

MDT Vulnerable Road User Safety Assessment








Advisory Committee Meeting #2

July 17, 2023



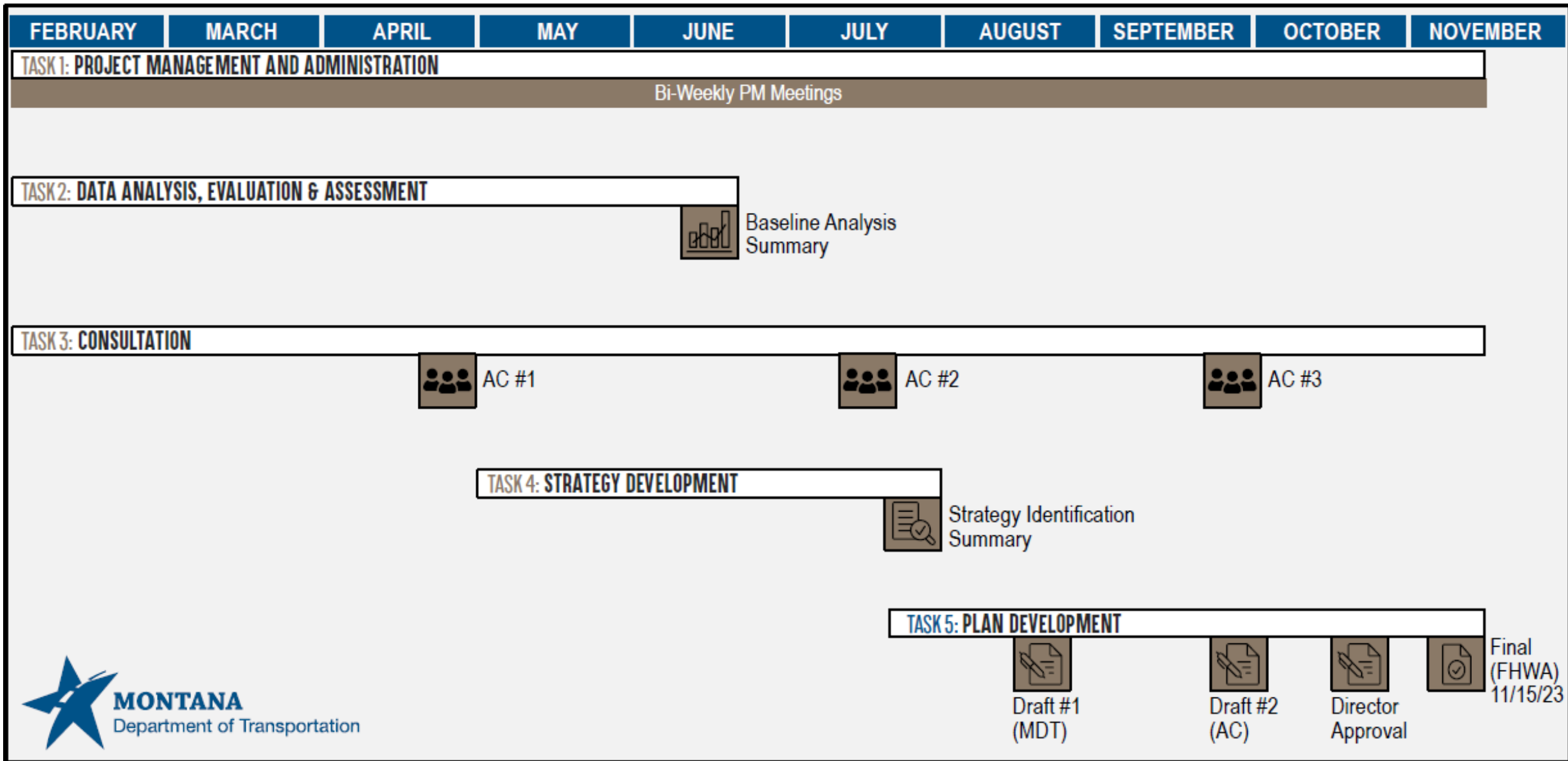
AGENDA

-  Welcome and Introductions
-  Schedule Review
-  Baseline Conditions Update
-  Initial Strategies
-  Next Steps

Schedule Review



VULNERABLE ROAD USER SAFETY ASSESSMENT SCHEDULE



Baseline Conditions Update

- Updated Data Set
- Updated Severity Index Factors
- Focus on Infrastructure Indicators
- Crash Narrative Review



Updated Data Set

- **Review Period:** 2017-2021 (5 years)
- **Data Source:** MDT database
- **Data Updates:**
 - Race/ethnicity information
 - Pedestrian/bicycle person details
 - 3 new crash records incorporated
 - 3 duplicate records removed





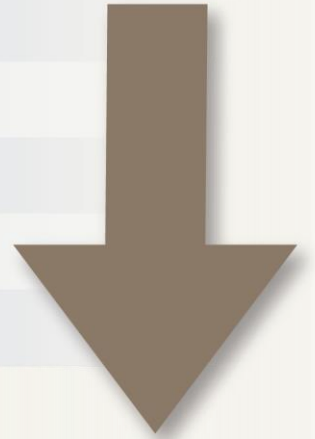
Severity Index

Q: What is a Severity Index?



