M Transportation Institute |
| | **Truck Running Costs** | American Transportation Research Institute |
| | **Average Value of Time** | (RITA)/Texas A&M Transportation Institute |

# Step 3: Owner Consequence Calculation

## Owner Worst Reasonable Case (WRC) for Threat-Asset Pair

## Asset Unit Cost Estimation

**EXHIBIT 3.10**
**SUMMARY OF WRC FOR OWNER CONSEQUENCE**

| Asset | Threat: Debris Flow | Threat: Flood | Threat: Scour | Threat: Rockfall |
|---|---|---|---|---|
| Bridge Approach | N/A | 100% ARC +$5,000 Cleanup | N/A | N/A |
| Bridge | N/A | 100% ARC +$5,000 Cleanup | 100% ARC +$5,000 Cleanup | 100% ARC + $200,000 if length < 100 ft, else $2.5 million |
| Culvert | 100% ARC + $5,000 Cleanup | 100% ARC +$5,000 Cleanup | N/A | N/A |
| PTCS | N/A | N/A | N/A | 25% ARC of 500 ft section + $200,000 Cleanup |
| Roadway | 100% ARC + $5,000 Cleanup | 100% ARC +$5,000 Cleanup | N/A | 100% ARC of 100 ft section + $200,000 Cleanup |

*ARC = Asset Replacement Cost*

**EXHIBIT 4.1.1.6**
**UNIT COSTS**

| Asset | Units | Unit Cost |
|---|---|---|
| Bridge Approach** | sq ft | $350 |
| Bridge* | sq ft | $600 |
| Culvert*** | cu ft | $55 |
| PTCS** | sq ft | $550 |
| Road Prism (Asphalt)** | sq yds | $150 |
| Road Prism (Concrete)** | sq yds | $350 |

* Bridge area is defined as deck length multiplied by deck width, derived from NBI Items 49 and 52, respectively.

**Bridge approach, roadway and PTCS width are derived from CDOT OTIS Highways feature class using fields for lane width, lane count, and shoulder width.

***For culvert (CBC), the volume, in cubic feet, is calculated by multiplying the box height by the box width by the length. These values are derived from the culverts feature class maintained by C-PLAN, CDOT's interactive online mapping platform.

$$Owner\ Consequence = 25\% \times ARC + \$200{,}000$$

# Step 4: User Consequence Calculation

## User Worst Reasonable Case (WRC) for Threat-Asset Pair

## Vehicle Operating Cost (VOC) and Lost of Wages (LW)

## Detour Estimation (Extra Travel Length and Time)

## Calculations

## Total User Consequence

**EXHIBIT 3.12**
I-70 Risk and Resilience Pilot
**NUMBER OF FULL CLOSURE AND PARTIAL CLOSURE DAYS FOR WRC**

| Asset | Threat | Full Closure Days ($d_{FC}$) | Partial Closure Days ($d_{PC}$) |
|---|---|---|---|
| Bridge Approach | All | 2 | 0 |
| Bridge | Flood | 180 | 0 |
| Bridge | Debris Flow | 2 | 0 |
| Bridge | Rockfall | 4 | 14 |
| Culvert | Debris Flow | 1 | 0 |
| Culvert | Flood | 3 | 0 |
| PTCS | Rockfall | 4 | 14 |
| Roadway (<=% Width) | Flood | 1 | 0 |
| Roadway (> 50% Width) | Flood | 3 | 0 |
| Roadway (2 Directions) | Flood | 3 | 0 |
| Roadway | Rockfall | 4 | 14 |

**EXHIBIT 3.11**
**CONSTANTS USED IN USER CONSEQUENCE CALCULATIONS**

| User Cost Terms | Variable | Value | Year Published |
|---|---|---|---|
| Average Vehicle Occupancy | *O* | 1.77 | 2019 |
| Car Running Cost per Mile | *C2* | $0.59 | 2019 |
| Truck Running Cost per Mile | *C3* | $0.96 | 2015 |
| Average Value of Time per Adult per Hour | *C4* | $10.62 | 2015 |
| Average Value of Freight Driver Cost per Hour | *C5* | $25.31 | 2015 |
| Car Running Cost per Hour | *C8* | $26.52 | 2015 |
| Truck Running Cost per Hour | *C9* | $44.24 | 2015 |

