

An aerial photograph of a city street, likely in San Francisco, showing a grid of buildings and a central street with crosswalks. The image is overlaid with a semi-transparent blue filter. The text is white and positioned in the upper left and lower left areas.

Introduction to SFMTA Autonomous Vehicle Policy Work

Citizens Advisory Council

October 05, 2023

Julia Friedlander

Lamis Ashour

City, State, & Federal AV Roles

City Role:

- **Adopts** traffic regulations, identifies proper use of street lanes & curbs
- **Designs and deploys** traffic control devices
- **Enforces** curb regulations & rules of the road
- **San Francisco:** as an early testing city, share observations with industry, regulators & stakeholders



State Role:

- **DMV:** licensing for human drivers
- **DMV:** issues testing & commercial permits for AVs on public roads
 - w/safety drivers
 - w/o safety drivers
- **CPUC:** issues permits for *carrying passengers* in AVs



Federal Role:

- **NHTSA:** sets minimum safety standards for vehicle features (FMVSS) to limit unreasonable risk and prevent injuries & fatalities
- **NHTSA:** approves exemptions from safety standards
- **NHTSA:** investigates defects & mandates recalls



AV Policy Work to Date

Industry Engagement

- Meetings with operators (esp. Cruise, Waymo, Zoox)
- Industry Workshop
- ITS America Board (SFCTA)

Development of Regulations

- Actively engaged with all levels of government on regulatory processes and policy
- Federal: NHTSA, FHWA, Access Board, TRB
- State: DMV, CPUC

City & County Collaboration

- Coordination w/ first responder agencies
- City department workshop
- Coordination w/ League of Cities, CACTI, NACTO

“SAE Level 4” AV Industry: Vision & Status in SF

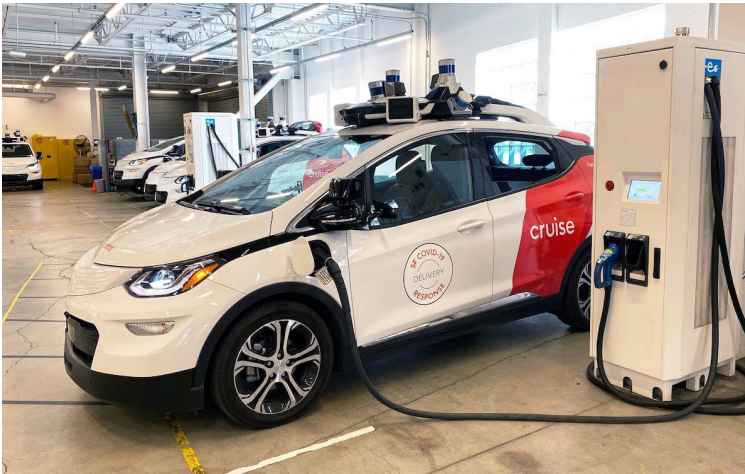
Industry Vision for Automated Driving

Safety:
eliminate
crashes caused
by human
driver error



Expand mobility for
people with
disabilities & others
with few
transportation
options

