usRAP Tribal Roadway Safety Experience: Northern Cheyenne and Crow Tribes

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How It All started

- Background
- Initial goal: Leveraging the usRAP
- Early collaboration

usRAP: UGPTI Perspective

- Understanding the Project Scope
- Workflow development
- Technology and Tools
- Collaboration & Iteration
- Outcome-Oriented Focus

Tribe Expectation from usRAP

Risk Mapping

Identification of high-risk zones

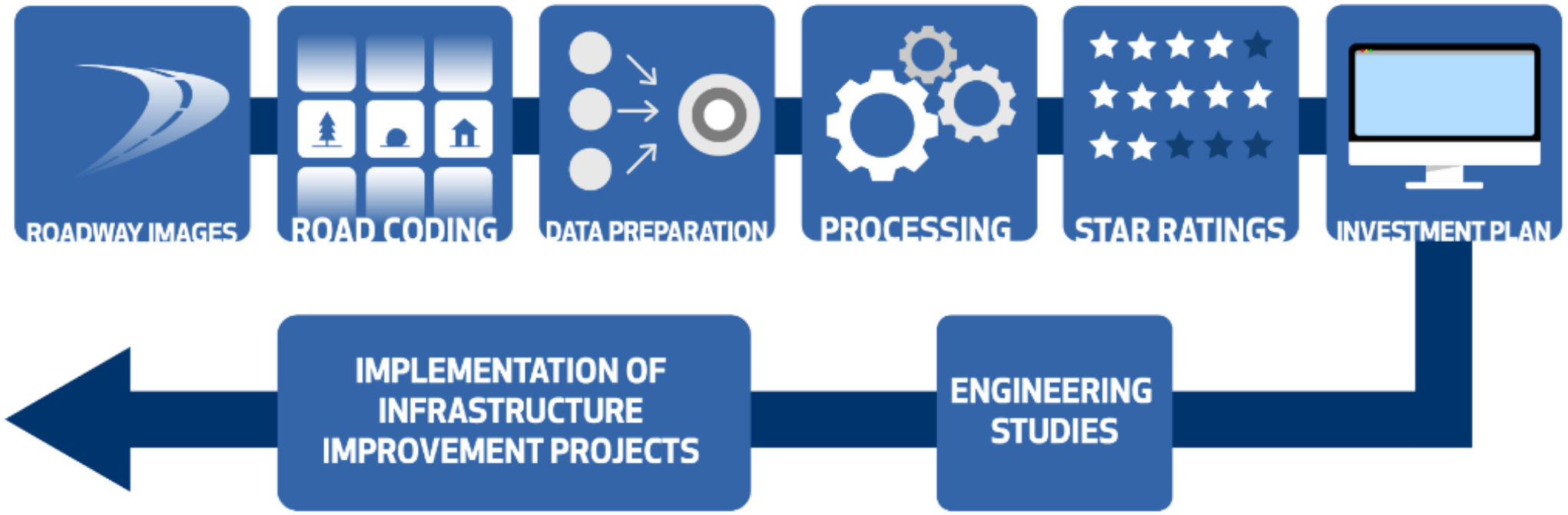
- Roadway Departure (RwD) Crashes
- Limited infrastructure, poor road conditions, and lack of clear signage

Road Inventory Tool

Low cost alternative

- Defined matrices related to roadway safety.
- Performance tracking over time with limited training.

usRAP in Action: Risk-based Safety Planning Steps



Source: usRAP Analysis Process Training Manual

Turning Data into Safer Roads

Data collection:
Equipment and Procedure

Image Processing

Coding of Roads

Network Calibration with crash information

Data Collection Equipment

Source: Image created by AI chatbot;
Disclaimer: FHWA/NDSU/UGPTI does not endorse any product as part of this presentation

Data Collection: GoPro 360 Installation

- 360 Camera has two lenses and captures spherical photos/videos.
- Mounts on top of the vehicle.
- View the photos/videos in a directions as if standing at the camera location.

Source: Sara Yockey permitted use of her photos, per FHWA Office of Tribal Transportation

Data Collection Equipment: Other

Powerextra 3 Pack Rapid 3-Channel USB Charger Compatible with GoPro MAX 360 Battery and ACDBD-001 ACBAT-001 — $31.49
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Subtotal (6 items): $508.46

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Data Collection: Network Identification

Source: Northern Cheyenne Tribe

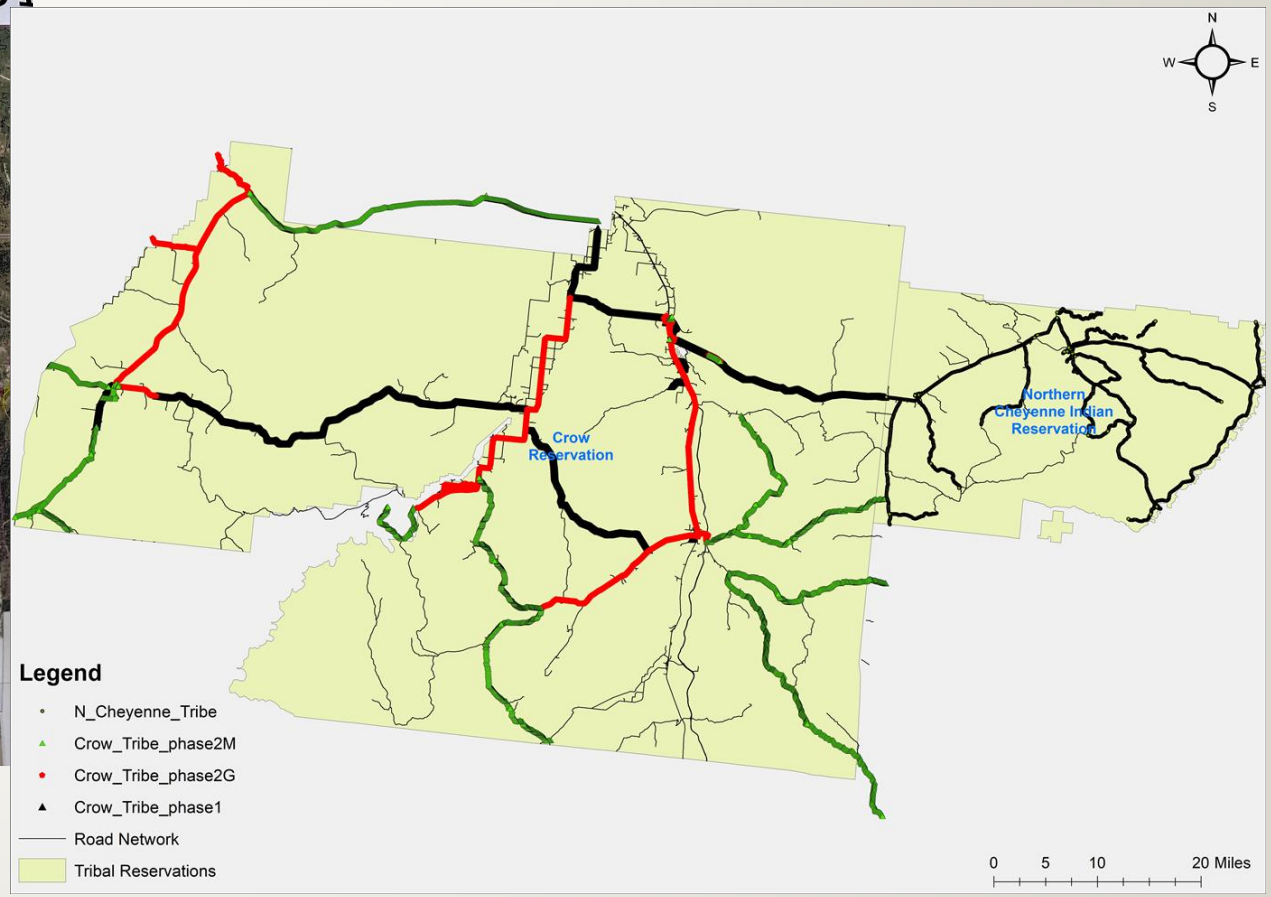
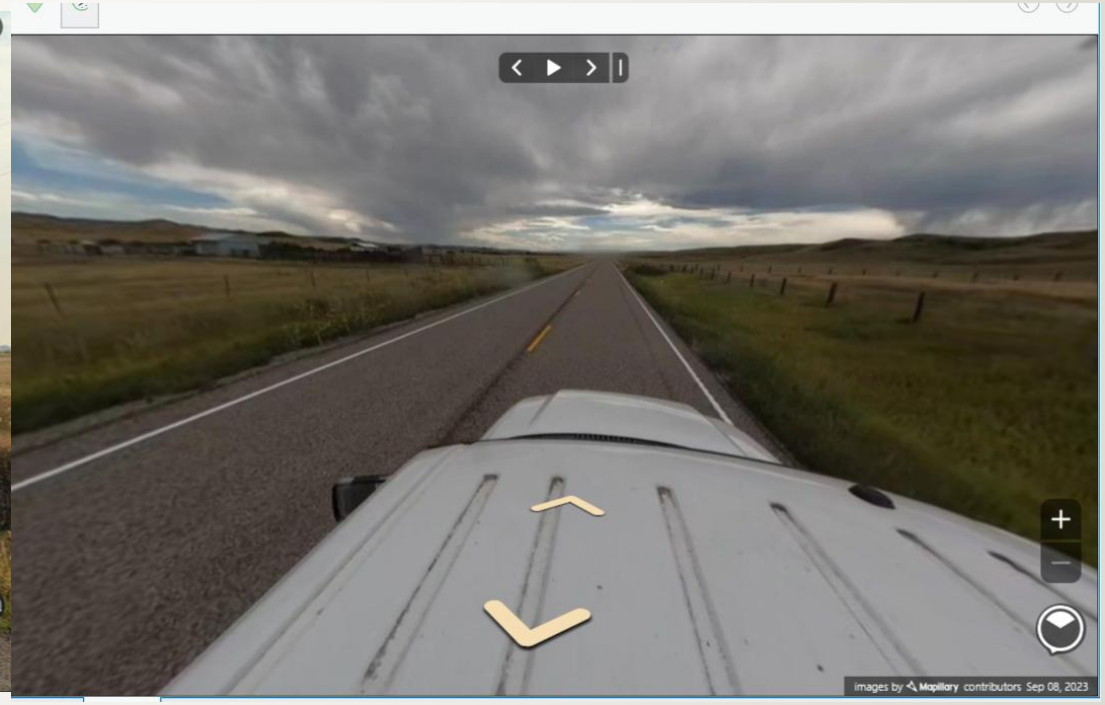


