

Tehama Rural Area eXpress (TRAX)

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Integrated Public Safety Communications Project Supplement to the Alternatives & Recommended Solution Report: Transit Workforce Management – Automation Applications for TRAX

Prepared and Submitted by:



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1. Purpose, Scope, and Relevance to Prior Work

This to the previously-submitted Alternatives & Recommended Solution Report provides additional information that is specific to TRAX and that augments the findings and TRAX-related guidance of that prior Report.

The purpose of this Supplement is to provide information about Transit Workforce Management/Automation (TWM-A) applications that would supplement and, potentially, replace the two-way voice radio system described in the Alternatives & Recommended Solution Report. Referred to in prior reports as an Intelligent Transit System (ITS), TWM-A applications have, at their core, a computer aided dispatch (CAD) program that uses a radio link (which can be of the two-way land mobile radio system or a cellular phone system) to exchange information between drivers and dispatchers. TWM-A applications can support the exchange of two-way mobile (wireless) voice calls and transit-specific mobile data features (such as real-time vehicle location) between transit vehicles and dispatchers. TWM-A applications can also support two-way voice conversations.

This Supplement draws on new information collected through a Request for Information (RFI) for TWM-A applications that was developed by CDX Wireless and released by the Tehama County Transit Agency Board (TCTAB) in June and July, 2022. The RFI asked vendors of TWM-A applications to provide details about their offerings including the features they support, the types of wireless networks they can use, and their budgetary pricing for an installation of the size and scope of TRAX.

This Supplement summarizes the responses from vendors of TWM-A applications to that RFI and compares the benefits and costs of the TWM-A applications from responding vendors to the benefits and costs of the findings and guidance for TRAX included in the Alternatives & Recommended Solution Report.



Important Point

Since the submission of our Alternatives & Recommended Solutions Report, we have learned that TRAX no longer uses a shared (subscription-based) UHF DMR two-way radio system for communications between dispatchers and drivers. Instead, we understand that TRAX uses Verizon Wireless' push-to-talk (PTT) cellular phone service and that its performance is generally viewed favorably among dispatchers and drivers. This change from the shared DMR two-way radio system to a cellular-based system has no impact on the findings and guidance in this Supplement.

Finally, this Supplement does not affect or adjust the findings and guidance of the Alternatives & Recommended Solution Report for the Tehama County Sheriff's Office (TCSO) or Tehama County Public Works (TCPW).

2. Recap of Prior Recommendations

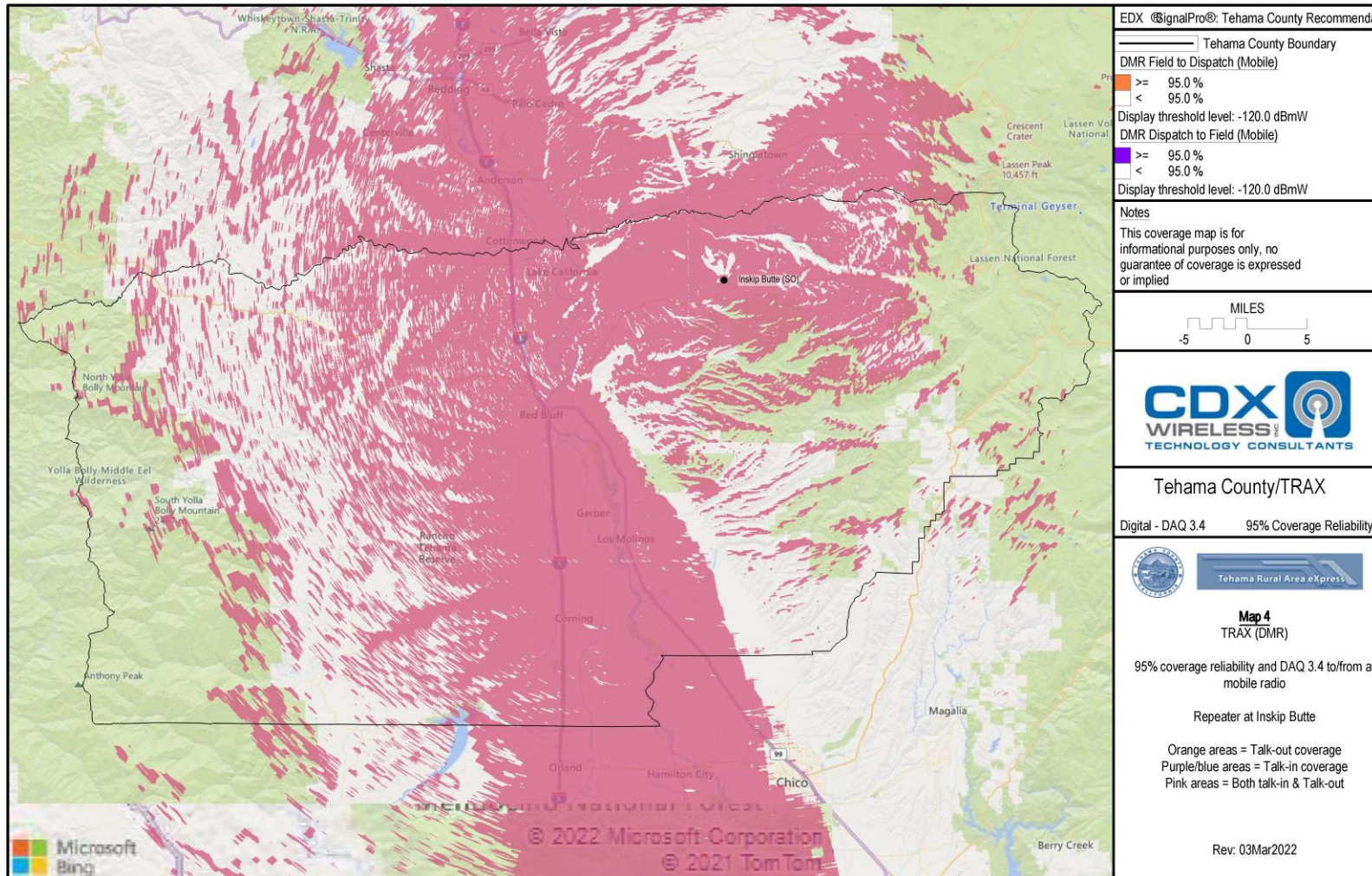
The previously-submitted Alternatives & Recommended Solution Report included the following specific findings and guidance for TRAX:

1. To meet its needs for two-way radio operations, TRAX should deploy a single channel, UHF, conventional, DMR site at Inskip Butte.