MDT Factors

Fatal:	66.7
Suspected Serious Injury:	3.53
Minor Injury:	1.29
Possible Injury:	0.73
Property Damage Only/Unknown:	0.12



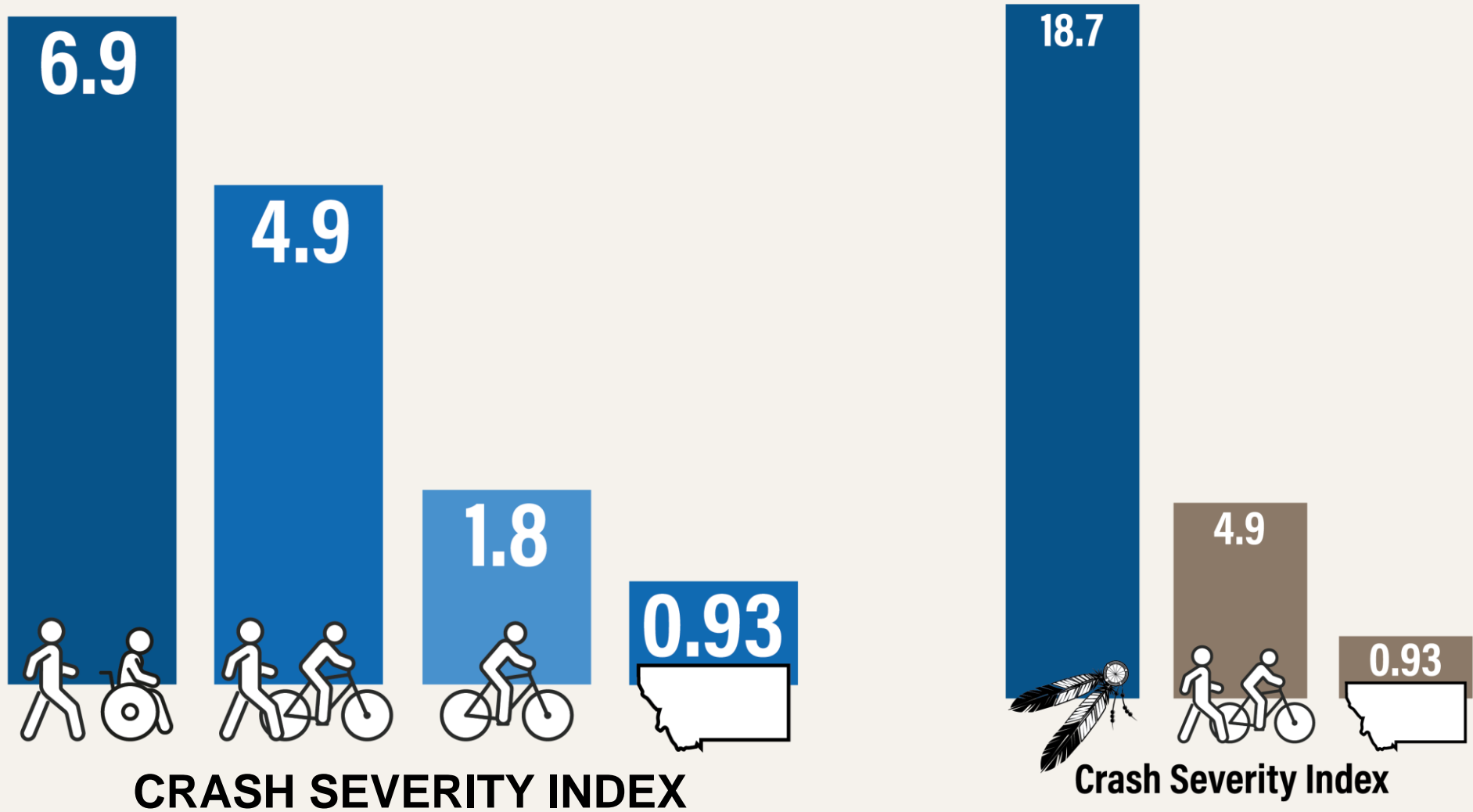
$$\text{Severity Index} = \frac{(66.7 * \text{Fatal}) + (3.53 * \text{Serious Injury}) + (1.29 * \text{Minor Injury}) + (0.73 * \text{Possible Injury}) + (0.12 * (\text{PDO} + \text{Unknown}))}{\text{Total Crashes}}$$

A: Numerical **comparison** with **severe crashes weighted more heavily** compared to property damage only crashes.