Image Processing

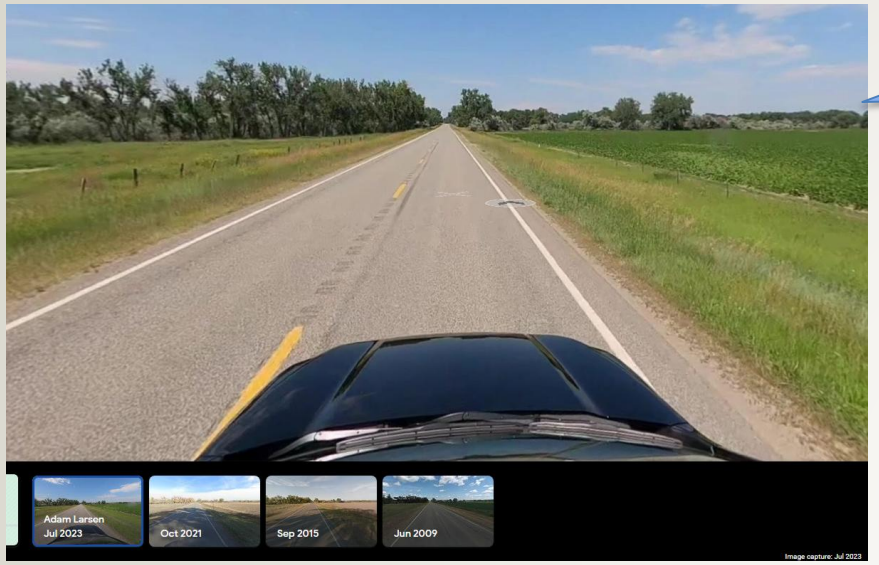
From Google



From Mapillary

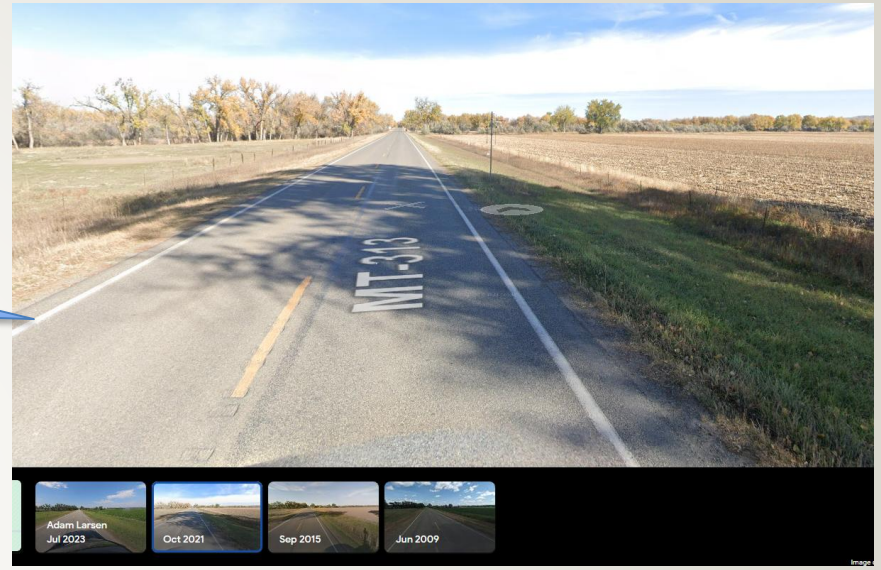
Image source: Google Street View and Mapillary