2. This single channel will be capable of simultaneously carrying two sets of information due to its two digital time slots.
 - a. One time slot will be used to provide voice communications to TRAX’s mobile radios throughout most of the county.
 - b. The second time slot will be available for data messaging for possible future TWM-A application data from TRAX’s vehicles (as well as for possible future GPS-based location services from TCSO’s and/or TCPW’s vehicles).
3. TRAX should continue to use wireless control stations for dispatch as they fit the operational needs of the organization. The only possible adjustment to this recommendation could come if TRAX were to deploy a TWM-A application such as those described in this Supplement.
4. TRAX should expect to replace a significant number of it’s in-vehicle radios – it’s existing 17 Motorola XPR4500 radios are considered end-of-life by their manufacturer. This means that while they may continue to operate for some time, they are no longer serviceable.

The performance of the TRAX subsystem (including its radio sites, dispatch equipment, subscriber radios, etc.) is described in the Alternatives & Recommended Solution Report and is summarized below:

Performance Attribute	Capabilities Delivered by Solution from Alternatives and Recommended Solution Report
Coverage	See coverage prediction map, following page
Capacity	Two time slots in one physical channel (the equivalent to two ‘virtual’ radio channels) would be available – this would allow a voice conversation on one time slot and either a second voice conversation or data transmissions on the other. The physical channel operates at 9,600bps so each timeslot can carry slightly less than 4,800bps of data bandwidth – this makes each timeslot viable for voice or low-bandwidth, packetized data. The channel would, however, be privately licensed to TRAX so no other users could access its bandwidth.
Channel Selection	The use of one site, and one physical channel, allows easy selection a radio mode
Scanning	Scanning would not be supported
Equipment	Options for various manufacturers and models of user radios are available
Features	DMR supports both traditional voice and user-agency-specific data applications
Interoperability	Direct radio interoperability between TRAX and TCSO, TCPW, and/or local government departments would not be supported in the system envisioned in the Alternative and Recommended Solutions Report – intervention from the dispatchers from the required agencies would be needed or additional gateways/bridging equipment would be required



The budgetary estimates included in the Alternatives and Recommended Solution Report included the assumption that all involved agencies - TCSO, TCPW, Teton County local government (LG) agencies, and TRAX – would simultaneously improve their radio systems as one large, multi-agency project. Therefore, the costs to TRAX for their radio improvements include some radio subsystems that are entirely and specifically unique to TRAX’s operations (for example, the new UHF, DMR site at Inskip Butte) as well as some subsystems that would be shared with the other agencies of TCSO, TCPW, and Tehama County’s local government (LG) departments (for example, project deployment services). These unique and shared subsystems, and their budgetary costs, are:

Subsystem	Category Components	Budgetary Estimates	
		Costs Unique to TRAX	Costs to Be Shared Among TRAX, TCSO, TCPW, and LG
TRAX Radio Subsystem	A single site, UHF, DMR subsystem (incl. antennas) at Inskip Butte	\$28,000	
TRAX Subscriber (User) Radios	16 UHF DMR mobile radios / 1 UHF DMR control station	\$43,000	
Radio Site Civil Work	New and/or upgraded shelters, towers, and main/standby power sources including the improvements noted in the Inventory/Needs Assessment Report as well as improvements to the new sites of Morgan Summit and Tomhead		\$565,000
System Spares	Typical set of spares for infrastructure		\$52,000
Project Contingency	Contingency & Professional Services (10% of all infrastructure for all agencies)		\$230,000
Vendor Implementation Services	Vendor services for design, licensing, staging, shipment, installation, configuration, testing, training, cutover, and project management		\$1,194,000
Professional Services	Development of Procurement Specifications, Assistance with Procurement and Negotiations, Management of Deployment, Testing, and Transition to Operations		\$125,000

We did not propose a method for dividing the shared costs among the various participating agencies, however, we would expect that some portion of those costs would be the responsibility of each agency.

Additionally, we noted that the combined, TCSO-TCPW-TRAX radio system would have on-going, support and maintenance fees with a budgetary estimate of \$175,000 per year (not including any internal staffing/administration costs or the costs to lease space at sites such as Inskip Butte). As with the one-time costs to deploy the system, we did not recommend any proportionality of this amount that would be due to any one agency but we assumed that each agency would be responsible for some portion.

3. Request for Information Process

In conjunction with the Tehama County Transit Agency Board (TCTAB), CDX Wireless developed and released in June 2022 a Request for Information (RFI) for Transit Workforce Management – Automation (TWM-A).

The RFI included a summary of TRAX’s operations and current radio systems and expressed a vision for TWM-A applications as a program that provides features to improve driver and rider satisfaction, efficiency, and safety. This vision further expressed that a TWM-A application can use a radio link to exchange information between buses and dispatchers including some or all of the following:

- Automatic Vehicle Location information in which the bus is equipped with a Global Positioning System receiver, and it sends its latitude and longitude on an established cadence to a dispatcher and/or other geographic information system (GIS) application
- Bus Equipment information in which basic diagnostic data from the bus’s engine, transmission, tire, wheelchair lift, or other parts is collected and sent to track, in real time, their performance and status
- Automatic Passenger Counters in which sensors count the number of riders entering and leaving the bus and provide that information to dispatchers
- Emergency Message in which a driver can notify dispatchers of an urgent situation and potentially active cameras or microphones on the bus to collect and share additional information
- Task Lists in which a dispatcher can build and send list of actions to be completed (including rides to be provided) to drivers or other field-based staff
- Logging/Recording of voice calls

The RFI then asked vendors to answer questions about the capabilities and scalability of their offerings, their compliance to industry standards, and the wireless networks and equipment they support. It also asked vendors to provide a sample deployment schedule for their offering as well as estimated pricing and options for procurement (other than an outright capital purchase).

A total of forty-three vendors were notified of the RFI’s release including:

- Twenty-seven vendors of traditional transit management applications: these companies offer mobile/wireless applications that are specific to the transit marketplace and that include transit-specific features
- Sixteen vendors of general mobile workforce automation applications: these companies offer mobile/workforce applications that are not specific to any industry but that provide general communications features to a mobile workforce

Vendors were given a 60-day period to respond and their responses were sent directly to Ms. Riske-Gomez of TRAX. Responses were received from the following two vendors:

- Spare Labs, Inc., whose response focused on paratransit applications
- Swiftly, Inc. who, in their response, noted partnerships with Spare Labs and with Orion Labs - the partnership was described a combination of Swiftly’s focus on fixed-route applications, Spare’s focus on paratransit applications, and Orion’s focus on two-way, push-to-talk voice communications

The information provided by these two companies is used as the basis for this Supplement’s comparisons to the findings and guidance of the Alternatives and Recommended Solutions Report. Although the number of responses is small, we believe they sufficiently represent the market for TWM-A applications and they are sufficient to help guide TRAX in decisions related to its future for mobile communications.

