Project Management Plan

Connected Intersection Phase 2 (DRAFT)

v1.00

October 13, 2022

PMP in support of:	Task Order No. 693JJ322F00303N
For approval by:	Deborah Curtis, Highway Research Engineer Federal Highway Administration
For use by:	Siva Narla, Senior Director, Transportation Technology Institute of Transportation Engineers
	Connected Intersection Phase 2 Working Group Co-Chairs – TBD.
	Members of the Connected Intersection Phase 2 Working Group (CI P. 2 WG)
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CHANGE HISTORY

Date	Version	Note
10/11/22	v0.1	Initial Draft Project Management Plan (PMP)
10/12/22	V0.2	Additional edits
10/13/22	V1.00	QC Review and Submitted to ITE

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Contents

1 PURPOSE OF THE PROJECT MANAGEMENT PLAN

This document defines a Project Management Plan (PMP) for the Connected Intersections Phase 2 Project (hereafter, "CI Phase 2"), under the United States Department of Transportation (USDOT) Task Order No. 693JJ322F00303N, awarded to the Institute of Transportation Engineers (ITE). This PMP establishes a common understanding of the management of the project for:

a) The USDOT Intelligent Transportation Systems (ITS) Joint Program Office (JPO) who is sponsoring the work;

b) The Standard Development Organizations (SDOs) overseeing the development, specifically ITE, the National Electrical Manufacturers Association (NEMA) and the American Association of State Transportation and Highway Officials (AASHTO);

c) The consulting team contracted to perform the work; and

d) The consultants, manufacturers, and public transportation professionals who participate in the CI Phase 2 Steering Committee which will use the deliverable items specified in this PMP.

This PMP conforms to the Project Management Plan Template found in Technical Exhibit 4 of the Performance Work Statement (PWS) for the project. It includes plans for scope management, communications, deliverables and milestones, quality management, and human resource management. Portions of this PMP may be updated during the course of the project if the management team or the USDOT determines that modification would significantly facilitate the project management functions. The PMP is not intended to be a progress tracking tool or to be modified for minor changes in schedule once the project has started.

1.1 Background of Project

USDOT and ITE have worked on ITS standards since the inception of the ITS Standards Program over 20 years ago. The USDOT, in conjunction with ITE, SAE International (SAE), the American Association of State Highway and Transportation Officials (AASHTO), the National Electrical Manufacturers Association (NEMA), and early deployment agencies, successfully developed a Connected Transportation Interoperability (CTI) 4501 Connected Intersections Implementation Guide under an equal equity voting membership between the traditional automotive stakeholder community led by SAE and the traditional Intelligent Transportation Systems (ITS) infrastructure community stakeholders led by ITE, AASHTO and NEMA. CTI 4501 provided the deployment guidance and concepts necessary to help deploy nationally interoperable CI applications. During the course of development and validation of CTI 4501, a number of potential activities were identified to update and enhance the existing guidance moving forward, initially identified as CI Phase 2 effort. In the first phase of CI Implementation Guidance development, ITE served as the lead SDO, with SAE supporting development by helping convene automotive stakeholders, providing relevant subject matter experts (SMEs), and helping identify the automotive voting members. For the CI Phase 2 effort, SAE is the lead SDO with ITE providing relevant SMEs and infrastructure owner operators (IOOs) stakeholders.

1.2 Objective

The primary objective of this task order is to support the development and publication of expanded and updated non-proprietary, industry-based consensus CI Implementation Guidance Standard. As mentioned in the background Section 1.1, these activities should build on the original guidance defined in CTI 4501. The effort will result in a standard that better defines the key capabilities and interfaces associated with accurate positioning, better analysis of performance of each component within a CI, and expanded capabilities to support signal priority and preemption interoperability for State, Local, Tribal, and Territorial (SLTT) infrastructure owner/operators (IOO). A CI is defined as an infrastructure system that broadcasts signal, phase and timing (SPaT), mapping information and position correction data to vehicles. For the purposes of this PWS, the term “standard” will also apply to a Best Practice, a Recommended Practice, or an Implementation Guidance

document that undergoes the systems engineering process and gains standards development organization (SDO) stakeholder consensus

1.3 Purpose of the Scope Management Plan

This Scope Management Plan establishes the scope management approach and processes as they pertain to scope description, verification and control measures. It establishes the processes which ensure that the CI Phase 2 Standard Project includes all of the work required to complete the project while excluding all work that is unnecessary.

