

# Developing and Monitoring Safety Risk Mitigations

May 26, 2022

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**Public Transportation Agency Safety Plan  
Technical Assistance Center  
(PTASP TAC)**



# Objectives

This webinar will provide participants with knowledge and skills to support the development and monitoring of safety risk mitigations

After this presentation, participants should be able to:

- Identify mitigations in response to safety risk assessment data
- Describe processes for documenting mitigations
- Identify mitigation monitoring methods



# Industry Speakers



**Serena Stevenson**  
General Manager  
Waco Transit System



**Seth Page**  
Safety Manager  
Greater Portland Metro

# Agenda

1. Introduction
2. Identifying mitigations following safety risk assessments
3. Documenting mitigations
4. Monitoring mitigations
5. Questions and answers



# Related Resources

Log onto FTA's PTASP TAC Resource Library for more webinars, tools, and fact sheets related to Safety Risk Management and Safety Assurance

[www.transit.dot.gov/PTASP-TAC](http://www.transit.dot.gov/PTASP-TAC)

**For information related to the Bipartisan Infrastructure Law,  
visit [www.transit.dot.gov/BIL](http://www.transit.dot.gov/BIL)**

Contact [FTA-IIJA@dot.gov](mailto:FTA-IIJA@dot.gov) with your questions related to the  
Bipartisan Infrastructure Law



# Feedback

Your feedback helps us deliver the resources and tools that are most relevant to your needs. Based on feedback from the previous webinar surveys, this webinar features:

- Multiple speakers
- Speakers on video
- Integrated audience feedback

Please stay tuned for another survey at the conclusion of this webinar!



# Audience Poll



**Are you personally involved in the safety risk mitigation process at your agency?**

- 44%** Yes, both developing and monitoring mitigations
- 24%** Yes, developing mitigations
- 13%** Yes, monitoring mitigations
- 10%** No, not involved
- 9%** Not applicable

# Identifying Mitigations





# Safety Management Systems (SMS)

The PTASP regulation establishes requirements for an SMS, including Safety Management Policy, **Safety Risk Management (SRM)**, **Safety Assurance (SA)**, and Safety Promotion



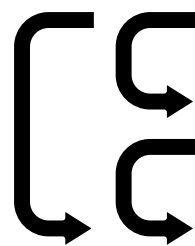


<https://www.transit.dot.gov/PTASP-TAC>



# Safety Risk Mitigations

Safety risk mitigations generally reduce either the likelihood or severity of the potential consequence of a hazard

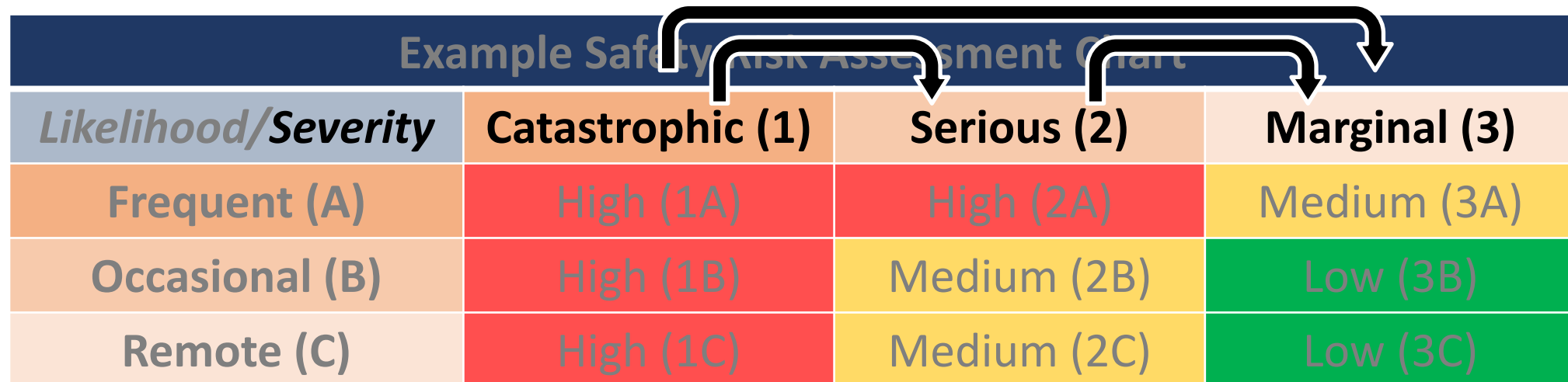


<i>Likelihood/Severity</i>	Catastrophic (1)	Serious (2)	Marginal (3)
<b>Frequent (A)</b>	High (1A)	High (2A)	Medium (3A)
<b>Occasional (B)</b>	High (1B)	Medium (2B)	Low (3B)
<b>Remote (C)</b>	High (1C)	Medium (2C)	Low (3C)

A safety risk mitigation may reduce the likelihood of the potential consequence of a hazard, such as reducing the likelihood from frequent to occasional, or occasional to remote

# Safety Risk Mitigations

Safety risk mitigations generally reduce either the likelihood or severity of the potential consequence of a hazard

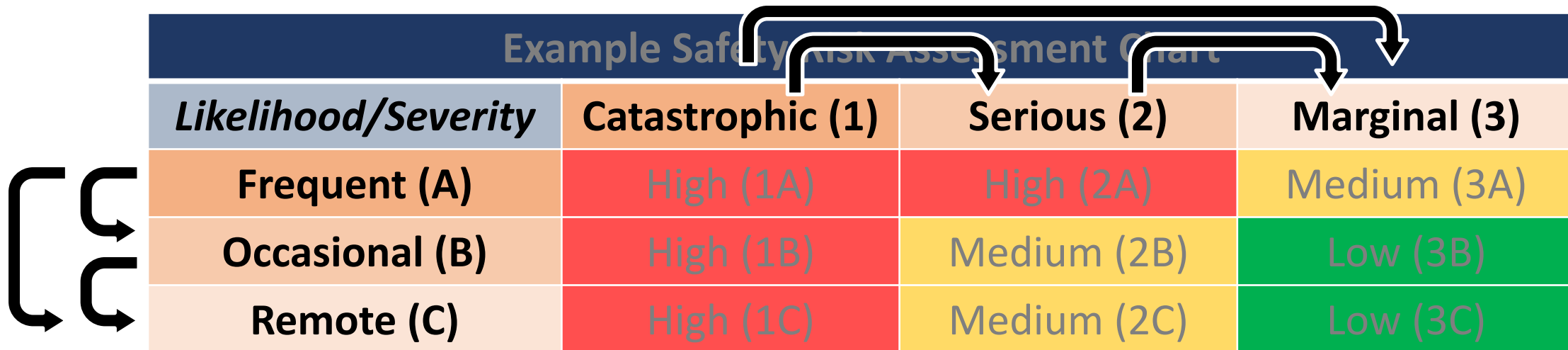


Example Safety Risk Assessment Chart			
<i>Likelihood/Severity</i>	Catastrophic (1)	Serious (2)	Marginal (3)
Frequent (A)	High (1A)	High (2A)	Medium (3A)
Occasional (B)	High (1B)	Medium (2B)	Low (3B)
Remote (C)	High (1C)	Medium (2C)	Low (3C)