4. Overview of Responding Vendors

This section of this report provides a high-level overview of the two vendors that provided responses to the RFI. The information in this section relies exclusively on excerpts taken directly from the vendors’ RFI responses. Vendor overviews are ordered alphabetically by vendor name with no implication of preference.

4.1. Overview of Spare Labs, Inc.

Spare Labs, Inc. (“Spare”) was founded six years ago and is based in Vancouver, BC, Canada to, as they state, build a “mobility operating system for the modern world, empowering public and private transportation companies to offer mobility services that are superior to those previously imagined.” They list among their accomplishments running “inclusive and efficient on-demand microtransit and ADA paratransit, including one of the largest on-demand transit systems in North America: *DART GoLink*”. In the past two years, they have expanded to serve “35+ new transit agencies across North America” and to develop paratransit specific operations.



Spare’s “Spare Platform” uses “modernized, cloud-based software” to offer “a complete and flexible mobility operating platform that allows transit agencies to easily launch and manage on-demand services—covering the full spectrum of automated dispatch and scheduling from the flexible and easy-to-use admin portal to the Rider and Driver apps.”

Spare’s response included repeated and significant focus on the applications of micromobility (bikesharing, scootersharing, etc.), paratransit, and student transit with little description of the application of their products to vehicle-based, fixed-route transit operations. Nothing in their response seemed to preclude the use of their products for fixed-route transit operations, however, their focused appeared to be on these other areas of public transit.

In response to our request for a listing of reference customers (other transit agencies that have similar project scopes and goals to that of TRAX), Spare provided contact information for:

- VANLNK for StarTran of Lincoln, NE
- Pinellas Suncoast Transit Authority of St. Petersburg, FL
- Ashland Connector for Rogue Valley Transportation District (RVTD) of Ashland, OR

More information about Spare can be found at their website of www.sparelabs.com.

4.2. Overview of Swiftly, Inc.

Swiftly Inc. (“Swiftly”) was founded in 2014 and is based in San Francisco, CA with a mission to “[help] cities move more efficiently by providing every public transit agency with a unified, dynamic platform to manage day-to-day operations.” Their product, also called Swiftly, is “a cloud-based technology platform designed to help transit agencies improve their service reliability, passenger information, and operational efficiency.” Their platform “uses a Software-as-a-Service (SaaS) model that is organized around three solution areas:



connecting with passengers, staff, and vehicles.” Swiftly also provides open data APIs to “enable authenticated third parties to access transit data” for real-time and historical insights.

Swiftly included in their response mention of two partner vendors: Spare Labs (the other respondent to the RFI and described above) as their paratransit partner and Orion Labs (“Orion”) as their partner for voice-based push-to-talk services. Orion provides “Push-to-Talk 2.0 (PTT 2.0)” communications using a cloud-based, intelligent Unified Communications platform.

In response to our request for a listing of reference customers (other transit agencies that have similar project scopes and goals to that of TRAX), Swiftly provided contact information for:

- Regional Transportation Authority of Central Maryland of Savage, MD
- VANLNK for StarTran of Lincoln, NE (a joint deployment with Spare)

They also noted that Orion has a microtransit installation at:

- The City of Sedona of Sedona, AZ



More information about Swiftly can be found at their website of www.goswift.ly.

5. Response to RFI Questions

5.1. Organization of Vendor Responses to RFI

This section of this Supplement summarizes each vendor’s response to each of the questions included in the RFI. (Note that Question #1 of the RFI was in regard to the vendor’s background and general capabilities – answers to Question #1 are in the preceding section of this Supplement.) Where appropriate, summaries include in quotation marks direct excerpts taken from the vendors’ RFI responses. Vendor answers are ordered alphabetically by vendor name with no implication of preference.


5.2. Question #2: Regarding Vision for TWM-A Applications


RFI Question #2	Is TRAX’s general understanding of a TWM-A application’s benefits, as described in the Background statements above, correct? If not, how should TRAX adjust its understanding?
Summary of Response from Spare 	Yes, the vision as included in the RFI is correct but there are additional features available (described below).
Summary of Response from Swiftly 	Swiftly reiterated the partnership of their products (for fixed-route transit) along with those of Spare (for paratransit) and Orion (for two-way voice). Swiftly also described a migration path from an environment without a TWM-A application that includes:

	<ul style="list-style-type: none"> ▪ Starting with a system whose only in-vehicle equipment is a cellular-enabled tablet – this would minimize the amount of equipment (and installation services) required per vehicle ▪ Later, adding enhancing the radio-coverage performance provided to vehicles by adding to the tablet external antennas or routers ▪ Also later, adding in-vehicle peripherals that could support features such as automatic passenger counters and/or automated voice annunciators (to announce next stops for fixed-route service) <p>Finally, Swiftly highlighted their focus on solutions that minimize cost, ease support, and maximize flexibility – they:</p> <ul style="list-style-type: none"> ▪ Use commercial-off-the-shelf (COTS) software (not custom-developed software) and that used cloud-based platforms ▪ Use COTS hardware such as tablets ▪ Use web-browser based, cloud-hosted applications for fixed-location uses (such as dispatch) ▪ Produce real-time data regarding passengers and routes and that is compliant to GTFS standards – this will support CalTrans’ GTFS initiatives
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5.3. Question #3: Regarding TWM-A Features

