

Fehr & Peers

Mitigating Emergency Evacuation Impacts

Exploring Proven and Effective Strategies



Grace Chen | June 30, 2026



Agenda

- 01** Introduction
- 02** Mitigation Strategies
- 03** Quantifying Effectiveness
- 04** Win–Win Scenarios
- 05** Evacuation Checklist

SECTION 01

Introduction

Significant Impact. Now what?

Determining Impact

- The industry has been focusing on how to determine evacuation impact
- It evaluates how a development project would affect evacuation for an existing community



Yes

Significant impact



No

Non-significant impact

Mitigating Evacuation Impact

Mitigation and improvement measures are what *really* improve evacuation flows.

SECTION 02

Mitigation Measures



Strategies to Reduce ETEs

- **Demand-Side:** Timely departures, phases evacuation, triggered evacuations, vehicle reduction
- **Supply-Side:** Shoulder usage, ramp closures, route closures, turn restrictions, signal priorities, manual traffic control, public transit, mode shift, parking restrictions
- **Information-Side:** Hazard detection systems, rapid information delivery, evacuation preparation, route preparation, dynamic route guidance, system monitoring, travel information



How to measure the effectiveness?

How to quantify the effectiveness?



Lack of Real-World Data

Not all events have available data that shows how people evacuated



Context Sensitive

- Every emergency event is unique
- Other factors that are difficult to model (police capacity)



Emerging Topic

Limited studies available

Deep Dive Into Mitigation Strategies



Intersection Control

Balance evacuation movements by reducing conflicts and preserving intersection capacity

Examples: free right lane (above), left turn receiving lane, roundabout with dedicated through lane



Roadway Capacity

Increase evacuation capacity through flexible use of existing infrastructure

Examples: contraflow (above), repurposing shoulders or shared-use paths for evacuation

Deep Dive Into Mitigation Strategies



Image credit: Muharrem Alper

Signal Timing

Respond to the changing evacuation demand using technology and dynamic signal control strategies

Examples: adaptive signal control, pre-developed evacuation signal timing plans



Image credit: NYC.gov

Demand Management

Reduce evacuation demand and prioritize those at greatest risk through coordinated departure strategies

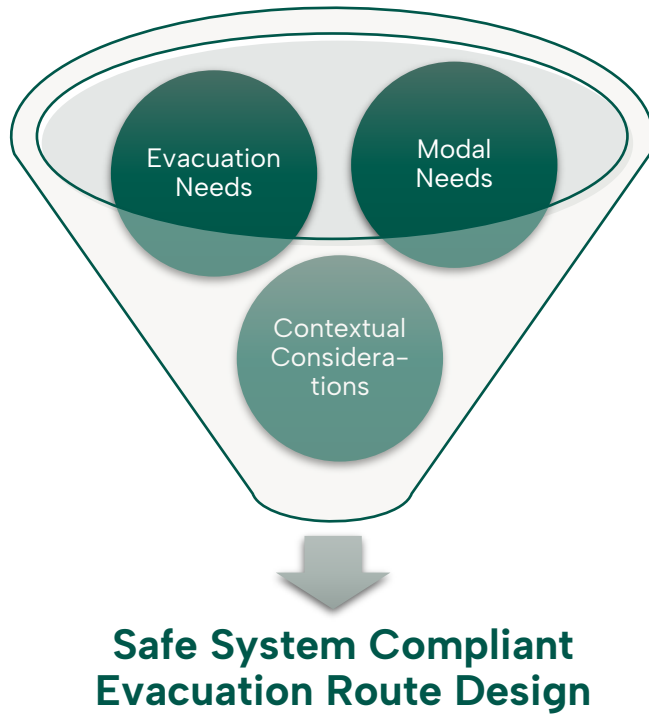
Examples: carpooling programs, phased evacuation by zone (pictured above for NYC)

SECTION 04

Develop Win-Win Strategies

“Win-Win” Strategies

There are co-benefits to certain roadway configuration & transportation system design.