Recent Images for Inventory



July 2023

October 2021



September 2015

June 2009

Image source: Google Streetview

Image Processing in GRIT

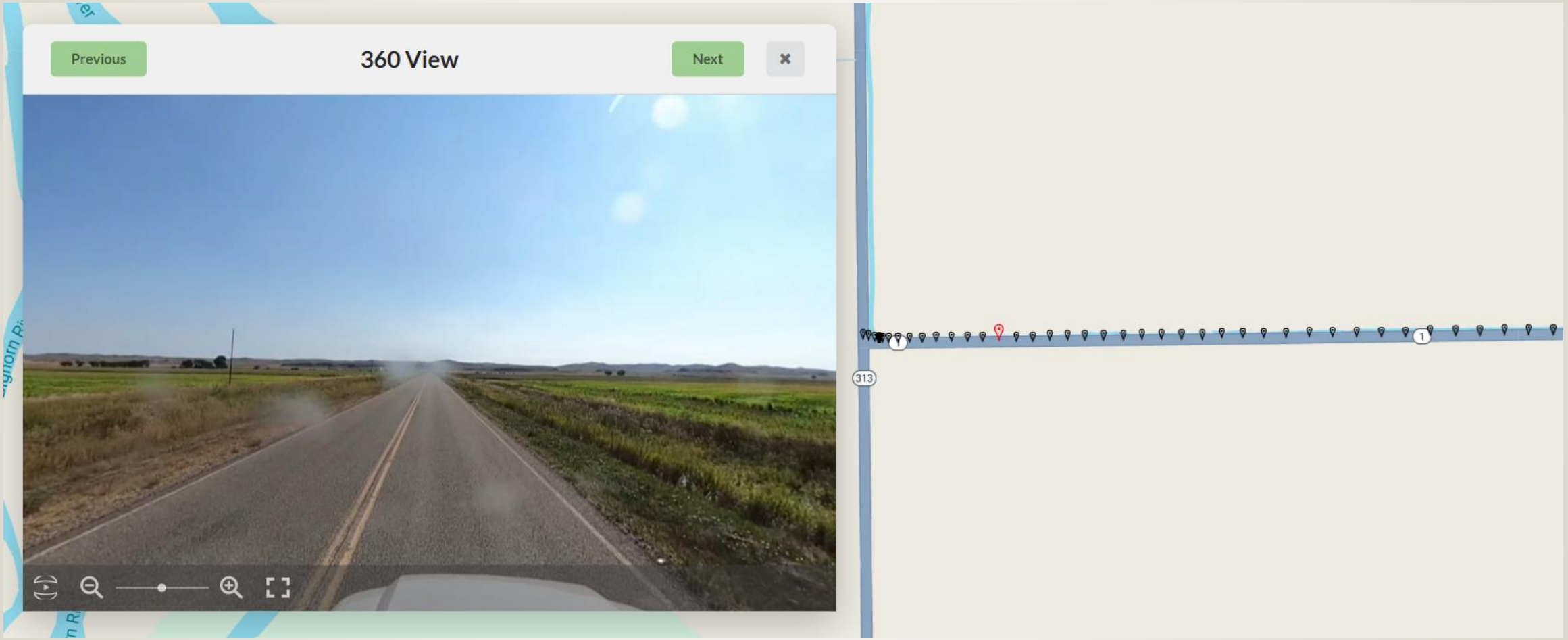


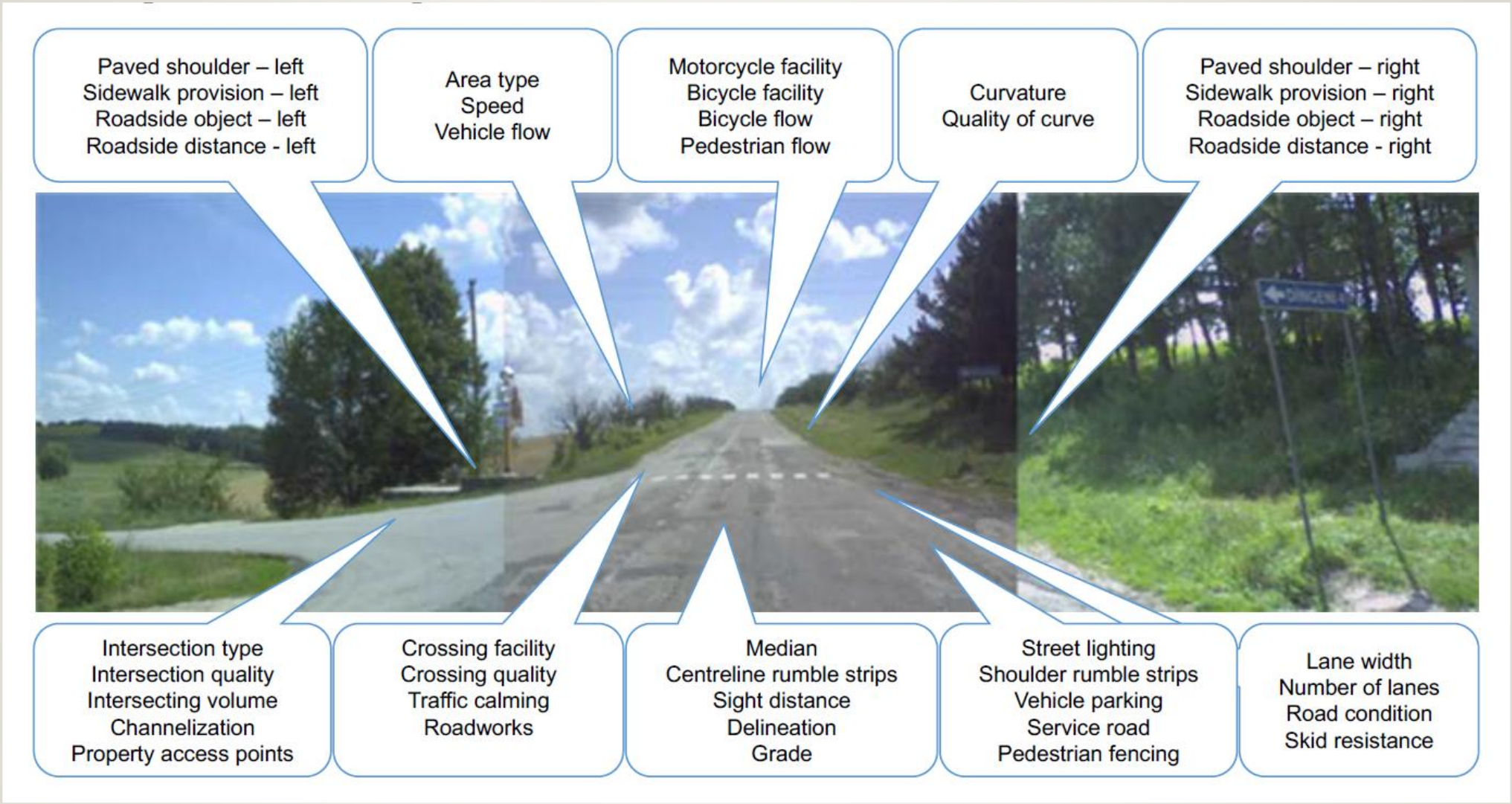
Image source: GRIT UGPTI

Demonstration: Sample of Road Segment

Coding/Logging Attributes

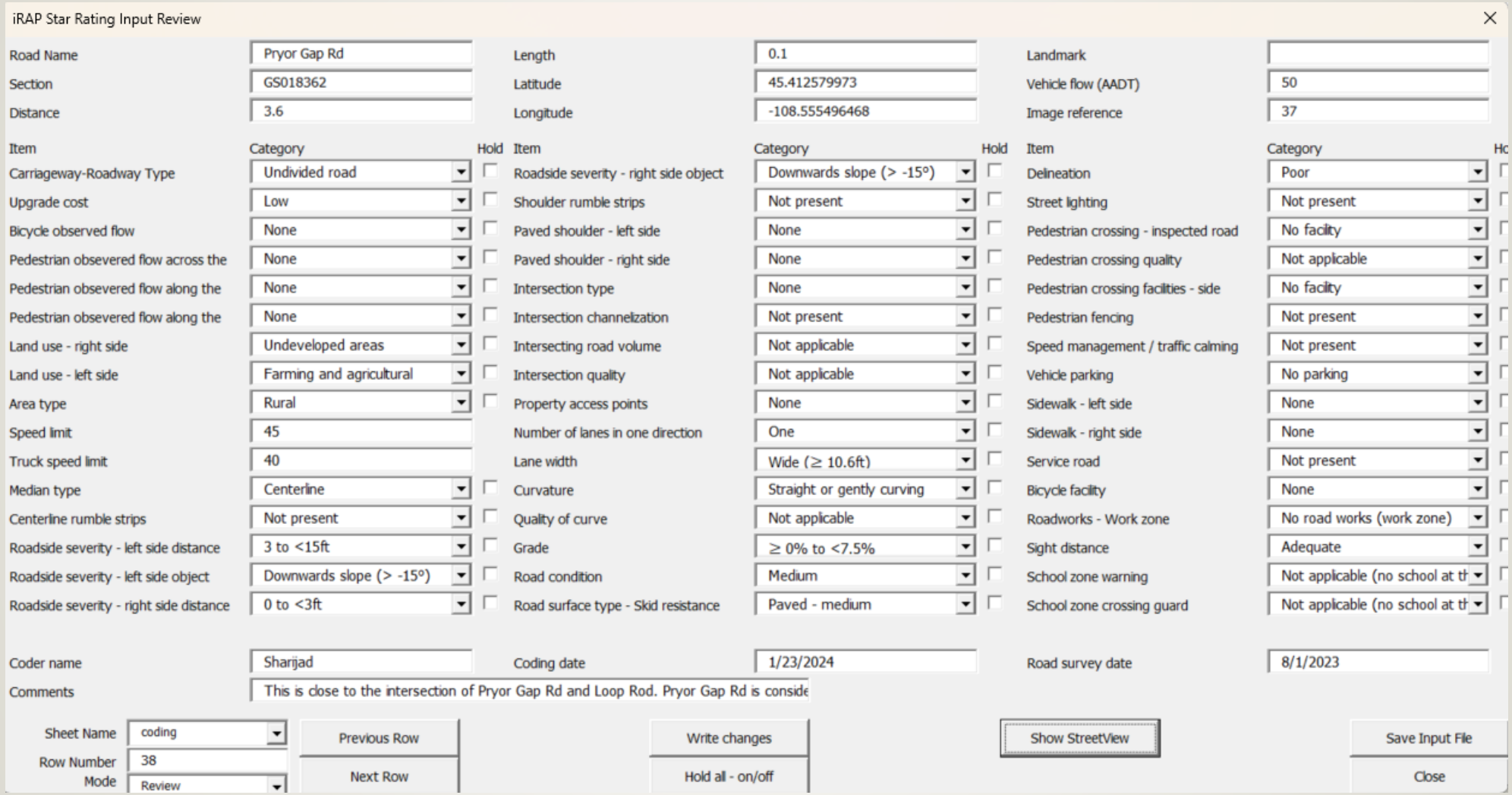
- Pre-coding (14 attributes): Road Identification
- Coding (47 attributes):
  - Roadside Object/ Obstacles
  - Curvature and Grade