Crash Record Characteristics

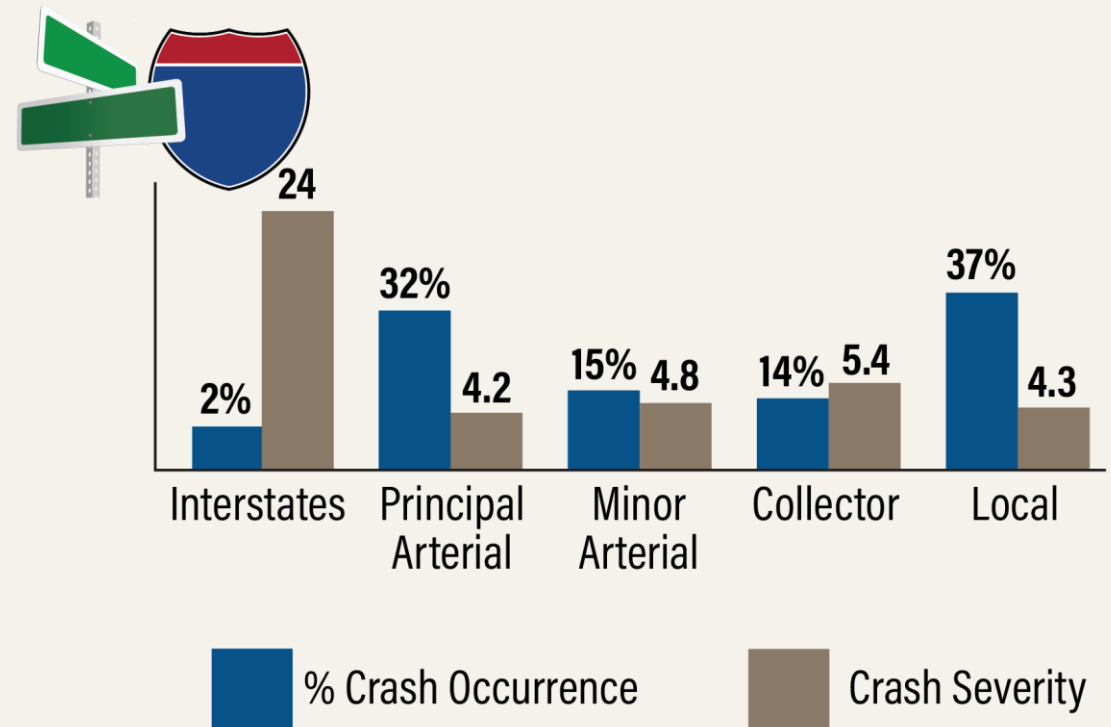
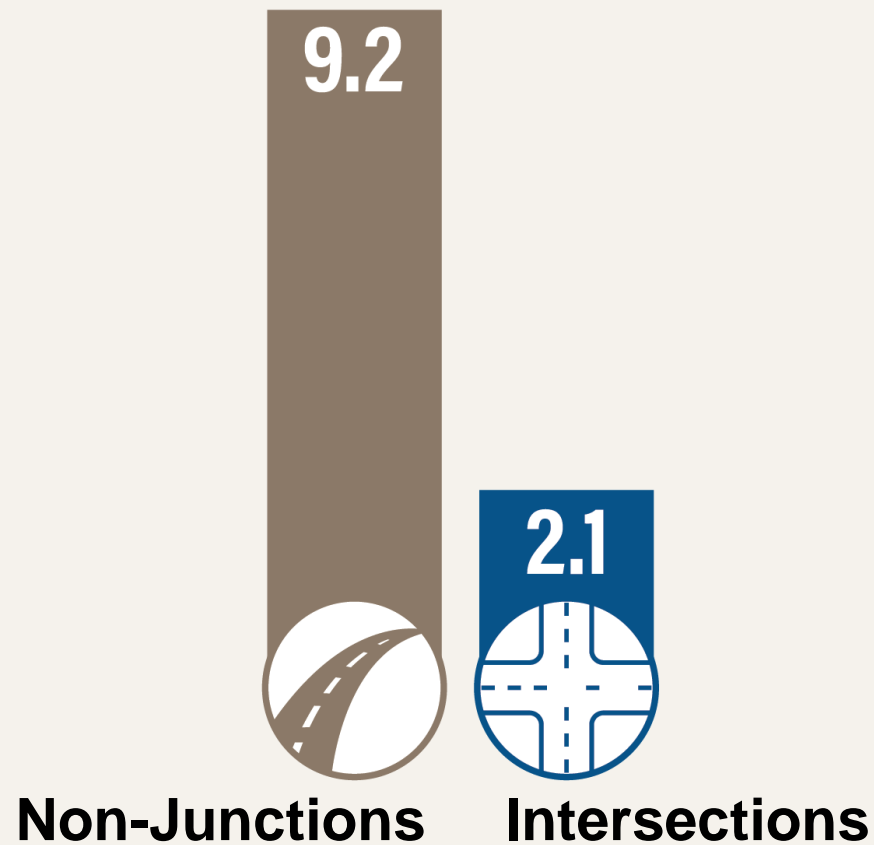
Baseline Conditions





