

Task Assignment: MPD0043-18
Smart Work Zone (SWZ) Technical Concept Study
Scope of Services
(Rev 09-13-18)

Project Understanding

As part of ADOT's Implementation Guidelines for Work Zone Safety & Mobility process review, ADOT is continually looking at ways to expand/enhance existing practices within work zones (WZs). ADOT is seeking the assistance to help develop and implement Smart Work Zone (SWZ) operational concepts using an intelligent combination of technologies that are effective and efficient at improving the safety of highway workers and traveling public, and optimize WZ traffic operations while minimizing congestions delays throughout the state.

ADOT has a long and proud history of being one of the nation's pioneers in the implementation of Intelligent Transportation System (ITS), which began in the early 1990s with the deployment of ADOT Freeway Management System (FMS) Phase 1. ADOT has successfully applied these ITS operational tools to be used during construction WZs for many years, when construction is within the vicinity of ITS infrastructure. With recent advancements in SWZ technologies, ADOT is no longer limited by the reach of the state's permanent ITS infrastructure.

Although there are some core ITS operational principles used in deployments of SWZ systems, there are many operational and deployment considerations unique to SWZ technology applications. For example, ADOT needs to avoid impeding current practices in deploying Temporary Traffic Control (TTC) devices, while simultaneously adding additional TTC devices (i.e., SWZ technologies) within the overall TTC plan.

It is understood that the operational capabilities of these SWZ systems may be enhanced by expanding their motorist information dissemination capabilities through integration (operational and/or systems) with ADOT's motorist information systems (i.e., variable message systems [VMS], Highway Condition Reporting Systems [HCRS], 511, az511.com, closed-circuit television [CCTV] to media, and soon to be tested dedicated short-range communications [DSRC]/vehicle-to-infrastructure [V2I]). These SWZ deployment strategies may need to inform the Arizona Traffic Operation Center (TOC) personnel and Region Traffic Engineers (RTE) of operational conditions, historical data, and performance while alerting highway motorist of traffic delays, stopped conditions, and other pertinent information needed for operators and the traveling public to make informed decisions.

It is understood that this application of SWZ systems cannot be a one-size-fits-all concept. ADOT needs varying levels of deployment strategies, with measures/guidelines developed to aid professionals throughout the state in selecting an appropriate SWZ deployment strategy for their project.

It is also understood that the performance of the selected SWZ deployment strategies need to be evaluated, by working with the WZ stakeholders (i.e., the State, general contractors, TTC subcontractors, and SWZ vendors), to refine these strategies for optimum effectiveness and efficiency.

Phase I:

In this phase, we will accomplish the concepts of operations, system requirements, and high-level design steps of the SE approach (Tasks 1-5).

Task 1 – Refine Scope of Work

In addition to the information contained in the Request for Proposal (RFP), we propose adding an open discussion about the project and SWZ system goals and objectives at the project kick-off meeting, so all project stakeholders (including Kimley-Horn) have a general understanding of what each person would like to accomplish. Kimley-Horn will start this discussion with some examples of what other stakeholders identified on similar SWZ projects.

Summary of Deliverables:

- ◆ *Refined Scope of Work (i.e., this document)*
- ◆ *Project schedule updated with actual NTP date*
- ◆ *Kick-off Meeting Agenda with SWZ system goals and objectives examples*

- ◆ *Meeting Minutes with agreed to SWZ system goals and objectives*
- ◆ *All previously completed SWZ system studies that Kimley-Horn developed for other DOT's*

Task 2 – Nationwide Review of SWZ Technologies (Working Paper 1)

The goal of Working Paper 1 (**WP-1**) is to give the ADOT Project Management Team (PMT) a general understanding of the tools currently available within the tool box (i.e., existing SWZ technologies), what they typically cost to deploy, operate, and own; and how other agencies applied these tools to improve WZ operations and safety (i.e., operational concepts).

WP-1 will be based on the nationwide review effort that is comprised of reviewing SWZ literature published by the FHWA and the National Work Zone Safety Information Clearinghouse, information obtained from up to five DOTs that have SWZ deployment experience, and researching the product offerings of five known SWZ equipment vendors.

After the draft version of WP-1 has been submitted to the PMT for review, Kimley-Horn will facilitate an **ADOT SWZ Workshop #1 – Operational Concepts** with the project stakeholder to accomplish the following:

- Summarize the SWZ tools currently available
- Discuss how other agencies used these tools
- Discuss concepts for applying SWZ on our highways
- Identify performance measures

Upon completion of ADOT SWZ Workshop #1, we will have an understanding, from an operational perspective, of what types of SWZ technologies we want to deploy, their general locations within the WZ, and the associated performance measures that will be used to measure improved safety and operations while minimizing congestions delays. With this approach, project stakeholders will understand the types of ADOT SWZ operational concepts we want to implement on our highways, which will provide focus for our efforts moving forward.