**EXHIBIT 3.13**
**I-70 RISK AND RESILIENCE PILOT DETOUR TABLE**

| Starting Milepost | Ending Milepost | Additional Travel Distance (miles) (*C7*) | Additional Travel Time (minutes) (*Dt*) |
|---|---|---|---|
| 1 | 14 | 146 | 189 |
| 14 | 90 | 90 | 112 |
| 90 | 155 | 140 | 167 |
| 155 | 205 | 98 | 126 |
| 205 | 231 | 83 | 109 |
| 231 | 245 | 49 | 77 |
| 245 | 288 | 3 | 7 |
| 288 | 353 | 15 | 24 |
| 353 | 360 | 71 | 96 |
| 360 | 404 | 76 | 73 |
| 404 | 438 | 69 | 70 |
| 438 | 450 | 63 | 77 |

**User Consequence**

Damage to the roadway may result in full or partial closures to through traffic and necessitate the use of a temporary work zone for construction and cleanup. Total User Consequences is the sum of user consequence due to full and partial closures as shown in Equation 3.2.

EQUATION 3.2

$$Total\ User\ Consequence = User\ Consequence_{FC} + User\ Consequence_{PC}$$

Where:

$User\ Consequence_{FC}$ = User consequences due to full closure
$User\ Consequence_{PC}$ = User consequences due to partial closure

User consequences for full closure are the sum of vehicle operating costs incurred due to travel on detour, lost wages, and truck revenue due to travel on detour as shown in Equation 3.3.

EQUATION 3.3

$$User\ Consequence_{FC} = VOC_{FC} + LW_{FC}$$

Where:

$VOC_{FC}$ = Vehicle operating costs incurred due to full closure
$LW_{FC}$ = Lost wages/truck revenue incurred due to full closure

User consequences for partial closures are the sum of vehicle operating costs incurred due to traffic delays, lost wages, and truck revenue due to delays incurred while driving through a partial closure as shown in Equation 3.4.

EQUATION 3.4

$$User\ Consequence_{PC} = VOC_{PC} + LW_{PC}$$

Where:

$VOC_{PC}$ = Vehicle operating costs incurred due to partial closure
$LW_{PC}$ = Lost wages/truck revenue incurred due to partial closure

# Step 5: Vulnerability Assessment
## Threat-Asset Pair Vulnerability

Vulnerability is the measure of an asset's susceptibility to damage from a natural hazard. It is quantified as the probability of the Worst Reasonable Case occurring if an event is realized. Vulnerability is the expected probability of loss within a range between nearly zero and nearly one. Vulnerability represents a number of factors that literature and empirical data imply may influence an asset's susceptibility to incur damage from threats included in this procedure. While there may be other factors that influence vulnerability, the factors included in this procedure are available to CDOT staff in a range of databases and field observations and have been vetted by **Subject Matter Experts** who participated in this study.