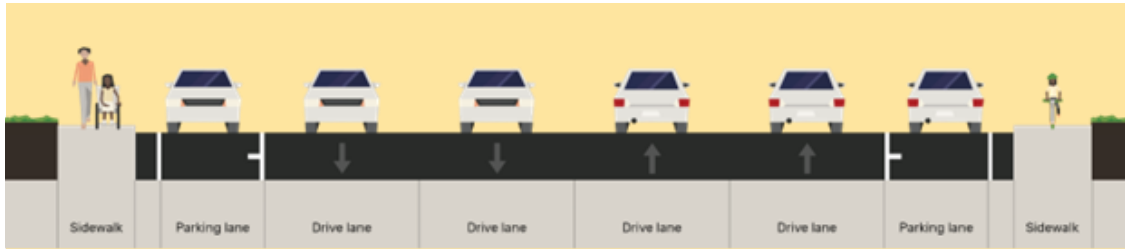


TSMO

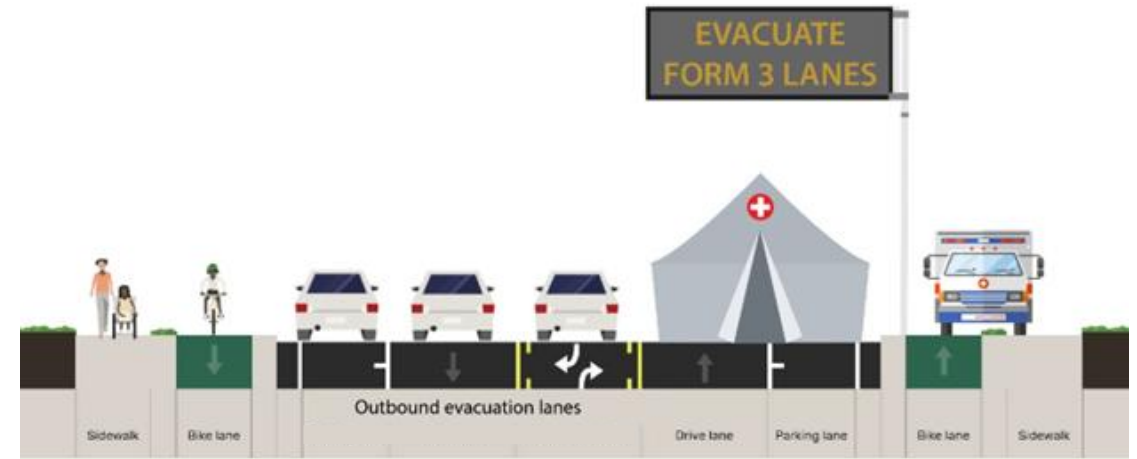
Strategies	→	Multi-Modal Co-Benefits
• Lane management • Operations (ITS, reversible lanes) • Roundabouts • Expanded shoulders • Connectivity improvements		• Enhanced on-street pedestrian & bicycle facilities • New access points for pedestrians & bikes • Redundant network – separation of modes

TSMO: Transportation Systems Management and Operations

“Win-Win” Strategies



Existing
four lane road with on-street parking



Win-Win Reconfiguration
flexible capacity, evacuation conditions



Classic Road Diet
4-to-3 with Class II buffered bike lanes & on-street parking



Win-Win Reconfiguration
flexible capacity, day-to-day use

SECTION 04

Evacuation Checklist

Checklist Analysis Approach



Qualitative Checklist Analysis

- Provide evidence for impact conclusion
- Move on to mitigation strategies faster

QUESTION	YES	NO	REQUIRES FURTHER ANALYSIS
1 Project Characteristics			
Project Location and Density			
Is the project located within a state responsibility area or local responsibility area, and within or near an area designated as a high or very high fire hazard severity zone? ¹ <i>A Yes response alone may constitute sufficient evidence for the lead agency to find a potentially significant impact.</i>	☐	☐	☐
Is the project located in or near any other defined hazard zone (e.g., flood plain, seismic fault zone, liquefaction zone) that could affect existing evacuation routes during a wildfire?	☐	☐	☐
Is the project characterized by low- to intermediate-density uses that are dispersed, which could increase the potential for wildfire to start or spread?	☐	☐	☐

Funding Opportunities for Mitigation

Local Funding Example

Nevada County evacuation route program

FEMA Building Resilient Infrastructure & Communities (BRIC)

Funds large-scale capital improvements that reduce risk from wildfires, floods, or other hazards, including evacuation infrastructure

FHWA PROTECT Resilience Grants (on hold since February)

Funds planning and capital projects that strengthen evacuation routes and transportation infrastructure against climate-driven hazards such as wildfires, flooding, heat, and extreme weather

Other federal funding sources

Favor those with evacuation considerations as part of project purpose and need

Thank you!

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