2023 Arterial Management Survey Instrument

Welcome to the Arterial Management Survey!

Before you get started, please review the following definitions:

Intelligent Transportation Systems (ITS) encompass the electronic, communication, and information processing technologies that enable transportation agencies to collect and transmit data in real time (or near real time) for use in transportation operations. ITS are deployed to support safety, mobility, environmental, and other goals. A few examples of ITS technologies for arterial roads include adaptive signal control, transit signal priority, dynamic/changeable message signs, and pedestrian warning systems.

Arterial roadways, also referred to as "**arterials**" throughout the survey: include **roads with uncontrolled access**, **often with at-grade intersections**. Arterials are represented by the following Federal Highway Administration's Highway Functional Classifications (see: https://www.fhwa.dot.gov/planning/processes/statewide/related/highway_functional_classifications/section00.cfm):

- Other principal arterials (functional class 3)
- Minor arterials (functional class 4)
- Major and minor collectors (functional classes 5, 6)
- Local Roads (functional class 7)

Navigating the Survey:

Use the "Next" and "Previous" buttons below to navigate the survey. Answers from each survey page are automatically saved when you go to the NEXT survey page.

To return to the dashboard, click on the "Return to Dashboard" button on the bottom of the page.

For many questions, there will be terms that are underlined. In this reference pdf, additional information for these terms is provided in a box below the question.

Note: The instructions in red font show the survey skip logic, which is automated in the online survey.

Signalized Intersections

1. [ASK ALL] **Does your agency operate signalized intersections?** *Please select one.*
   - o Yes
   - o No – SKIP TO Q9

2. [IF Q1=YES] **What is the total number of signalized intersections operated by your agency?** *If you don't know the exact number, please provide your best estimate.*

   Number of intersections: _____

3. [IF Q1=YES] **Does your agency deploy any of the following detection technologies at signalized intersections?** *Please select all that apply.*

   - ❑ Inductive Loop
   - ❑ Radar/microwave detection
   - ❑ Video imaging detection
   - ❑ Magnetometers
   - ❑ Infrared/Thermal detection
   - ❑ Other (please specify): _____
   - ❑ No detection technologies are deployed at signalized intersections

DEFINITIONS SHOWN IN HOVER BOXES:

Inductive loop detectors are comprised of a series of wired loops that sense the presence of a vehicle on the roadway and transfer the signal to an electronic unit housed in a controller cabinet on the side of the roadway.

Radar/microwave detection identifies vehicles by transmitting an electromagnetic signal that gets reflected to the radar sensor once a vehicle passes through the area.

Video imaging detection (e.g., traffic and infrared cameras) uses cameras above traffic to capture images of passing vehicles. These images are analyzed by a vision processor using application specific algorithms to detect vehicles and monitor traffic.

Magnetometers detect a vehicle whenever a sufficient portion of its magnetic shadow falls on a sensor probe.

Infrared/Thermal detection identifies vehicles by transmitting infrared light or heat from a transmitter to a receiver placed on the opposite side of the road perpendicular to the direction of travel.

4. [IF Q1=YES] **Does your agency equip signalized intersections with Closed Circuit Television (CCTV) cameras for the purpose of monitoring traffic flow?** *Please select one.*

   - o Yes
   - o No

Traffic Signal Control Operation Strategies

5. [IF Q1=YES] **Does your agency use <u>adaptive signal control technology (ASCT)</u> as an operational strategy to improve coordinated signal timing?** *Please select one.*
   - ○ Yes
   - ○ No – SKIP TO Q7

DEFINITION SHOWN IN HOVER BOX:
Adaptive signal control technology monitors traffic on a roadway and automatically adjusts signal timing (when and how long the signals should remain green) to accommodate the current traffic.

6. [IF Q5 = YES] **What percentage of signalized intersections are operated using adaptive signal control technology (ASCT)?** *Please select one.*
   - ○ 1% to 24% of intersections
   - ○ 25% to 49% of intersections
   - ○ 50% to 74% of intersections
   - ○ 75% to 99% of intersections
   - ○ 100% of intersections

7. [IF Q1=YES] **Does your agency participate in traffic signal coordination activities across jurisdictional boundaries?** *Please select all that apply.*
   - ❑ Yes, informally with 1 or more adjacent jurisdictions.
   - ❑ Yes, informally within a regional traffic signal program managed by a State Department of Transportation, Metropolitan Planning Organization (MPO), or other regional authority.
   - ❑ Yes, formally (e.g., Memorandums of Understanding, written agreements), with 1 or more adjacent jurisdictions.
   - ❑ Yes, formally (e.g., Memorandums of Understanding, written agreements), within a regional traffic signal program managed by a State Department of Transportation, Metropolitan Planning Organization (MPO), or other regional authority.
   - ❑ No traffic signal coordination activities across jurisdictional boundaries.
   - ❑ Don’t know

Traffic Signal Preemption and Priority

8. [IF Q1 = YES] **Does your agency deploy any traffic signal pre-emption or priority technologies at signalized intersections?** *Please select all that apply.*
   - ❑ Emergency vehicle signal preemption
   - ❑ Transit signal priority
   - ❑ Truck (or freight) signal priority
   - ❑ Signal preemption near a rail grade crossing
   - ❑ Maintenance and construction signal priority
   - ❑ Other (please specify): _____
   - ❑ No traffic signal pre-emption or priority technologies are deployed

DEFINITIONS SHOWN IN HOVER BOXES:

Emergency vehicle signal preemption interrupts normal traffic signal timing to provide a green light to approaching emergency vehicles so that they can pass through intersections to get to emergencies safely and quickly.

Transit signal priority (TSP) makes it more likely that the light is green when a transit vehicle reaches a signalized intersection. This strategy reduces travel times for transit vehicles by avoiding the need to stop and start at signalized intersections.

Truck (or freight) signal priority provides extra green light time so that a heavy truck can move through a traffic signal without stopping.

Signal preemption near a rail grade crossing connects signals with railroad crossings to ensure that people and/or traffic queues have moved away from a railroad grade crossing prior to the arrival of the train, restricting movements towards the track.

Maintenance and construction signal priority allows a maintenance and construction vehicle (e.g., a snowplow or a lane striping vehicle) to request priority at one or a series of intersections.

Real-Time Traffic Data Collection on Arterials

9. [ASK ALL] **Does your agency deploy any roadside infrastructure technologies to collect real-time traffic data on arterials?** *Please **do not** include technologies deployed at intersections. Please select all that apply.*
   - ❑ Inductive Loop
   - ❑ Radar/microwave detection
   - ❑ Video imaging detection
   - ❑ Magnetometers
   - ❑ Infrared/thermal detection
   - ❑ Other (please specify): _____
   - ❑ No roadside infrastructure technologies are deployed

DEFINITIONS SHOWN IN HOVER BOXES:

Inductive loop detectors are comprised of a series of wired loops that sense the presence of a vehicle on the roadway and transfer the signal to an electronic unit housed in a controller cabinet on the side of the roadway.

Radar/microwave detection identifies vehicles by transmitting an electromagnetic signal that gets reflected to the radar sensor once a vehicle passes through the area.

Video imaging detection (e.g., traffic and infrared cameras) uses cameras above traffic to capture images of passing vehicles. These images are analyzed by a vision processor using application specific algorithms to detect vehicles and monitor traffic.