EXHIBIT 4.1.1.10
ROCKFALL
VULNERABILITY
TABLE

| Magnitude | Factors | | | | Vulnerability | | |
|---|---|---|---|---|---|---|---|
| Return Period (years) | Natural or Cut Slope | Lithology | Ditch | Monitored | No Mitigation | Slope Maintained | Installed Mitigation |
| 1-year (≤ 100 cu yds) | Cut Slope | Rock Slope | Absent | Yes | 0.00 | 0.00 | 0.00 |
| | | | | No | 0.01 | 0.01 | 0.00 |
| | | | Present | Yes | 0.00 | 0.00 | 0.00 |
| | | | | No | 0.01 | 0.01 | 0.00 |
| | | Non-Rock Slope | Absent | Yes | 0.00 | 0.00 | 0.00 |
| | | | | No | 0.01 | 0.00 | 0.00 |
| | | | Present | Yes | 0.00 | 0.00 | 0.00 |
| | | | | No | 0.01 | 0.00 | 0.00 |
| | Natural | Rock Slope | Absent | Yes | 0.01 | 0.00 | 0.00 |
| | | | | No | 0.01 | 0.01 | 0.00 |
| | | | Present | Yes | 0.00 | 0.00 | 0.00 |
| | | | | No | 0.01 | 0.01 | 0.00 |
| | | Non-Rock Slope | Absent | Yes | 0.00 | 0.00 | 0.00 |
| | | | | No | 0.01 | 0.01 | 0.00 |
| | | | Present | Yes | 0.00 | 0.00 | 0.00 |
| | | | | No | 0.01 | 0.01 | 0.00 |
| 6-year (101 - 499 cu yds) | Cut Slope | Rock Slope | Absent or Width ≤ 10 ft | Yes | 0.35 | 0.30 | 0.15 |
| | | | | No | 0.65 | 0.50 | 0.25 |
| | | | Width > 10 ft | Yes | 0.30 | 0.25 | 0.15 |
| | | | | No | 0.60 | 0.45 | 0.25 |
| | | Non-Rock Slope | Absent or Width ≤ 10 ft | Yes | 0.30 | 0.25 | 0.15 |
| | | | | No | 0.55 | 0.45 | 0.25 |
| | | | Width > 10 ft | Yes | 0.25 | 0.20 | 0.10 |
| | | | | No | 0.50 | 0.40 | 0.20 |
| | Natural | Rock Slope | | Yes | 0.40 | 0.30 | 0.15 |
| | | | | No | 0.80 | 0.50 | 0.25 |
| | | Non-Rock Slope | | Yes | 0.35 | 0.30 | 0.15 |
| | | | | No | 0.30 | 0.25 | 0.15 |
| 20-year (≥ 500 cu yds) | NA | | | | 0.99 | | |

# Step 6: Risk Assessment

## Annual Owner Risk Calculation

## Annual User Risk Calculation

## Total Annual Total Risk

EQUATION 3.9

$$\sum_{i=1}^{n} Annual\ Owner\ Risk_i = Owner\ Consequence\ x\ Vunerability_i\ x\ Threat\ Likelihood_i$$

**Where n = number of events**

EQUATION 3.11

$$\sum_{i=1}^{n} Annual\ User\ Risk_i = Consequence\ x\ Vunerability_i\ x\ Threat\ Likelihood_i$$

**Where n = number of events**

EQUATION 3.10 (Scour-Bridge)

$$Annual\ Owner\ Risk = Owner\ Consequence\ x\ PF\ x\ K$$

**Where $K = K_1 * K_2$**
**$K_1$ is a bridge type factor based on NBI data, and $K_2$ is a foundation type factor based on information.**

In the case of scour-bridge analysis, the probability of failure (PF) is a combined threat and vulnerability probability.

EQUATION 3.12 (Scour-Bridge)