A safety risk mitigation may reduce the severity of the potential consequence of a hazard, such as reducing the severity from catastrophic to serious, or serious to marginal

# Safety Risk Mitigations

Safety risk mitigations generally reduce either the likelihood or severity of the potential consequence of a hazard



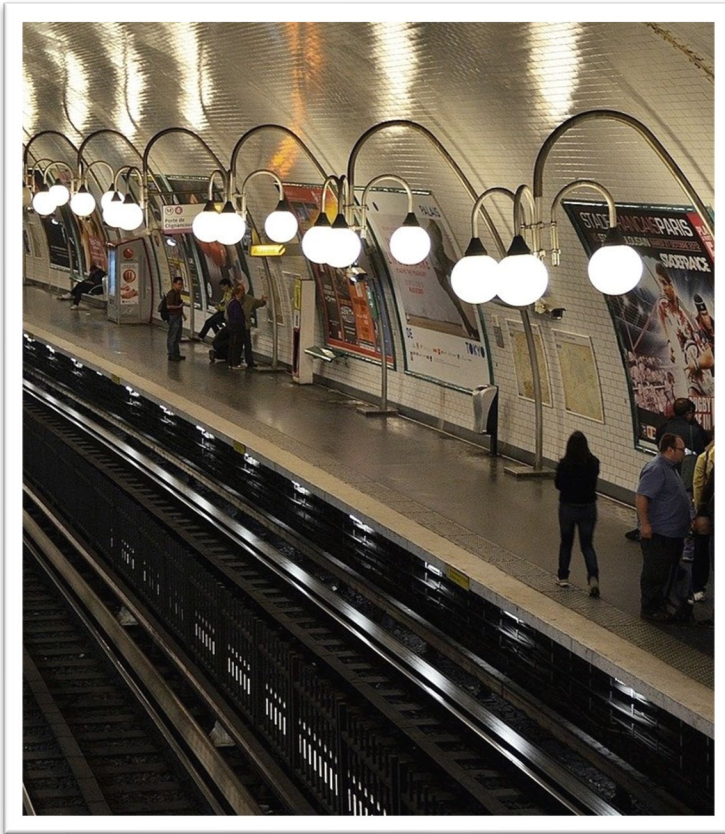
**Example Safety Risk Assessment Chart**

<i>Likelihood/Severity</i>	<b>Catastrophic (1)</b>	<b>Serious (2)</b>	<b>Marginal (3)</b>
<b>Frequent (A)</b>	High (1A)	High (2A)	Medium (3A)
<b>Occasional (B)</b>	High (1B)	Medium (2B)	Low (3B)
<b>Remote (C)</b>	High (1C)	Medium (2C)	Low (3C)

The diagram illustrates a 3x3 safety risk assessment matrix. The columns represent severity levels: Catastrophic (1), Serious (2), and Marginal (3). The rows represent likelihood levels: Frequent (A), Occasional (B), and Remote (C). The cells are color-coded: red for High risk (1A, 1B, 1C), yellow for Medium risk (2A, 2B, 2C), and green for Low risk (3A, 3B, 3C). Arrows indicate mitigation paths: from High (1A) to High (2A), from High (2A) to Medium (2B), from High (2B) to Low (3B), from High (1B) to Medium (2B), from High (1C) to Medium (2C), and from Medium (2C) to Low (3C). A large bracket on the left side of the matrix indicates the overall risk reduction from Frequent (A) to Remote (C).

A safety risk mitigation may reduce both the likelihood and the severity of the potential consequence of a hazard

# Safety Risk Mitigations



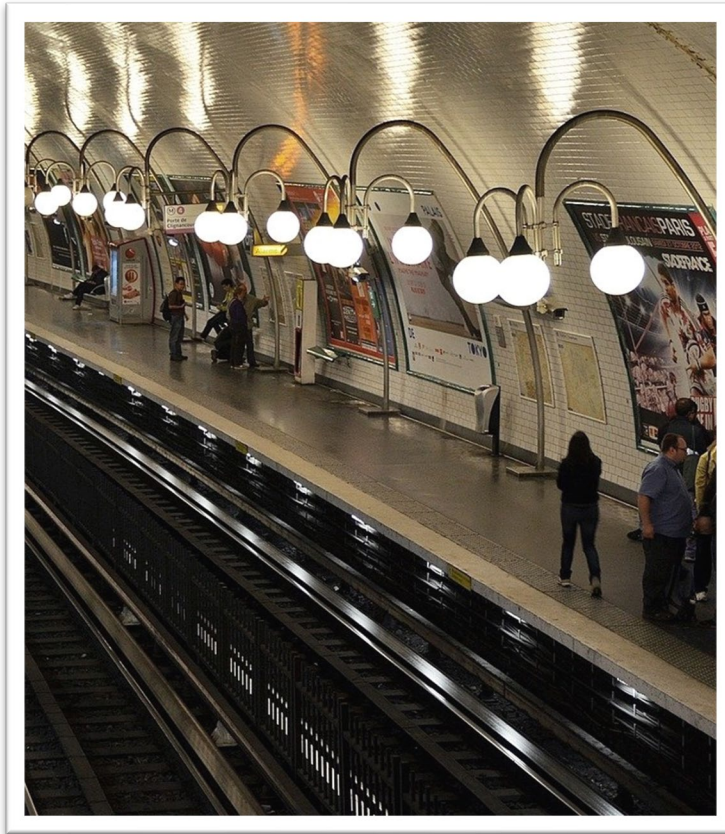
## Example:

A rail transit agency determines that the risk associated with falls on an open platform is not adequately mitigated

What are some example mitigations?