Magnetometers detect a vehicle whenever a sufficient portion of its magnetic shadow falls on a sensor probe.

Infrared/Thermal detection identifies vehicles by transmitting infrared light or heat from a transmitter to a receiver placed on the opposite side of the road perpendicular to the direction of travel.

10. [ASK ALL] **Has your agency deployed any vehicle probe readers to collect real-time traffic data on arterials?** *Please select all that apply.*

    *Please note that your response should include your agency's deployed equipment only; please **do not** include vehicle probe reader data purchased or obtained from an external source.*

    - ❑ Toll tag readers
    - ❑ License plate readers
    - ❑ Bluetooth readers
    - ❑ Cellular/mobile phone readers
    - ❑ In-vehicle GPS readers
    - ❑ Other (please specify): _____
    - ❑ No vehicle probe readers are deployed

DEFINITIONS SHOWN IN HOVER BOXES:

Toll tag readers match tag numbers read at the starting and ending points of the segment of road to estimate travel times.

License plate readers use optical cameras to capture images of oncoming or receding traffic and use video image processing to "read" the license plates. License plate numbers can also be matched at sensor locations downstream.

Bluetooth readers work by actively searching for in-range Bluetooth devices and capturing the unique address of each device.

Cellular/mobile phone readers automatically and anonymously downloaded phone location information from cellular network switching centers in real time. The location of a cell phone on a roadway is determined by cell phone network handoff or signal tower triangulation and compared to a map database.

In-vehicle GPS readers are used in vehicles equipped with GPS to transmit positional information via GPS signal to a central control center.

11. [ASK ALL] **Does your agency use any external data sources (i.e., collected outside of your agency) for arterial management (e.g., incidents, road weather, traffic, etc.)?** *Please select all that apply.*

- ❑ Notifications from the public via social media, emails, texts, phone calls, etc.
- ❑ Publicly available mapping and traffic information apps (e.g., Google Maps, Waze, etc.)
- ❑ Purchased third party commercial data (e.g., Inrix, HERE, TomTom)
- ❑ Other transportation agency data (e.g., State DOT, MPO, etc.)
- ❑ Other (Please specify): _____
- ❑ No external data sources are used – SKIP TO Q14
- ❑ Don't know – SKIP TO Q14

12. [IF Q11 = OPTIONS 1, 2, 3, 4, or 5] **How is your agency using the arterial data obtained from external sources?** *Please select all that apply.*

- ❑ Traffic incident management
- ❑ Work zone management
- ❑ Road weather management
- ❑ Traveler information
- ❑ Arterial management
- ❑ Performance management/measurement
- ❑ Road/Intelligent Transportation Systems (ITS) asset management
- ❑ Emergency management
- ❑ Traffic studies and/or project prioritization
- ❑ Safety analytics/management
- ❑ Other (please specify): _____

13. [IF Q11 = OPTION 3 THIRD PARTY COMMERCIAL DATA] **You indicated that your agency purchases third party commercial data. What type(s) of arterial data is your agency purchasing?** *Please select all that apply.*

- ❑ Vehicle probe data
- ❑ Connected vehicle data
- ❑ Multimodal probe data
- ❑ Origin-destination (trip) data
- ❑ Non-recurring event data (e.g., incidents, closures, road weather events)
- ❑ Other (please specify): _____

Automated Enforcement

14. [ASK ALL] **Does your agency deploy automated enforcement on arterials (e.g., speed, red light running, school zones, work zones, bus-use only, etc.)?** *Please select one.*

- ○ Yes
- ○ No – SKIP TO Q17

15. [IF Q14=YES] **What types of automated enforcement are covered on arterials?** *Please select all that apply.*

- ❑ Speeding
- ❑ Red light running
- ❑ School zone
- ❑ Work zone
- ❑ Bus-use only
- ❑ Railroad crossing
- ❑ Other (please specify): _____

16. [IF Q14=YES] **What automated enforcement technologies does your agency use on arterials?** *Please select all that apply.*

- ❑ License plate recognition
- ❑ Cameras
- ❑ Toll tag readers
- ❑ Radar
- ❑ Other (please specify): _____

DEFINITIONS SHOWN IN HOVER BOXES:

Toll tag readers match tag numbers read at the starting and ending points of the segment of road to estimate travel times.

License plate recognition uses optical cameras to capture images of oncoming or receding traffic and use video image processing to "read" the license plates. License plate numbers can also be matched at sensor locations downstream.

Radar detects vehicles by transmitting an electromagnetic signal that gets reflected to the radar sensor once a vehicle passes through the area.

Safety and Road Weather Management

17. [ASK ALL] **Has your agency deployed any Intelligent Transportation Systems (ITS) safety systems on arterials?** *Please select all that apply.*

- ❑ Automated visibility warning system
- ❑ Bicyclist warning system
- ❑ Downhill truck speed warning
- ❑ Dynamic curve warning system
- ❑ Highway-rail crossing safety system
- ❑ Intersection collision warning system
- ❑ Over-height warning system (e.g., bridge, tunnel, gantries)
- ❑ Pedestrian warning system (e.g., pedestrian hybrid beacon, passive pedestrian sensors)
- ❑ Queue warning system
- ❑ Speed feedback sign
- ❑ Variable speed limit
- ❑ Wildlife warning system
- ❑ Wrong way driving detection system
- ❑ Other (please specify): _____
- ❑ No ITS safety systems are deployed

DEFINITIONS SHOWN IN HOVER BOXES:

Automated visibility warning system uses weather sensors to detect reduced visibility conditions and then trigger a dynamic message sign with a warning indicating the adverse driving conditions.

Bicycle warning system alerts drivers (e.g., flashing beacons) of bicyclists using the roadway or shoulder

Downhill truck speed warning alerts drivers (e.g., illuminated signs) to slow down if their vehicle speed is too high to travel safely downhill.

Dynamic curve warning system detects vehicles approaching a curve and activates a warning to drivers (e.g., illuminated signs, flashing beacons, etc.) to slow down if their vehicle speed is too high to travel safely through the curve.

Highway-rail crossing safety system detects drivers approaching an at-grade rail crossing and alerts drivers of oncoming trains (e.g., illuminated signs).

Intersection collision warning system alerts the crossing or entering vehicles if there is an approaching vehicle. These systems are used at intersections where one direction is stop-controlled while the other is uncontrolled.

Over-height warning system detects vehicles and activates a warning to drivers (e.g., illuminated signs, flashing beacons, etc.) identifying upcoming tunnels, bridges, or other obstacles that may limit the size of the vehicle that can pass.

Pedestrian warning systems detect pedestrians and activates a warning to drivers (e.g., in-pavement lights, illuminated crosswalk signs, flashing beacons, etc.) to slow to a stop, allowing pedestrians to safely pass through the crosswalk.

Queue warning system uses sensors to display messages on dynamic message signs to warn drivers about stopped or slowed traffic ahead.

Speed feedback sign is a traffic control device that displays a driver's speed or provides a message to drivers exceeding a certain speed threshold.

Variable speed limit uses current traffic conditions to determine the appropriate speed at which drivers should be traveling and displays this information on dynamic message signs.