  - Intersection and Road Crossing
  - On-road and Roadside Safety Measures
  - Pavement and Shoulder Condition
  - Multimodal Facility and Demographic Data
- Post-coding (19 attributes): Vehicular Flow

usRAP Matrices

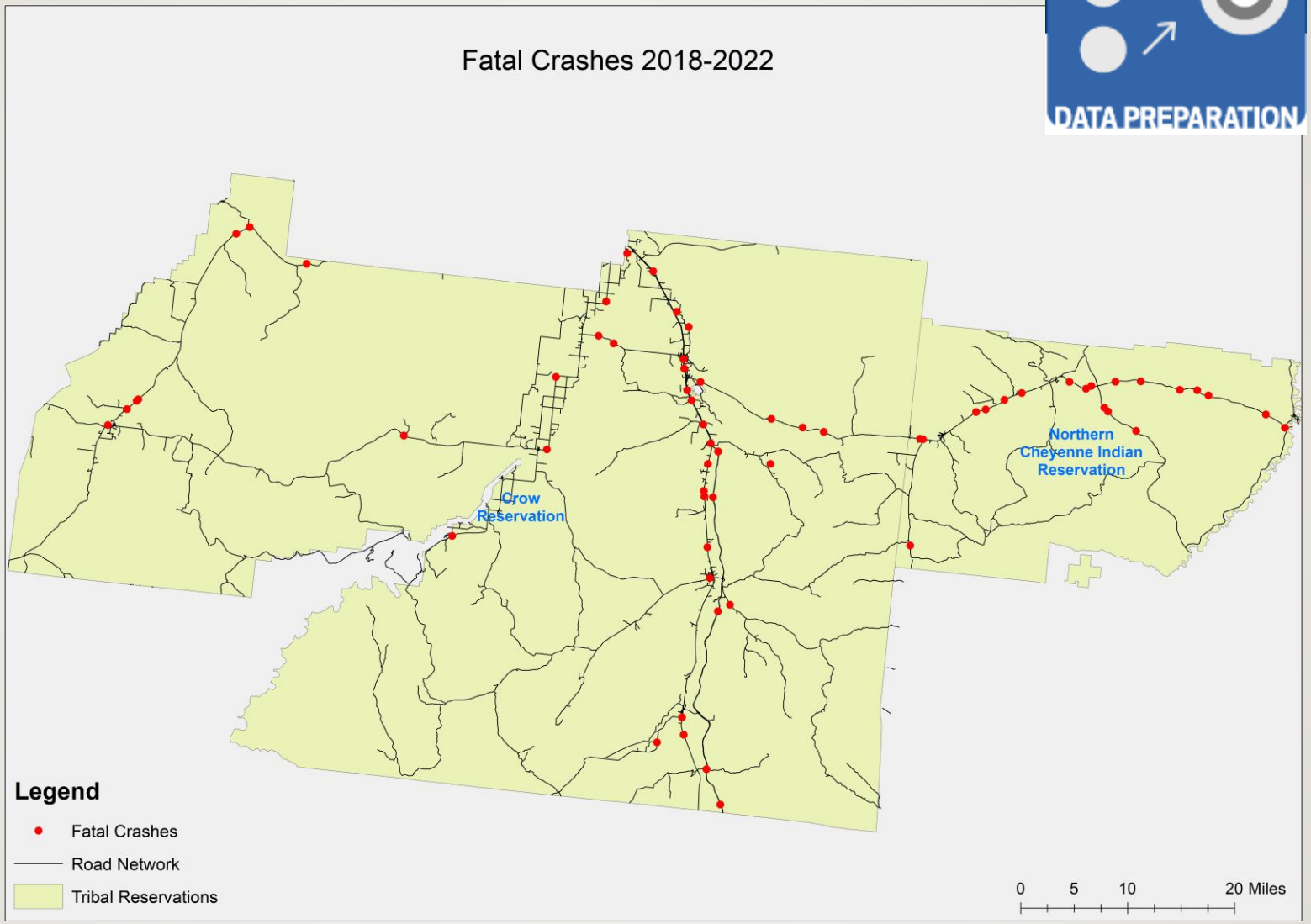


Source: usRAP Analysis Process Training Manual

Coding/Logging Attributes



Network Calibration



DATA PREPARATION

The Road Ahead: What usRAP Shows Us

- usRAP/ ViDA
- Star Rating
- Risk Map
- FSI (Fatality and Serious Injury) Estimation