<p>RFI Question #3</p>	<p>Please describe the features provided by your firm’s TWM-A applications, especially those that are applicable to transit operations. Please describe how they are used by, and what benefits they provide to, dispatchers, drivers, and riders.</p> <p>Please describe the support your firm’s TWM-A application, and its associated equipment, has for two-way voice radio communications between: i) dispatchers and drivers and ii) among drivers. Describe the method (or methods) by which drivers may begin a radio conversation including simple push-to-talk (at the control of the driver) or request to push-to-talk (at the approval of a dispatcher).</p>
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<p>Summary of Response from Spare</p> 	<p>Spare has six main modules that provide the following features:</p> <ul style="list-style-type: none"> ▪ Spare Launch is used to define transit services including routes, times, vehicles, stops, drivers, driver availability, fares
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	<p>(<i>management and planning, not collection</i>), promotions, rider notifications, service alerts, and other aspects of (para)transit operations</p> <ul style="list-style-type: none"> ○ Spare Launch is also used to book rider-specific trips or day-specific routes, driver schedule and it provides the graphical view to the real-time location of vehicles as well information such as their mileage and speed ▪ Spare Driver is the driver’s view to all that is created in Launch – it displays itineraries, gives navigation guidance, allows for the logging of cancellations and no-shows, and transmits location and other data back to Launch ▪ Spare Rider is a free application to riders that allows them to search routes, request a trip, track vehicles, request support, note requirements to special accommodation, and make payments. ▪ Spare Analyze can help planners create and review analytical reports on services, fleets and trips (rider patterns) ▪ Spare Realize, an optional service, has planning and optimization modes ▪ Spare Engage which is used for paratransit to create and assign cases and to evaluate ADA paratransit eligibility <p>Spare noted that messaging features can be supported by external applications (such as WhatsApp) and that driver-dispatcher voice calls are a commitment for their product roadmap for 2023.</p>
<p>Summary of Response from Swiftly</p> 	<p>Swiftly’s response was broken into three areas: the features of Swiftly’s software for fixed-route operations, the features of Spare for paratransit, and the features of Orion for two-way push-to-talk (PTT) voice. Information about Swiftly and Orion are included below – information provided by Swiftly about Spare matched the information provided by Spare that is included directly above.</p> <p>Swiftly’s features for fixed-route operations are divided into the following five categories:</p> <ul style="list-style-type: none"> ▪ A “Connect with Vehicles” Onboard App that provides information to drivers such as schedule and route/timetable adherence, mapping/location, service adjustments (reroutes). This can also support real-time vehicle spacing to reduce bus bunching and gapping. The Onboard App can be augmented with a Samsara Vehicle gateway to collect and share information about the vehicle’s diagnostics via an OBD/II or J1939 port. It can be further expanded through the



	<p>deployment of and interconnection with automatic passenger counters (APCs) for real-time ridership information.</p> <ul style="list-style-type: none"> ▪ A “Live Operations” program that can be used by dispatchers to see the real-time location of every vehicle in the system along with each vehicle’s schedule adherence. “Live Operations” can also be used by dispatchers to create and send to drivers detailed service adjustments (including rerouting instructions) to account for detours, closed stops, etc. as well as to reduce bus bunching and gapping. Alerts can also be prepared and sent to riders from the “Live Operations” program. The passenger application and the “Live Operations” program exchange data via an GTFS-RT interface. ▪ A “Connect with Staff” program for use by planners and managers to graphically track real-time locations and performance of vehicles, to playback selected routes (also map-based), and to produce reports on routes, segments, stops, and drivers. ▪ A “Connect with Passengers” app that can be used by riders to be informed about routes and to receive alerts about service and updates about arrivals. ▪ A set of “Connect with Partners” application program interfaces (APIs) and open data standards to exchange relevant data with such external programs as: Iris (for automatic passenger counters), Way Sine (for on-vehicle display boards), and, as mentioned above, Samsara (for vehicle diagnostics). <p>As noted, Swiftly also partners with Spare for paratransit planning, management, and operations.</p> <p>Swiftly also supports Orion Lab’s (Orion’s) push-to-talk (PTT) services for voice communications among users. Orion can be configured to support various communications groups which can be assigned to individual users, based on logon, only as needed and as authorized. Voice communications with Orion are encrypted and logged/recorded.</p>
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5.4. Question #4: Regarding TWM-A Standards/Compliance



<p>RFI Question #4</p>	<p>What, if any, involvement does your firm have with initiatives to develop or deploy products that meet General Transit Feed Specifications or GTFS (https://gtfs.org/background/)?</p> <p>What does your firm see, if any, as the possible benefits or drawbacks to the GTFS?</p>
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	<p>Other than GTFS, are there standards within the TWM-A application industry that promote the interchange of TWM-A information between products or systems of different vendors?</p> <p>If so, what are those standards and to what extent does your firm’s TWM-A applications comply with those standards?</p>
<p>Summary of Response from Spare</p> 	<p>Spare has the capability to “pull from the GTFS”. This can support Spare’s planning/modeling/optimization features.</p> <p>Spare is also SOC 2 compliant. According to Spare, SOC 2 “defines criteria for managing customer data based on five ‘trust service principles’ – security, availability, processing integrity, confidentiality, and privacy.”</p> <p>Spare also provided details on how their cloud-based services undergo numerous, regular quality control (QC) processes for development, testing, backups / disaster recovery, and customer support.</p>
<p>Summary of Response from Swiftly</p> 	<p>Swiftly stated their “Connected Transit Platform runs on GTFS Static and produces GTFS-Realtime. We are actively involved in the GTFS community, and continually pushing the development of expanded standards to support future capabilities such as non-revenue service data and real-time detour management.</p> <p>They continued, “We believe adhering to the GTFS standard is beneficial for all transit agencies because it allows for third-party applications such as Google Maps and the Transit App to provide accurate trip planning and real-time information to passengers across a network of regional services, rather than requiring individual apps for each service. For example, Redding Area Bus Authority uses Swiftly’s GTFS-Realtime for passenger information. A transit rider who uses Google Maps or the Transit App in Redding could access trip planning and real-time information in those same apps for planning transit trips on TRAX without needing to download an additional app to their mobile phone.”</p>

5.5. Question #5: Regarding CalTrans ITP

RFI Question #5	What, if any, involvement does your firm have with the Cal-ITP (https://dot.ca.gov/cal-itp)?
Summary of Response from Spare 	Spare stated that they are “heavy supporters” of Cal-ITP’s goals, that they have “a fully open API that has already been implemented into many multimodal apps, and that are actively working with our partners to support emerging standards in the field.”
Summary of Response from Swiftly 	Swiftly noted that they have not contractual relationship with Cal-ITP but they have “been involved in providing feedback to Cal-ITP as they have developed standards for GTFS-RT and Operational Data (an extension of GTFS to support interfaces between scheduling software and CAD/AVL systems).” They further describe providing Cal-ITP with “open access to the GTFS-RT feeds that we provide for California transit agencies in support of building out a statewide GTFS-RT database.”



5.6. Question #6: Regarding Fixed Network Equipment

RFI Question #6	<p>What fixed network (Local Area Network or Wide Area Network) equipment is involved in the deployment of a TWM-A applications?</p> <p>Where is that equipment deployed and can any of it be virtualized?</p> <p>What expectations or assumptions does your firm have for network equipment or interfaces that are to be provided by a customer?</p>
Summary of Response from Spare 	Spare’s services are cloud-based they do “not require additional hardware or software for workstations and can be accessed from any modern web browser. Because of this, TRAX would only require an internet connection and a modern web browser to access Spare Platform.”
Summary of Response from Swiftly 	Swiftly is also cloud-based and, therefore, requires only “computers with internet connections”. This applies to their partner products from Spare and Orion which they likewise describe as cloud-based and deployable/useable from any internet-connected location.