Wildlife warning system detects the presence of an animal on or near the road and activates a warning to drivers (e.g., illuminated signs, flashing beacons, etc.).

Wrong way driving detection system detects vehicles traveling in the wrong direction and alerts the driver. May also have a traffic or CCTV camera to record the incident.

18. [IF Q17 = OPTION 8 PEDESTRIAN WARNING SYSTEM] **What percentage of signalized intersections are equipped with ITS pedestrian warning technology (e.g., pedestrian hybrid beacon, passive pedestrian sensors?** *Please select one.*

- ○ 0% of intersections
- ○ 1% to 24% of intersections
- ○ 25% to 49% of intersections
- ○ 50% to 74% of intersections
- ○ 75% to 99% of intersections
- ○ 100% of intersections

19. [ASK ALL] **Does your agency use any ITS Road Weather Information Systems (RWIS)/Environmental Sensor Stations (ESS) to collect weather and road condition data on arterials?** *Please select all that apply.*

- ❑ Mobile (vehicle-mounted)
- ❑ Permanent (stationary)
- ❑ Transportable (temporary use for work zones, recurring problem spots, etc.)
- ❑ Other (Please specify): _____
- ❑ No ITS (RWIS/ESS) are deployed to collect weather and road condition data

DEFINITIONS SHOWN IN HOVER BOXES:

Environmental sensor stations (ESS) are at a fixed roadway location with one or more sensors measuring atmospheric, pavement, and/or water level conditions.

Road Weather Information Systems (RWIS) are comprised of environmental sensor stations (ESS), a communication system for data transfer, and a central system to collect and process the field data. The data is used to disseminate road weather information.

20. [ASK ALL] **Does your agency use any tools and strategies for managing adverse road weather impacts on arterials?** *Please select all that apply.*

- ❑ Automated vehicle location (AVL)
- ❑ Decision support systems
- ❑ Dynamic message signs (permanent and/or portable)
- ❑ Pathfinder
- ❑ Queue warning systems
- ❑ Resource pre-positioning (e.g., pre-positioning trucks for plowing)
- ❑ Route Optimization
- ❑ Traffic modeling and/or analysis
- ❑ Traffic signal timing
- ❑ Variable speed limits
- ❑ Other (please specify): _____
- ❑ No tools or strategies are used to manage adverse road weather impacts

DEFINITIONS SHOWN IN HOVER BOXES:

Pathfinder is a communication and collaboration strategy developed by Federal Highway Administration and supported by National Weather Service. For more information, see: https://ops.fhwa.dot.gov/publications/fhwahop18034/index.htm.

Route Optimization is a static or adaptive routing response tool and/or strategy based on road weather conditions, incidents, recurring problem areas, etc.

Incident Detection

21. [ASK ALL] **Does your agency use any incident detection/verification methods on arterials?** *Please select all that apply.*

- ❑ Closed Circuit Television (CCTV)
- ❑ Call boxes
- ❑ Computer algorithms to detect incidents
- ❑ External data (e.g., data provided by crowdsourcing, commercial providers, or citizen-reported)
- ❑ Other (Please specify):_____
- ❑ No incident detection/verification methods are used

Work Zone Management

22. [ASK ALL] **Does your agency deploy Intelligent Transportation Systems (ITS) technology at work zones on arterials?** *Please select one.*

- ○ Yes
- ○ No – SKIP TO Q24

23. [IF Q22 = YES] **Which ITS technologies does your agency deploy at work zones on arterials?** *Please select all that apply.*

- ❑ Dynamic lane merge system
- ❑ Intrusion alarm
- ❑ Portable Closed Circuit Television (CCTV)
- ❑ Portable dynamic message sign
- ❑ Portable dynamic speed feedback/speed radar trailer
- ❑ Portable traffic monitoring device
- ❑ Queue detection and alert system
- ❑ Route guidance around work zones
- ❑ Temporary traffic signal
- ❑ Travel time system
- ❑ Variable speed limit
- ❑ Other (please specify): _____

DEFINITIONS SHOWN IN HOVER BOXES:

Dynamic lane merge system uses dynamic message signs and other devices to control vehicle merging behavior.

Intrusion alarm detects errant vehicles entering the work zone and alerts workers.

Portable CCTV system provides visual surveillance and is typically mounted in a light truck or van or on a trailer.

Portable dynamic message sign (DMS) displays a variety of messages to inform motorists of unusual driving conditions.

Portable dynamic speed feedback/speed radar trailer systems are portable traffic control devices that display a driver's speed or provide a message to drivers exceeding a certain speed threshold.

Portable traffic monitoring device uses radar or microwave detection to collect traffic-related data and communicates this information in real-time to a central server, which can also be automatically conveyed to motorists via a public website or portable dynamic message signs.

Queue detection and alert system uses sensors upstream of a work zone and displays messages on dynamic message signs to warn drivers about stopped or slowed traffic ahead.

Route guidance around work zones advises drivers of alternative routes when work zones necessitate lane closures or other types of diversions.

Temporary traffic signal is installed for a limited time and then removed when conditions no longer warrant a signal.

Travel time system measures actual traffic flow conditions using vehicle travel time detectors and displays current travel time information (e.g., on messaging signs, websites, etc.).

Variable speed limit uses current traffic conditions to determine the appropriate speed at which drivers should be traveling and displays this information on dynamic message signs.

Traveler Information

24. [ASK ALL] **What methods does your agency use to disseminate real-time traveler information about arterials?** *Please select all that apply.*

- ❑ 511
- ❑ Social media
- ❑ Email or text/SMS alert
- ❑ Agency-branded mobile application (e.g., white-label commercial app, custom built)
- ❑ Third party mobile app (e.g., Google Maps, Waze)
- ❑ Dynamic message signs (permanent and/or portable)
- ❑ Website
- ❑ Highway Advisory Radio
- ❑ Other (please specify): _____
- ❑ No real-time traveler information about arterials is disseminated

25. [ASK ALL] **Does your agency provide an open data feed that shares real-time transportation-related data using data standards/specifications?** *Please select one.*

- ○ Yes
- ○ No, but my agency is working on this
- ○ No current plans for an open data feed

25a. [IF Q25=YES] **What data standards/specifications are used to share real-time transportation-related data in your agency's open data feed?**

- ❑ Work Zone Data Exchange (WZDx) specification
- ❑ Traffic Management Data Dictionary (TMDD) standard
- ❑ PC5-based C-V2X specification (5.9GhZ)
- ❑ Other communications interface, data format, and/or protocol (please specify): _____
- ❑ Don't know

DEFINITIONS SHOWN IN HOVER BOXES:

Work Zone Data Exchange (WZDx) specification enables infrastructure owners and operators (IOOs) to make harmonized work zone data available for third party use. The goal of WZDx is to enable widespread access to up-to-date information about dynamic conditions occurring on roads such as construction events.

Traffic Management Data Dictionary (TMDD) standards were developed to support center-to-center communications. TMDD provides the dialogs, message sets, data frames, and data elements to manage the shared use of Intelligent Transportation Systems (ITS) devices and the regional sharing of data and incident management responsibility.

PC5-based C-V2X specification (5.9GhZ) uses device-to-device radio access technology for direct low latency connectivity between user equipment within a wide-area network independent of the traditional cellular network.