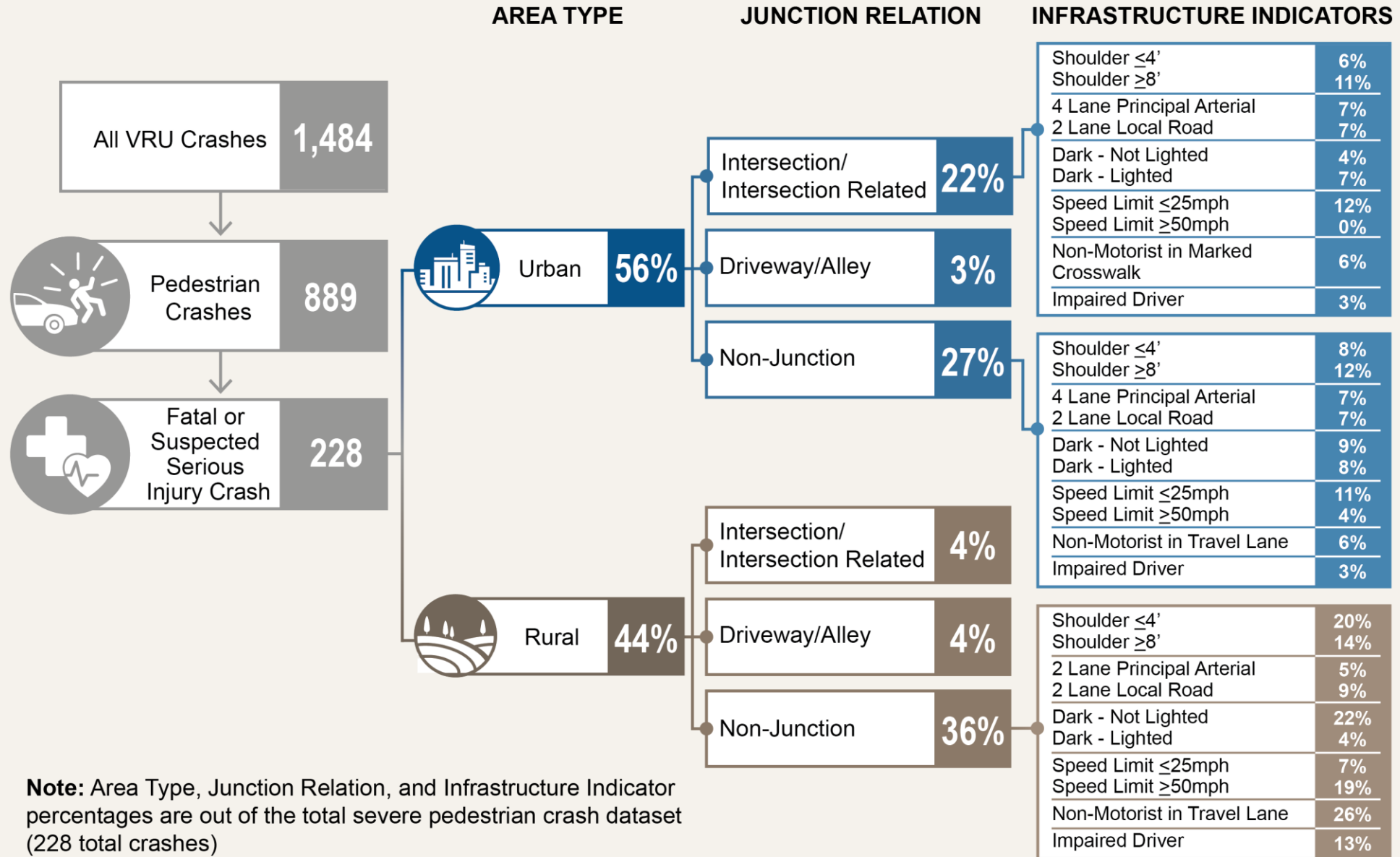
Crash Record Characteristics

Crash Severity Index



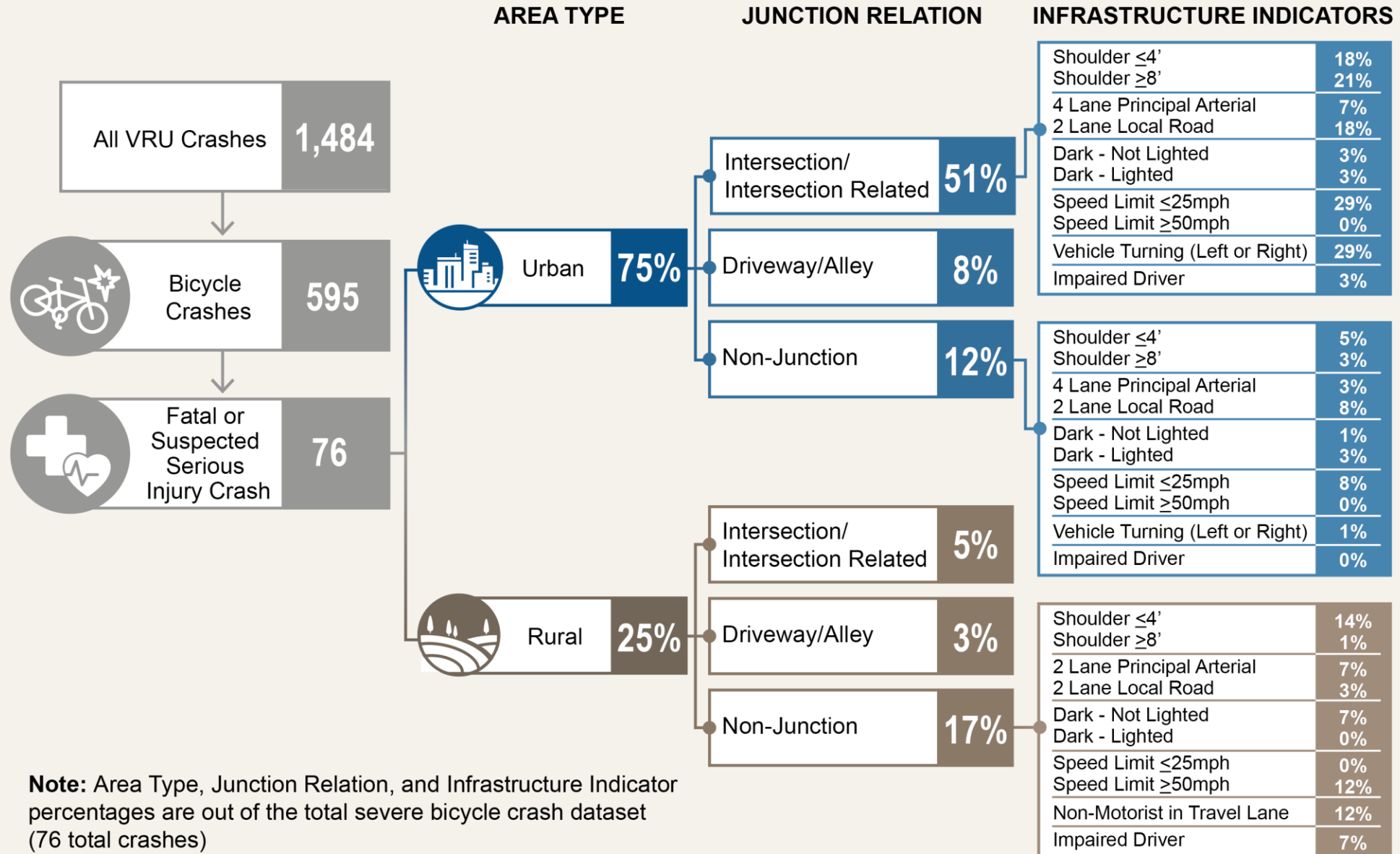


Infrastructure Indicators





Infrastructure Indicators



Note: Area Type, Junction Relation, and Infrastructure Indicator percentages are out of the total severe bicycle crash dataset (76 total crashes)



Crash Narrative Review

Narrative Review

- 2017-2021 (5 years)
- **Fatal & Suspected Serious Injury Crashes Only (304)**
- MHP and Local Reports, aerials/street view imagery





Crash Narrative Review



Trends and Key Findings

- Severe Crash with Non-Motorist in Transport: **257 (85%)**
- Severe Crash with Non-Motorist **Not** in Transport: **47 (15%)**
 - Emergency Service/Tow Truck Workers
 - Former Occupant of Disabled/Crashed/Other Vehicle
 - Building Occupant



Crash Narrative Review

Common Circumstances & Contributing Factors



Non-Motorist Only

- Mid-Block Crossings (“Jaywalking”)
- Dark Clothing/No Reflective Gear
- Walking in Roadway/Improperly Riding
- Lack of Dedicated Facility/Maintenance Issue
- Dart/Dash/Jumped From Vehicle
- Medical Condition



Motor Vehicle Occupant(s) Only

- Vehicle Backing
- Speeding



Crash Narrative Review

Common Circumstances & Contributing Factors



Non-Motorist & Motor Vehicle Occupant(s)

- Impairment
- Dark/Not Lighted Conditions/Weather/Other Visibility Issues
- Unattended Minor
- Faulty Vehicle/Equipment
- Distraction/Recklessness/Failure to Yield
- Intentional/Argument/Aggression