# Safety Risk Mitigations



## Example:

A rail transit agency determines that the risk associated with falls on an open platform is not adequately mitigated

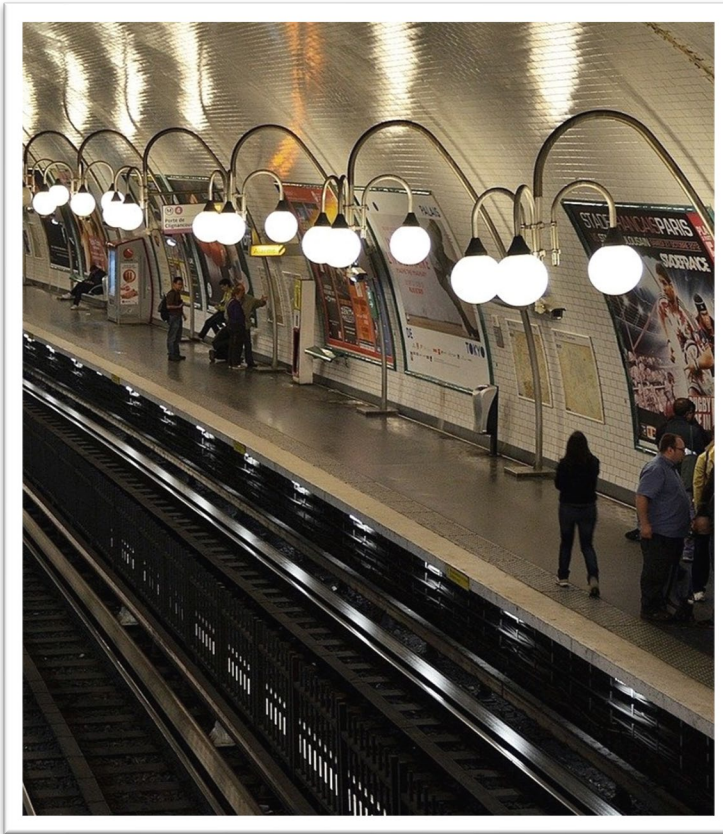
## Example Mitigation:



Increase platform monitoring by assigning personnel, such as station agents or transit police or security officers, to warn individuals to stay back from the platform edge

This mitigation reduces the ***likelihood*** of the potential consequence of the hazard

# Safety Risk Mitigations



## Example:

A rail transit agency determines that the risk associated with falls on an open platform is not adequately mitigated

## Example Mitigation:

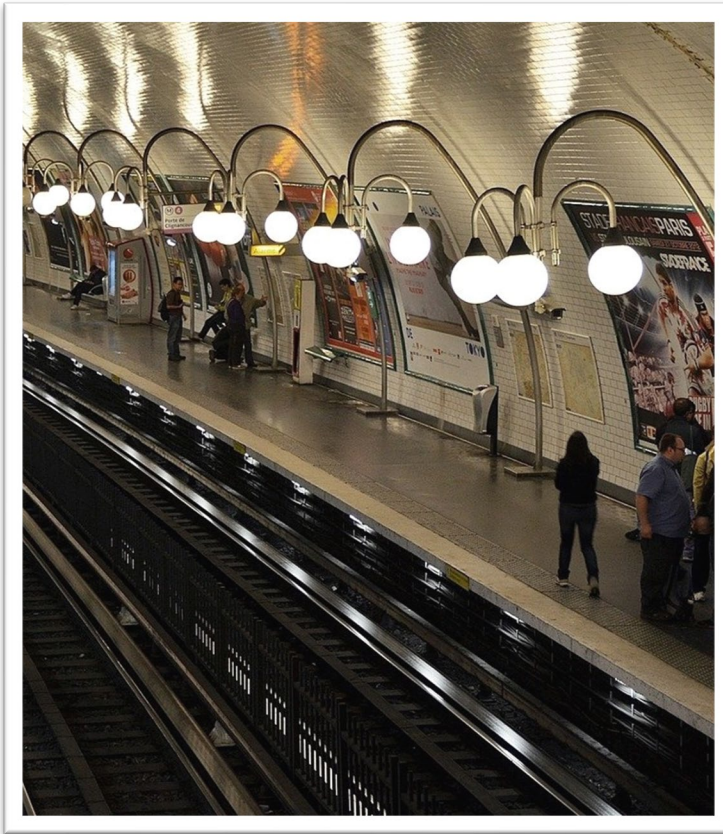


Install sensors that feed into the Operations Control Center to alert controllers to stop trains on approach to the station when someone has fallen on the right-of-way

This mitigation reduces the ***severity*** of the potential consequence of the hazard



# Safety Risk Mitigations



## Example:

A rail transit agency determines that the risk associated with falls on an open platform is not adequately mitigated

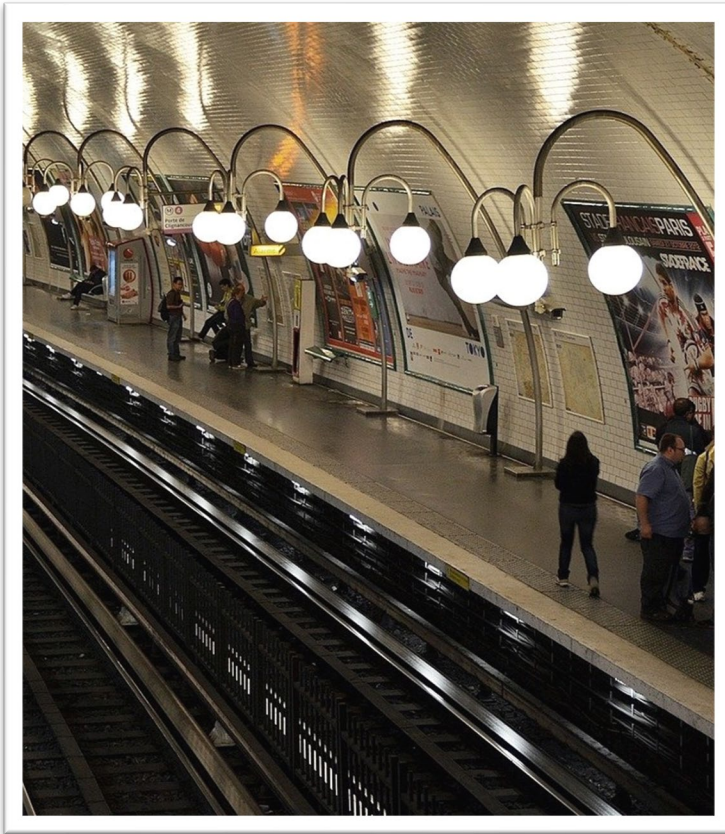
## Example Mitigation:



Install platform screens that prevent passengers from falling to the right-way when the screens are closed

This mitigation reduces both the ***likelihood*** and the ***severity*** of the potential consequence of the hazard

# Safety Risk Mitigations



Reduce *likelihood*

Reduce *severity*

Reduce *likelihood* and *severity*

Eliminate *risk*

# Developing Safety Risk Mitigations

When deciding on a safety risk mitigation

- An agency may not be able to make a consequence less likely, but they may be able to make it less severe
- An agency may only be able to reduce the likelihood of the consequence

Deciding on a mitigation may come down to a practical decision

- Is it more practical/cost effective to reduce the likelihood or the severity?