Reduce
greenhouse gas
emissions

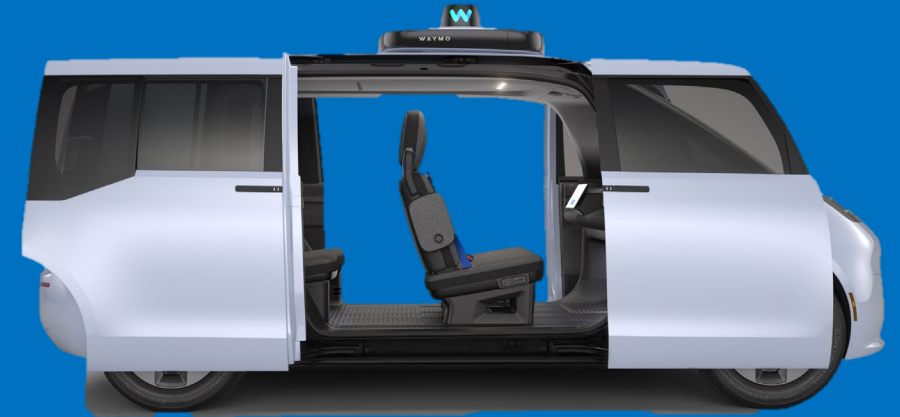


Reduce
congestion

Today



Coming

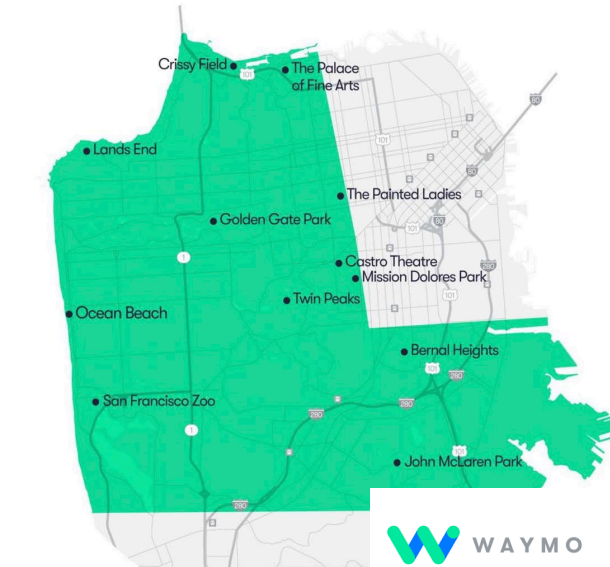


SFMTA

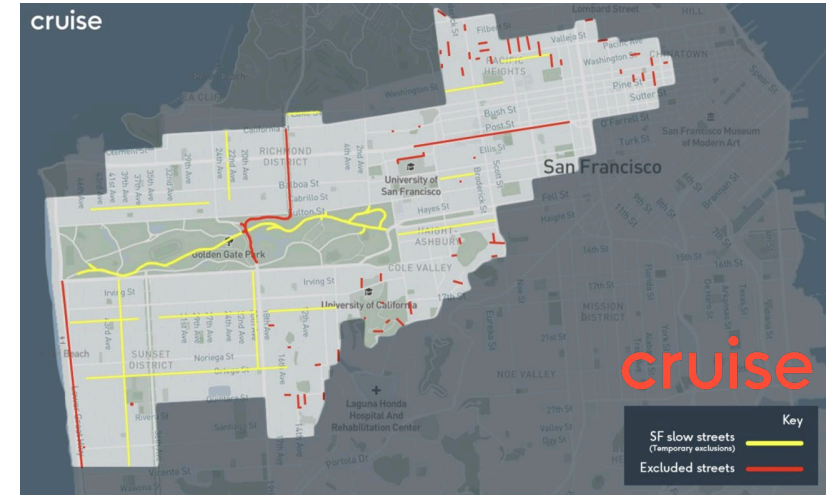
SAE Level 4 Automated Driving in San Francisco



- Testing with safety drivers in vehicle with conventional human controls



- Testing without safety drivers
- **Aug 10 2023:** Received CPUC permit to provide commercial services with no limits on geographic area, hours of service or fleet size



- Testing without safety drivers
- **June 02 2022:** Received a permit to authorize commercial driverless service in limited area from 10 pm to 6 am
- **Aug 10 2023:** Received a similar CPUC permit to WAYMO
- **Aug 18 2023:** DMV asked Cruise to reduce its fleet of driverless taxis by 50% due to recent crashes

San Francisco AV Policy Foundation

Private Emerging Mobility Service Goals

For any new private mobility service, we ask whether it will:

- Allow our streets to move more people and reduce travel time?
- Reduce greenhouse gas emissions (per capita or per person mile traveled)?
- Improve safety of transportation network - especially for vulnerable road users?
- Provide better mobility choices, especially for:
 - People with disabilities?
 - Low income and historically underinvested communities?
- Support economic recovery and resilience?