5.7. Question #7: Regarding In-Vehicle Equipment



<p>RFI Question #7</p>	<p>What in-vehicle equipment is involved in the deployment of a TWM-A applications?</p> <p>What expectations or assumptions does your firm have for in-vehicle equipment or interfaces that are to be provided by a customer?</p>
<p>Summary of Response from Spare</p> 	<p>Spare’s in-vehicle application operates on a cellular-enabled phone or a tablet. Spare expects these devices to be provided by TRAX and most new versions of iPhones and iPads (including Air, Pro, and Mini so long as they have iOS Version 8 or higher) are supported as are Android phones and tablets (must have Android Version 8 or higher). Any driver device must also be securely mounted (RAM mounts are recommended) and should be charged from the vehicle or other external source.</p>
<p>Summary of Response from Swiftly</p> 	<p>Swiftly’s in-vehicle application operates on cellular-enabled Android tablets and they specifically name the Samsung Galaxy Tab A7 Lite. They further mention the GPSLockbox Eclipse PTT kit as a push-to-talk hardware add-on to the Samsung Galaxy Tab A7 Lite tablet – it provides a handheld microphone and a speaker with volume control and it integrates with the Orion PTT application. A picture of the combined hardware set is shown to the right. Swiftly also recommends a temperature-regulating mounting cradle for the tablet/PTT device and mentions one that is available from Atmos.</p> <p>Swiftly recommends public agencies, like TRAX, procure both the devices and the cellular service on which they operate directly from cellular carriers as they can typically receive low, government-level pricing for these items.</p> 

5.8. Question #8: Regarding Radio Systems

<p>RFI Question #8</p>	<p>Does your firm support an interface to the UHF DMR system and in-vehicle radios used by TRAX?</p> <p>What other radio systems (by technology or vendor/brand name) are supported by your firm’s TWM-A applications?</p> <p>Are there any benefits to using one type of radio system over others and, if so, please list the preferred system(s) and the benefits they provide?</p> <p>How does your firm’s TWM-A application address loss of coverage or reduction of wireless-system service (such as roaming from an area of 5G to an area of 4G speeds)?</p>
<p>Summary of Response from Spare</p> 	<p>Answers to these questions were not provided however, based on the in-vehicle equipment (phones and tablets) it is assumed that cellular-based services are supported but traditional, two-way radios systems (including DMR) are not. There were no details provided on a preferred cellular system nor on the coverage expectations from using any available system.</p>
<p>Summary of Response from Swiftly</p> 	<p>Swiftly and its partner companies of Spare and Orion support “any cellular data or Wi-Fi network ... “[t]his includes 5G networks as well as older generation technologies whether 4G, 3G, etc.” It is assumed that DMR or other traditional two-way radio systems are not supported.</p> <p>Additionally, Orion offers a “Bridge-as-a-Service” (BaaS) interoperability product that can link an Orion talkgroup on a cellular or WiFi network to a traditional two-way radio system/channel. If established, the BaaS would connect the communications of users on cellular/WiFi to those using the traditional two-way communications.</p>
<p>CDX Wireless Note:</p>	<p>Coverage maps for the major cellular carriers are available at:</p> <ul style="list-style-type: none"> • AT&T: https://www.att.com/maps/wireless-coverage.html • T-Mobile/Sprint: https://www.t-mobile.com/coverage/coverage-map • Verizon Wireless: https://www.verizon.com/coverage-map/



5.9. Question #9: Regarding Scalability

<p>RFI Question #9</p>	<p>How does your firm’s TWM-A applications adjust to meet the scale of TRAX’s operations?</p> <p>Are there any limits for the scale of a customer’s operations at which your firm’s TWM-A applications become unviable?</p> <p>What mechanisms are included in your firm’s TWM-A applications to scale up or down as the scale of a customer’s operations changes including:</p> <ul style="list-style-type: none"> • As additional vehicles are deployed? • As additional features are required?
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<p>Summary of Response from Spare</p> 	<p>Spare’s “Launch” application provides the set-up for features and users. It expands to support the resources of the organization.</p>
<p>Summary of Response from Swiftly</p> 	<p>Swiftly stated, “There are no limits to the scale of a customer’s operations that we can support. As cloud-based platforms, Swiftly, Spare, and Orion can support agencies of all sizes without reaching any limits associated with on-premise servers such as data storage limits. The solutions support agencies operating anywhere from vehicles to upwards of 2,000 vehicles.”</p> <p>Additionally, “[n]ew features that are deployed as upgrades to products that TRAX has already purchased will be rolled out seamlessly, over the air, with no downtime.”</p>

5.10. Question #10: Regarding Deployment Schedule


<p>RFI Question #10</p>	<p>What are the typical phases involved in deploying a TWM-A applications?</p> <p>What is the typical duration such a deployment project?</p> <p>What resources (other than funds to purchase or otherwise procure) does your firm expect a client to provide for such a deployment project?</p>
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<p>Summary of Response from Spare</p> 	<p>Spare provided an outline of an “Implementation Work Plan and Timeline” that included the following Project Stages, however, no durations (for either individual stages or the entire project) were included:</p> <ul style="list-style-type: none"> ▪ Pre-Kickoff (scope and documentation review) ▪ Kickoff and Project Planning (confirmation of schedule, resources, and deliverables) ▪ Service Planning and Design (development of operational configurations to match service requirements) ▪ System Development (set-up of services based on design) ▪ Training and Vehicle Setup (installation of devices into vehicles and training of users) ▪ Testing (functional tests and user dry-runs) ▪ Pre-Launch (final verification of users and other configurations) ▪ Launch (full use of Spare by all users, accompanied by feedback gathering) ▪ Post-Launch Support and Optimization (track and resolve any issues, monitor ongoing operational quality)
<p>Summary of Response from Swiftly</p> 	<p>Swiftly described a serial, four-phase deployment schedule, with estimated durations, that includes :</p> <ul style="list-style-type: none"> ▪ A review of GTFS and GPS data (review of real-time data feed to identify any necessary changes) – 2 weeks ▪ Data integration (incorporating existing AVL and GTFS information into Swiftly’s systems) – 2 weeks ▪ Internal testing (review records of AVL reports, real-time prediction accuracy, and system on-time performance – also test customer interfaces) – 4 to 6 weeks ▪ Launch (begin use of passenger web and mobile apps – also conduct press and social media outreach campaigns to notify riders) – 6 to 8 weeks <p>The full deployment project would, according to the above information, have a duration of 14 to 18 weeks. Included in the first phase would be the installation of tablets and PTT kits into vehicles which, according to Swiftly, can occur within several days.</p> <p>The duration of this schedule would extend if options such as automatic passenger counters are deployed.</p>