What will our safety risk mitigation achieve?

Reduce ***likelihood***

Reduce ***severity***

Reduce ***likelihood*** and ***severity***

Eliminate ***risk***



# Developing Safety Risk Mitigations

One mitigation may impact the safety risk associated with another hazard

- A mitigation may increase the safety risk associated with another hazard

What will our safety risk mitigation achieve?

Reduce ***likelihood***

Reduce ***severity***

Reduce ***likelihood*** and ***severity***

Eliminate ***risk***





# Developing Safety Risk Mitigations



## Example:

Reducing maximum authorized speeds when approaching intersection

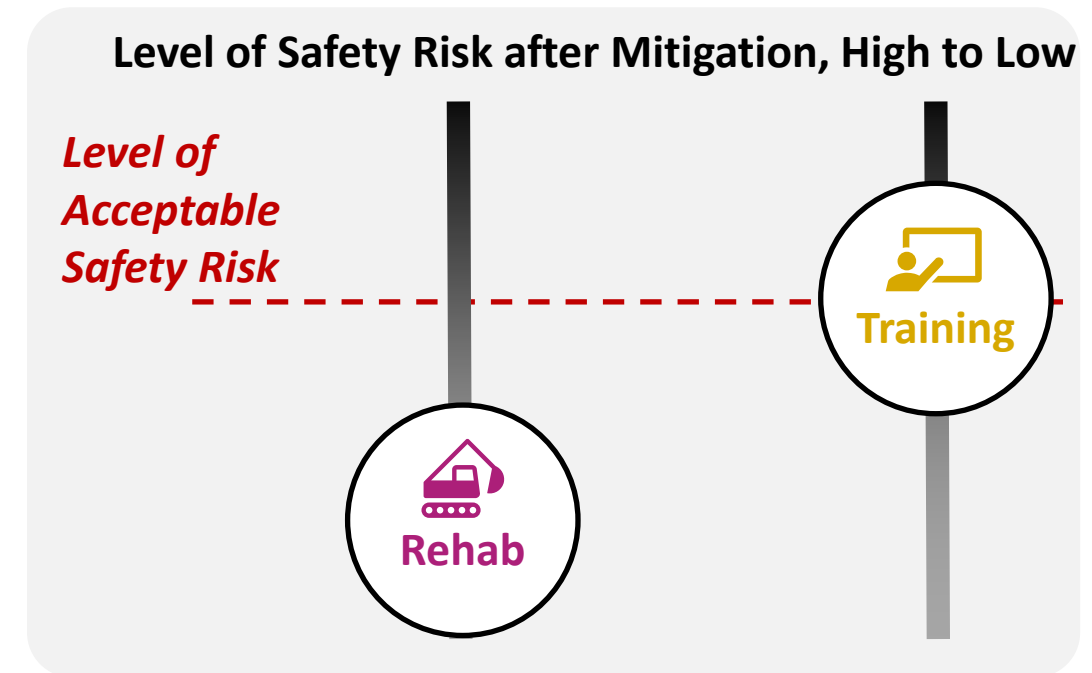
- Provides operators more time to visually assess the road and to identify and react to potential situations, potentially reducing the likelihood of a collision with a pedestrian or bicyclist
- However, slowing transit service also may lead to crowding on transit vehicles that increases the potential for passenger boarding and alighting injuries

# Deciding on a Safety Risk Mitigation

## Some Safety Risk Mitigations may be more effective than others

When deciding on a mitigation strategy, consider whether the mitigation will lower the safety risk to a level acceptable by the agency

- For example, a “hard” mitigation, such as rehabilitating a station to eliminate a sightline obstruction may be more effective than training operators to approach at a low speed

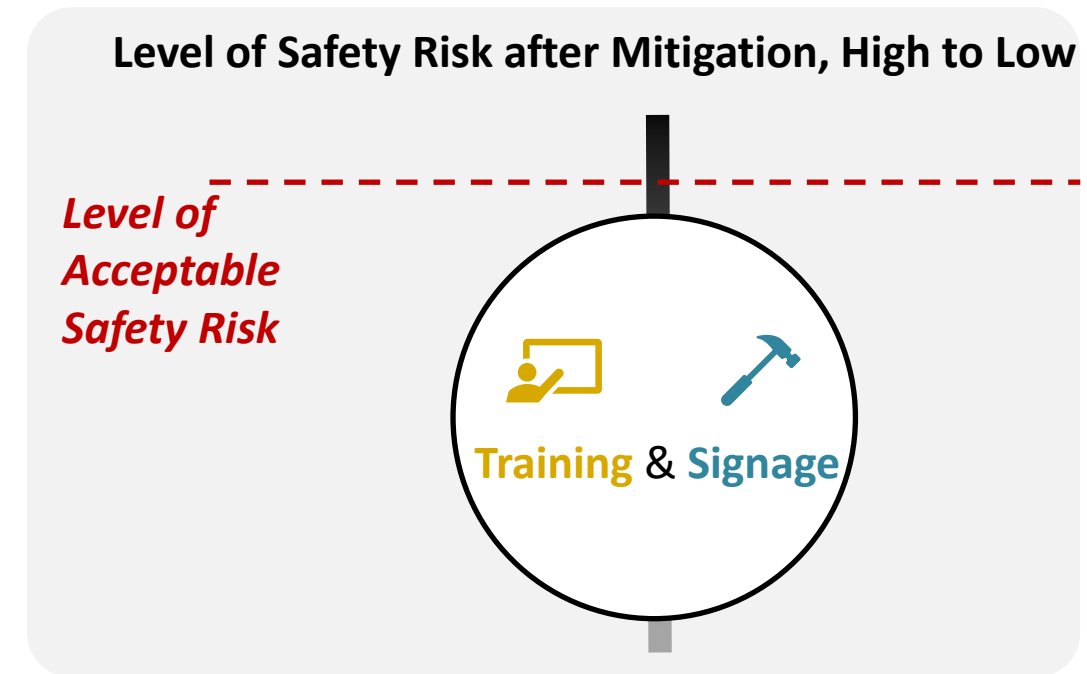


# Deciding on a Safety Risk Mitigation

## Some Safety Risk Mitigations may be more effective than others

When deciding on a mitigation strategy, consider whether the mitigation will lower the safety risk to a level acceptable by the agency

- In some cases, multiple mitigations may be applied to lower the level of safety risk to a level acceptable by the transit agency
- For example, a combination of operator training and signs warning pedestrians of limited sightlines



# Subject Matter Expertise

Subject matter experts can help agencies identify effective safety risk mitigations

- Leverage experience in identifying potential mitigations
- Provide valuable insight and ensure that your proposed mitigation does not unintentionally create new hazards or worsen existing hazards