$$Annual\ User\ Risk = Owner\ Consequence\ x\ PF$$

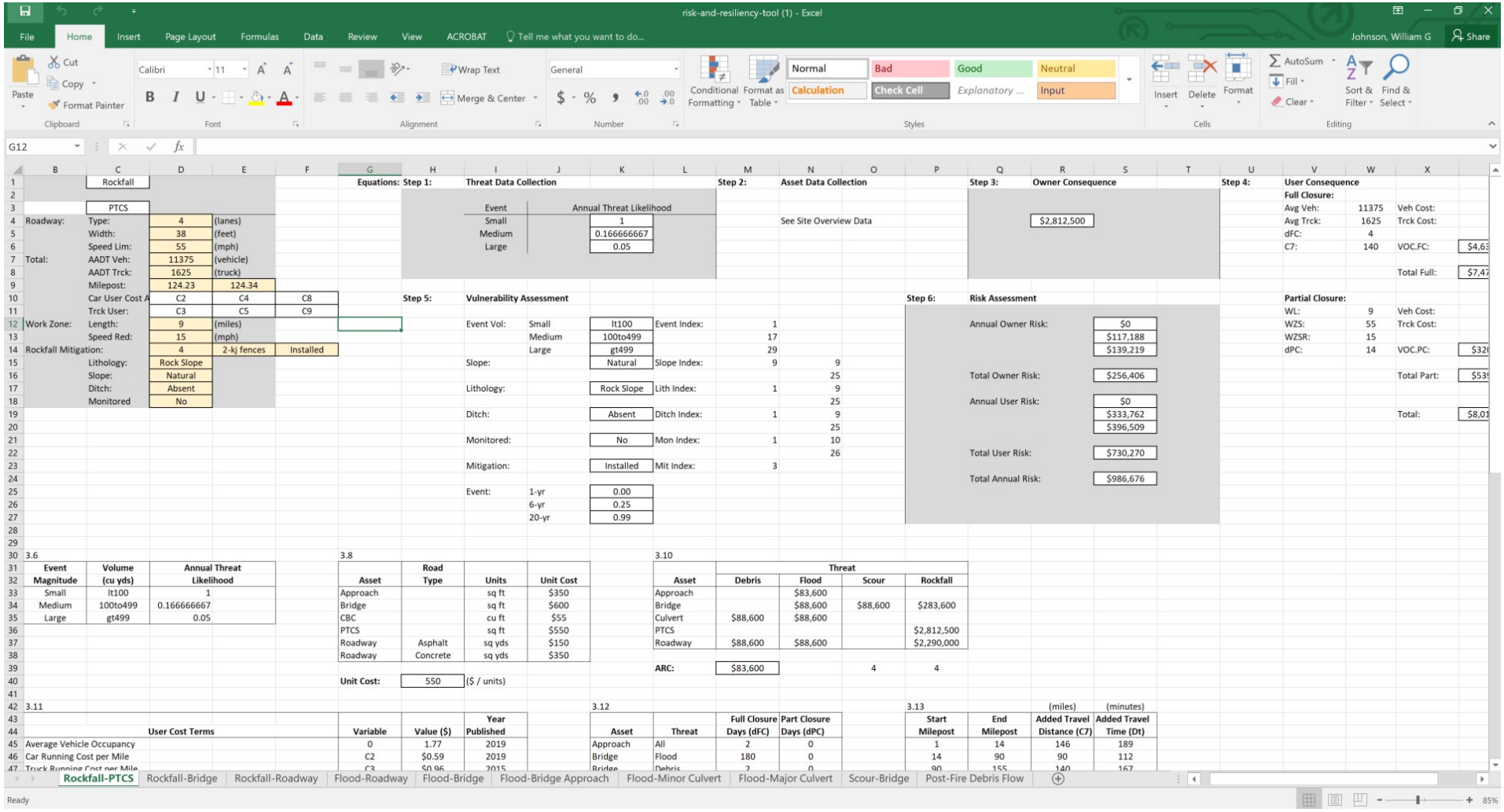
**Total Annual Risk Calculation**

EQUATION 3.13

$$Total\ Annual\ Risk = \sum_{i=1}^{n} Annual\ Owner\ Risk_i + \sum_{i=1}^{n} Annual\ User\ Risk_i$$

**Where n= number of events**

# Resilience Analysis Tool



# For More Information:


## Elizabeth Kemp – RnR Program Manager
elizabeth.kemp@state.co.us


https://www.codot.gov/programs/planning/cdot-rnr-analysis-procedure-8-4-2020-v6.pdf
https://www.codot.gov/programs/planning/risk-and-resiliency-tool.xlsx