SAFETY



TRANSIT



SUSTAINABILITY



COLLABORATION



EQUITABLE
ACCESS



LABOR



CONGESTION



FINANCIAL
IMPACT



ACCOUNTABILITY



DISABLED
ACCESS

SF Street Space Geometry Problem



Space for transit riders- pedestrians



Space for cyclists



Space for solo drivers

Will AVs Change Street Space Geometry?



Solo Driver Cars



**TNC Cars
(Uber/Lyft)**



AV Cars??

Learning from TNC History: Claims vs. Research

TNCs Will...	Evidence/Research Results	AV?
Reduce congestion	No. TNC driving caused 51% of increased travel delay in SF 2010-2016	?
Reduce VMT	No. TNC driving caused 47% of increased VMT in SF 2010-2016. 40% of TNC VMT = deadheading (no passenger).	?
Serve 1 st / last-mile	No. ~ 1% of TNC trips in Bay Area in 2018-19 made a transit connection	?
Facilitate car-free lifestyle	No. The # of vehicles/household remained unchanged in SF 2010-2019. A UC Davis 'chauffer study' simulating AV service found 85% increase in user VMT	?
Carry more passengers	No. TNCs have the same average occupancy as trips made in private vehicles.	?
Expand mobility for non-drivers	Limited. Less than 1% of TNC trips in Bay Area are made by people > 75 years. Wheelchair accessible trips required litigation & legislative mandate after years of advocacy.	?

AV Operations & Street Safety

All Streets are Not Equally Challenging

- GM: When comparing San Francisco to Phoenix: *“Our San Francisco vehicles predict an average of 32 times as many possible interactions as those in Phoenix.”*
- GM: *“San Francisco challenges our self-driving system more because, as the number of objects increase, there are exponentially more possible interactions with objects that the self-driving system must consider.”*

Maneuver / Scenario	San Francisco	Phoenix Suburbs	Ratio
Left turn	1462	919	1.6:1
Lane change	772	143	5.4:1
Construction blocking lane	184	10	19.1:1
Pass using opposing lane	422	17	24.3:1
Construction navigation	152	4	39.4:1
Emergency vehicle	270	6	46.6:1

Per 1,000 miles of autonomous driving

AV Safety Optimism

Positive driving practices observed:

- Apparent compliance with posted speed limits
- Attention to details like stopping before limit lines

But actual *measured* safety performance is still uncertain:

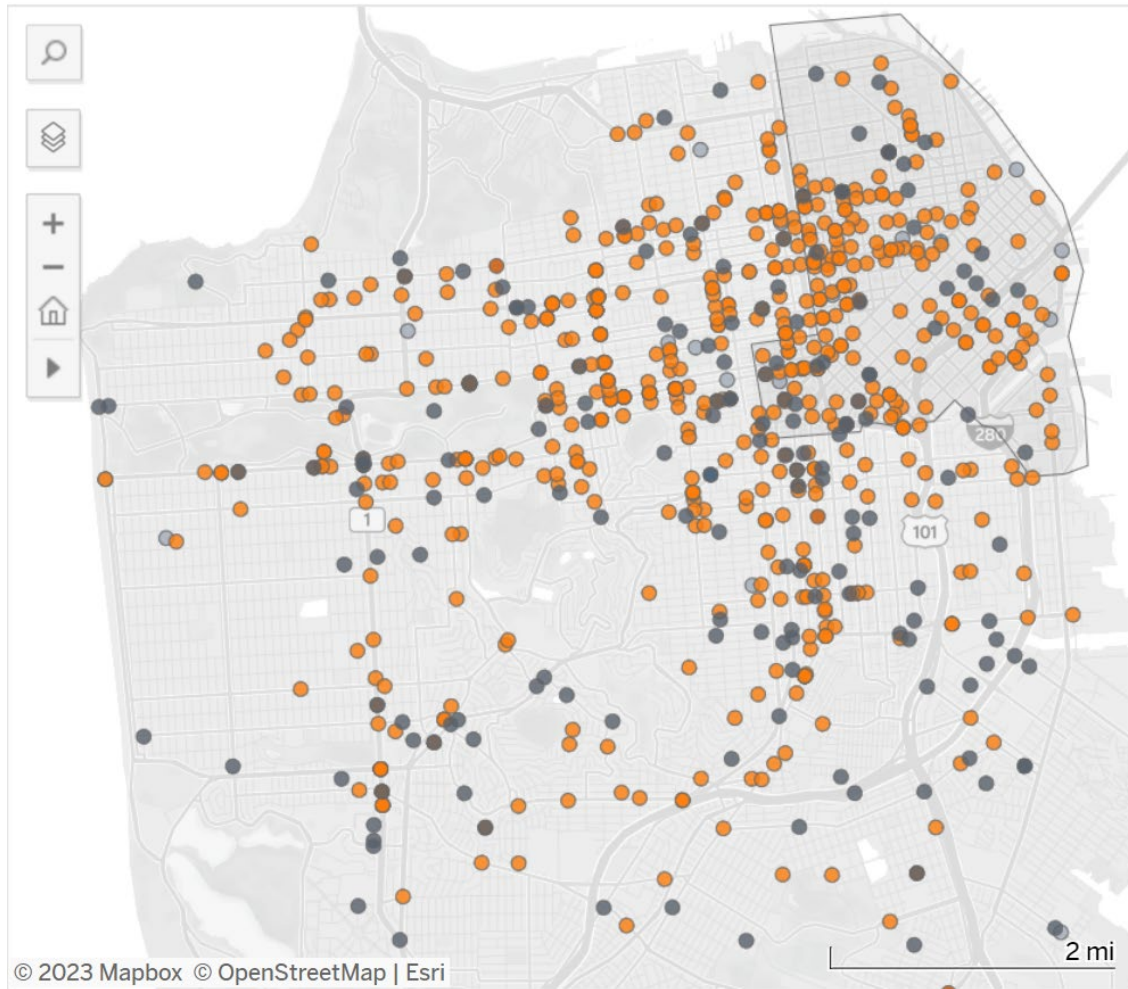
- No industry regulator consensus on how to validate AV driving competency
- No state or federal minimum safety performance standards
- No monitoring of compliance with rules of the road (& some clear violations)
- Complaints of erratic driving & failure to yield right of way to pedestrians
- Planned & unplanned stops that create hazards & violate Rules of the Road
- AV miles driven too few to effectively compare to human crash rates

Measuring Safety Impact of Driverless AVs

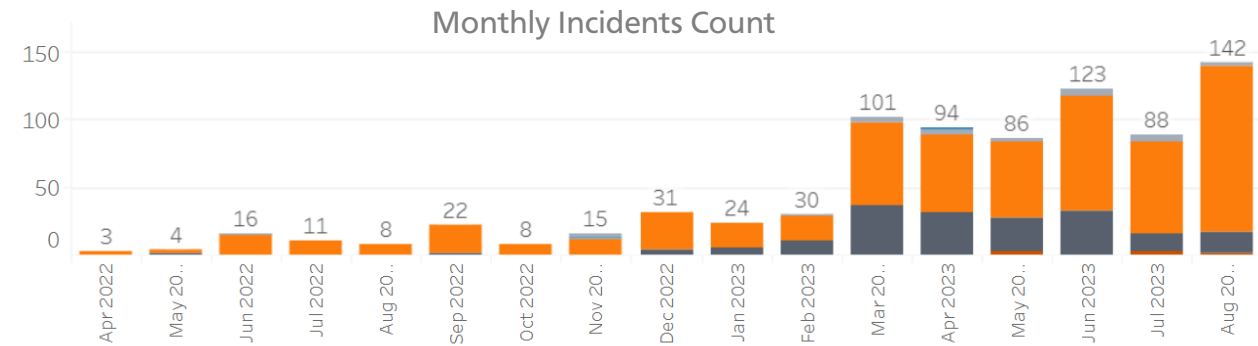
- Primary indicator for Vision Zero: serious injury & fatality crashes
- Crashes = “lagging Indicator”
- Safe Systems approach to driverless AV assessment calls for additional “leading indicators”



Reported Incidents: Leading Indicators?