VRU Strategies





Existing VRU Strategies

- Engineering
 - *Data analysis*
 - *Identify projects targeting crash pattern locations*
 - *Provide dedicated facilities with separation between vehicles and non-motorists*
 - *Provide widened shoulders on rural roadways*
 - *Provide crossing treatments based on current guidance*
 - *Maintain pedestrian and bicycle infrastructure*
- Education
 - *Traffic safety education and training programs*
- Enforcement and Emergency Medical Services
 - *Coordination and collaboration through CHSP and other efforts*

Existing VRU Strategies – CHSP

CHSP Emphasis Areas

1 Roadway Departure & Intersections Related Crashes

- *Data-driven problem identification and use of best practices*
- *Speed-related*
- *Traffic safety education*
- *Accuracy, completeness, integration, timeliness, uniformity, collection, accessibility of data*
- *Enforcement of proper road use behaviors by all road users (motorized and nonmotorized)*
- *Distracted/fatigued driving and other behavioral factors*

2 Impaired Driving

- *Deterrence and Enforcement*
- *Prevention and Education*
- *Criminal Justice System*
- *Communication Program*
- *Alcohol and Other Drug Misuse: Screening, Assessment, Treatment and Rehabilitation*

4 Emergency Response-Post-Crash Care

- *On Scene Care Training/Education*
- *Safe/Rapid Transport of Crash Victims*
- *Hospital-Based Trauma Care*
- *Integrate Crash, EMS, Trauma and Roadway Surveillance Databases*
- *Provide Injury Prevention Education to Communities*
- *Support Laws, Policy Development and Legislation*

Note: CHSP Emphasis Area 3 (Unrestrained Vehicle Occupants) is not applicable

Proposed VRU Strategies

- Includes countermeasures targeting the **4Es of Safety**



EDUCATION



ENFORCEMENT



ENGINEERING

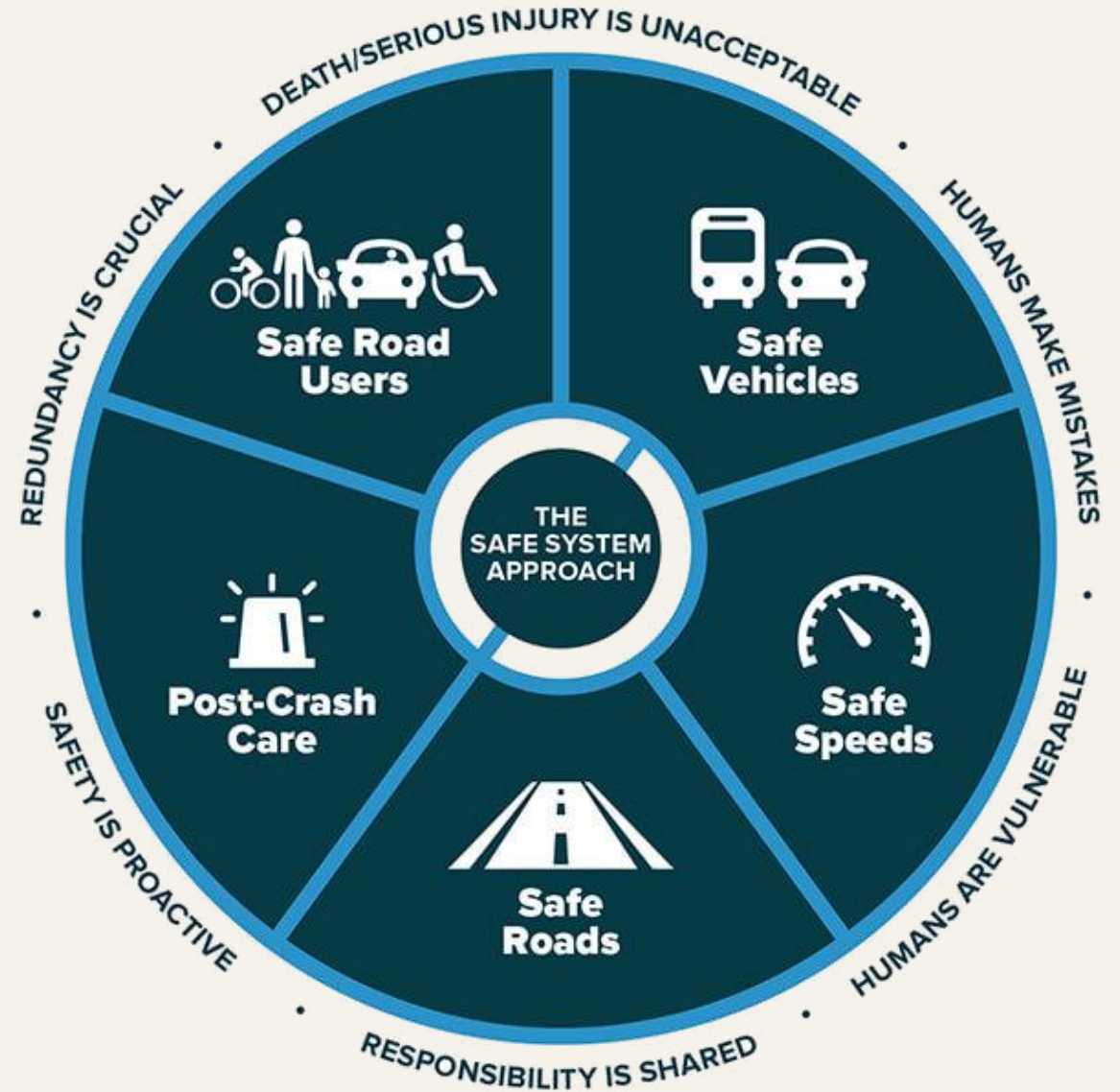


EMS

Proposed VRU Strategies

Organized by Safe Systems Approach

- *Death/serious injury is unacceptable.*
- *Humans make mistakes.*
- *Humans are vulnerable.*
- *Responsibility is shared.*
- *Safety is proactive.*
- *Redundancy is crucial.*