ViDA Features

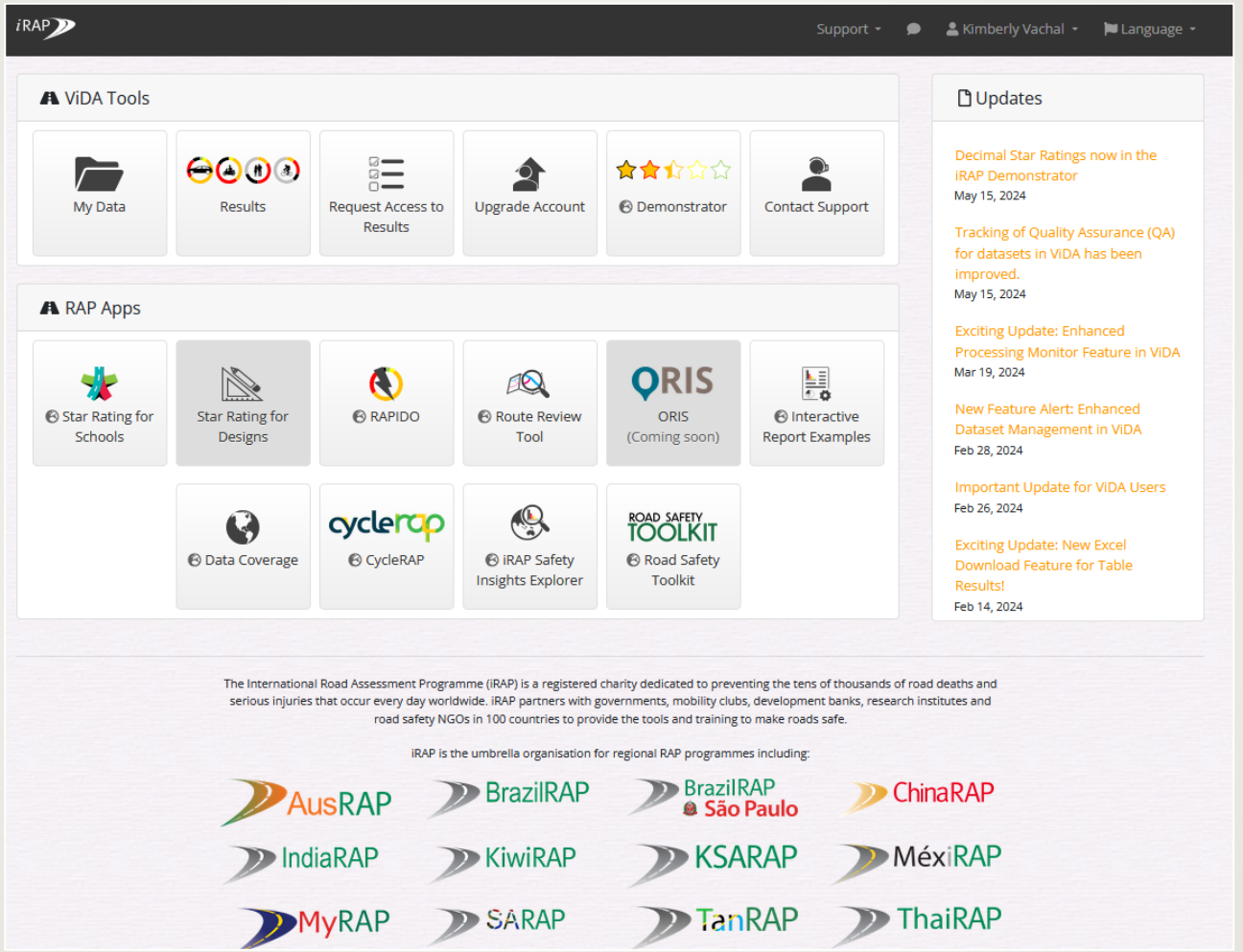
- Safer Roads Investment Plan – detailed recommendations on countermeasures and their estimated cost and benefits.

Tribal Community Road Safety Plan

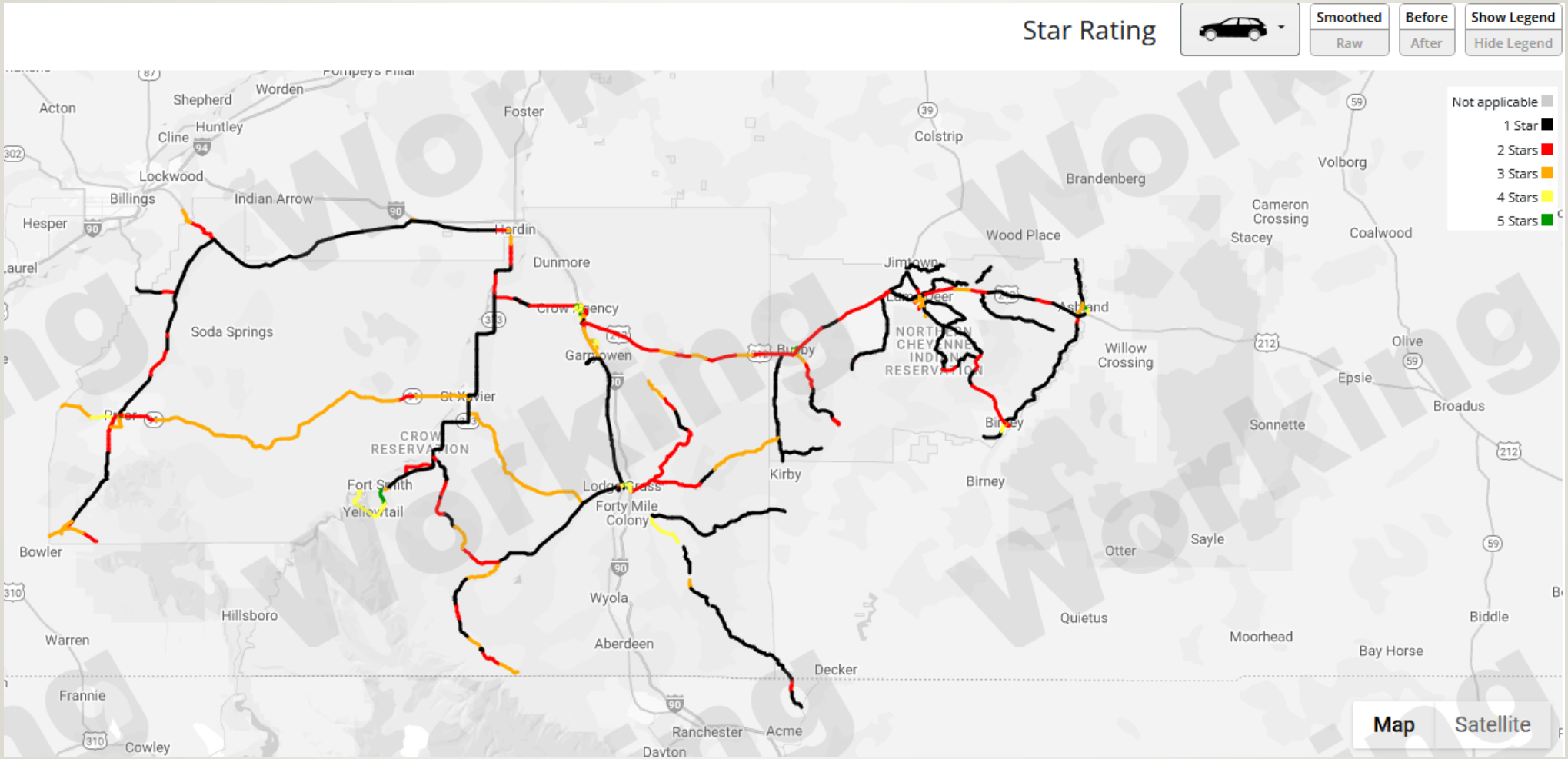
- Strip Plans – Detail of countermeasure application on roadway section.
- Performance Tracking – Tools to review and download the coded attribute data, risk results, and recommended countermeasures.