2 SCOPE STATEMENT

2.1.1 Project Scope Description

The subsections below describe the project activities listed in the Gantt Chart in Section 4.3, Project Schedule. The project follows a systems engineering process and explicitly incorporates layers of review and modification of the deliverable documents corresponding to a standards consensus process. Each of the major project tasks are listed below with the objectives, approach and deliverables identified. Specific TOPR tasks are identified in brackets (i.e. [TOPR Task #]). Specific formal TOPR deliverables are identified as such (i.e. [TOPR Deliverable – Task #]), as described in Technical Exhibit 2 Deliverables Schedule. These formal TOPR deliverables are also identified in the Project Schedule, see Section 4.2 Deliverable Summary.

2.1.1.1 Task 1: Project Management [TOPR Task 1]

Task Objective:

ITE and its subcontractors will participate in a “kick off” meeting with the USDOT and its representatives to ensure that all parties have a clear understanding of the requirements of this PWS and what the USDOT’s expectations are. The kick-off meeting shall take place within 45 working days of the Authorization to Proceed (ATP) unless otherwise agreed to by the Government.

2.1.1.1.1 Task 1.1: Monthly Progress Report [TOPR Task 1.1]

Approach:

ITE will deliver a monthly progress report as described in the PWS.

Deliverables

- Monthly Progress Reports [TOPR Deliverable – Task 1.1]

2.1.1.1.2 Task 1.2: Project Management Plan (PMP) [TOPR Task 1.2]

Approach:

ITE will develop a Project Management Plan (PMP) that describes the overall approach to managing the efforts described in this PWS, and coordinating the work performed by any and all Subcontractors. The PMP shall be consistent with the template attached in Exhibit 4, containing the following:

- ITE will describe the overall structure of their team including how to leverage key experience and capabilities, explain the roles and responsibilities of all key individuals, and describe the reporting relationships among the team. The PMP shall contain a Human Resources Management Plan that includes team resumes, representing domain experts and a qualified technical editor. The Human

Resources Management Plan, including team members, is subject to USDOT approval as part of the overall approval of the PMP.

- ITE will describe its Quality Management, how it will ensure that the documents submitted as deliverables herein, shall:
    - contains suitable material for the target audience
    - be organized in presentation
    - contains proper word use and English diction
    - contains detailed illustrations
    - be comprehensive, complete, and correct
    - be edited for grammatical and editorial errors

  The Quality Management section is subject to USDOT approval as part of the overall approval of the PMP.
- The Risk Management Plan shall document risks that might affect the project and the characteristics of the risk. Types of risks that must be considered include risks potentially impacting technical, project schedule, scope, and costs. A Risk Management Log must be maintained on an on-going basis during the entire period of performance to track risks, mitigation plans and status. Each risk will have a unique number, probability of occurrence and impact of occurrence rating.
- ITE will describe how they will coordinate their efforts with the USDOT, particularly the Contracting Officer's Representative (COR) and the Contracting Officer (CO).
- ITE will provide support to SAE in the creation of the Project Schedule. ITE will develop a Project Schedule for Task 7 of this PWS that shall be submitted with the PMP.

ITE will develop the PMP based on a PMP template attached as Exhibit 4. ITE may use a different template for their PMP if their organization has a standard that it uses for such plans. However, a copy of the format for the PMP, if different, shall accompany the proposal, and its use is subject to USDOT approval.

The PMP shall be delivered 30 days after ATP with the Project Schedule for Task 7.

ITE may revise the approved version of the PMP and Task 7 Project Schedule only with pre-approval from the COR and must deliver, to the COR, any modified version within 10 working days after receiving COR approval.

Once the draft PMP and Task 7 Project Schedule is ready for review, ITE will schedule a meeting with the USDOT and its representatives to review each document and ensure that all parties agree on the overall approach to project execution.

ITE will put the revised version of each contract deliverable (including the detailed project schedule) under document configuration control, with version numbers assigned to each document. All documents submitted to, and approved by, USDOT shall be assigned a unique version number.