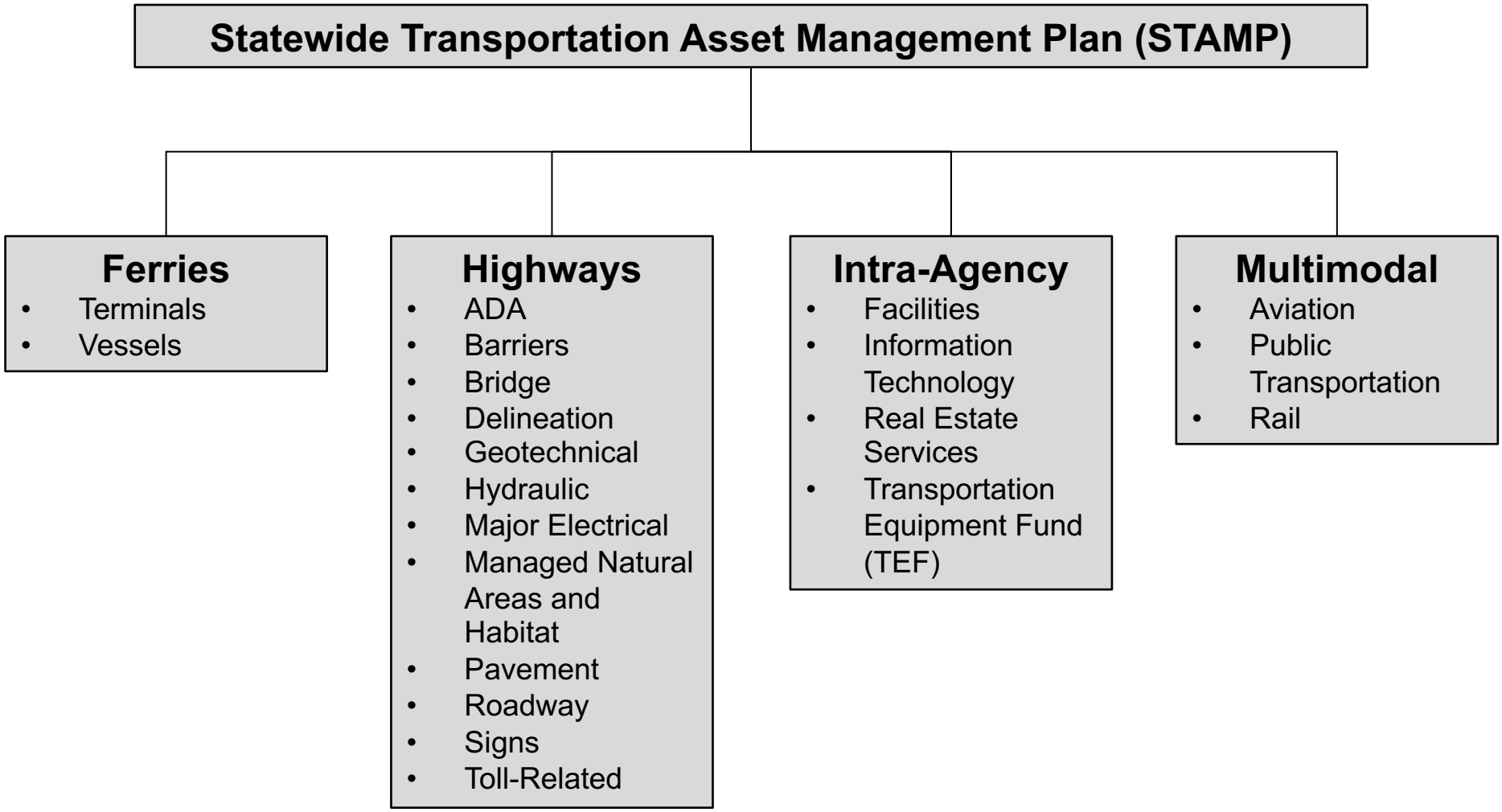
# WSDOT Asset Management and Resiliency

Todd Lamphere, Statewide Transportation Asset Manager

May 27, 2021

***WSDOT Asset Management:*** *Applying the right treatment, at the right time, at the right location…**Practical Solutions***

# Statewide Transportation Asset Management



# Statewide Transportation Asset Management
# State of Transportation

| Preservation (Millions of dollars) | Replacement Value | Average Annual Need | Current plan annual average spending | Average annual funding shortfall |
|---|---|---|---|---|
| Highways | $123,425 | $730 | $350 | $380 |
| Multimodal (i.e. Aviation, Public Transportation, Rail) | $710 | $105 | $15 | $90 |
| Intra-Agency (i.e. IT, Facilities, Fleet, Real Estate) | $67,085 | $135 | $40 | $95 |
| Ferries | $5,145 | $460 | $160 | $300 |
| **TOTAL** | **$196,365** | **$1,430** | **$565** | **$865** |