April 01, 2022 – August 31, 2022



Incident Types:

- Unplanned stops in travel lanes
- Hazardous stops for passenger pick up or drop off
- Interference with emergency response/street work
- Slow response to human traffic control direction
- Erratic driving

Report Sources: Public calls to 911 , City staff reports, Media & social media

Low Impact Events are Relevant as Possible Leading Indicators

AV Low Damage Crash



AV v. Transit Near Miss



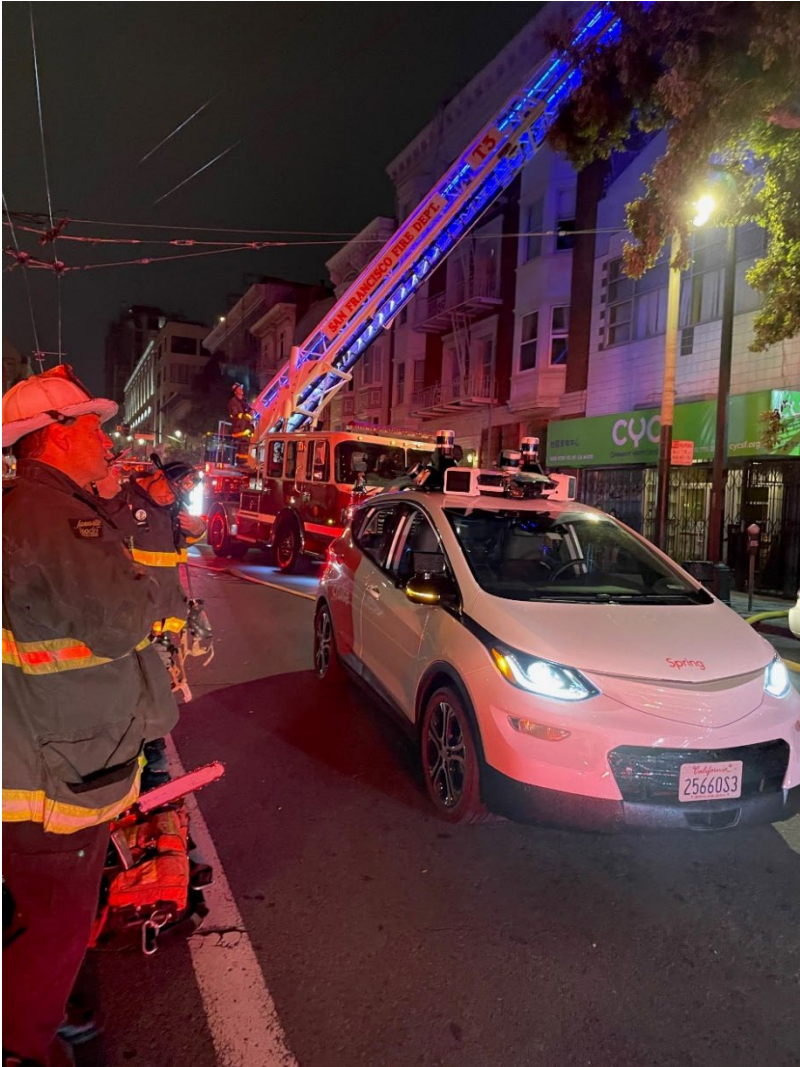
Intrusion Events



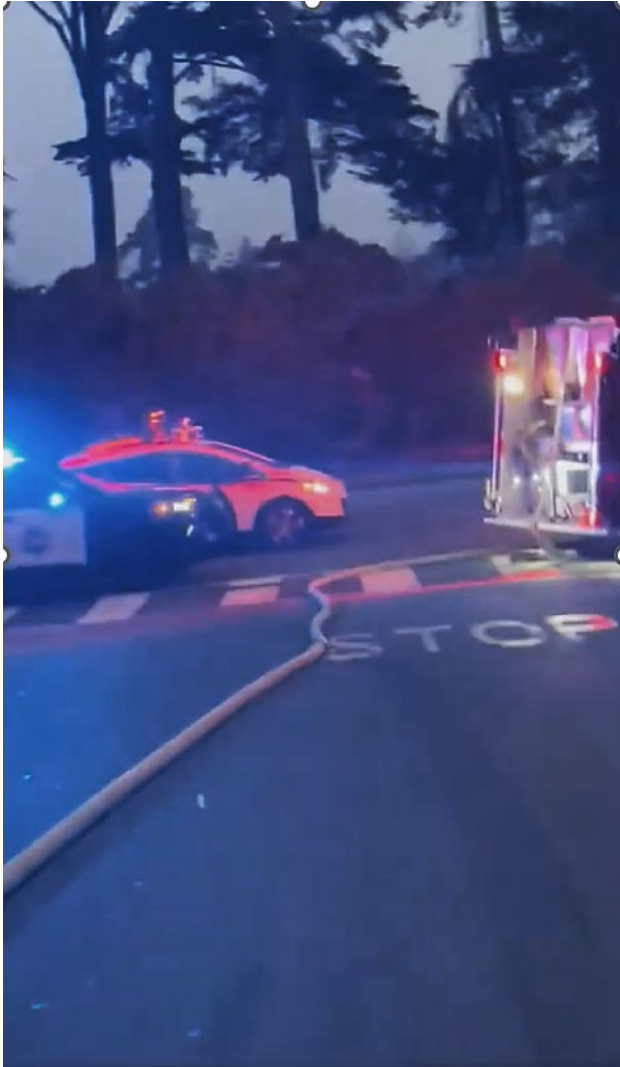
Obstructions Affecting SFFD Response



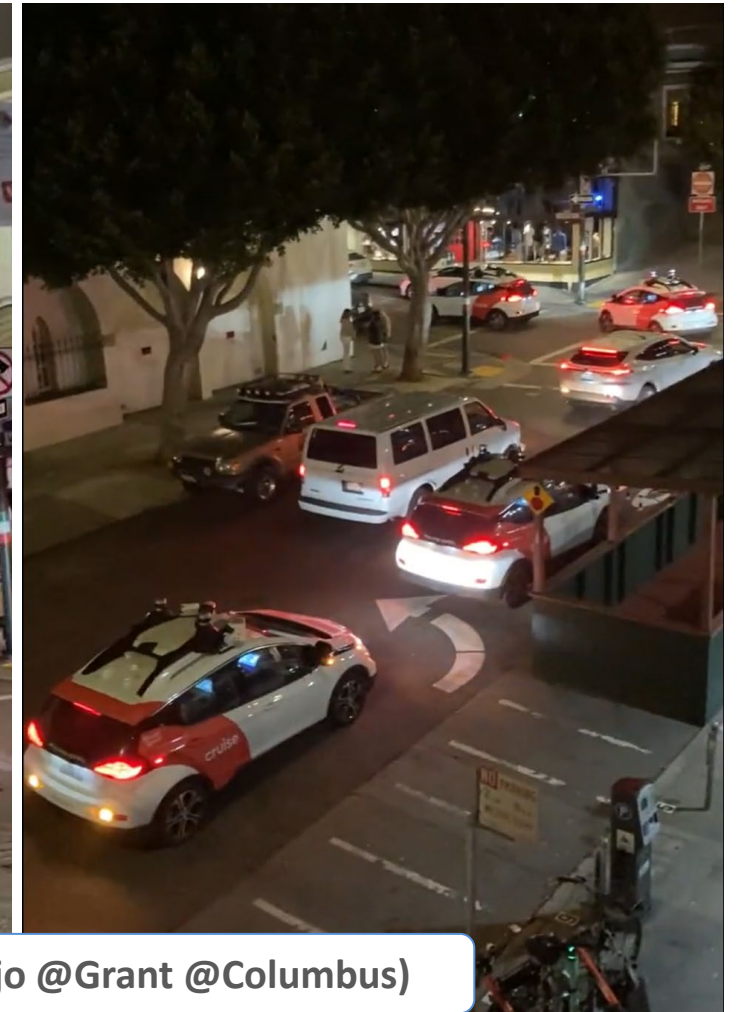
Intrusions affecting SFFD use of essential equipment