Deliverables:

- Kick-off Meeting
- Test Plan
- Project Schedule
- Project Schedule for Task 7
- Risk Management Plan
- Monthly Progress Report

2.1.1.2 Task 2: Support Development of Updated and Enhanced Positioning Guidance [TOPR Task 2]

Task Objectives:

ITE will coordinate ITS Infrastructure Stakeholder participation and provide SME support to CI activities related to developing updated and enhanced guidance related to positioning and positional accuracy. These activities may include, but are not limited to:

- Developing best practices/guidelines for implementing and putting into operations Radio Technical Commission for Maritime Services (RTCM) position corrections
    - This guidance may include step-by-step guides, workforce training, planning and installation requirements and how to keep RTCM in operation
- Developing guidance on determining positional accuracy and how to evaluate both positional accuracy and the application of RTCM corrections
    - This may also include guidance on the types of warnings and/or types of applications that can safely be deployed at connected intersections based on the level positional accuracy
- Developing guidance, as necessary and appropriate, for positioning techniques other than from Global Navigation Satellite Systems (GNSS).

Deliverables:

- Technical documentation and analysis that support Task 2 activities. Task 2 technical documentation and analysis may include whitepapers, test plans/test cases/test procedures, test results analysis or comments/analysis on proposed positioning guidance/test documentation or other technical documentation. [TOPR Task 2]

2.1.1.2.1 Task 3: Support Execution of Additional Verification and Validation Activities [TOPR Task 3]

Task Objectives:

ITE will coordinate ITS Infrastructure Stakeholder participation and provide SME support to CI activities related to verification and validation activities of CI Implementation Guidance, use cases and applications. These activities may include, but are not limited to:

- Testing and validating signal timing through the full CI Data flow, including:
    - Determining how close the signal timing at the signal controller is to the signal phase and timing (SPAT) Message processed by the vehicle
    - Analysis of the latency of each link of the CI Data flow and across include multiple device vendors and CI configurations
- Conducting analysis to determine whether an external mechanism is necessary to determine SPAT message validity (similar to a conflict monitor in an ITS cabinet)
- Testing and validating MAP message contents generated via multiple MAP message generation methods.

Deliverables:

- Technical documentation and analysis that support Task 3 activities. Task 3 technical documentation and analysis may include whitepapers, test plans/test cases/test procedures, test results analysis or comments/analysis on verification and validation documentation. [TOPR Deliverable – Task 3]

2.1.1.2.2 Task 4: Support Development of Updated and Enhanced Security Guidance [TOPR Task 4]

Task Objectives:

ITE will coordinate ITS Infrastructure Stakeholder participation and provide SME support to CI activities related to updating and enhancing guidance related to security capabilities, guidance and best practices within CI applications and use cases.

These activities may include, but are not limited to:

- Expanding security guidance for messages that are received by infrastructure equipment (Basic Safety Message (BSM) or Signal Request Messages (SRM)) for traffic signal priority and preemption applications
- Developing additional security guidance and best practices based on responses to the Security Questionnaire in CI Phase 1 Validation Activity
- Establishing minimum security needs and operations for all CI system elements and data links leveraging existing transportation, information and communications technology (ICT) security standards where appropriate
- Collaborating with volunteer validation sites to implement security guidance/best practices and conduct a self-validation.

Deliverables:

- Technical documentation and analysis that support Task 4 activities. Task 4 technical documentation and analysis may include whitepapers, security guidance/best practices or comments on security guidance/best practices or other technical documentation. [TOPR Deliverable – Task 4]

2.1.1.2.3 Task 5: Support Development of Signal Priority and Preemption Guidance [TOPR Task 5]

Approach:

ITE will coordinate ITS Infrastructure Stakeholder participation and provide SME support to CI activities related to developing guidance for signal priority and preemption use cases and applications. These activities may include, but are not limited to:

- Using a systems engineering (SE) process to develop implementation guidance for applications and use cases that utilize signal priority and preemption including:
    - Developing a Concept of Operations (ConOps) update with new use cases and user needs focused on signal priority and preemption, including supporting a ConOps walkthrough.
    - Developing a System Requirements Specification (SyRS) update with new system requirements that trace to the new user needs focused on signal priority and preemption, including supporting a SyRS walkthrough.
    - Developing a System Design Document (SDD) update with new system design elements that race to the new system requirements focused on signal priority and preemption, including supporting a SDD walkthrough.
- Conducting test and validation activities to verify that the system requirements are achievable and appropriate and validate that the proposed guidance meets the user needs.