Parking Management Capabilities

26. [ASK ALL] **Does your agency monitor the availability of parking (including on-street spaces or off-street lots or garages)?** *Please select one.*

- ○ Yes, my agency and/or agency contractor(s) monitor
- ○ No – SKIP TO Q28
- ○ Don't know – SKIP TO Q28

27. [IF Q26=YES] **Does your agency do any of the following?** *Please select all that apply.*

- ❑ Disseminate parking availability information to drivers
- ❑ Use a parking pricing strategy (e.g., peak period surcharges) to manage congestion
- ❑ Allow drivers to reserve a parking space at a destination facility on demand to ensure availability
- ❑ None of the above

Connected Vehicle Technologies

This section includes questions about your agency's deployment of connected vehicle (CV) technologies. Your responses should only include CV technologies deployed on ARTERIALS (do not include CV deployment on freeways.

28. [ASK ALL] **Is your agency currently developing, testing, or deploying connected vehicle (CV) technology on arterials?** *Please select one.*

- ○ Yes – SKIP TO Q31
- ○ No, but my agency is planning for CV
- ○ No plans for CV – SKIP TO Q36
- ○ Don't know – SKIP TO Q36

DEFINITION SHOWN IN HOVER BOX:

Connected vehicle (CV) technologies enable vehicles, roadway infrastructure, and mobile devices to wirelessly exchange data and "talk" to one another. Connected vehicles encompass vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I), and vehicle-to-pedestrian (V2P) communications, collectively known as "V2X." When integrated into a vehicle, roadway infrastructure, or mobile device, these technologies can deliver significant transportation safety, mobility, and environmental benefits.

29. [IF Q28 = NO, BUT PLANNING FOR CV] **Does your agency have any documented plans (e.g., internal planning documents, State Transportation Improvement Plan (STIP), etc.) to develop, test, or deploy connected vehicle technology on arterials?** *Please select one.*

- ○ Yes
- ○ No
- ○ Don't know

30. [IF Q28 = NO, BUT PLANNING FOR CV] **When do you expect to begin developing, testing, or deploying connected vehicle technology on arterials?** *Please select one.*

- ○ Within the next 3 years – SKIP TO Q36
- ○ In 3 to 6 years – SKIP TO Q36
- ○ In 7 or more years – SKIP TO Q36
- ○ Don't know – SKIP TO Q36

31. [IF Q28 = YES] **Is your agency deploying roadside units (RSUs) on arterials to support connected vehicle and/or automated vehicle testing/deployment?** *Please select one.*

- ○ Yes
- ○ No – SKIP TO Q34
- ○ Don't know – SKIP TO Q34

32. [IF Q31 = YES] **Approximately how many roadside units (RSUs) is your agency currently testing or deploying on arterials?** *Please select one.*

- ○ 1-10
- ○ 11-50
- ○ 51-150
- ○ 151 or more

33. [IF Q31 = YES] **On arterials, what standard data structures are being transmitted for your connected vehicle system (e.g., from your roadside units, connected vehicles, etc.)?** *Please select all that apply.*

- ❑ Basic Safety Message (BSM)
- ❑ MAP data
- ❑ Pedestrian Safety Message (PSM)
- ❑ Position Correction Message (RTCM)
- ❑ Roadside Safety Message (RSM)
- ❑ Sensor Data Sharing Message (SSDM)
- ❑ Signal Phase and Timing (SPaT)
- ❑ Signal Request Message (SRM)
- ❑ Signal Status Message (SSM)
- ❑ Traveler Information Message (TIM)
- ❑ Other (please specify): _____
- ❑ Don't know

34. [IF Q28 = YES] **Is your agency developing, testing, or deploying any connected vehicle applications for use on arterials, including in-vehicles (i.e., using an onboard unit (OBU), Human Machine Interface (HMI), or similar) or among pedestrians or cyclists (i.e., using a handheld device)?** *This may include applications that your agency is testing either on its own fleet or in partnership with automakers/original equipment manufacturers. Please select one.*

- ○ Yes
- ○ No – SKIP TO Q36
- ○ Don’t know – SKIP TO Q36

35. [IF Q34 = YES] **Which connected vehicle (CV) applications is your agency developing, testing, or deploying on arterials?** *This may include applications that your agency is testing either on its own fleet or in partnership with automakers/original equipment manufacturers. Please select all that apply.*

Safety Applications (Vehicle to Infrastructure (V2I)):

- ❑ Curve Speed Warning (CSW)
- ❑ Pedestrian in Signalized Crosswalk Warning
- ❑ Red Light Violation Warning (RLVW)
- ❑ Reduced Speed/Work Zone Warning (RSWZ)

Safety Applications (Vehicle to Vehicle (V2V)):

- ❑ Blind Spot/Lane Change Warning (BSW/LCW)
- ❑ Emergency Electronic Brake Lights (EEBL)
- ❑ Forward Collision Warning (FCW)
- ❑ Intersection Movement Assist (IMA)
- ❑ Vehicle Turning Right in Front of Bus Warning (VTRFBW)

Mobility Applications:

- ❑ Emergency Vehicle Preemption (PREEMPT)
- ❑ Freight Signal Priority
- ❑ Integrated Dynamic Transit Operations (IDTO) (e.g., Connection Protection (T-CONNECT), Dynamic Transit Operations (T-DISP), and Dynamic Ridesharing (D-RIDE))
- ❑ Intelligent Traffic Signal System (I-SIG)
- ❑ Queue Warning (Q-WARN)
- ❑ Transit Signal Priority

Environment Applications:

- ❑ Dynamic Eco Routing
- ❑ Eco-Approach and Departure at Signalized Intersections

Agency and Road Weather Applications:

- ❑ Agency Data Applications (e.g., probe data collection, CV-enabled data collection etc.)
- ❑ Road Weather Warnings (e.g., Motorist Advisories and Warnings (MAW); Enhanced Maintenance Decision Support System (MDSS))

Other CV Applications being developed, tested, or deployed:

Please specify any other CV applications: _____

DEFINITIONS SHOWN IN HOVER BOXES:

Curve Speed Warning (CSW) alerts a driver if current speed is too fast for an approaching curve.

Pedestrian in Signalized Crosswalk Warning notifies a driver when a pedestrian is using a crosswalk in the vehicle's projected path.

Red Light Violation Warning (RLVW) issues a warning when a driver is about to run a red light.

Reduced Speed/Work Zone Warning (RSWZ) alerts a driver to use caution when traveling through a work zone.

Blind Spot/Lane Change Warning (BSW/LCW) alerts a driver changing lanes if there is a vehicle in the driver's blind spot.

Emergency Electronic Brake Lights (EEBL) application notifies a driver if there is a sudden-braking vehicle ahead (or several vehicles ahead).

Forward Collision Warning (FCW) alerts a driver when a vehicle ahead is stopped or traveling slower and there is a risk of a rear-end collision.

Intersection Movement Assist (IMA) warning notifies a driver if it is not safe to enter an intersection - for example, if another vehicle is running a red light or making a sudden turn.

Vehicle Turning Right in Front of Bus Warning (VTRFBW) notifies a bus driver when a vehicle attempts to turn right in front of the bus as the bus pulls away from a bus stop.