***Note: Rounded to the nearest $5M***

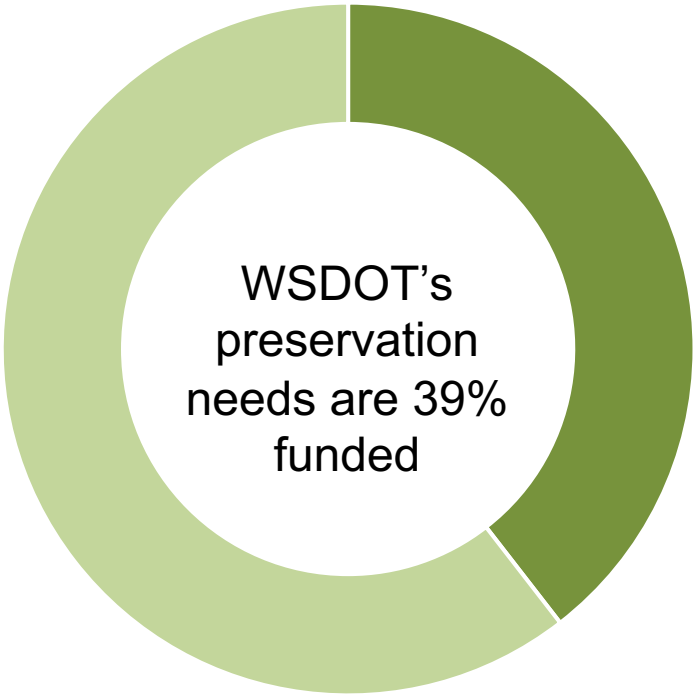
**61% unfunded**

# Statewide Transportation Asset Management
# State of Transportation

| (Millions of dollars) | Replacement Value | 10-year Future Annual Avg. Spending | 10-year Annual Additional Needs | 10-year Budget, Plus Needs Annual Avg. | Percent funded |
|---|---|---|---|---|---|
| TOTAL | $196,365 | $565 | $865 | $1,430 | 39% |

- **Key takeaways:**
- WSDOT's preservation program is funded at 39 percent of its need
- How to deal with additional revenue
- What preservation activities will likely get funded

- This is why Asset Management Plans are key!



# Statewide Transportation Asset Management

**Statewide Asset Management Structure and Results**

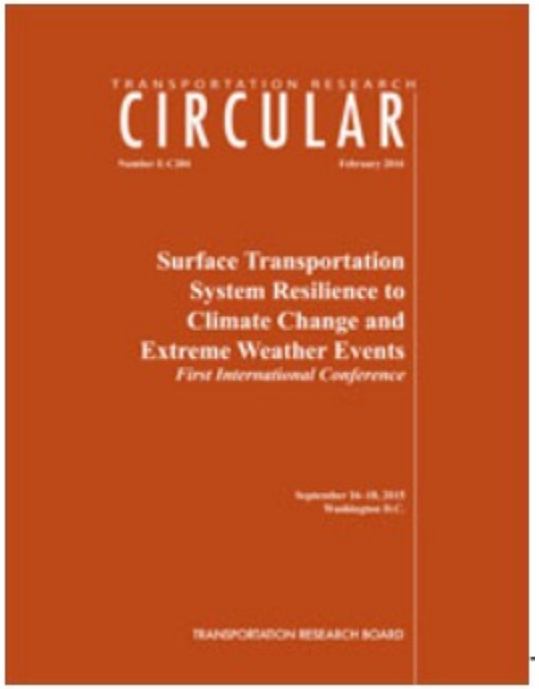
- Executive Steering Committee Structure
- Monthly Asset Management Technical Advisory Groups meetings
- State of Transportation replacement value for WSDOT's Transportation System in 2018 , 2019, 2020 & 2021
- State of Transportation unfunded needs
- Formal Risk Workshops for several asset classes
  - Self assessments for the remaining asset classes
- Asset Management plan updates should include their current practices that involve the respective Asset Class' resiliency efforts

# Statewide Transportation Asset Management

## WSDOT'S DEFINITION OF RESILIENCE

The term "resilience" means the ability to prepare for, and adapt to, changing conditions and withstand and recover rapidly from disruptions.

Adopted from:
*Presidential Policy Directive 21, Critical Infrastructure Security and Resilience, February 12, 2013.*



# Statewide Transportation Asset Management

## Federal Regulations related to Resilience and Asset Management

- Risk-based **asset management** plans must address risks associated with current and future environmental conditions (23 CFR 515)
- Assets requiring repeated repair require **analysis of alternatives** (23 CFR 667)
- State and metro **transportation planning** should now include resilience as a planning factor (23 USC 134, 23 CFR 450)
- **Metropolitan transportation plans** shall include an assessment of capital investment and other strategies to…reduce the vulnerability of the existing transportation infrastructure to natural disasters (23 CFR 450.324 (f)(7))

# Statewide Transportation Asset Management

**Resilience and Asset Management key thoughts…**

- How do each of the programs prepare their respective Asset Management Plans with Resiliency in mind?
  - Include information that informs our partners during the planning phase. For example, modal long-range plans and Washington's Transportation Plan
  - Perform appropriate community engagement during these planning phases
- In our Asset Management Plans, how do we better communicate the need for WSDOT to prepare for, and adapt to, changing conditions and withstand and recover rapidly from disruptions?