Deliverables:

- Technical documentation and analysis that support Task 5 activities which may include Use cases, user needs, requirements or design elements related signal priority and preemption or comments/analysis on ConOps, System Requirements or System Design Document updates [TOPR Deliverable – Task 5].

2.1.1.2.4 Task 6: Support Technical Task Execution [TOPR Task 6]

Approach:

ITE will coordinate ITS Infrastructure Stakeholder participation and provide SME support to CI activities related to technical activities such as test tool development, deployment validation procedures/checklists or other technical tasks that may arise during the development of the standards.

These activities may include, but are not limited to:

- Developing updates to test tools utilized in CI Phase 1 to better support other connected vehicle (CV) technologies such as Long-Term Evolution (LTE) vehicle-to-everything (LTE-V2X)
- Conducting additional test and verification activities not defined in Task 2 through Task 5 above to support verification and validation of CI Implementation Guidance
- Developing test cases and procedures to help CI deployment agencies conduct operational checkout of new deployments and verify that their CI deployments are operating correctly and in accordance with the CI Implementation Guidance

Deliverables:

- Deliverables for this task may include technical documentation and analysis that support Task 6 activities. Task 6 technical documentation and analysis may include whitepapers, inputs to test tool development, test plans/test cases/test procedures, and operational checkout procedures or comments/analysis on documentation produced by other participants in Task 7 activities. [TOPR Deliverable – Task 6]

2.1.1.2.5 Task 7: Work with ITS Infrastructure Vendors to Develop CI Capabilities in Infrastructure Devices [TOPR Task 7]

Approach:

ITE will work with the ITS Infrastructure device vendor community to implement new capabilities and concepts defined in CTI 4501 such as the Assured Green Period (AGP). ITE will offer all signal controller vendors an opportunity to participate in this effort on a volunteer basis. Any software developed as part of this effort that utilizes DOT funding, either in development of signal controller software or in development of software to test the new CTI 4501 capabilities shall be offered as open source software with open-source licensing.

Deliverables:

- After receiving confirmation that one or more signal controller vendors are willing to implement the new CTI 4501 capabilities:
  - A CTI 4501 Capabilities Test Plan that details test cases and detailed test procedures that verify the requirements associated with those CTI 4501 capabilities.
- Following the successful delivery of a signal controller that implements the new CTI 4501 capabilities:
  - Conduct testing in accordance with the New CTI 4501 Capabilities Test Plan.
  - After the completion of testing activities, develop a New CTI 4501 Capabilities Test Report [TOPR Task 7]

2.1.1.2.6 Task 8: Support Balloting and Publication of Updated CI Implementation Guidance: [TOPR Task 8]

Approach:

When the CI Stakeholder Community reaches consensus that the CI Implementation Guidance Update is complete for Phase 2, the Contractor, and appropriate Subcontractors, shall assist in the balloting of the CI Implementation Guidance Update in accordance with the CI Working Groups balloting processes. Upon successful completion of the balloting process the Contractor shall assist in the publication and distribution of

the CI Implementation Guidance Update at no cost via the internet.

Deliverables:

- The publication and distribution of the CI Implementation Guidance Update at no cost via the internet. [TOPR Deliverable – Task 8]

2.1.2 Performance Requirements Summary

The ITE service requirements are summarized into performance objectives that relate directly to mission essential items. The performance threshold briefly describes the minimum acceptable levels of service required for each requirement. These thresholds are critical to mission success.