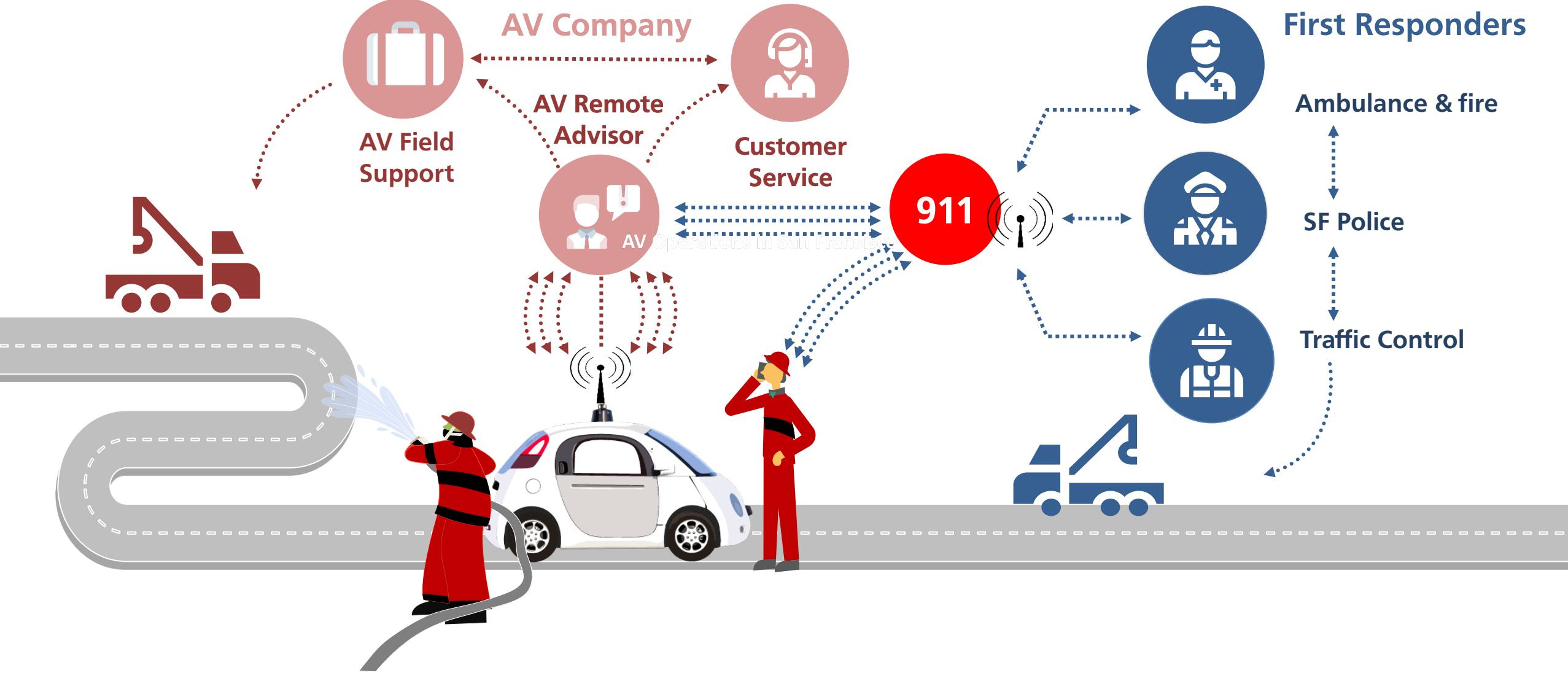
Obstruction at perimeter



Interference with routine emergency response & multi-AV outages raise disaster resiliency concerns