	<p>Swiftly describes their assignment of a single point of contact from their firm to oversee the deployment and to conduct weekly check-in meetings.</p>
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5.11. Question #11: Regarding Procurement Options

<p>RFI Question #11</p>	<p>What procurement options (e.g., capital purchase, financed purchase, lease, etc.) does your firm offer?</p> <p>If capital financing is offered, how is the cost of the capital finance calculated (as a percentage of the capital purchase)?</p>
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<p>Summary of Response from Spare</p> 	<p>Spare stated their offering is “a SaaS (Software as a Service) platform and therefore procurement is not needed for working with us.”</p>
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<p>Summary of Response from Swiftly</p> 	<p>Swiftly does not offer financing options but their software, along with that of their partners at Spare and Orion, can “be purchased through prepaid multi-year contracts or through annual recurring payments for licenses. Swiftly offers discounted software prices for prepaid contracts.” Swiftly also described a “‘blended’ approach where one-time costs for hardware, installation, software implementation, and first-year software licenses are considered capital costs and annual software license fees for subsequent years are considered operating costs.”</p> <p>Swiftly noted that their software products are available via cooperative purchasing contracts including NASPO Cloud Solutions and The Interlocal Purchasing System (TIPS).</p>
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5.12. Question #12: Regarding Budgetary Estimates

<p>RFI Question #12</p>	<p>Please provide a budgetary pricing estimate for a TWM-A application that provides the functions of voice communications, real-time automatic unit (vehicle or person) location, emergency notification, tasks/assignment lists, and user-to-user messaging that meets the scale and scope of TRAX’s operations, as described above. Please scope your estimate for 19 vehicles, 10 separate personnel (managers or maintenance staff that require communications but are not in transit vehicles), and one dispatch position. For the 19 vehicles, please</p>
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chose and include user equipment that best fits the operations of a transit driver. For the 10 separate personnel, please chose and include user equipment that best fits the operations of a mobile worker in an office environment. For the dispatch position, please chose and include all typical computer, screen, mouse, keyboard, microphone, speaker, and push-to-talk (e.g., foot pedal) equipment. Please provide a short narrative that describes what is included in your budgetary pricing estimate.

Please identify what, if any equipment or resources (e.g., in-vehicle mobile radios, fixed location workstations, etc.) your firm has assumed would be provided by TRAX. Please also describe the wireless network(s) that would be supported by (and that you assume would be available for) the TWM-A application included in your budgetary pricing estimate.

Please provide a budgetary pricing estimate for the annual, on-going services to support and maintain the TWM-A application included in your response to the above request.

Please provide optional/incremental budgetary pricing estimates for other TWM-A application features or capabilities available from your firm.


Budgetary pricing estimates are to be inclusive of all equipment, software, and services (other than those expressly noted/assumed to be the responsibility of TRAX) required to deploy your firm’s TWM-A application. Budgetary pricing estimates are to be conservative (e.g., based on current list prices or some other pricing method that is not to be less than the expected sales price nor to exceed the expected sales price by 25%).

Summary of Response from Spare



Spare’s pricing is based on their offering as a Software-as-a-Service (SaaS) platform – there is an annual subscription that is based on the size of the service which consists of two components, the software, and the support required for the agency/service. The software fee has two parts: the annual platform fee and a per vehicle fee. The support fee is based on the level of support to be required of Spare.


Spare noted the following, “To properly provide a quote on this zone, and microtransit service(s) inside of it Spare would need to understand things like current and expected ridership, service population, and requirements for implementation. These factors would go into our planning model to get an idea of how many vehicles would be required to properly satisfy the demand at the lowest possible cost.”


	<p>Spare also provided the following two pricing estimates (in two separate sections of their answer to this question):</p> <ul style="list-style-type: none"> • “A rough estimate of 19 vehicles would be \$91,000.” • “At this time, Spare can estimate pricing for this service that may range anywhere from \$95,000 to \$300,000. More secure pricing will be able to follow post-RFI if TRAX wishes to work more with Spare.” <p>Spare also noted they do “not operate on warranty—we continuously deliver software updates to our customers”, and, “this means you will never have to pay for a new version of Spare, or pay incrementally for things like implementation, testing, training, maintenance, or customer service/support.”</p>
<p>Summary of Response from Swiftly</p> 	<p>Swiftly included a detailed price estimate that had a break-down of their costs for their solution into the following four major categories:</p> <ul style="list-style-type: none"> • One-Time Fees which cover their implementation services, the in-vehicle mounting and PTT kits (including installation at one location) and the GTFS integration: \$19,476 (one-time) <ul style="list-style-type: none"> ○ Swiftly assumed TRAX will provide the 19 tablets with SIM cards (noted as being available from carriers at \$200 plus on-going service fees) as well as the dispatcher workstations (with network connectivity) • Swiftly’s Annual Fees for Fixed Route Operations which cover the setup, launch, and operation of their software as well as the app available to riders: \$22,700 (annual with 5% escalation every year thereafter) <ul style="list-style-type: none"> ○ Swiftly assumed 10 of 19 of TRAX’s vehicles are used for fixed-route operations • Swiftly’s Annual Fees for Paratransit Operations which cover the setup, launch, and operation of Spare’s software as well as the app available to riders: \$69,000 (annual with 5% escalation every year thereafter): <ul style="list-style-type: none"> ○ Swiftly assumed 9 of 19 of TRAX’s vehicles are used for fixed-route operations • Swiftly’s Annual Fees for voice PTT use which cover the setup, launch, and operation of Orion’s and Samsara’s software: \$10,788 (annual with 5% escalation ever year thereafter): <ul style="list-style-type: none"> ○ Swiftly assumed there would be a total of 30 named users, 19 of which would be operational at any time <p><u>These amounts total to a one-time cost of \$19,476 and a first-year annual operating cost of \$102,488 (with 5% escalation ever year thereafter).</u></p>

	<p>Swiftly also provided costs for optional services including the analytical features of their software (e.g., “GPS Playback”, “Speedmap”, etc.), automatic passenger counters, and the Spare “Engage Paratransit Eligibility Platform”.</p>
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5.13. Question #13: Regarding Funding Options