Proposed VRU Strategies

PROPOSED VRU STRATEGY



Example Actions/Efforts

- Example projects, programs, actions, and efforts that may relate to the proposed strategy
- Actions may not be appropriate in all locations/situations – additional studies may be necessary

Observed Trends

- Statistics and trends observed through review of **all crash records** and through review of **severe VRU crash narratives/reports**

Partner Agencies

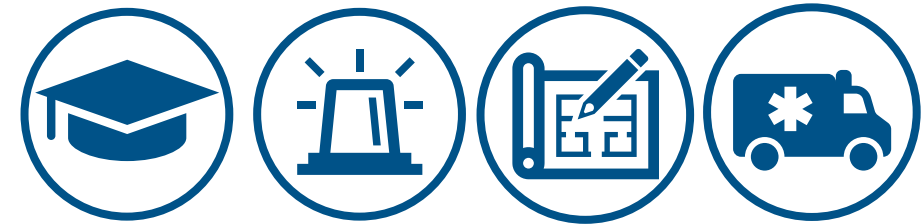
- Agencies that may play a role in implementation of the strategy
- Listed in **alphabetical order**

CHSP Connection & Additional Considerations

- *Many of the proposed strategies overlap with things MDT is already doing as part of the CHSP*
- *Context and other considerations to optimize strategy implementation, as applicable*

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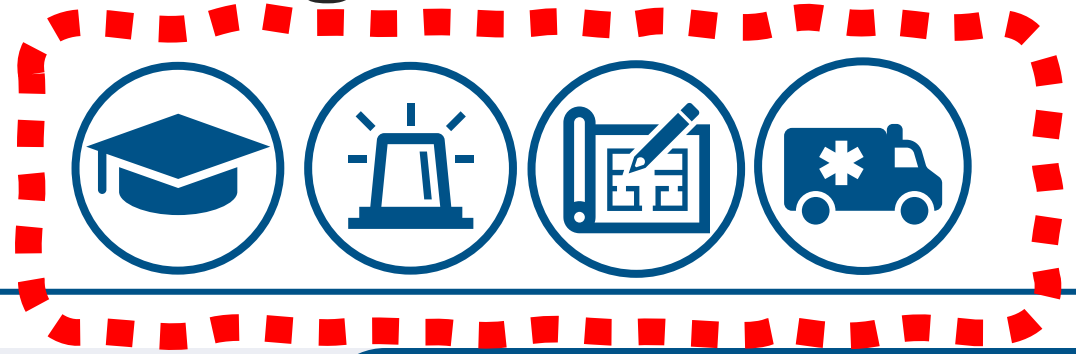
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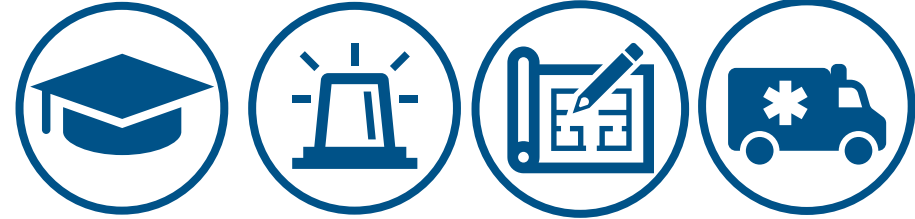
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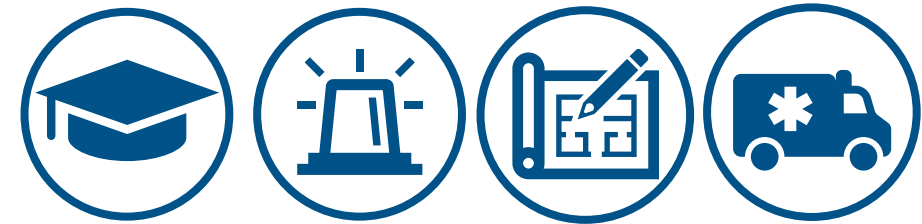
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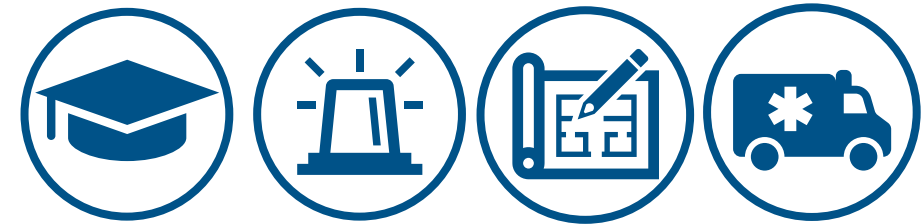
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SAFE ROAD USERS

Proposed VRU Strategies

REDUCE DRIVER & NON-MOTORIST IMPAIRMENT



Example Actions/Efforts

- Substance avoidance education
- Targeted communication campaigns
- Partnerships with addiction specialists/ other social services
- Penalties for impaired driving and biking

Observed Trends

- **28%** of severe VRU crashes involved an impaired driver and/or non-motorist.
- **14 out of 18** fatal VRU crashes on Reservations involved an impaired driver and/or non-motorist.

Partner Agencies

- | | |
|---|------------------------------------|
| • Bicycle Clubs | • Local Governments |
| • City/County Public Health/Injury Prevention Specialists | • MDT |
| • Individuals | • Social Service Organizations/EMS |
| • Law Enforcement | • Walking Groups |

CHSP Connection

- *Impaired driving is an emphasis area with several associated strategies*

Proposed VRU Strategies

INCREASE PEDESTRIAN VISIBILITY



Example Actions/Efforts

- Education campaigns & incentives
 - Light/white/bright clothing
 - Reflective gear/headlamps
 - Proper awareness (e.g., texting, headphones, ear buds)
 - Rules of the road
- Walking buses, crossing guards

Observed Trends

- **12%** of severe VRU crashes involved a non-motorist wearing dark clothing.
- **9%** of severe VRU crashes involved a non-motorist darting/dashing into the road.
- Many of the crash reports do not comment on the pedestrians' clothing or actions; crashes involving this trend are likely underreported.