Emergency Vehicle Preemption (PREEMPT) is an application that gives emergency response vehicles a green light on their approach to a signalized intersection, allowing them to proceed through the intersection more quickly and under safer conditions.

Freight Signal Priority gives signal priority to freight vehicles approaching a signalized intersection, taking into consideration the vehicle's location, speed, type, and weight.

Integrated Dynamic Transit Operations (IDTO) includes three applications that improve transit mobility, operations, and services: Transfer Connection Protection dynamically holds vehicles at bus stops to meet with connecting passengers; Dynamic Transit Operations adjusts transit routing to pick up passengers or avoid congestion; and Dynamic Rideshare facilitates first-mile and last-mile shared riders.

Intelligent Traffic Signal System (I-SIG) uses high-fidelity data collected from vehicles (through V2V and V2I wireless communications), pedestrian, and non-motorized travelers to control traffic signals and maximize flows in real time, and may also seek to optimize overall network performance (i.e., accommodating transit or freight signal priority, preemption, and pedestrian movements).

Queue Warning (Q-WARN) provides a vehicle operator with sufficient warning of an impending queue backup, allowing the operator to brake safely, change lanes, or modify the route such that secondary collisions can be minimized or even eliminated. It is distinct from collision warning, which pertains to events or conditions that require immediate or emergency actions.

Transit Signal Priority is an application that allows transit agencies to manage bus service by granting buses priority at intersections. Decisions are made using information communicated by the transit vehicle (e.g., passenger count data, service type, scheduled and actual arrival time, and heading information) to roadside equipment via an on-board device.

Dynamic Eco-Routing application determines the most eco-friendly route, in terms of minimum fuel consumption or emissions, for individual travelers. This application recommends routes that produce the fewest emissions or reduce fuel consumption based on historical, real-time, and predicted traffic and environmental data (e.g., prevailing weather conditions).

Eco-Approach and Departure at Signalized Intersections is an application that uses traffic signal phase and timing (SPaT) data to determine speed advice that can be presented to drivers, allowing them to adapt their vehicle's speed to pass the next traffic signal on green or to decrease to a stop in the most eco-friendly manner.

Agency Data Applications include applications used to collect, transmit, analyze, or report local data related to traffic conditions, road conditions, travel patterns, or other metrics. Examples include: Probe-based Pavement Maintenance, Probe-based Traffic Monitoring, CV-enabled Origin-destination Studies, Work Zone Travel Information applications, etc.

Road Weather Warnings issue alerts and advisories to travelers about deteriorating road and weather conditions on specific roadway segments.

Automated Vehicle Technologies

This section asks about automated vehicle tests and deployments **on arterials**; your responses should also include any pilots or demonstrations related to automated vehicles.

36. [ASK ALL] **Has your agency participated in any automated vehicle (AV) tests or deployments on arterials in the last five years?** *Please select all that apply.*

- ❑ Yes, my agency is leading or has led AV testing/deployment (i.e., completed or in progress) – SKIP TO Q39
- ❑ Yes, my agency is supporting or has supported the planning or execution of AV testing/deployment – SKIP TO Q39
- ❑ No, my agency is not participating in any AV testing/deployment
- ❑ Don't know

DEFINITION SHOWN IN HOVER BOX:

Automated vehicles (AVs) are those in which at least some aspect of a safety-critical control function (e.g., steering, throttling, or braking) occurs without direct driver input. AVs may include light duty vehicles, transit vehicles, commercial motor vehicles, and small delivery devices, among others. Automated vehicles are widely categorized by their levels of driving automation defined by the Society of Automotive Engineers (SAE). These levels begin with Level 0 (no driving automation) and conclude with Level 5 (full driving automation).

37. [IF Q36 = NO or DON'T KNOW] **Does your agency have any documented plans (e.g., planning documents, State Transportation Improvement Plan (STIP), etc.) to participate in automated vehicle (AV) testing or deployment on arterials in the future?** *Please select one.*

- ○ Yes, my agency has a documented plan
- ○ No, but my agency is considering AV testing or deployment
- ○ No, my agency is not considering AV testing or deployment – SKIP TO Q42
- ○ Don't know – SKIP TO Q42

38. [IF Q37 =YES HAS PLAN OR CONSIDERING AV)] **When does your agency expect to participate in automated vehicle testing or deployment on arterials?** *Please select one.*

- ○ Within the next 3 years – SKIP TO Q42
- ○ In 3 to 6 years – SKIP TO Q42
- ○ In 7 or more years – SKIP TO Q42
- ○ Don't know – SKIP TO Q42

39. a. [IF Q36 = AGENCY SUPPORTING (AND ONLY OPTION 2 SELECTED)]: **Which entity(ies) are/were leading the automated vehicle testing or deployment on arterials?** *Please select all that apply.*

- ❑ Automakers or Original Equipment Manufacturers (OEMs), including Transit Vehicle Manufacturers
- ❑ Advanced Driver Assistance Systems (ADAS) Developers (or Driver Support Features Developers)
- ❑ Automated Driving Systems (ADS) Developers
- ❑ Transportation Network Companies (TNCs) (e.g., Uber or Lyft)
- ❑ State agencies
- ❑ Metropolitan Planning Organizations (MPOs)
- ❑ Universities
- ❑ Transit agencies
- ❑ Other local agencies
- ❑ Private sector consultants (please specify):
- ❑ Other (please specify): _____
- ❑ Don't know

39 b. [IF Q36 = AGENCY LEADING (OPTION 1 ONLY) OR BOTH OPTIONS 1 AND 2] **For the automated vehicle testing or deployment on arterials that your agency is/was leading, what other entity(ies) are/were you partnering with?** *Please select all that apply.*

- ❑ Automakers or Original Equipment Manufacturers (OEMs), including Transit Vehicle Manufacturers
- ❑ Advanced Driver Assistance Systems (ADAS) Developers (or Driver Support Features Developers)
- ❑ Automated Driving Systems (ADS) Developers
- ❑ Transportation Network Companies (TNCs) (e.g., Uber or Lyft)
- ❑ State agencies
- ❑ Metropolitan Planning Organizations (MPOs)
- ❑ Universities
- ❑ Transit agencies
- ❑ Other local agencies
- ❑ Private sector consultants (please specify):
- ❑ Other (please specify): _____
- ❑ Don't know

40. [IF Q36 = AGENCY LEADING OR SUPPORTING] **Which of the following automated vehicle (AV) tests or deployments on arterials has your agency led or supported in the last five years?** Please include Advanced Driver Assistance Systems (ADAS) or Automated Driving Systems (ADS) tests or deployments**.** *Please select all that apply.*

Automated Transit/ On-Demand Tests/Deployments:

- ❑ Automated Bus Rapid Transit (BRT)
- ❑ Automated Passenger Fixed Route
- ❑ Automated Passenger On-Demand
- ❑ Automated Maintenance and Bus Yard Operations

Automated Delivery/Freight/Commercial Motor Vehicle Tests/Deployments:

- ❑ Automated Personal Delivery Device (e.g., sidewalk delivery robot) – OMIT FROM Q41
- ❑ Automated Last Mile Delivery (e.g., light duty vehicle) – OMIT FROM Q41
- ❑ Automated Regional or Long-Haul Trucking – OMIT FROM Q41
- ❑ Truck Platooning – OMIT FROM Q41
- ❑ Automated Logistics Yard Operations (e.g., automated yard trucks) – OMIT FROM Q41
- ❑ Construction or Maintenance Operations (e.g., automated truck mounted attenuators) – OMIT FROM Q41

Automated Light Duty Passenger Vehicle Tests/Deployments:

- ❑ Automated light duty passenger vehicle test/deployment – OMIT FROM Q41

Other AV Tests/Deployments on arterials:

- ❑ Other AV test/deployment (please specify): _____ – OMIT FROM Q41

DEFINITIONS SHOWN IN HOVER BOXES:

Automated Bus Rapid Transit (BRT) applies rail transit concepts to automated buses to deliver fast and efficient service. These concepts focus on eliminating causes of delay that typically slow regular bus services and may include dedicated lanes, busways, traffic signal priority, off-board fare collection, platforms, and enhanced stations.