# Audience Poll



Which, if any, of the below does your agency use to identify safety risk mitigations? *Select all that apply.*

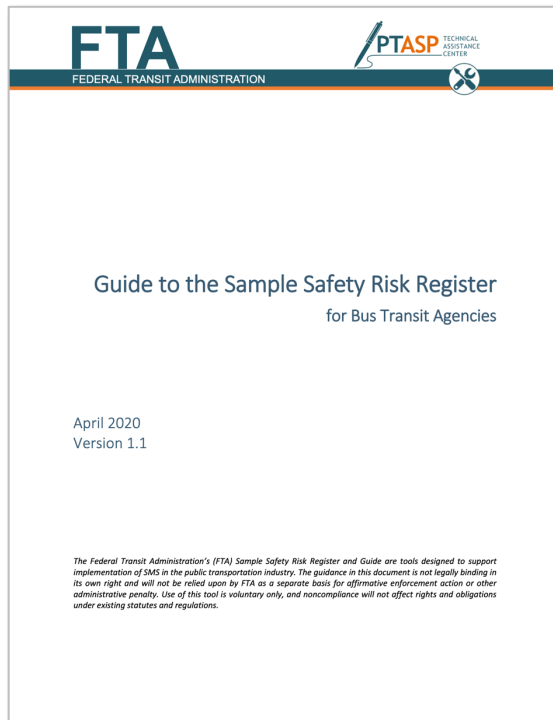
- 36%** Safety Department
- 27%** Operations Subject Matter Experts
- 21%** Research into industry practices
- 16%** External Subject Matter Experts

# Documenting Mitigations



# How do I document mitigations?

- FTA does not specify how agencies must document their mitigations
- What documentation looks like is up to each agency



The screenshot shows a Google Sheet titled "sample-safety-risk-register-bus-transit-agencies\_v1-1". The spreadsheet is titled "Sample Safety Risk Mitigation Register" and is organized into columns for Potential Consequence(s), Safety Performance Monitoring (SPI Value, Safety Performance Target), and Timeframe and Mitigation(s) to be Implemented. The table contains three rows of data, with the first two rows having multiple rows of mitigation actions listed in the final column.

Potential Consequence(s)	Safety Performance Indicator (SPI)	SPI Value	Safety Performance Target	Timeframe	Mitigation(s)
Bus falling into pit resulting in worker fatality.	Bus alignment over pit.	[Number] events of bus misalignment over pit per [time unit].	Reduce the number events of bus misalignment over pit per [time unit] by [%] by [date].	180 days	1. Revised SOP and Rulebook to require watch and signal for bus placement.
				180 days	2. Establish speed restrictions moving over pits.
				180 days	3. Stripe lines around pits with high visibility.
				180 days	4. Revise SOPs to ensure pit is not occupied by bus movements over pit.
Car turning right in front and colliding with the bus as the bus pulls out of the stop.	Bus pulling of the stop while a car turns in front.	[Number] events of bus pulling of the stop while a car turns in front per [time unit].	Reduce the number events of bus pulling of the stop while a car turn in front per [time unit] by [%] by [date].	120 days	1. Issue alert bulletin to Blue Line operators.
				120 days	2. Install an alerting signal at the bus stop.
Inspection panels in XYZ model buses difficult to access by maintenance personnel.	N/A	N/A	N/A	N/A	N/A

*FTA's Sample Safety Risk Register*

# How do I document mitigations?

## *Items to consider documenting:*

### Hazard and Potential Consequence(s)

- Hazard
- Hazard Type
- Identification Date
- Potential Consequence
- Existing Mitigations

### Safety Risk Rating

- Safety Risk Rating before mitigation
- Revised Safety Risk Rating (following mitigation)

### Implementation

- Implementation lead
- Department responsible
- Implementation timeframe/schedule

### Safety Performance Monitoring

- Measures to determine whether the mitigation is effective, implemented as intended, and appropriate



# Guest Speaker





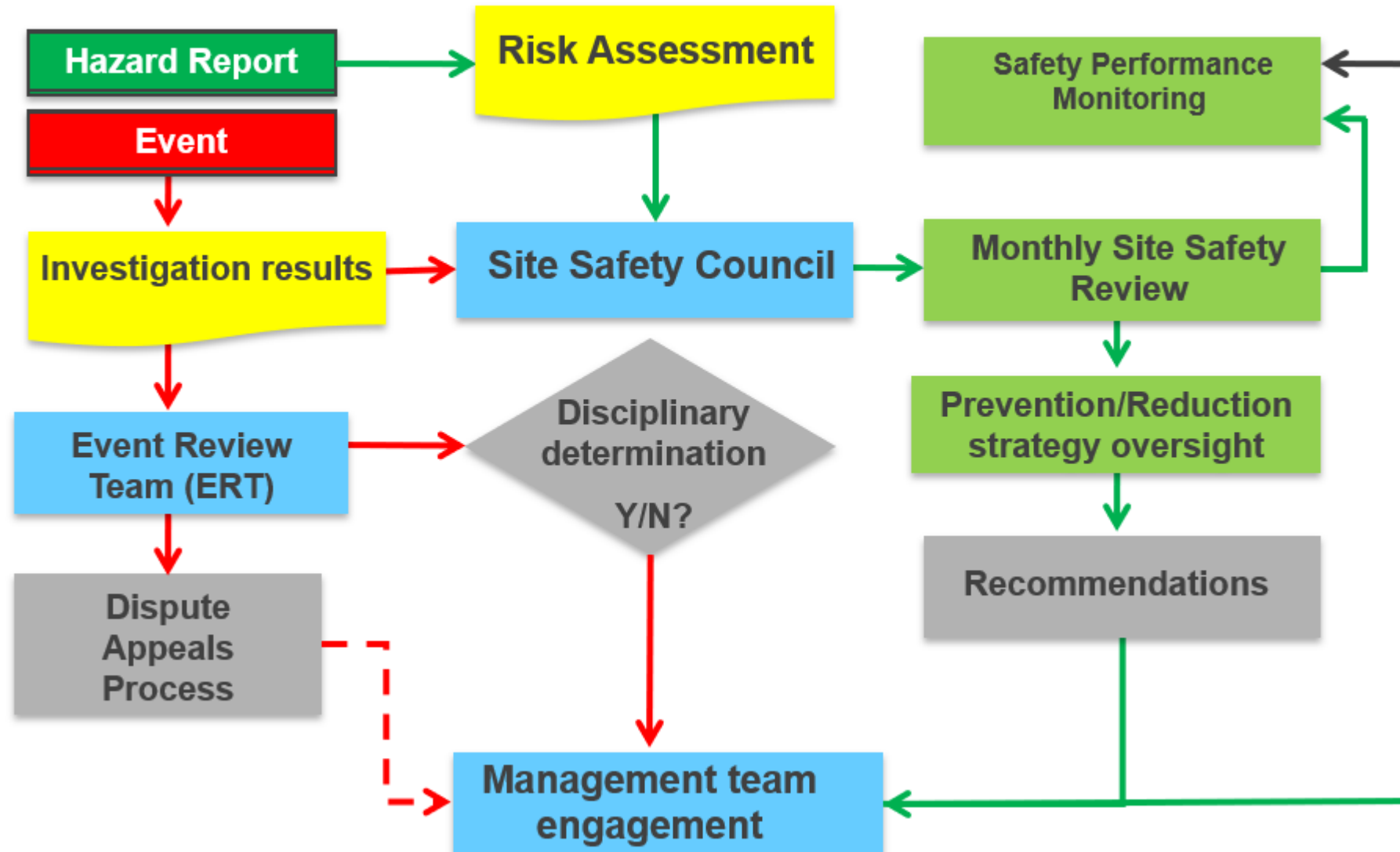
**Serena Stevenson**  
General Manager  
Waco Area Transit