Human eye contact, simple gestures & on-site conversation are much faster than AV substitutes

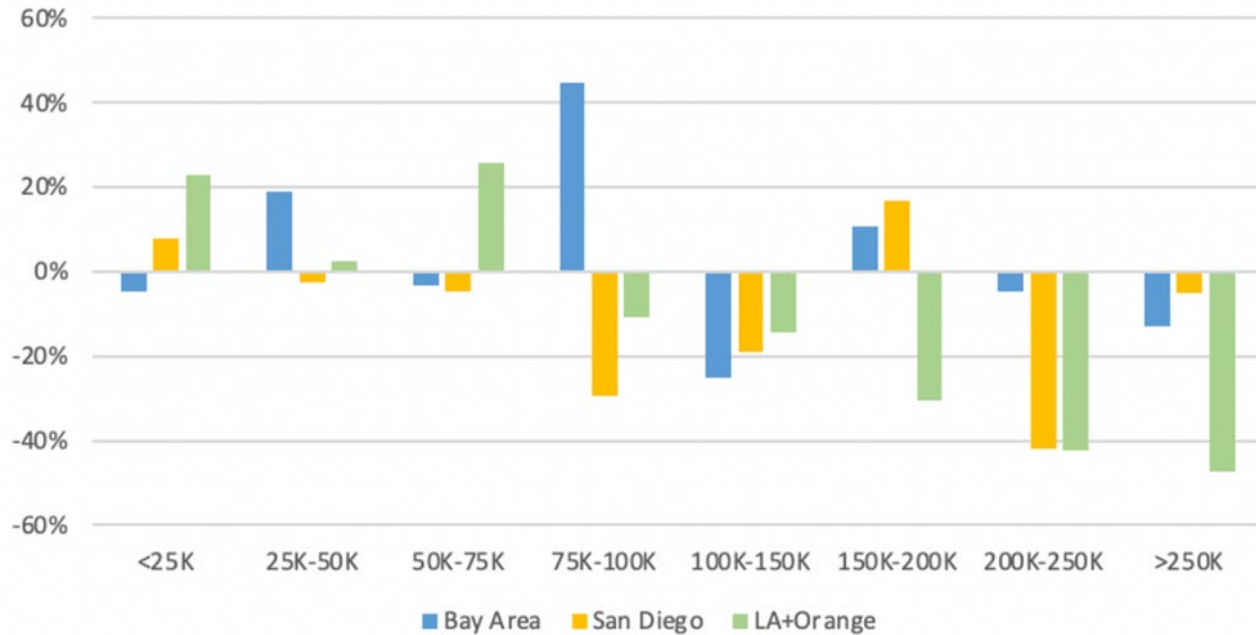


AV Operations & Equity – Disability Access



AV Operations: Equitable Access & Impacts?

TNC Wait Times Relative to Regional Average
by Income



Low-income users wait longer for Uber/Lyft than high income users

AV disruption of transit operations burdens transit-dependent riders



AV Operations: Disability Access & Impacts



- **No operator is currently testing wheelchair accessible AVs in SF**
- **Is regulation needed to prevent race to the bottom where new inaccessible services compete against legacy accessible services?**

San Francisco Conclusions and Policy Advocacy

Data reporting and public transparency is critical to evaluation of whether AV driving performance can achieve the vision without negative unintended consequences.

Data is needed:

- To analyze safety performance
- To analyze network and climate impacts
- To analyze equity access and impacts
- To analyze disability access and impacts

AV Data for Policy & Accountability

Key Points of State & Federal Advocacy

- **Performance:** Permits should be based on performance, not just stated vision, across broad policy goals
- **Incremental Growth:** Growth should be incremental, not exponential, until safe driving competence has been demonstrated
- **Data collection:** Must be expanded to support development of performance standards and permit authorizations
- **Data transparency:** Data documenting performance should be available for public analysis – with protections for personal privacy & trade secrets – and should be used to inform permit decisions
- **Collaboration not Preemption:** Federal, state and local agencies should collaborate across different areas of expertise

Thank you