Automated Passenger Fixed Route service provides rides along a single route with pre-defined stops and a set schedule. The route may be limited to closed environments, such as parking lots, busways, campuses, and retirement communities, or it may operate in mixed traffic on public roads in areas, such as business parks or downtown districts.

Automated Passenger On-Demand provides on-demand service between any two addresses within a defined service area. The concept is similar to the automated passenger fixed route service; however, it is not restricted to predefined routes or schedules - users can request pick-ups and drop-offs on demand (e.g., using an application on a smartphone, tablet, or kiosk).

Automated Maintenance and Bus Yard Operations is the deployment of automated driving systems (ADS) on transit vehicles for use within the domain of the bus yard. Use cases may include precision movement for fueling/recharging, maintenance, disinfection/bus wash, or automated parking and recall.

Automated Delivery Device (e.g., sidewalk delivery robot) testing/deployment includes automated delivery devices (i.e., robots) that navigate using GPS, sensors and cameras, allowing them to operate on sidewalks or other pedestrian areas, making deliveries in limited-service areas.

Automated Last Mile Delivery (e.g., light duty vehicle) uses automation to deliver goods over short distances on local roadways from business to consumer.

Automated Regional or Long-Haul Trucking applies automation to trucking. Automated trucking generally refers to SAE Level 3-5 automation, where the automated driving system is primarily responsible for monitoring the driving environment.

Truck Platooning incorporates on-board computers, vehicle sensors, and automated driving technology, allowing equipped long-haul trucks to communicate with each other and travel closely together on the highway (40 to 50 feet apart) to improve fuel efficiency and reduce vehicle emissions.

Automated Logistics Yard Operation is the deployment of automation (e.g., robots, yard trucks with automated driving systems) to perform logistics tasks in the yard. For example, this may include moving trailers from one part of the yard to another.

Construction or Maintenance Operations (e.g., automated truck mounted attenuator) is the deployment of automated driving systems (ADS) on commercial vehicles for the purpose of performing construction and maintenance activities on the road.

Automated light duty passenger vehicle test/deployment: Use this category for any light-duty passenger vehicle test/deployment not covered in other categories.

41. For your [Q41 = AUTOMATED BUS RAPID TRANSIT/ AUTOMATED PASSENGER FIXED ROUTE/AUTOMATED PASSENGER ON DEMAND/AUTOMATED MAINTENANCE AND BUS YARD OPERATIONS] **test or deployment, which type of vehicle is being used?** *Please select all that apply.*

- ❑ Full-sized transit bus
- ❑ Articulated bus
- ❑ Motorcoach (over the road bus)
- ❑ Cutaway bus or minibus
- ❑ Novel-design low-speed shuttle
- ❑ Light-duty passenger vehicle (e.g., car, van, SUV)
- ❑ Other (please specify): _____
- ❑ Don't know

Telecommunications

42. [ASK ALL] **What type of telecommunications technologies does your agency use to enable Intelligent Transportation Systems (ITS) on arterial roadway?** *Please select all that apply.*

Wired:

- ❑ Coaxial – OMIT FROM Q43
- ❑ Fiber optic cable – OMIT FROM Q43
- ❑ Twisted copper pair/Twisted wire pair
- ❑ Digital subscriber line (DSL)
- ❑ Data cable over modem

Wireless:

- ❑ 5G New Radio and Small cell infrastructure
- ❑ Cellular (LTE-4G)
- ❑ Cellular (GPRS – 2G or 3G)
- ❑ LTE-Cellular V2X (LTE-CV2X)
- ❑ Dedicated short range communications (DSRC)
- ❑ Wi-Fi
- ❑ Mobile or Fixed service satellite (FSS) – OMIT FROM Q43
- ❑ Ultra-wideband (UWB)
- ❑ Microwave – OMIT FROM Q43
- ❑ Other telecommunications (wired and/or wireless) (please specify): _____ – OMIT FROM Q43
- ❑ Don't know – SKIP TO Q44
- ❑ No telecommunications used to enable ITS on arterials – SKIP TO Q44
- ❑ No ITS infrastructure or devices are deployed – SKIP TO Q44

DEFINITIONS SHOWN IN HOVER BOXES

Coaxial cable is mainly used to provide communications between field controllers and a central controller. Coaxial cables have an inner conductor, insulating layer, conductive shielding, and protective outer jacket.

Fiber-optic cables transmit large amounts of information over long distances (e.g., camera images) through use of many super-thin strands of optical glass fiber.

Twisted copper pair/Twisted wire pair is composed of two insulated copper wires twisted around one another. This is mainly used to provide basic telephone services and ethernet over short distance.

Digital subscriber line (DSL) is a wireline transmission technology that uses existing infrastructure to provide integrated traffic video and field device communications. This includes all forms of DSL (e.g., ADSL, RADSL, HDSL, SDSL).

Data cable over modem service enables operators to provide broadband using standard cable lines (e.g., 56 kilobits/second).

5G New Radio and 5G small cell infrastructure (which communicates over very short distances) represents the newest generation of cellular data communication. The 5G New Radios can operate within and share existing 4G LTE infrastructure in non-standalone (NSA) mode (e.g., cell towers). The other critical component of 5G, small cell infrastructure, consists of small antennae placed in the public right-of-way to act as a high-speed intermediary between a field device and the larger cell tower.

Cellular (LTE-4G) is the fourth generation of cellular data communication. LTE (Long Term Evolution) is standard to 4G and is both forward and backward compatible. Cellular LTE 4G operates in 600 MHz, 700 MHz, 850 MHz, 1.7 GHz, 1.9 GHz, 2.3 GHz, 2.5 GHz spectrum.

Cellular GPRS – 2G or 3G are the older generations of cellular data communications and are being phased out. These generations of cellular rely on radio signals in a digital format and operate in the 470-690 MHz, 690-805 MHz, 1.850-1.995 GHz spectrum.

LTE-Cellular V2X (LTE-CV2X) operates in the reduced 5.895-5.925 GHz spectrum, known as the Safety Band (dedicated for safety-of-life and public benefit transportation purposes). LTE-CV2X is intended to service connected vehicle technology.

Dedicated short range communications (DSRC) is two-way radio communication operating in the reduced 5.895-5.925 GHz spectrum, currently known as the Safety Band (dedicated for safety-of-life and public benefit transportation purposes). The Federal Communications Commission (FCC) is planning to phase out DSRC in the future.