# Characteristics and Service



- Waco Transit System is a small urban provider that operates motor bus and demand response. We operate nine Fixed Routes, two Downtown Waco Shuttles, complementary Paratransit and Evening Link services, Monday-Saturday.
- Waco Transit System operates seven shuttles for the BUS-Baylor University Service, Monday-Friday, and two of those shuttles run on Saturday and Sunday as well.
- Waco Transit System maintains its on vehicles.
- Waco Transit System's downtown transfer center, is an intermodal facility, and is under lease by FlixBus/Greyhound for inter-city bus service.
- Waco Transit System contracts (5310) purchase of service.
- Waco Transit System provides (5311) Rural services under an interlocal agreement between the City of Waco and McLennan County.

# Waco Transit System PROCESS





# Waco Transit System FY 2022 Year To Date Safety Data and Trends

FY22 ZONE GOAL

Targets	Waco FY22 - YTD as of March	MWA <input checked="" type="checkbox"/> select			YTD	FY21		FY22 Zone Goal				FY22		AFR/IFR	FY22 ZONE	Target Status	FY21	ZONE RATING	Improve By	FY22 GOAL
		Fixed	Para	Rail		AFR/IFR	ZONE		Fixed	Para	Rail	YTD	(+/-)							
1	Total Collision	19	15	0	34	1.83	1	1	10	13	0	23	(17)	0.00	0	On ZONE	0	Excellance	Flat	0
2	Passenger Injuries	7	4	0	11	0.38	0	0	0	0	0	0	0	0.00	0	On ZONE	1	Zone 1		1
3	Employee Injuries	5	9	0	14	14.23	6	4	1	1	0	2	0	0.00	0	On ZONE	2	Zone 2	1	1
4	Lost Time Injuries	3	7	0	10	10.17	6	4	1	1	0	2	(0)	0.00	0	On ZONE	3	Zone 3	1	2
	PrevCollisions	13	9	0	22	1.18	0	0	6	3	0	9	(5)	0.00	0	On ZONE	4	Zone 4	1	3
	Pedestrian / Bike Strike	0	1	0	1	0.05	0	0	0	0	0	0	0	0.00	0	On ZONE	5	Zone 5	1	4
																	6	Beyond Tolerance	2	4

YTD SAFETY TRENDS		Waco			
COLLISION CAUSES		2021	%	2022	%
Improper Backing		3	13%	3	23%
Hit Fixed Object		6	25%	4	31%
Hit Parked Vehicle		3	13%	3	23%
Intersection		1	4%	0	0%
Read End		2	8%	0	0%
Pedestrian/Cyclist		1	4%	0	0%
Sideswipe		3	13%	1	8%
Improper Turning		2	8%	0	0%
All Other		3	13%	2	15%
		24	100%	13	100%

YTD SAFETY TRENDS		PrevCollisions			
INJURY CAUSES		2021	%	2022	%
Slip, Trip, Fall		3	21%	1	50%
Improper lifting		0	0%	0	0%
Push, Pull, Twist		0	0%	0	0%
Collision		1	7%	1	50%
Cut/laceration/puncture		1	7%	0	0%
Occupational injury		0	0%	0	0%
Assault		0	0%	0	0%
All Other		9	64%	0	0%
		14	100%	2	100%



# Audience Poll



**How does your agency document your mitigations? *Select all that apply.***

- 38%** Other
- 36%** Excel or other data processor
- 14%** Safety Risk Register
- 12%** Specialized software

# Mitigation Monitoring Methods



# Monitoring Mitigations



Under **Safety Assurance (SA)**, transit agencies are required to monitor operations to identify safety risk mitigations that may be:

- Ineffective
- Inappropriate
- Not implemented as intended

# Monitoring Mitigations

One way transit agencies could monitor safety risk mitigations is to establish safety performance indicators (SPIs) and safety performance targets (SPTs) for the mitigation

- Define the data you will watch to in order to know if a mitigation is working



An ***SPI*** is a signal or early warning sign that measures inputs, outputs, outcomes, or impacts of a particular process or activity

***Number of passenger injuries from slip/fall events on vehicles per vehicle revenue mile***

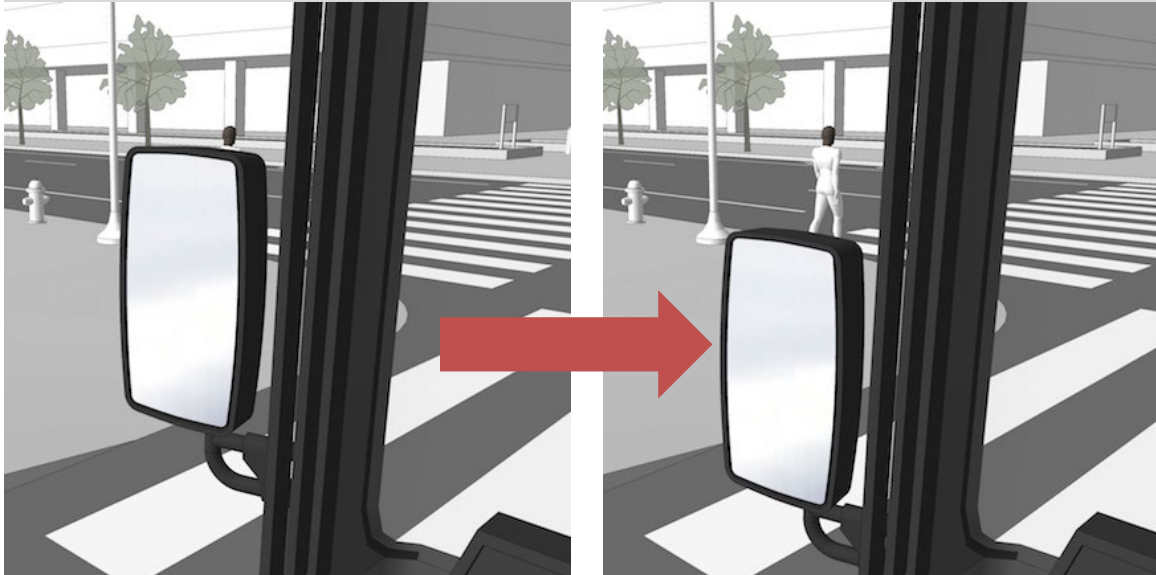


***SPTs*** apply quantitative thresholds to draw conclusions from observed changes in an SPI over a specific timeframe compared to the expected change