<p>RFI Question #13</p>	<p>What, if any, creative sources has your firm seen customers use to fund the purchase of a TWM-A application?</p>
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<p>Summary of Response from Spare</p> 	<p>Spare noted it “works closely with [the Shared-Use Mobility Center] (https://sharedusemobilitycenter.org/) and if funding help is needed, Spare will work closely with TRAX and SUMC to ensure our best attempts at helping you make every ride possible and to not be held back by lack of funding.”</p>
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<p>Summary of Response from Swiftly</p> 	<p>Swiftly used this opportunity to reiterate the availability of their software on cooperative purchasing agreements, such as NASPO Cloud Solutions and The Interlocal Purchasing System (TIPS).</p>
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5.14. Question #14: Other Relevant Information

<p>RFI Question #13</p>	<p>Please use this opportunity to provide any other information your firm feels is relevant to TRAX as it plans for deployment of a TWM-A application.</p>
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<p>Summary of Response from Spare</p> 	<p>No response was provided.</p>
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<p>Summary of Response from Swiftly</p> 	<p>Swiftly encouraged TRAX to hold demonstration meetings with vendors in order to best evaluate the value of their products. They also encouraged TRAX to contact vendors’ “reference customers to hear</p>
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	about their experience with each system” and they offered to provide additional reference customers.
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6. Comparison and Recommendations

6.1. Comparison of Solution Approaches

In comparing the findings and guidance of the Alternatives & Recommended Solutions Report; which included for TRAX a subsystem of a single-channel, UHF, conventional, DMR site at Inskip Butte and new wireless dispatch control stations and user radios; to the type of solutions offered by vendors of TWM-A solutions, there are three key differentiators between them:

1. **Network-Centric vs Application-Centric:** The DMR solution of the Alternative & Recommended Solutions Report is a radio network that supports two-way, mobile voice and low-speed data communications but it, in and of itself, does not offer any applications – it is a network that supports but does not provide applications. In comparison, the TWM-A applications are the services operated by users and they require cellular-phone-based networks (with possible augmentation by WiFi ‘hot-spots’) as a means of transport.
2. **Private-Ownership/Control vs Subscription Service:** The DMR solution would be privately owned and operated by TRAX solely for its use – its coverage, capacity, and other performance attributes would not be shared with other agencies (unless use of the second time slot were granted to TCSO or TCPW for any future automatic vehicle location applications). In comparison, the cellular-phone-based networks that are the transport for TWM-A applications are shared on a subscription-basis by many corporate and individual users and their performance attributes are defined by the carriers that operate them.
3. **Capital Cost vs Operating Costs:** The DMR solution has significant one-time, capital costs associated with purchasing and deploying its infrastructure and user equipment but, once in operation, its ongoing, operational costs are relatively low. In comparison, the TWM-A applications, as well as the use of the cellular-phone-based networks on which they operate, have low capital/deployment costs but higher ongoing/operational costs.

In addition to these fundamental differences, a comparison of the performance-attributes of the two solutions is shown in the following table:

Performance Attribute	Capabilities Delivered by Solution from Alternatives and Recommended Solution Report	Capabilities Delivered by Solutions Described in Vendor Responses to RFI for TWM-A applications
Coverage	See coverage prediction map in Section 2, Page 3.	Coverage will be provided by a cellular network (and possibly enhanced in select areas by WiFi) – see the links to major

Performance Attribute	Capabilities Delivered by Solution from Alternatives and Recommended Solution Report	Capabilities Delivered by Solutions Described in Vendor Responses to RFI for TWM-A applications
		cellular carriers’ coverage maps in Section 5.8, Page 11.
Capacity	<p>Two time slots in one physical channel (the equivalent to two ‘virtual’ radio channels) would be available via the DMR site – this would allow one voice call to occur on one time slot and for either a second voice call or data packets to be carried on the other.</p> <p>The physical channel operates at 9,600bps so each timeslot can carry slightly less than 4,800bps of data bandwidth – this makes each timeslot viable for voice or low-bandwidth, packetized data. The channel would, however, be privately licensed to TRAX so no other users could access its bandwidth.</p>	<p>There was no stated limit to a number of talkgroups that could be supported by the Orion PTT voice application.</p> <p>The bandwidth available for data applications will depend on the class of cellular coverage provided by the selected cellular provider, however, the “peak” data rates of those classes are:</p> <ul style="list-style-type: none"> • LTE: 100Mbps • 4G: 1Gbps • 5G: 20Gbps <p>Note that “peak” rates are the rates that all transmissions from all users that access the system are aggregated to. As the channels are shared (i.e., not licensed privately to TRAX), the rate available to one user should be expected to be less and will depend on the total number of users accessing the system at that time.</p>
Channel Selection	The use of one site, and one physical channel, allows easy selection of which radio mode to use for communications.	Voice conversations will require the selection of a talkgroup but not of any specific site.
Channel Scanning	Scanning would not be supported.	Scanning was not mentioned as an available feature.
Equipment Usability	Options for various manufacturers and models of user radios would be available.	Available user devices include phones and/or tablets that meet vendor operating-system requirements.
Features	Conventional DMR supports both traditional voice and user-agency-specific data applications.	RFI respondents described various features for their TWM-A applications including vehicle location, route assignment, driver messaging and task lists, etc. Optional features for vehicle diagnostics and automatic passenger counters were also

Performance Attribute	Capabilities Delivered by Solution from Alternatives and Recommended Solution Report	Capabilities Delivered by Solutions Described in Vendor Responses to RFI for TWM-A applications
		described. Voice features that were mentioned include basic PTT-talkgroup calls, end-to-end encryption, and voice-recognition-based messaging and calls.
Interoperability	Direct radio interoperability between TRAX and TCSO, TCPW, and/or local government departments would not be supported – intervention from the dispatchers from the required agencies would be needed.	Interoperability for the data applications can be achieved to the degree to which the applications support the GTFS standard (which is available from the offerings of both Spare and Swiftly). Should voice interoperability with users of traditional two-way radio systems be required, Swiftly has a Bridge-as-a-Service offering.

As noted, the two solution types have different approaches to their costs with the DMR solution having a higher capital cost but lower ongoing/operational costs. The budgetary estimates for each solution are shown in the following table. (For this comparison, the costs provided by Swiftly were used because: i) there were inclusive of their applications as well as those from Spare and Orion and ii) they were more defined values rather than the ranges provided by Spare.)