Table 1. Performance Requirements Summary

Performance Objective	Performance Standard	Performance Threshold	Method of Surveillance
The Contractor shall provide the PMP	The Contractor provided a final PMP that followed the PWS guidance, contained the required sections, delivered on time.	Zero deviation from standard and no grammatical/spelling errors	100%, FHWA will review upon receipt
PRS # 2 The Contractor shall provide the Task 2 Technical Documentation and Analysis	The Contractor provided a technical documentation and analysis that followed the PWS guidance, supported Task 2 activities, delivered on time	Zero deviation from standard and no grammatical/spelling errors.	100%, FHWA will review upon receipt
PRS # 3 The Contractor shall provide the Task 3 Technical Documentation and Analysis	The Contractor provided a technical documentation and analysis that followed the PWS guidance, supported Task 3 activities, delivered on time.	Zero deviation from standard and no grammatical/spelling errors.	100%, FHWA will review upon receipt
PRS #4 The Contractor shall provide the Task 4 Technical Documentation and Analysis	The Contractor provided a technical documentation and analysis that followed the PWS guidance, supported Task 4 activities, delivered on time.	Zero deviation from standard and no grammatical/spelling errors.	100%, FHWA will review upon receipt
PRS # 5 The Contractor shall provide the Task 5 Technical Documentation and Analysis	The Contractor provided a technical documentation and analysis that followed the PWS guidance, supported Task 5 activities, delivered on time.	Zero deviation from standard and no grammatical/spelling errors.	100%, FHWA will review upon receipt
PRS # 6 The Contractor shall provide the Task 6 Technical Documentation and Analysis	The Contractor provided a technical documentation and analysis that followed the PWS guidance, supported Task 6 activities, delivered on time	Zero deviation from standard and no grammatical/spelling errors.	100%, FHWA will review upon receipt
PRS # 7 The Contractor shall provide a New CTI 4501 Capabilities Test Plan	The Contractor provided a final document that followed the PWS guidance, contained the required sections, delivered on time	Zero deviation from standard and no grammatical/spelling errors.	100%, FHWA will review upon receipt
PRS #8 The Contractor shall provide a New CTI 4501 Capabilities Test Report	The Contractor provided a final document that followed the PWS guidance, contained the required sections, delivered on time	Zero deviation from standard and no grammatical/spelling errors	100%, FHWA will review upon receipt

Performance Objective	Performance Standard	Performance Threshold	Method of Surveillance
PRS # 9 The Contractor shall provide a CTI 4501 CI Implementation Guidance Update for no-cost distribution via the web	The Contractor provided the standard via no cost distribution that followed the PWS guidance, contained the required sections, delivered on time.	Zero deviation from standard and grammatical/spelling errors	100%, FHWA will review upon receipt

2.1.3 Project Exclusions

No exclusions have been identified.

2.1.4 Project Constraints

The following constraints have been established for the CI Phase 2 Project:

a) The project schedule end date is September 11, 2024.
b) Capital expenditures are contractually limited and must be preapproved by ITE.
c) Project travel costs are contractually limited and must be preapproved by ITE.

2.1.5 Project Assumptions

The following assumptions are being made for the CI Phase 2 Project:

a) Additional teleconferences will be used as needed to meet the project goals.
b) Time has been built into many of the tasks due to the need for CI Phase 2 WG and USDOT reviews.
c) ITS JPO will have a representative participating in the CI Phase 2 WG as a non-voting member.
d) Documents produced for this project are to be suitable for their defined purpose as determined by the CI Phase 2 WG.
e) Throughout the project, there will be various versions of the project schedule produced to take advantage of economies discovered or to account for anomalies unforeseen. As long as there is no change in scope, this PMP does not need to be modified.

2.2 Scope Verification

The scope description found in Section 2 has been developed using the scope provided in the TOPR / PWS ensuring that all tasks and deliverables identified in the TOPR are included in this PMP. Project tasks in the scope description are mapped to TOPR tasks using the form “[TOPR Task].” Deliverable items in the scope description are mapped to TOPR deliverables using the form “[TOPR Deliverable].” Acceptance of this PMP by the ITS JPO verifies the initial scope of the CI Phase 2 Standard Project.

It is the responsibility of the Project Manager to verify interim project deliverables against the scope as defined in the scope description (see Section 2.1.1). If there is a proposed change of scope (see Section 2.3), ITS JPO must formally accept the change prior to its incorporation into the project.

2.3 Scope Control

The Project Manager and the ITE Team will work together to control of the scope of the project. The ITE Team will leverage the project scope description (see Section 2.1.1) and the project schedule (see Section 4.3) as a statement of work for each task. The ITE Team will ensure that they perform only the work described in the project scope description and generate the deliverables identified. The Project Manager will oversee the ITE Team and the progression of the project to ensure that this scope control process is followed.