***Reduce the number of passenger injuries from slip/fall events on vehicles per vehicle revenue mile by 10% over the next 12 months***

# Monitoring Mitigations

**Safety risk mitigation: bus mirror is moved to reduce visual obstruction**



Mirror obstructs the operator's view of pedestrians during left-hand turns

Mirror placement reduces obstruction of the operator's view during left-hand turns

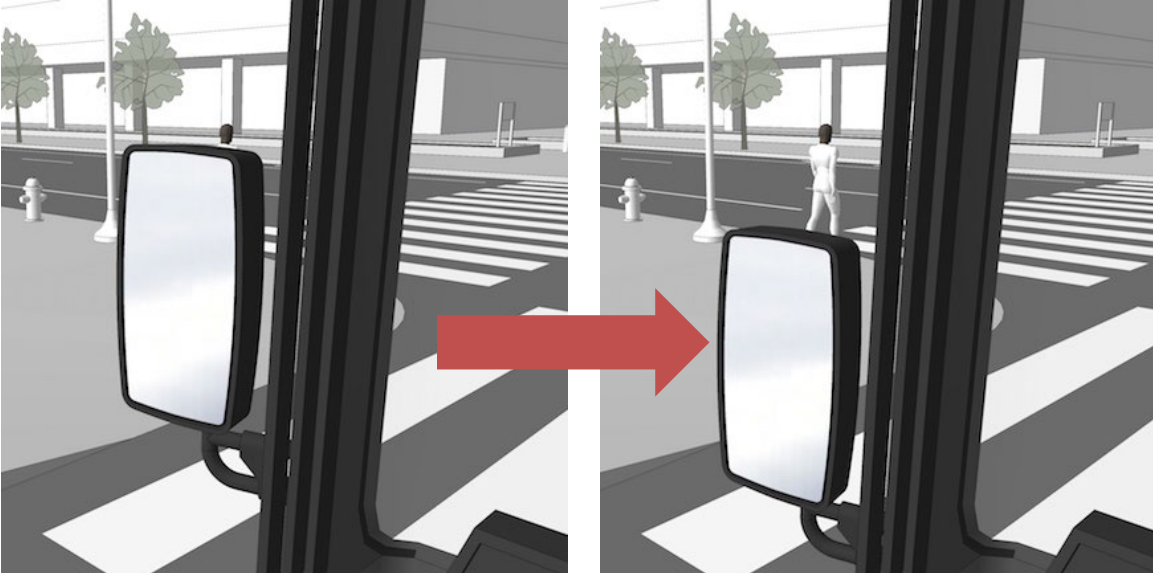
## Example SPIs and SPTs:

### Effectiveness

- SPI: Number of collisions with pedestrians during left-hand turns
- SPT: Zero collisions with pedestrians during left-hand turns over the next six months

# Monitoring Mitigations

**Safety risk mitigation: bus mirror is moved to reduce visual obstruction**



Mirror obstructs the operator's view of pedestrians during left-hand turns

Mirror placement reduces obstruction of the operator's view during left-hand turns

## Example SPIs and SPTs:

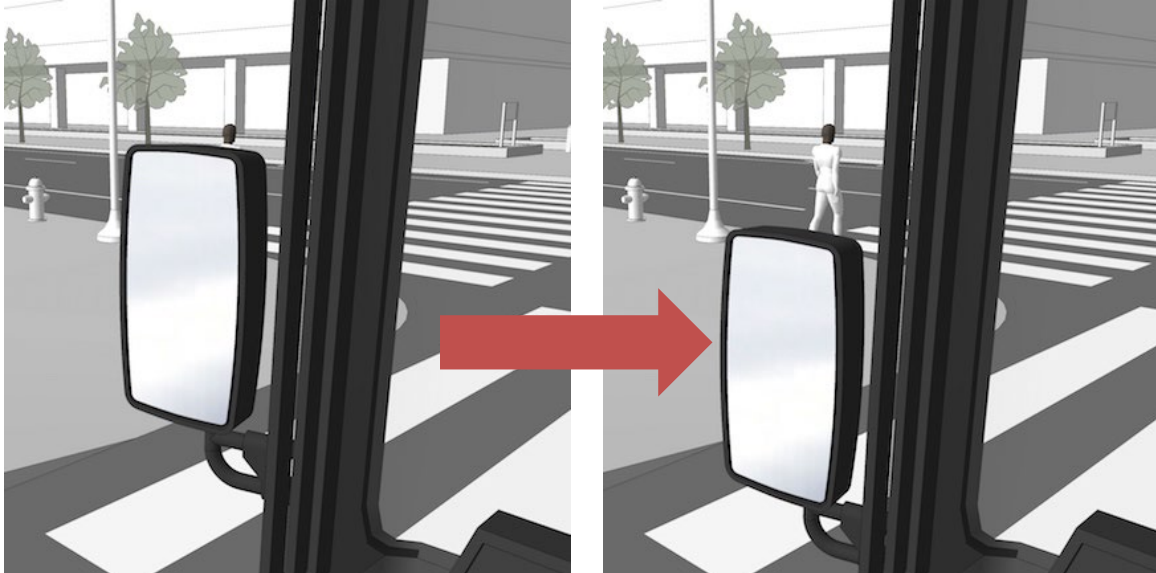
### Implementation

- SPI: Percentage of mirrors adjusted
- SPT: 100-percent implementation 30-days after issuing maintenance instruction



# Monitoring Mitigations

**Safety risk mitigation: bus mirror is moved to reduce visual obstruction**



Mirror obstructs the operator's view of pedestrians during left-hand turns

Mirror placement reduces obstruction of the operator's view during left-hand turns

## Example SPIs and SPTs:

### Effectiveness

- SPI: Number of operator reports about mirrors blocking line-of-sight
- SPT: Reduction of over 75% of reports over the next six months