Source: iRAP

ViDA Road Safety Assessment Dashboard



*us*RAP Montana Star Rating



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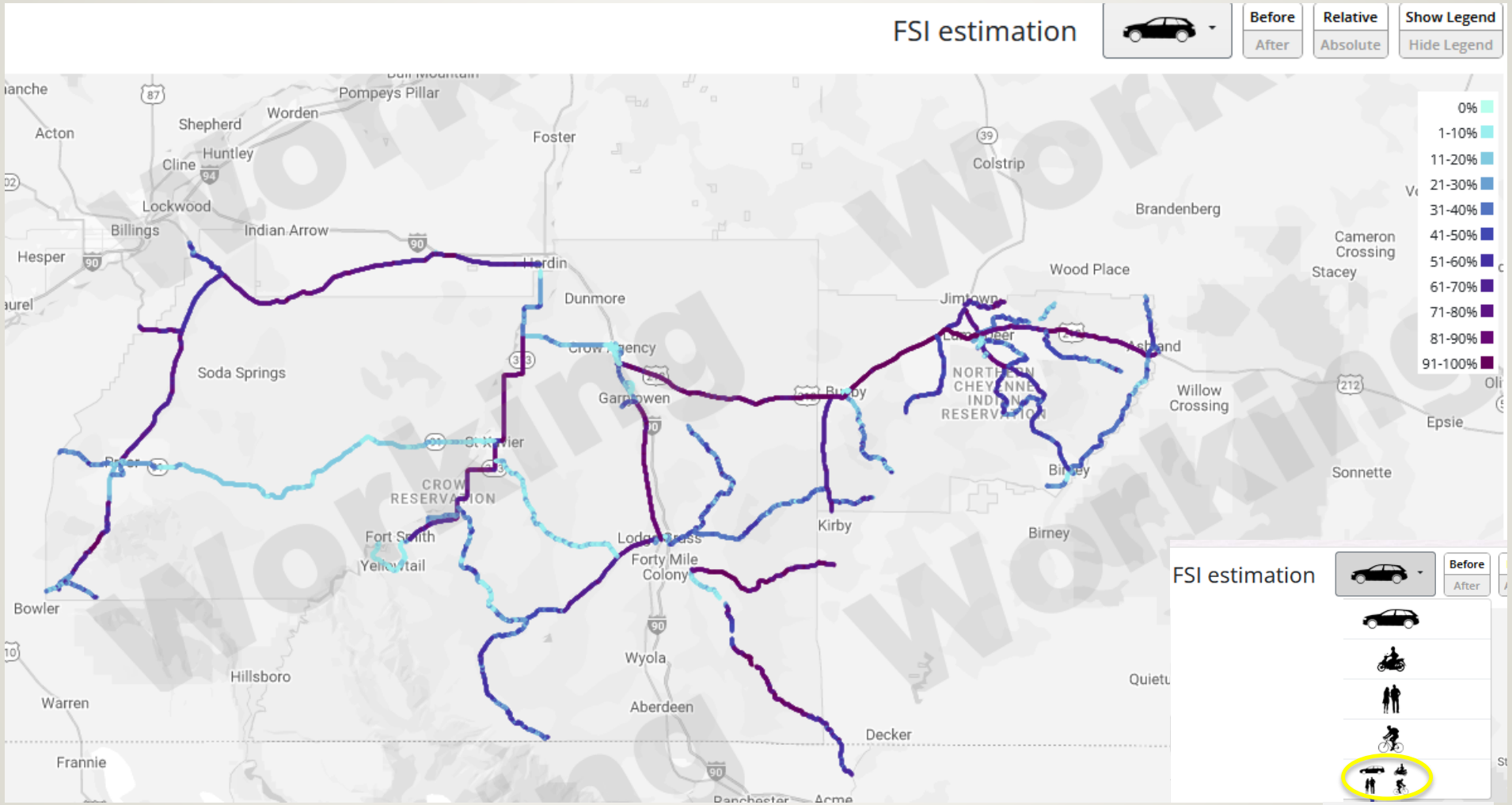
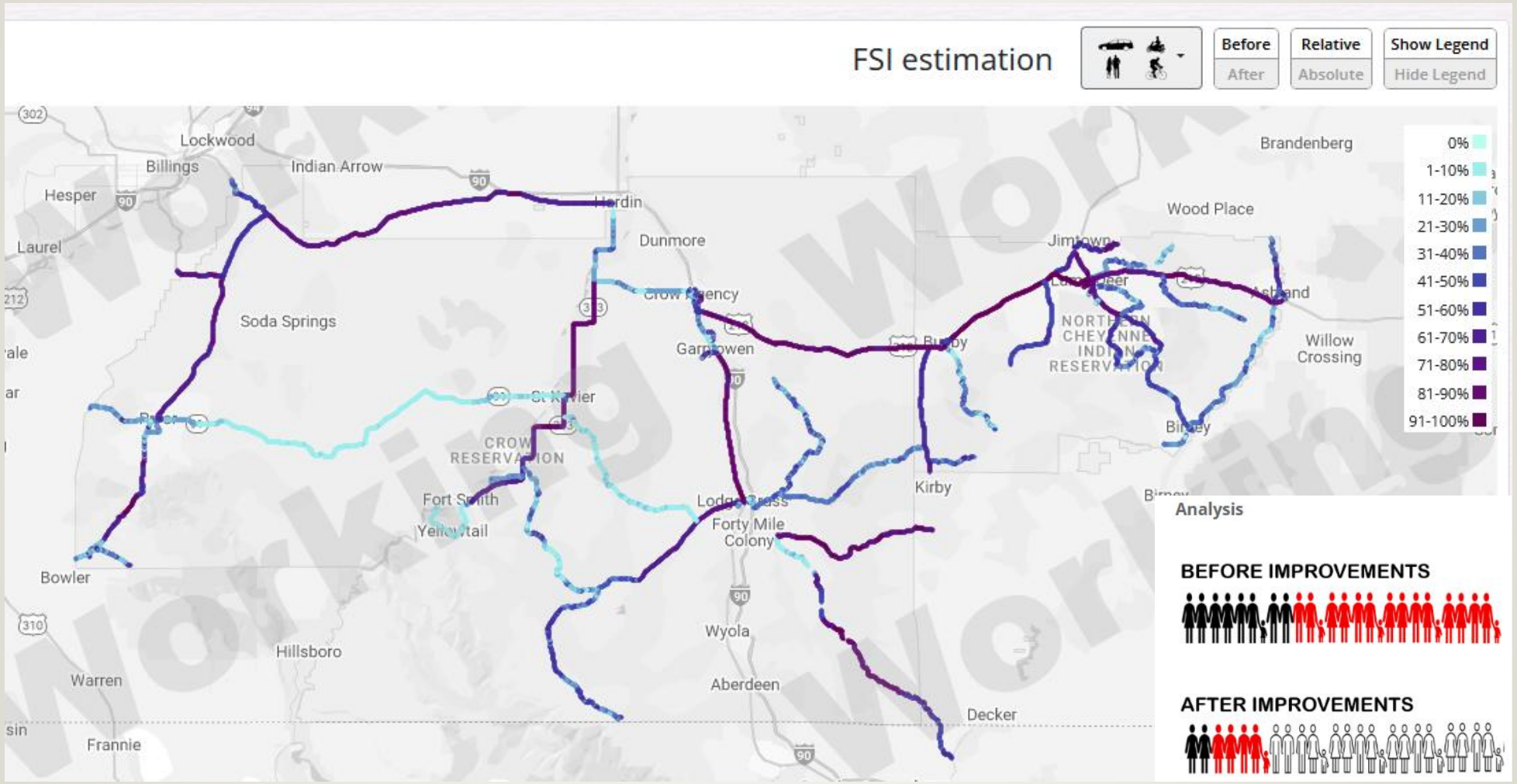
Source: International Road Assessment Programm (iRAP)