Cost Type	Budgetary Estimates of Solution from Alternatives and Recommended Solution Report	Budgetary Estimates Solutions Described in Vendor Responses to RFI for TWM-A applications
Capital – Purchase and Deployment of Network and User Equipment	\$71,000 for equipment to be used specifically by TRAX plus some portion of \$2,116,000 for the radio-site improvements and deployment services required to deploy a shared TRAX-TCSO-TCPW-LG system of subsystems	\$19,476 for the one-time setup fees, vehicle mounts, and PTT kits plus approximately \$3,800 for 19 cellular-equipped tablets (not included in the above are dispatcher workstation computers)
Operational – Ongoing Costs for Use, Maintenance,	Some portion of \$175,000 per year for the maintenance and support of a shared TRAX-TCSO-TCPW-LG system	\$22,700 per year for usage fees for Swiftly’s fixed-route application plus \$69,000 per year for usage fees for Spare’s paratransit application plus

Cost Type	Budgetary Estimates of Solution from Alternatives and Recommended Solution Report	Budgetary Estimates Solutions Described in Vendor Responses to RFI for TWM-A applications
and Support of the Solution		\$10,788 per year for usage fees for Orion’s cellular-based push-to-talk application Notes: 1) All of the above have an annual 5% escalation factor. 2) Not included are the costs of subscription for cellular-based data services from a cellular carrier.

6.2. Recommendations

CDX Wireless feels that either solution (traditional, DMR-based two-way radio or TWM-A application, potentially with PTT voice) could be viable for TRAX and we have the following recommendations for next steps to be taken to further evaluate them in preparation to selection of approach and deployment of a corresponding system to meet TRAX’s needs.

6.2.1. Determine A Cost Sharing Approach with TCSO, TCPW, and Local Government (LG)

As noted in our budgetary cost estimates, some costs of deploying a DMR-based solution will be entirely attributable to TRAX but some will be shared with TCSO, TCPW, and LG as part of the purchase, deployment, and operation of what we have conceptualized as a shared system of subsystems. We recommend that TRAX have discussions with TCSO and TCPW to determine their level of interest in jointly pursuing that shared-system approach as well as to establish a framework by which the shared-costs would be divided among all participating departments. This will help TRAX determine a more accurate total (capital plus operational) cost for the DMR-based solution. Any agreements on cost-sharing and joint decision-making should be established in-writing as the basis for an on-going governance arrangement for the shared system.

6.2.2. Determine the Viability/Importance of a Shared System with TCSO, TCPW, and Local Government (LG)

We recommend that if any of the agencies involved in the Integrated Public Safety Communications Project (i.e., TRAX, TCSO, TCPW, and/or TC Local Government) consider a shared-system with the other involved agencies, the do so after considering the degree to which the three following outcomes can be realized:

- I. The overall costs to the involved agencies for deploying and operating a shared system will be reduced (when compared to deploying multiple, non-shared, individual-agency systems).
- II. There is a need for both daily and incident/event-driven interoperability among the involved agencies and that need will be met by the technologies deployed in a shared system.

- III. The involved agencies can establish a mutually-agreeable and cooperative shared system structure that will define the roles, responsibilities, expected costs, and methods of decision-making to ensure the existence of processes for deliberation on, and creation of, operational/usage issues. (The existence and success of structures between the agencies on topics other than public safety radio communications can serve as an indication of the potential success for a structure for public safety radio communications.)

We recommend that TRAX heavily evaluate the first two considerations as we are unsure if TRAX can benefit from cost savings (this is dependent on the outcome of the previous recommendation regarding the determination of a cost-sharing approach) or if TRAX has a high level of need for interoperability with the other agencies (or if that interoperability cannot be met through other non-shared-system means such as dispatch-to-dispatch phone calls and/or calls to users via cell phones).

6.2.3. Learn More About TWM-A Applications Through Demos

We at CDX Wireless believe the information gathered through the RFI process and summarized in this Supplement is a good initial exposure to the benefits and costs of TWM-A applications, however, we agree with the recommendation provided by Swiftly that a much greater understanding can be achieved through demonstrations. TRAX can directly contact providers of such applications – including Swiftly as well as the other firms notified of the RFI’s publication - to arrange for such demos.

(We recognize that TRAX has prior experience with DMR-based two-way radio communications as it has previously used such services from the site operated by Day Wireless at Cohasset Ridge. While we expect the coverage from a new, privately-owned site at Inskip Butte to provide significantly better coverage, the other aspects of system performance are already known to TRAX and, therefore, should not require demonstration.)

6.2.4. Evaluate A DMR vs TWM-A Approach

We recommend that once TRAX has had the chance to learn more about TWM-A applications, it focus on one of the two solutions approaches using the following factors:

- 1) **Importance of Voice vs Data:** The DMR solution is a radio network that, based on our inclusion of two-way voice radios, will inherently provide voice communications and that also has support for low-speed mobile data, however, it does not inherently include any applications. The opposite is true of TWM-A applications – they use cellular data networks to transport their application-based information, including voice. If voice is of utmost importance to TRAX, then preference may be given to the DMR solution but if use of transit applications has high priority, then preference may be given to a TWM-A application solution.
- 2) **Importance of Control and Ownership:** The DMR solution, which will be owned by TRAX, can be designed specifically to TRAX’s requirements and policies regarding its usage can be entirely directed/controlled by TRAX. The opposite is true of TWM-A applications – they rely on subscriptions for both the use of the applications and the cellular-based service on which they operate. If private ownership and control is important to TRAX, then preference may be given to the DMR solution but if this factor is not crucial, then preference may be given to a TWM-A application solution.

- 3) Availability of Capital vs Operational Funds:** We recognize that different organizations have different financial models and constraints and that some have an easier time obtaining capital funding while others are freer to secure and use operational funds. Availability to one type of funding may also vary with time and such considerations as access to sources such as bonds or grants. If capital funds are more available to TRAX, then preference may be given to the DMR solution but if operating funds are easier to secure and use, then preference may be given to a TWM-A application solution.

No one factor alone should make the decision for a solution – these factors must be balanced in the decision-making process with weight applied based on TRAX’s operational, financial, and cultural sensitivities.

6.2.5. Conduct an Open, Functional-Requirements Based Procurement

Finally, whichever approach is chosen by TRAX, we recommend that the procurement of the solution be conducted using an open procurement process to solicit offers from multiple vendors. This should include development of specifications that are based on functional requirements, grounded in industry standards, and reviewed to ensure that, unless absolutely necessary to meet operational needs, not specific to any one vendor. These specifications should be released to vendors through a Request for Proposals/Bids/Qualifications process that includes confirmation of evaluation/selection criteria prior to the receipt of vendor responses.