# Mitigation Monitoring Plan

## Mitigation Description

Move bus mirrors to reduce visual obstruction

## Implementation Roles and Responsibilities

Maintenance Department; Susan Smith

## Defined SPIs and SPTs

- Effectiveness: Zero collisions with pedestrians during left-hand turns over the next six months;
- Implementation: 100% implementation by 30 days after issuing maintenance instruction

## Implementation Timeframes

Completion within 30 days of maintenance instruction

## How agency will report on safety performance

Monthly report provided by the safety department to the safety committee



# Guest Speaker





**Seth Page**  
Safety Manager  
Greater Portland Metro

# Related Resources

- Today's webinar focused on topics in Safety Risk Management (SRM), and Safety Assurance (SA)
- Log onto FTA's PTASP TAC Resource Library for more webinars, tools, and fact sheets related to SRM and SA

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**Contact [FTA-IIJA@dot.gov](mailto:FTA-IIJA@dot.gov) with your questions related to the  
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# PTASP Technical Assistance Center

Welcome to the Public Transportation Agency Safety Plan (PTASP) Technical Assistance Center (TAC). We are here to help you meet PTASP regulation requirements.

For information on Bipartisan Infrastructure Law safety requirements, see [FTA's web page](#) or email [IIJA@dot.gov](mailto:IIJA@dot.gov).

## PTASP Resource Library

Choose your agency type to begin



Small Bus  
Transit Provider



Bus Transit  
Provider



Rail Transit  
Provider



State Department  
of Transportation



State Safety  
Oversight Agency



Metropolitan  
Planning Organization

<https://www.transit.dot.gov/PTASP-TAC>





## Bus Transit Providers

FTA developed a host of materials to help large bus transit providers develop Agency Safety Plans.

- [Applicability](#)
- [Plan Development](#)
- [Certification](#)
- [Safety Performance Targets](#)
- [Safety Management Policy](#)
- [Safety Risk Management](#)
- [Safety Assurance](#)
- [Safety Promotion](#)
- [Implementation](#)
- [SMS Records and Documentation](#)
- [Annual ASP Review](#)

<https://www.transit.dot.gov/PTASP-TAC>





## Safety Risk Management

### Fact Sheets

- [Guide to Developing the Safety Risk Management Component of a Public Transportation Agency Safety Plan](#)
- [Addressing Operator Assault through a Safety Management System](#)

### Guidance

- [Sample Hazard Classification System](#)
- [Hazard Management vs. Safety Risk Management Guide](#)
- [Potential Sources of Hazard Information for Bus Transit Operations](#)

### Tools

- [Sample Safety Risk Assessment Matrices for Bus Transit Agencies](#)
- [Guide to the Sample Safety Risk Register for Bus Transit Agencies](#)
  - [Sample Safety Risk Register for Bus Transit Agencies](#)

### Training

- [PTASP Hazards and Consequences Self Guided Learning Tool](#)

### Webinars

- Safety Risk Assessment in Practice: April 27, 2022  
[Webinar Presentation](#) | [Webinar Recording](#) 
- Implementing Safety Risk Assessment Approaches: Thursday, June 30, 2021  
◦ [Webinar Presentation](#)

<https://www.transit.dot.gov/PTASP-TAC>







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- [SMS Records and Documentation](#)
- [Annual ASP Review](#)

<https://www.transit.dot.gov/PTASP-TAC>



## Safety Assurance


### Fact Sheets

- [SMS Techniques for Monitoring Operations and Maintenance Procedures](#)
- [Guide to Developing the Safety Assurance Component of a Public Transportation Agency Safety Plan](#)
- [Monitoring Compliance and Sufficiency of Operations and Maintenance Procedures](#)
- [Lessons Learned from Voluntary Agency Safety Plan Reviews \(Part 2\)](#)

### Guidance

- [Introduction to Safety Performance Indicators and Targets](#)

### Webinars

- SMS Techniques for Monitoring Operations and Maintenance Procedures: February 24, 2022
  - [Webinar Presentation](#) | [Webinar Recording](#) 
- Safety Event Investigation in an SMS: Wednesday, July 28, 2021
  - [Webinar Presentation](#) | [Webinar Recording](#)
- Safety Assurance: Thursday, July 11, 2019
  - [Webinar Presentation](#) | [Webinar Recording](#) 
- Safety Assurance Agency Safety Plan Section Lessons Learned: Thursday, March 26, 2020
  - [Webinar Presentation](#) | [Webinar Recording](#) 
- Management of Change: Thursday, August 27, 2020
  - [Webinar Presentation](#) | [Webinar Recording](#) 
- Compliance Monitoring Webinar: Wednesday, September 16, 2020

<https://www.transit.dot.gov/PTASP-TAC>

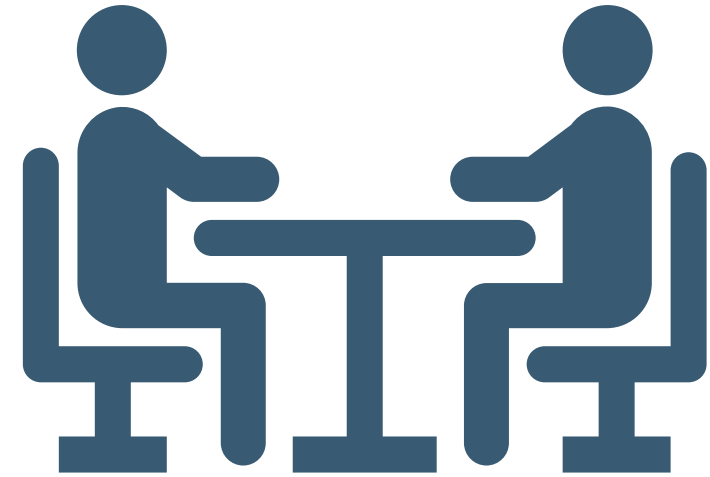


# Technical Assistance

- **TAC Website** [transit.dot.gov/PTASP-TAC](https://transit.dot.gov/PTASP-TAC)
- **FAQs** [transit.dot.gov/PTASP-FAQs](https://transit.dot.gov/PTASP-FAQs)

The TAC help desk is available to assist the transit industry with PTASP questions, including questions about ASP development and implementation:

- **Email** [PTASP-TAC@dot.gov](mailto:PTASP-TAC@dot.gov)



# Questions and Answers

- Question and Answer session on safety risk mitigations
- For information related to the Bipartisan Infrastructure Law
  - Please visit FTA's [Bipartisan Infrastructure Law](#) webpage
  - Review FTA's March 1, 2022 [Bipartisan Infrastructure Law webinar](#)
  - Contact [FTA-IIJA@dot.gov](mailto:FTA-IIJA@dot.gov) with your questions related to the Bipartisan Infrastructure Law







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