*us*RAP Montana FSI Estimates



Source: iRAP

*us*RAP Montana FSI Likelihood

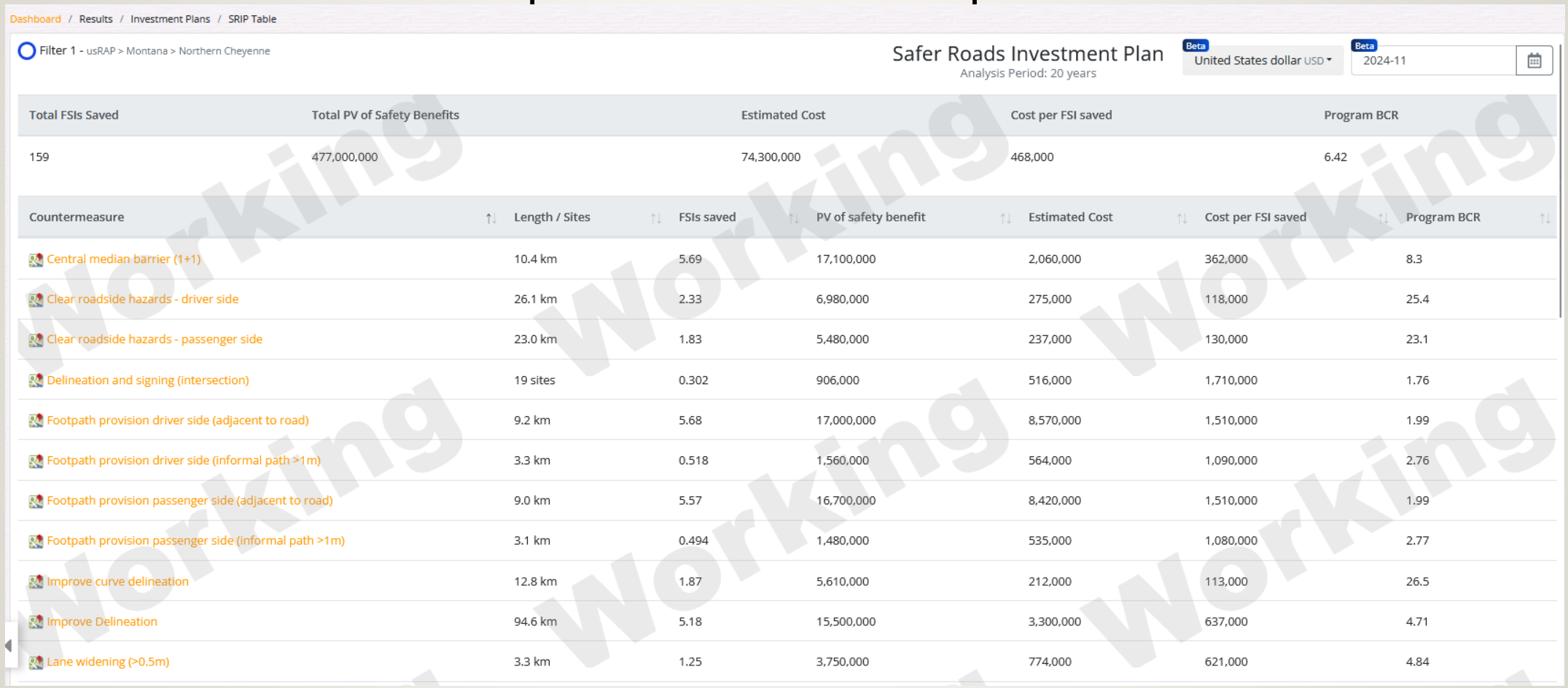


Source: iRAP

ViDA & Road to SRIP

Sample: usRAP Output

(download image, pdf, or csv)



Dashboard / Results / Investment Plans / SRIP Table

Filter 1 - usRAP > Montana > Northern Cheyenne

Safer Roads Investment Plan

Analysis Period: 20 years

Beta United States dollar USD

Beta 2024-11

Total FSIs Saved	Total PV of Safety Benefits	Estimated Cost	Cost per FSI saved	Program BCR
159	477,000,000	74,300,000	468,000	6.42

Countermeasure	Length / Sites	FSIs saved	PV of safety benefit	Estimated Cost	Cost per FSI saved	Program BCR
Central median barrier (1+1)	10.4 km	5.69	17,100,000	2,060,000	362,000	8.3
Clear roadside hazards - driver side	26.1 km	2.33	6,980,000	275,000	118,000	25.4
Clear roadside hazards - passenger side	23.0 km	1.83	5,480,000	237,000	130,000	23.1
Delineation and signing (intersection)	19 sites	0.302	906,000	516,000	1,710,000	1.76
Footpath provision driver side (adjacent to road)	9.2 km	5.68	17,000,000	8,570,000	1,510,000	1.99
Footpath provision driver side (informal path >1m)	3.3 km	0.518	1,560,000	564,000	1,090,000	2.76
Footpath provision passenger side (adjacent to road)	9.0 km	5.57	16,700,000	8,420,000	1,510,000	1.99
Footpath provision passenger side (informal path >1m)	3.1 km	0.494	1,480,000	535,000	1,080,000	2.77
Improve curve delineation	12.8 km	1.87	5,610,000	212,000	113,000	26.5
Improve Delineation	94.6 km	5.18	15,500,000	3,300,000	637,000	4.71
Lane widening (>0.5m)	3.3 km	1.25	3,750,000	774,000	621,000	4.84