Partner Agencies

- | | |
|---|---------------------|
| • City/County Public Health/Injury Prevention | • Local Governments |
| • Emergency Responders | • Local Hospitals |
| • Individuals | • MDT |
| • Law Enforcement | • School Districts |
| | • Walking Groups |

CHSP Connection

- *Roadway Departure/Intersection Crashes Emphasis Area:*
 - *Encouraging road users to behave safely & pay attention*
 - *Providing VRU safety education*

Proposed VRU Strategies

INCREASE BICYCLIST VISIBILITY & PROTECTION



Example Actions/Efforts

- Education campaigns & incentives
 - Light/white/bright clothing, helmets
 - Reflective gear/headlamps
 - Proper awareness (e.g., texting, headphones, ear buds)
 - Rules of the road

Observed Trends

- 9 severe bicyclist crashes involved bicyclists not wearing a helmet.
- Many of the crash reports do not comment on the cyclists' use of protective equipment, clothing, reflective gear, or actions; crashes involving this trend are likely underreported.

Partner Agencies

- | | |
|---|---------------------|
| • Bicycle Clubs | • Law Enforcement |
| • Bike Shops | • Local Governments |
| • City/County Public Health/Injury Prevention | • Local Hospitals |
| • Individuals | • MDT |
| • Emergency Responders | • School Districts |

CHSP Connection

- *Roadway Departure/Intersection Crashes Emphasis Area :*
 - *Encouraging road users to behave safely & pay attention*
 - *Providing VRU safety education*



SAFE VEHICLES

Proposed VRU Strategies

ENHANCE BICYCLE VISIBILITY & FUNCTION



Example Actions/Efforts

- Education campaigns & incentives
 - Bicycle lamps/reflectors
 - Reflective strips/clothing
 - Functioning brakes

Observed Trends

- **12%** of severe bicycle-involved occurred under dark/unlighted conditions
- Some severe VRU crash reports indicated the bicyclists' brakes were faulty.

Partner Agencies

- Bicycle Clubs
- Bike Shops
- City/County Public Health/Injury Prevention
- Emergency Responders
- Individuals
- Local Business/Community Groups
- Local Governments
- Local Hospitals
- MDT

CHSP Connection

- *Providing VRU safety education is included in the Roadway Departure/Intersection Crashes Emphasis Area*



SAFE ROADS

Proposed VRU Strategies

REDUCE CROSSING DISTANCES



Example Actions/Efforts

- Roadway reconfiguration
- Curb bulbouts
- Pedestrian refuge islands
- Roundabouts

Observed Trends

- **21%** of severe pedestrian crashes involved crossing more than two traffic lanes
 - **60%** of those crashes occurred at an intersection or marked crosswalk
- **43%** of severe pedestrian crashes occurred at locations without pedestrian facilities

CHSP Connection & Additional Considerations

- *Designing intersections to mitigate user conflicts and reduce crashes, including roundabouts and VRU safety improvements, is included in the Roadway Departure/Intersection Crashes Emphasis Area*
- *Strategy may be more appropriate in urban settings.*

Partner Agencies

- Local Governments
- MDT

Proposed VRU Strategies

INCREASE CROSSWALK VISIBILITY & ACCESSIBILITY



Example Actions/Efforts

- Accessible curb ramps
- High-visibility pavement markings
- Rapid Rectangular Flashing Beacons (RRFBs)
- Pedestrian Hybrid Beacon (PHB)/High-intensity Activated crossWalks (HAWKs)
- Intelligent Transportation Systems (ITS)

Observed Trends

- **15%** of severe VRU crashes involved a non-motorist crossing at a location without traffic controls
- No crashes occurred at crossings with high-visibility measures already in place.

CHSP Connection

- *Designing intersections to mitigate user conflicts and reduce crashes including VRU safety improvements, is included in the Roadway Departure/Intersection Crashes Emphasis Area*

Partner Agencies

- Local Governments
- MDT

Proposed VRU Strategies

ENHANCE SIGNALIZED CROSSINGS



Example Actions/Efforts

- Accessible curb ramps
- High-visibility pavement markings
- Pedestrian push buttons, audible/visual cues
- Leading Pedestrian Intervals (LPIs)
- Increased pedestrian phase

Observed Trends

- **12%** of severe VRU crashes occurred at signalized intersections
- Several severe VRU crashes involved a pedestrian being hit while 'Walk' signal was illuminated

Partner Agencies

- Local Governments
- MDT

CHSP Connection

- *Designing intersections to mitigate user conflicts and reduce crashes including signalization and VRU safety improvements, is included in the Roadway Departure/Intersection Crashes Emphasis Area*

Proposed VRU Strategies

INCREASE ROADWAY VISIBILITY



Example Actions/Efforts

- Street lighting
- High-visibility pavement markings
- Vegetation management

Observed Trends

- **38%** of severe pedestrian-involved crashes occurred at night with no lighting.
- **12%** of severe bicyclist-involved crashes occurred at night with no lighting.
- **16%** of all VRU crashes occurred at night with street lighting

Partner Agencies

- Local Governments
- MDT

CHSP Connection

- *Designing roadways and intersections to mitigate user conflicts and reduce crashes, including lighting and VRU safety improvements, is included in the Roadway Departure/Intersection Crashes Emphasis Area*

Proposed VRU Strategies

ENHANCE ON-ROAD BICYCLE FACILITIES



Example Actions/Efforts

- Shared facilities
 - Widened shoulders
 - Sharrows, signage
 - Appropriately placed rumble strips
 - Maintenance of facilities (i.e., street sweeping, snow removal, etc.)

Observed Trends

- **54%** of severe bicyclist crashes occurred on roadways with shoulders 4 ft or less, potentially indicating the bicyclist did not have adequate room to ride outside of the travel lane.