Wi-Fi provides wireless high-speed internet access or communications between devices (point-to-point or point-to-multipoint). It includes agency-installed Wi-Fi access points and client devices, or subscription-based Wi-Fi in the 2.4 GHz, 5.8 GHz, and (recently) 6 GHz spectrum.

Mobile or Fixed service satellite (FSS) provides radio communication between two or more fixed or mobile receivers. MSS or FSS allows uploading/downloading data across a wide range (137 MHz-51.4 GHz) of spectrum in the form of space-to-earth, earth-to-space, or broadcast communications.

Ultra-wideband (UWB) is a short-range communication technology ideal for transmitting data at high speeds between devices 10 to 30 meters apart, using any spectrum as unlicensed communications (similar to radar).

Microwave (also known as Ultra High Frequency (UHF) or Extremely High Frequency (EHF)) communicates as fixed point-to-point backhaul or as very short-range, line-of-sight radar/Lidar communications, typically between 300 MHz and 300 GHz spectrum.

43. [IF Q42 = EACH TELECOM TECH CHECKED EXCEPT FOR COAXIAL, FIBER OPTIC CABLE, FSS, and MICROWAVE; **Please indicate how your agency is using the telecommunication technology(ies) shown below to enable ITS on arterials.**

Each of the use cases listed is based on the Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT) service packages. Click this link for more information: https://www.arc-it.net/html/servicepackages/servicepackages-areaspsort.html. *Please select all that apply in each column.*

- ❑ Commercial Vehicle Operations
- ❑ Data Management
- ❑ Maintenance and Construction
- ❑ Parking Management
- ❑ Public Safety
- ❑ Public Transportation
- ❑ Support
- ❑ Sustainable Travel
- ❑ Traffic Management
- ❑ Traveler Information
- ❑ Vehicle Safety
- ❑ Weather
- ❑ Other (please specify):_____
- ❑ Don't know

EXAMPLES SHOWN IN HOVER BOXES:

Commercial Vehicle Operations: Examples include commercial vehicle parking, smart roadside and weigh in motion, roadside commercial vehicle operator safety, freight-specific dynamic travel planning, HAZMAT management, etc.

Data Management: The two relevant service packages are ITS data warehouse and performance monitoring.

Maintenance and Construction: Examples include maintenance and construction vehicle maintenance, winter maintenance, roadway maintenance and construction, work zone management, maintenance and construction signal priority, asset tracking, etc.

Parking Management: Examples include parking space management, smart park and ride system, parking electronic payment, regional parking management, etc.

Public Safety: Examples include emergency response, mayday notification, incident scene safety monitoring, disaster response and recovery, disaster traveler information, etc.

Public Transportation: Examples include dynamic transit operations, transit fare collection management, transit security, transit fleet management, transit signal priority, intermittent bus lanes, etc.

Support: Examples include connected vehicle system monitoring and management, map management, ITS communications, location and time, security and credentials management, field equipment maintenance, etc.

Sustainable Travel: Examples include emissions monitoring, eco-traffic signal timing, roadside lighting, electric charging stations management, etc.

Traffic Management: Examples include infrastructure-based traffic surveillance, vehicle based traffic surveillance, connected vehicle traffic signal system, traffic incident management system, variable speed limits, speed harmonization, etc.

Traveler Information: Examples include broadcast traveler information, dynamic route guidance, infrastructure-provided trip planning and route guidance, dynamic ridesharing, and shared use transportation, etc.

Vehicle Safety: Examples include autonomous vehicle safety systems, V2V basic safety, situational awareness, curve speed warning, pedestrian and cyclist safety, stop sign gap assist, automated vehicle operations, etc.

Weather: Examples include weather data collection, weather information processing and distribution, spot weather impact warning, etc.

44. [ASK ALL] **If your agency has any notes or additional information about its use of telecommunications, please provide below.**

Maintenance of Arterial ITS Technology

45. [ASK ALL] **Does your agency utilize an asset management system to track Intelligent Transportation Systems (ITS) inventory and/or ITS maintenance and operations activity on arterials?** *Please select all that apply.*

- ❑ Yes, system tracks inventory of ITS field devices
- ❑ Yes, system tracks inventory of ITS central systems / software
- ❑ Yes, system tracks maintenance and operations of ITS field devices
- ❑ Yes, system tracks maintenance and operations of ITS central systems / software
- ❑ No, my agency does not have an ITS asset management system
- ❑ Not applicable, my agency has not deployed ITS – SKIP TO Q47

DEFINITION SHOWN IN HOVER BOX:

An ITS **asset management system** is a software system, procedure, or tool that assists an agency in managing and maintaining data on ITS assets across the entire lifecycle of these assets, from acquisition to disposal. For more information see: https://ops.fhwa.dot.gov/publications/fhwahop20047/chap4.htm.

46. [EXCLUDE IF Q45 = OPTION 6 NO ITS] **What is your agency's primary approach for conducting maintenance activities on arterial ITS assets?** *Please select one.*

- o My agency primarily schedules maintenance based on the regularly monitored condition of arterial ITS assets.
- o My agency primarily schedules maintenance of arterial ITS assets based on regular intervals.
- o My agency primarily conducts maintenance in response to reported arterial ITS asset failures or events, such as a vehicle collision or component failure.
- o Other (please specify): _____
- o Don't know

Transportation Systems Management and Operations (TSMO) Plan

47. [ASK ALL] **Does your agency have a Transportation Systems Management and Operations (TSMO) Plan?** *Please select one.*

- o Yes
- o No, but my agency plans to develop a TSMO Plan
- o No current plans to develop a TSMO Plan

Cybersecurity

48. [ASK ALL] **Does your agency have a documented cybersecurity policy that explicitly addresses Intelligent Transportation Systems (ITS) technologies/equipment?** *Please select one.*

- ○ My agency has a cybersecurity policy which explicitly addresses ITS. – SKIP TO Q50
- ○ My agency's general cybersecurity policy (i.e., for information technology (IT)) is applied to ITS.
- ○ My agency's ITS is not covered by a cybersecurity policy.
- ○ My agency has not deployed ITS technologies/equipment. – SKIP TO Q51
- ○ Don't know – SKIP TO Q50

49. [IF Q48 = OPTIONS 2 or 3] **Is your agency planning to develop a cybersecurity policy that explicitly addresses ITS technologies/equipment?** *Please select one*

- ○ Yes
- ○ No
- ○ Don't know

50. [EXCLUDE IF Q 48 = OPTION 4 NO ITS] **In the last five years, has your agency conducted incident response exercises that include ITS equipment/technologies to prepare for ITS cybersecurity events?** *Please select one.*

- ○ Yes, my agency's incident response exercises have included ITS equipment/technologies
- ○ No, my agency's incident response exercises have not included ITS equipment/technologies
- ○ No, my agency has not conducted incident response exercises in the last five years
- ○ Don't know

DEFINITION SHOWN IN HOVER BOX:

Incident response exercises are agency-run tests of protocols that mitigate violations of security policies and recommended practices.