Summary of Deliverables:

- ◆ *Working Paper 1 (WP-1) – A draft submittal*
- ◆ *Workshop #1 Agenda with draft ADOT SWZ operational concepts and performance Measurers*
- ◆ *Workshop #1 Meeting Minutes with final ADOT SWZ operational concepts and performance Measurers*

Task 3 – Challenges to Implementation (Working Paper 2)

The goal of task is to advance beyond the SWZ operational concepts and move toward a high-level understanding of how the system is going to function (i.e., high-level system requirements), how the various system components need to interact (i.e., high-level sub-system requirements), and how we are going to implement the ADOT SWZ systems from a procurement perspective (i.e., high-level design).

The goal of Working Paper 2 (**WP-2**) is to give the ADOT Project Management Team (PMT) a general understanding of the challenges that departments of transportation (DOTs) encountered when implementing similar systems; the challenges of working within the limitations of the FHWA and State procurement rules; and the challenges that are inherent within the SWZ equipment vendor industry.

Kimley-Horn will prepare a preliminary list of known high-level design approaches, and associated challenges, to implementing SWZ strategies and facilitate an **ADOT SWZ Workshop #2 – High-Level Design** with the project stakeholders. At this workshop we will discuss the benefits/demerits of each high-level design approach and ultimately identify which approaches the ADOT PMT wants to move forward with (i.e., the approaches that minimize the challenges that could be encountered during implementation). The following are just a few examples of high-level design considerations that may be discussed during this workshop to help mitigate these challenges:

- Does ADOT want to own and maintain this SWZ equipment, or will equipment be rented from the industry, like TTC devices typically are?
- Does ADOT want the responsibility of deploying and operating equipment within the WZ, or is it going to be the contractor's responsibility, like other TTC plan devices?

- In addition to integrating the SWZ with the Traffic Operation Center (TOC) and Region Traffic Engineer (RTE) from an operational perspective, at what level are we going to integrate from a systems perspective (i.e., software communications between SWZ and other existing ADOT motorist information systems), if any?
- Is there more than one vendor that can provide all the functionality/integration that ADOT desires, or is a Public Interest Finding (PIF) letter going to be needed for every highway construction project that uses this equipment?
- Are SWZ equipment vendors willing to implement changes within their product offerings, and if they are, to what extent, at what cost, and within what timeline?
- Does ADOT want to establish an approved product list (APL), through a request for qualifications (RFQ) process that is open to the SWZ industry for getting multiple SWZ vendor's products tested and approved, before they can be provided by the highway contractors for deployment within WZs; or are we going to use a request for proposal process (RFP) to select a single SWZ vendor (with fixed unit costs) for testing, and if approved, it becomes ADOT furnished equipment (i.e., by the SWZ vendor) that the highway contractor will be required to deploy within the WZs, for SWZ technology performance evaluations.

Upon completion of ADOT SWZ Workshop #2, we will develop WP-2 to summarize the high-level design approaches discussed, the implementation challenges associated with each, and the selected approach for overcoming these challenges, in each high-level design category.

Summary of Deliverables:

- ◆ *Workshop #2 Agenda with a list of high-level design approaches to discuss*
- ◆ *Working Paper 2 (WP-2) – A draft submittal – Summarizing the findings from Workshop #2*

Task 4 – Equipment Hardware and Software Requirements

The goal of Task 4 is to develop an ADOT standard specification for SWZ systems that includes the “Materials” requirements section (i.e., system hardware and software requirements, system functional requirements), and the system submittal requirements (i.e., acceptance testing and training) part of the “Construction” requirements section, that will be modified and referenced, within the Phase II when the SWZ special provision or RFP is developed, to fit the specific SWZ strategies to be implemented for equipment acceptance testing and system performance evaluations. Kimley-Horn will first develop a preliminary requirements matrix that will be used in facilitating SWZ industry outreach to assess what requirements are currently supported, could be added with funding/time, and what functionality the SWZ industry is not willing to add. Based upon the results from the industry outreach, Kimley-Horn will update the functional requirements matrix and include it in the appendices of the ADOT SWZ System specification.

Summary of Deliverables:

- ◆ *ADOT SWZ System Specification – A draft submittal*

Task 5 – Final Report

Within this report, we will briefly document the system engineering approach followed, summarize the findings/conclusions of the previous tasks, describe each of the operational concepts that are best suited for each typical type of WZ identified and the hardware/software requirements for each. A matrix will be added for selecting which SWZ concepts are best suited for different WZ conditions, and we will ultimately describe the implementation process that ADOT wants to use within Phase II of this project.