A change in scope is defined by a change in the overall budget, a change that extends the overall schedule, or a change in the work to be performed. Any member of the Project Management Team, the ITE Team, the CI Phase

2 Working Group, or the ITS JPO may propose a change in scope. The proposed change is assessed by the Project Management Team and ITE Team. If the Project Management Team and ITE Team determine that a change in scope is warranted, formal approval from ITS JPO is required. This PMP is to be updated in the case of an approved change in scope.

3 COMMUNICATIONS PLAN

3.1 Purpose of the Communications Plan

This Communications Management Plan sets the communications framework for the administration of the CI Phase 2 Project. It identifies representatives of the key stakeholders for the project, their roles, and contact information.

3.2 Stakeholder Points of Contact

ITS JPO Task Order Contracting Officer's Representative (TOCOR)

Acts on behalf of the Contracting Officer (CO).

Steve Sill, ITS Architecture & Standards Program Manager
RITA ITS JPO
United States Department of Transportation
1200 New Jersey Avenue, SE
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Project Manager

TBD

Connected Intersections Phase 2 Working Group Co-Chairs

TBD by SAE

3.3 Communications with ITS JPO

Communications between the project team and ITS JPO will formally take place once monthly and deliverables occur as described in Section 3. It is anticipated that ITS JPO will have one or more technical staff participating in the CI Phase 2 WG where they will have extemporaneous and informal communication with the project team. Official communications between ITS JPO and the Project Team should be made through the Project Administrator/Coordinator and the TOCOR (see Section 3.3).

3.4 Communications with SAE International

The PWS states that SAE will lead the Phase 2 activities, with ITE providing support through coordinating infrastructure community stakeholders, providing relevant SMEs to support verification, validation, and standards development activities, and coordinating with ITS infrastructure voting members. Official communications between SAE International and the Project Team should be made through the Project Administrator/Coordinator and the TOCOR (see Section 3.3).

4 DELIVERABLES AND MILESTONES

4.1 Monthly Progress Reports

On a monthly basis, the Project Administrator/Coordinator will provide a progress report to the CO. This report will contain the following:

a) Project Schedule
b) Deliverables Status
c) Red Flags
d) Budget
    i) Limitation of Funds Analysis
    ii) Chart 1: Current /Cumulative Expenditures by Month vs. Planned Expenditures
    iii) Chart 2: Cumulative Expenditures vs. Funds Obligated by Month of Task Order
    iv) Chart 3: Current Month Expenditures, Cumulative Expenditures vs. Total Budget, by Budget Line Item

The project schedule will reflect the baseline task start and end dates and the actual start and end dates for each task in the project schedule and the percentage of project completion. The project schedule will be provided in both Microsoft Project and Adobe Acrobat.