# Asset Management Plan Updates

**Asset Management Plan Technical Update Potential Focus Areas**

- Updating information that may have changed
  - Have your objectives and/or measures changed?
  - Has your inventory changed?
  - Do you need to change any of your investment strategies?
- Adding a Resilience section to the Risk Chapter of the Asset Management Plans
  - Direction has been provided in the CPDM Asset Management Plan Updated Guidance
  - This will be an initial step to include resilience in the Asset Management Plans
  - This section will be further refined and improved in future updates
  - Resilience may be featured in future federal legislation
- Developing and/or Improving Processes for conducting Trade-Off Analysis

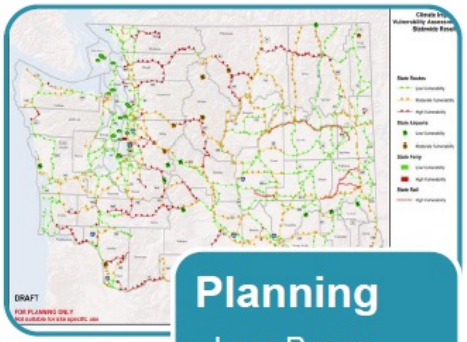
…WSDOT's goal is to start small and continuously improve.

# Statewide Transportation Asset Management

## Integrating Resilience

Goal: Integrate consideration of resilience in transportation decision making

- In support of 23 U.S.C. § 503(b)(3)(B)(viii), which directs the U.S. Department of Transportation "to carry out research and development activities … to study vulnerabilities of the transportation system to … extreme events and methods to reduce those vulnerabilities."

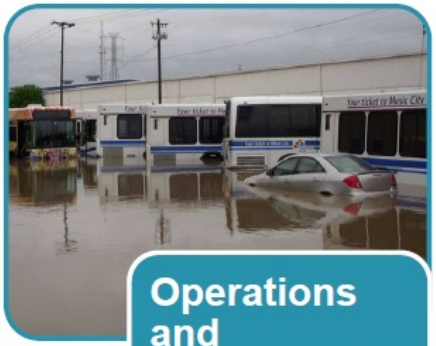


**Planning**

- Long Range Transportation Plans
- Asset Management Plans

**Project Level**

- Environmental Processes
- Engineering
- Design



**Operations and Maintenance**

- Emergency Relief
- Snow Removal Programs

4

From a FHWA Presentation

# Questions?

# AASHTO TAM Guide Book Club
## Quest

- **Quest** - Develop a risk register of 3 to 5 enterprise or program level asset management risks.

- **Instructions** - Use examples of risks from the TAM Guide or from your experience. Use resources from the guide to identify, analyze, and prioritize each risk. As time allows, identify potential mitigation strategies for each risk. Use the form to record your risk register and identify the sections or components of the TAM Guide that you used to develop your register. An example risk has been included to get you started.

# AASHTO TAM Guide Book Club
## Quest


To **select a breakout room** to join,
1.Click the ***Breakout Rooms*** menu
2.Click the ***Join*** link next to a room.

Your breakout room will be assigned one of the three quests.

# Quest Breakout Session
## Feedback

- How did the guide help you develop your example risk register?
- What are your thoughts on how we can improve the value of the Guide based on the quest?
  - Updated resources?
  - Sharing new practices?
  - Linking to new guidance?
  - More resources to support the 2022 TAMP development?

# Open Discussion

# Q & A

# Full Schedule and Registration Information

https://www.tam-portal.com/event-directory/tam-webinars/

**6. Increasing Your Workforce Capacity**
Wednesday 6/2/21 - 2:00 – 3:30 PM eastern time

**7. Investment Strategies and Multi-Objective Decision Analysis**
Wednesday 6/9/21 - 2:00 – 3:30 PM eastern time

**8. Strengthening How Data Supports Your TAM Program**
Wednesday 6/16/21 - 2:00 – 3:30 PM eastern time

**To register:**
**https://www.tam-portal.com/event-directory/tam-webinars/**

**To access the Guide:**
**TAMGuide.com**

**Questions?**
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