ViDA & Road to SRIP

Sample: usRAP Output

Filter 1 - usRAP > Montana > Crow

Safer Roads Investment Plan
Analysis Period: 20 years

Beta United States dollar USD

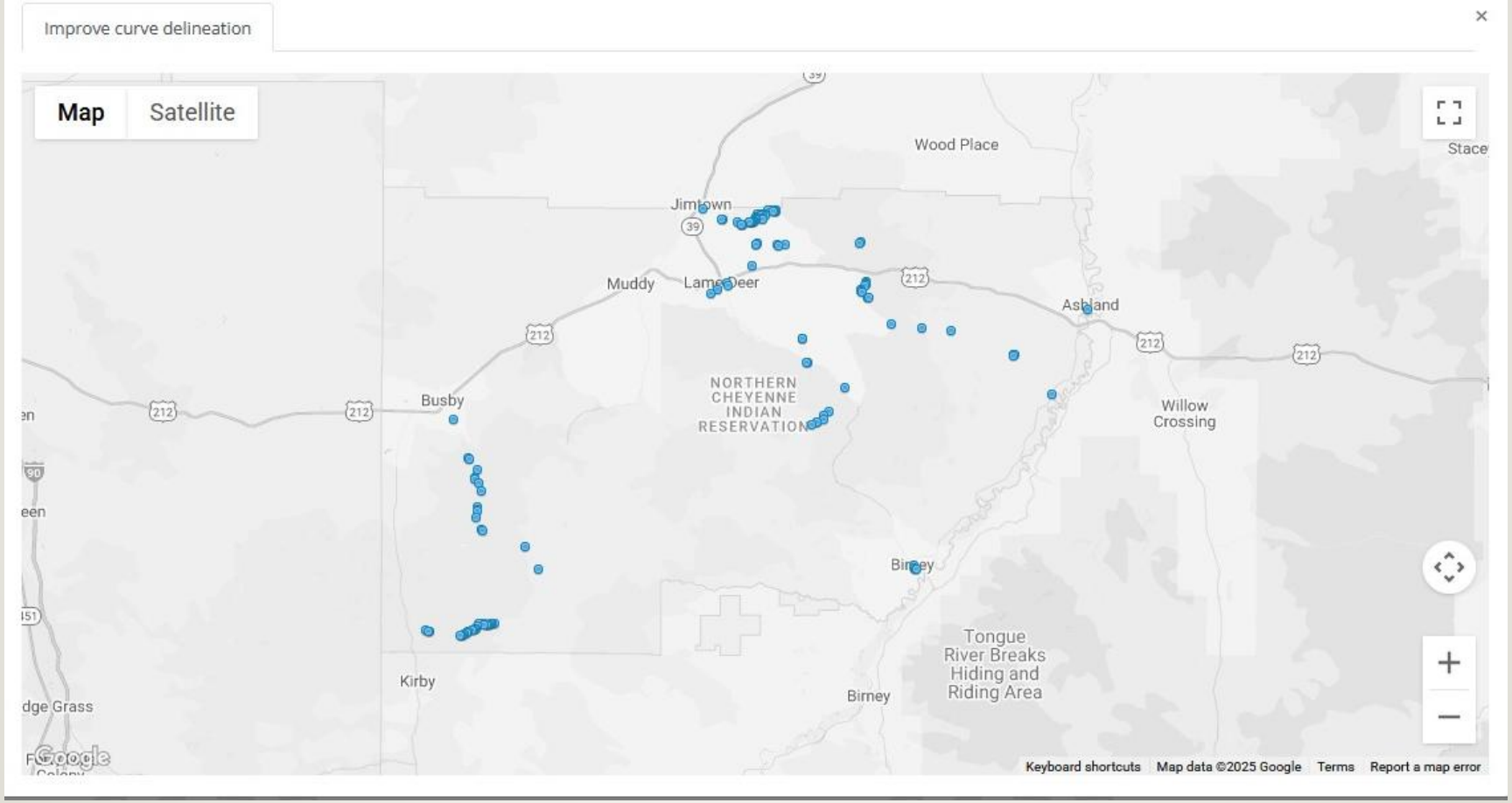
Beta 2024-11

Total FSIs Saved	Total PV of Safety Benefits	Estimated Cost	Cost per FSI saved	Program BCR
289	710,000,000	87,800,000	304,000	8.08

Countermeasure	Length / Sites	FSIs saved	PV of safety benefit	Estimated Cost	Cost per FSI saved	Program BCR
Pave road surface	110.6 km	74.8	184,000,000	18,600,000	249,000	9.86
Shoulder rumble strips	180.9 km	34.6	85,000,000	14,300,000	413,000	5.96
Roadside barriers - driver side	33.5 km	30.5	74,900,000	6,700,000	220,000	11.2
Roadside barriers - passenger side	36.5 km	29.9	73,600,000	7,630,000	255,000	9.64
Skid Resistance (paved road)	31.4 km	20.9	51,200,000	6,090,000	292,000	8.42
Improve Delineation	134.9 km	16.6	40,800,000	4,810,000	290,000	8.48
Sideslope improvement - driver side	26.0 km	9.03	22,200,000	1,520,000	168,000	14.6
Clear roadside hazards - driver side	20.1 km	8.15	20,000,000	220,000	27,000	90.9
Central median barrier (1+1)	28.8 km	7.72	19,000,000	5,990,000	776,000	3.17
Shoulder sealing driver side (<1m)	74.5 km	7.57	18,600,000	3,100,000	409,000	6
Lane widening (>0.5m)	10.4 km	7.55	18,500,000	2,450,000	324,000	7.57

ViDA & Road to SRIP

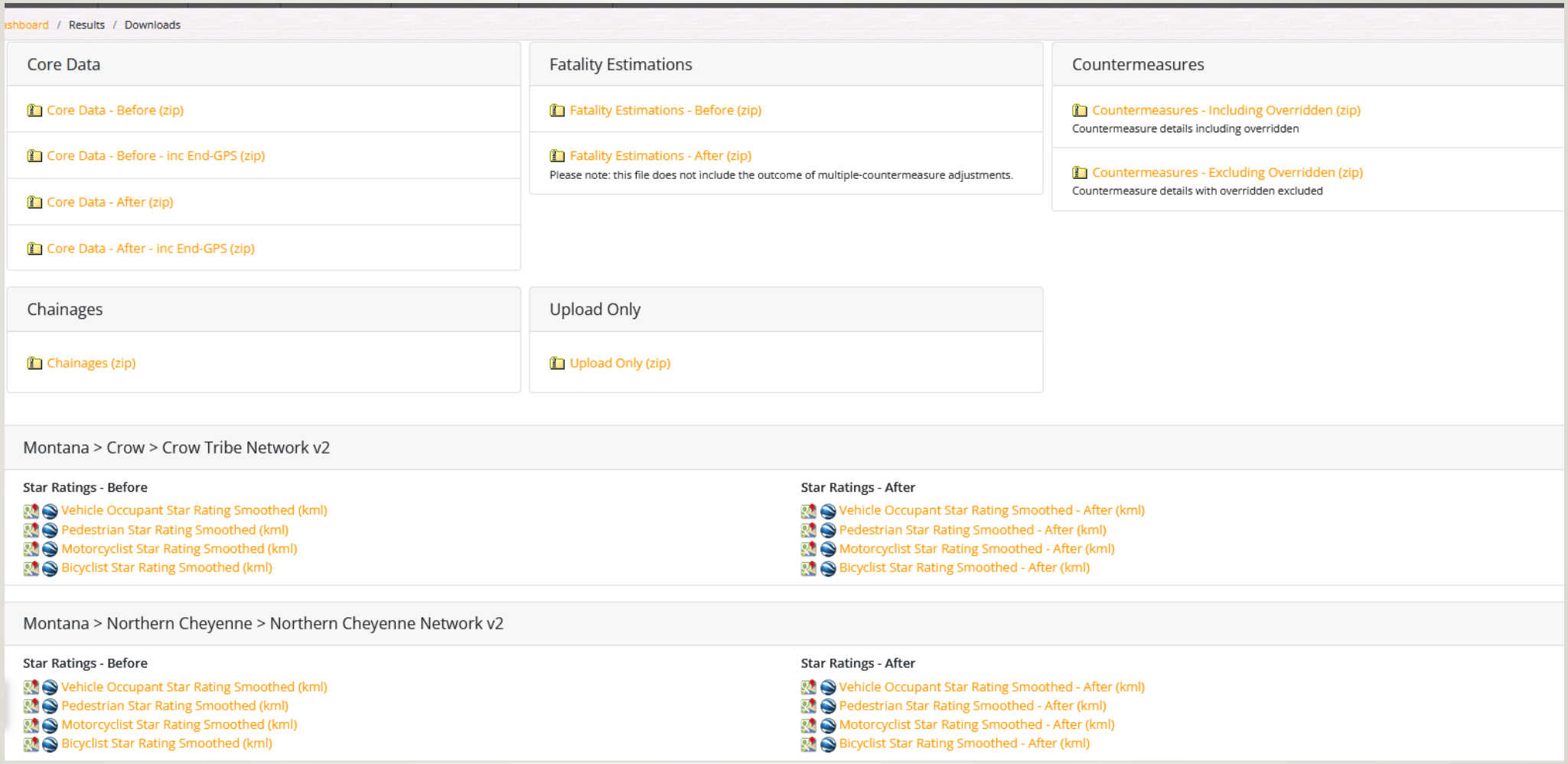
Sample: usRAP Output



ViDA & Road to Strip Plan

Sample: usRAP Output

ViDA Downloads



Safety Plan Adoption

- Development of a Comprehensive Roadway Departure Safety Plan
  - Targeted identification of critical segments for effective safety interventions
- Assessment of challenges and potential obstacles
- Alignment of policies with proposed countermeasures

Questions/Comments

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Thank You!