Partner Agencies

- Local Governments
- MDT

CHSP Connection & Additional Considerations

- *Roadway Departure/Intersection Crashes Emphasis Area includes:*
 - *Designing roadways to mitigate user conflicts, including rumble strips and VRU safety improvements*
 - *Share the Road education*
- *Solutions may be more appropriate in rural areas or where separated facilities are not feasible.*

Proposed VRU Strategies

ENHANCE OFF-ROAD VRU FACILITIES



Example Actions/Efforts

- Dedicated facilities
 - Bike lanes, shared-use paths (SUPs)
 - Sidewalks, curb ramps
- Separated facilities
 - Boulevards, raised curbs, planters, concrete barriers
 - Overpasses, underpasses, pedestrian bridges

Observed Trends

- **61%** of severe bicycle crashes occurred in locations without dedicated bicycle facilities
- **43%** of severe pedestrian crashes occurred in locations without dedicated pedestrian facilities

Partner Agencies

- Local Governments
- MDT

CHSP Connection & Additional Considerations

- *Designing roadways to mitigate user conflicts, including separating users, is included in the Roadway Departure/Intersection Crashes Emphasis Area*
- *Solutions may be more appropriate in urban areas or where separated facilities are feasible to install and maintain.*
- ***Maintenance of non-motorized facilities is key to ensuring year-round usage and access.***

Proposed VRU Strategies

DESIGNATE NON-MOTORIZED CORRIDORS



Example Actions/Efforts

- Low-volume/low-speed walking & bicycle routes
- Connected facilities – neighborhoods, parks, schools, businesses
- Signage, striping
- Educational materials

Observed Trends

- ~38% of all VRU crashes occurred on roadways with 10,000+ vpd (~33% of severe injury crashes)
- 8% of all VRU crashes occurred on roadways with speeds >50 mph.

Partner Agencies

- Local Governments
- MDT

CHSP Connection & Additional Considerations

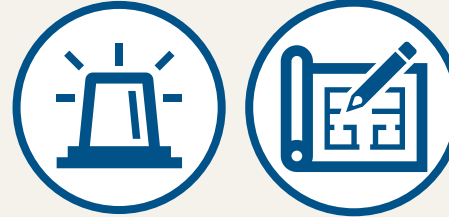
- *Designing roadways to mitigate user conflicts, including signing, striping, and VRU improvements, is included in the Roadway Departure/Intersection Crashes Emphasis Area*
- *Within urban areas, **low-volume, low-speed routes** can be prioritized for walking, biking and rolling.*
- *Example communications for rural routes include MDT's Biking the Big Sky.*

SAFE SPEEDS



Proposed VRU Strategies

REVIEW POSTED SPEED LIMITS



Example Actions/Efforts

- Speed studies
- Special speed zones (schools, high-use areas, work zones)

Observed Trends

- **8%** of all VRU crashes occurred on roadways with posted speeds above 50 mph – **28%** were fatal
- **83%** of VRU crashes in urban areas occurred on roadways with posted speed limits between 25 and 35 mph

Partner Agencies

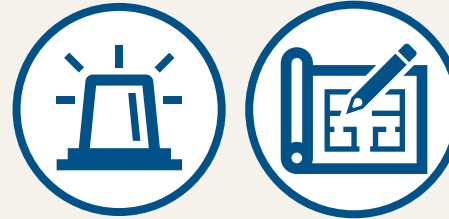
- Law Enforcement
- MDT
- Local Governments
- School Districts

CHSP Connection & Additional Considerations

- *Reducing and mitigating speed-related crashes is included in the Roadway Departure/Intersection Crashes Emphasis Area*
- *Speed reduction strategies may be more effective in urban areas.*
- *Posted speeds subject to review by Transportation Commission.*

Proposed VRU Strategies

REDUCE VEHICULAR TRAVEL SPEEDS



Example Actions/Efforts

- Traffic calming
 - Speed bumps/humps/speed tables/raised crosswalks
 - Visual friction (paint, art, vegetation, objects)
 - Narrowed roadways/curb extensions
 - Roundabouts/traffic circles
 - Horizontal shifts
 - ITS/dynamic speed feedback signage
- Enforcement

Observed Trends

- 4% of drivers involved in VRU crashes were traveling above posted/appropriate speeds

Partner Agencies

- | | |
|----------------------------|---------------------|
| • Business District Groups | • Local Governments |
| • Law Enforcement | • MDT |
| | • School Districts |

CHSP Connection & Additional Considerations

- *Reducing and mitigating speed-related crashes is included in the Roadway Departure/Intersection Crashes Emphasis Area*
- *Speed reduction strategies may be more effective in urban areas and must be balanced with visibility issues.*



POST-CRASH CARE

Proposed VRU Strategies

ENHANCE EMERGENCY WORKER VISIBILITY & AWARENESS



Example Actions/Efforts

- ITS – portable, dynamic signage
- Construction cones, reflective striping
- Reflective strips/clothing/PPE
- Educational campaigns
- Enforcement

Observed Trends

- 5 VRU crashes occurred in work zone locations
- 4 severe VRU crashes involved Work Zone or Emergency Workers

Partner Agencies

• City/County Public Health/Injury Prevention	• Highway Contractors
• Emergency Responders	• Law Enforcement
• Fire & Rescue	• Local Governments
	• MDT
	• Tow Operators

CHSP Connection & Additional Considerations

- *Investigating first responder/emergency worker crash injuries is included in the Emergency Response/Post-Crash Care Emphasis Area*
- *None of the reports indicate whether proper visibility and awareness measures were in effect in work-zone related crashes*

Proposed VRU Strategies

IMPROVE POST-CRASH CARE FOR INJURED VRUs



Example Actions/Efforts

- Emergency responder/bystander training and education
- Post-crash arrival and transport
- Hospital/clinic care
- Database enhancements
- Policy development and legislation

Observed Trends

No observed trends

Partner Agencies

- | | |
|-------------------|---------------------|
| • EMS | • Local Governments |
| • Law Enforcement | • MDT |

CHSP Connection & Additional Considerations

- *Emergency Response/Post-Crash Care is an Emphasis Area with multiple strategies/opportunities for action.*
- *No data related to timeliness or adequacy of post-crash care for injured VRUs.*

Next Steps

- Strategy Summary Memo
- VRU SA Development
- AC Meetings #3 (*September*)