Within the appendices of this final report, Kimley-Horn will provide the final submittal versions of the previous draft submittal documents, based on the agreed to comment resolutions.

Summary of Deliverables:

- ◆ *Final Report – A draft and a final submittal*
- ◆ *Appendix A, Working Paper 1 – the final submittal*
- ◆ *Appendix B, Working Paper 2 – the final submittal*
- ◆ *Appendix C, ADOT SWZ System Specification – the final submittal*

PHASE II:

Prior to starting Phase II, ADOT and Kimley-Horn will meet to discuss a revised workplan and scope of work refinements for Phase II, based on the information obtained within the Phase I efforts. It is currently envisioned that the ADOT SWZ system implementation testing/evaluation processes will follow a two-step process:

- **Step 1:** Select vendor(s) for pilot project testing, using the procurement documents that Kimley-Horn prepares as part of Tasks 6 and 7, to confirm the SWZ system(s) achieve all the functional requirements and operates properly, before it is approved for deployed in a construction WZ on one of our highways (i.e., used in Step 2).
- **Step 2:** Implement the SWZ technologies in a highway construction project, using the SWZ special provisions, plan set details, and bid quantities that Kimley-Horn developed as part of Tasks 7, 8, and 9, for evaluating the SWZ technologies against the performance measures identified (i.e., coordination, measurements/payments, system/contractor reporting, mobilization, and roadway deployment requirements). This will determine if the SWZ system is effective/efficient at addressing ADOT's goals for this project.

However, the procurement/implementation approach that ADOT selects, during Phase I, is currently unknown and the associated Phase II services will need to be refined to define the required scope of services more accurately.

Task 6 – Initial Implementation Project

Within this task, Kimley-Horn will assist ADOT in identifying an appropriate pilot project testing site and help prepare the procurement documents (RFP or RFQ for an APL) needed to select SWZ vendor(s) for pilot project testing. The Task 6 deliverables that Kimley-Horn will provide includes the SWZ Vendor Scope of Work. Depending on the procurement approach, this task may include the following:

- Description of the SWZ equipment deployment scenarios being evaluated
- Measurement and payment provisions
- Post vendor selection submittal requirements

If ADOT decides to go with the RFP process (not RFQ for an APL), a Cost Proposal Form may need to be developed and unit quantities may need to be defined for ADOT to evaluate the cost proposals from the prospective vendors. Kimley-Horn will also provide some technical support during the vendor selection process, post-selection submittal reviews, and equipment testing as part of Task 10.

Task 7 – System Operational/Coordination Requirements

The deliverable for this task is a matrix identifying the roles and responsibilities of each stakeholder (including ADOT staff, SWZ vendor, and roadway contractor). This deliverable will be used to develop the operational and coordination requirements within the contract documents for both the SWZ vendor and highway contractor.

Task 8 – Other System Deployment Considerations

Within this task, we will facilitate a workshop with ADOT representatives to identify practical locations for SWZ device trailers within an anticipated TTC plan (i.e., with other traffic control devices) using the roadway geometry for a construction phase of the highway construction project that the system will be deployed and evaluated on. At this workshop, we will discuss the ideal deployment parameters and roadway geometry challenges to build consensus on the locations of each SWZ device within the WZ, for evaluating the SWZ system against the performance measures identified in Phase I for achieving effective and efficient SWZ deployment.

Task 9 – Final Implementation Plan

Using information obtained from previous tasks, Kimley-Horn will develop the SWZ special provisions and possibly plan set details to be added as part of the contract documents for the highway construction project. These documents will identify the SWZ equipment requirements, deployment scenarios to be evaluated within contractor's TTC plans, operational and coordination requirements before, during, and after WZ deployments, as well as measurement/payment provisions and anticipated quantities of SWZ work items required of the highway contractor. We will coordinate with the roadway designer and ADOT staff when developing the requirements within the SWZ special provision section.

Task 10 – SWZ System Pilot Testing Support

Kimley-Horn will provide ADOT with some technical support during the vendor selection process, post-section submittal reviews, and equipment testing, as defined within the revised workplan for Phase II.

Task 11 – WZ Implementation Support

After ADOT awards the highway construction project, with SWZ special provision section developed in Task 9, Kimley-Horn will facilitate a workshop, one week after SWZ system implementation, to discuss questions that may arise during deployment and operations. Other types of WZ implementation and evaluation support services may be added to this scope of services, as agreed to within the revised workplan for Phase II.