51. a. [EXCLUDE IF Q 48= OPTION 4 NO ITS] **In the last three years, has your agency had any cybersecurity events or attacks (e.g., ransomware, data breach) that affected its information technology (IT) system and/or ITS technologies/equipment on arterials?** *Please select all that apply.*

If your agency has experienced multiple events or attacks, please respond based on all experiences.

- ❑ Yes, affecting IT system
- ❑ Yes, affecting ITS technologies/equipment
- ❑ No – SKIP TO Q54
- ❑ Don't know – SKIP TO Q54

51 b. [ASK IF Q 48 = OPTION 4 NO ITS] **In the last three years, has your agency had any cybersecurity events or attacks (e.g., ransomware, data breach) that affected its information technology (IT) system?**

If your agency has experienced multiple events or attacks, please respond based on all experiences.

- ❑ Yes – SKIP TO Q53
- ❑ No – SKIP TO Q54
- ❑ Don't know – SKIP TO Q54

DEFINITION SHOWN IN HOVER BOX:
Information technology (IT) systems include personal computers or commercial servers along with the network equipment to connect this equipment together.

52. [IF Q51 = YES (OPTIONS 1 OR 2)] **What was (or were) the initial point(s) of entry for the cybersecurity event(s) or attack(s)?** *Please select all that apply. If your agency has experienced multiple events or attacks, please respond based on all experiences.*

- ❑ IT system
- ❑ ITS equipment/technologies
- ❑ Don't know

53. [IF Q51 = YES (OPTIONS 1 OR 2) OR Q51b = YES] **Did any of the cybersecurity event(s) or attack(s) affect transportation system operations on arterials?** *Please select one.*

- ○ Yes
- ○ No
- ○ Don't know

Regional ITS Architecture

54. [ASK ALL] **Is your agency/region covered by a <u>Regional (or State) Intelligent Transportation Systems (ITS) Architecture</u>?**

- ○ Yes
- ○ No – SKIP TO Q57
- ○ Don't know – SKIP TO Q57
- ○ Not familiar or never heard of a Regional ITS Architecture – SKIP TO Q57

DEFINITION SHOWN IN HOVER BOX

A **Regional ITS Architecture** is a plan for institutional and technical integration of ITS in a region or state. A Regional ITS Architecture uses the National ITS Architecture (which provides a common framework for planning, defining, and integrating ITS deployments) as the template for its definition, including only the systems and services that are planned for implementation in the local area or state. For more information about the Regional ITS Architecture, please see: https://ops.fhwa.dot.gov/its_arch_imp/index.htm. For more information about the National ITS Architecture see: https://www.arc-it.net/.

55. [IF Q54 = YES] **Is your agency using your Regional (or State) ITS Architecture to support ITS deployments on arterials?** *Please select one.*

- ○ Yes, for all ITS deployments – SKIP TO Q57
- ○ Yes, for some ITS deployments – GO TO Q56b
- ○ No, my agency does not use our Regional ITS Architecture – GO TO Q56a
- ○ Not applicable (i.e., my agency does not use federal funds for ITS deployment OR my agency has not deployed ITS) – SKIP TO Q57
- ○ Don't know – SKIP TO Q57

56. a. [IF Q55=OPTION 3 NO DOES NOT USE]: **What are key reasons for NOT using your Regional ITS Architecture to support arterial ITS deployments?** *Please select all that apply.*

56b. [IF Q55=OPTION 2 YES FOR SOME ITS DEPLOYMENTS]**: What are key reasons for NOT using your Regional ITS Architecture to support all of your arterial ITS deployments?** *Please select all that apply.*

- ❑ Lack of experience/technical expertise with the Regional ITS Architecture
- ❑ The Regional ITS Architecture is out of date
- ❑ The scope and/or scale of my agencies' ITS projects are generally too small
- ❑ No perceived technical or operational benefit to using the Regional ITS Architecture
- ❑ Other (please specify): _____

Integrated Corridor Management

This next question focuses on Integrated Corridor Management (ICM). ICM is an approach that manages a transportation corridor as a multimodal system (**freeway**, **arterial**, and **public transit**), integrating operations such as traffic incident management, work zone management, traffic signal timing, managed lanes, real-time traveler information, and active traffic management to maximize the capacity of all facilities and modes across the corridor.

For the purposes of this survey, a corridor is defined as: a largely linear geographic band and a bounded travel shed of (mostly) commute and daily trips. The corridor must include **freeway**, **arterial**, and **public transit facilities**, with cross-facility connections.

You can find more information about ICM at https://rosap.ntl.bts.gov/view/dot/38816.

57. [ASK ALL] **Has your agency deployed Integrated Corridor Management (ICM) in one or more corridors (i.e., integrating operations across freeway, arterial, and public transit networks) to actively manage travel demand and capacity in the corridor as a whole?** *Please select one*.

- ○ Yes, my agency has deployed ICM
- ○ No, but my agency plans to deploy ICM
- ○ No, my agency has no plans to deploy ICM

Agency Coordination

58. [ASK ALL] **Does your agency RECEIVE the following incident information in real-time from any public safety agency?** *Please select one response for each item.*

	Yes	*No*
Incident clearance	○	○
Incident severity and type	○	○

59. [ASK ALL] **Does your agency PROVIDE real-time arterial traffic information (e.g., travel time, speed, and condition) to the following types of agencies?** *Please select one response for each agency type.* SCRIPTING NOTE: It should not be required that respondents respond to yes/no to any of the options. If select no for "Other," should not be able to fill in the "Other" box.

	Arterial Traffic Information	
	Yes	*No*
Freeway management agencies	○	○
Arterial management agencies	○	○
Public transit agencies	○	○
Law enforcement public safety agencies	○	○
Fire rescue public safety agencies	○	○
Other agencies (please specify)	○	○

Future Deployment Planning

60. [ASK ALL] **Does your agency plan to expand or upgrade current ITS on arterials during the next three years (2024 through 2026)?** *Please select one.*

- ○ Yes
- ○ No
- ○ Don't know
- ○ Not applicable, my agency has not deployed ITS

61. [ASK ALL] **Does your agency plan to invest in new or emerging ITS on arterials during the next three years (2024 through 2026)?** *Please select one.*

- ○ Yes
- ○ No – SKIP TO Q63
- ○ Don't know – SKIP TO Q63

62. [IF Q61 = YES] **Please describe new or emerging ITS technologies your agency plans to invest in:**

Additional Comments

63. Please use the space below to provide any additional comments regarding your agency's deployment, operations, or maintenance of ITS. Please be as specific as possible when commenting on particular ITS technologies.

64. Can we contact you if we have any follow-up questions about your agency's experience deploying ITS? *Please select one.*

- Yes
- No – SKIP TO Q65

Thank you. How can we best reach you if we have follow-up questions about your agency's experience deploying ITS?

64b. The phone number we have on file is [RESPONDENT PHONE]**. If this is not your preferred phone number, please provide your preferred phone number below:**

64c. The email address we have on file is [RESPONDENT EMAIL]**. If this is not your preferred email, please provide your preferred email address below:**

65. Please confirm if you are ready to submit your responses. *Please select one.*

- Yes, I have completed the survey and I would like to submit my final responses (Note: if you click this button, you will not be able to return to the survey).
- No, I am still working on the survey and will complete it later.

Thank you for your time and effort in completing this survey!