4.2 Deliverable Summary

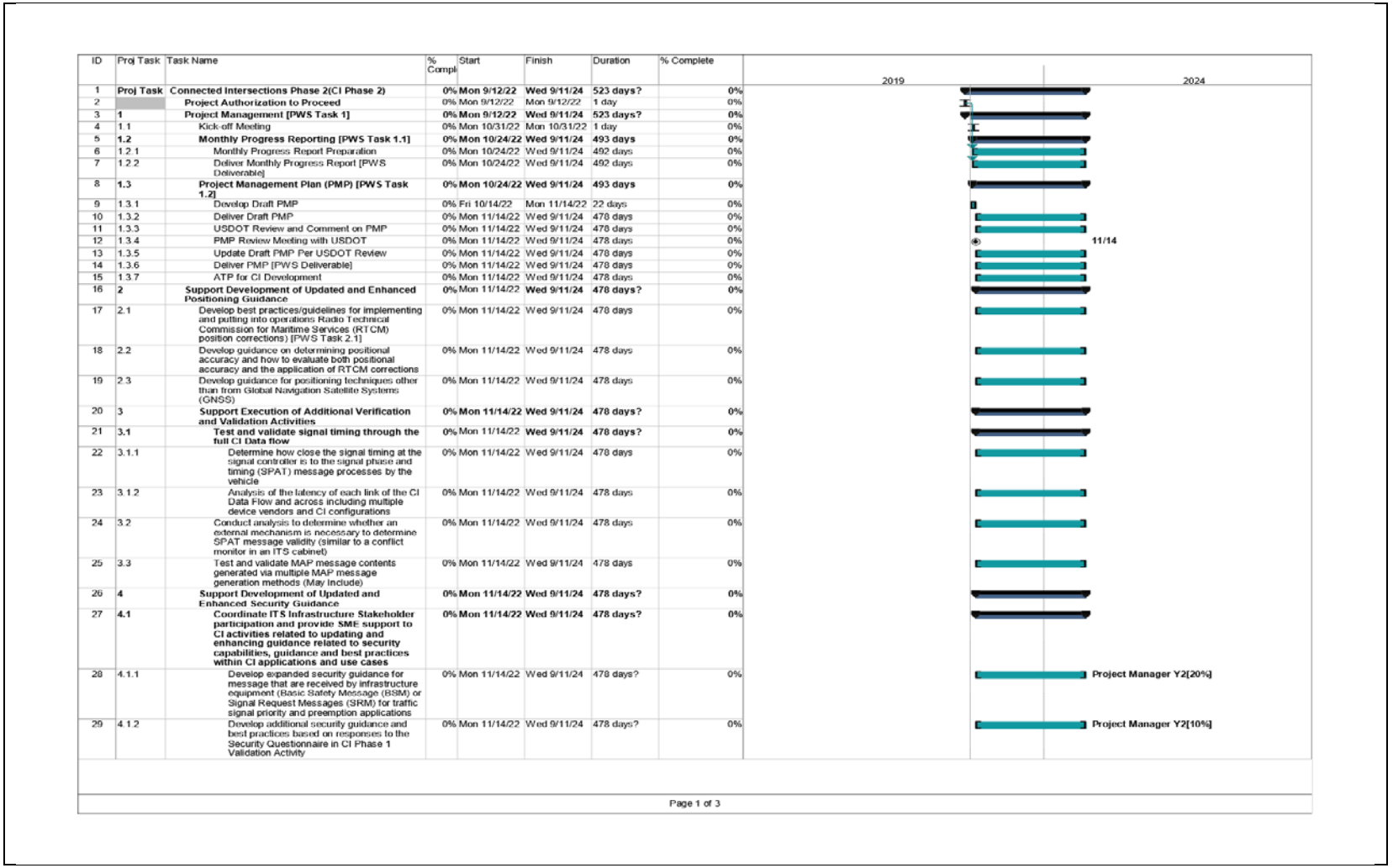
Documents and software deliverables are to be sent electronically to the CO. Table 2 identifies the deliverables based on the project tasks described in Technical Exhibit 2 of the TOPR – Deliverables Schedule.

Table 2. Deliverables by Project Task

Task	Deliverable Item	Delivery Date
1.1	Progress Reports [TOPR Deliverable – Task 1.1]	Monthly
1.2	Kickoff Meeting	10/31/2022
	Draft PMP	30 days after Accepted Test Plan with the Project Schedule for Task 7.
	Final PMP [TOPR Deliverable – Task 1.2]	Within 10 working days after receiving COR approval.
2	Technical Documentation and Analysis supporting development of Updated and Enhanced Positioning Guidance [TOPR Deliverable – Task 2]	As per SAE's PMP
3	Technical Documentation and Analysis supporting Execution of Additional Verification and Validation Activities [TOPR Deliverable– Task 3]	As per SAE's PMP
4	Technical Documentation and Analysis supporting Development of Updated and Enhanced Security Guidance [TOPR Deliverable – Task 4]	As per SAE's PMP
5	Technical Documentation and Analysis supporting Development of Signal Priority and Preemption Guidance [TOPR Deliverable – Task 5]	As per SAE's PMP
6	Technical Documentation and Analysis supporting Technical Task Execution [TOPR Deliverable – Task 6]	As per SAE's PMP
7	New CTI 4501 Capabilities Test Plan [TOPR Deliverable – Task 7]	9/11/24
	New CTI 4501 Capabilities Test Report [TOPR Deliverable – Task 7]	9/11/24
8	CTI 4501 CI Implementation Guidance Update [TOPR Deliverable – Task 8]	9/11/24

4.3 Project Schedule

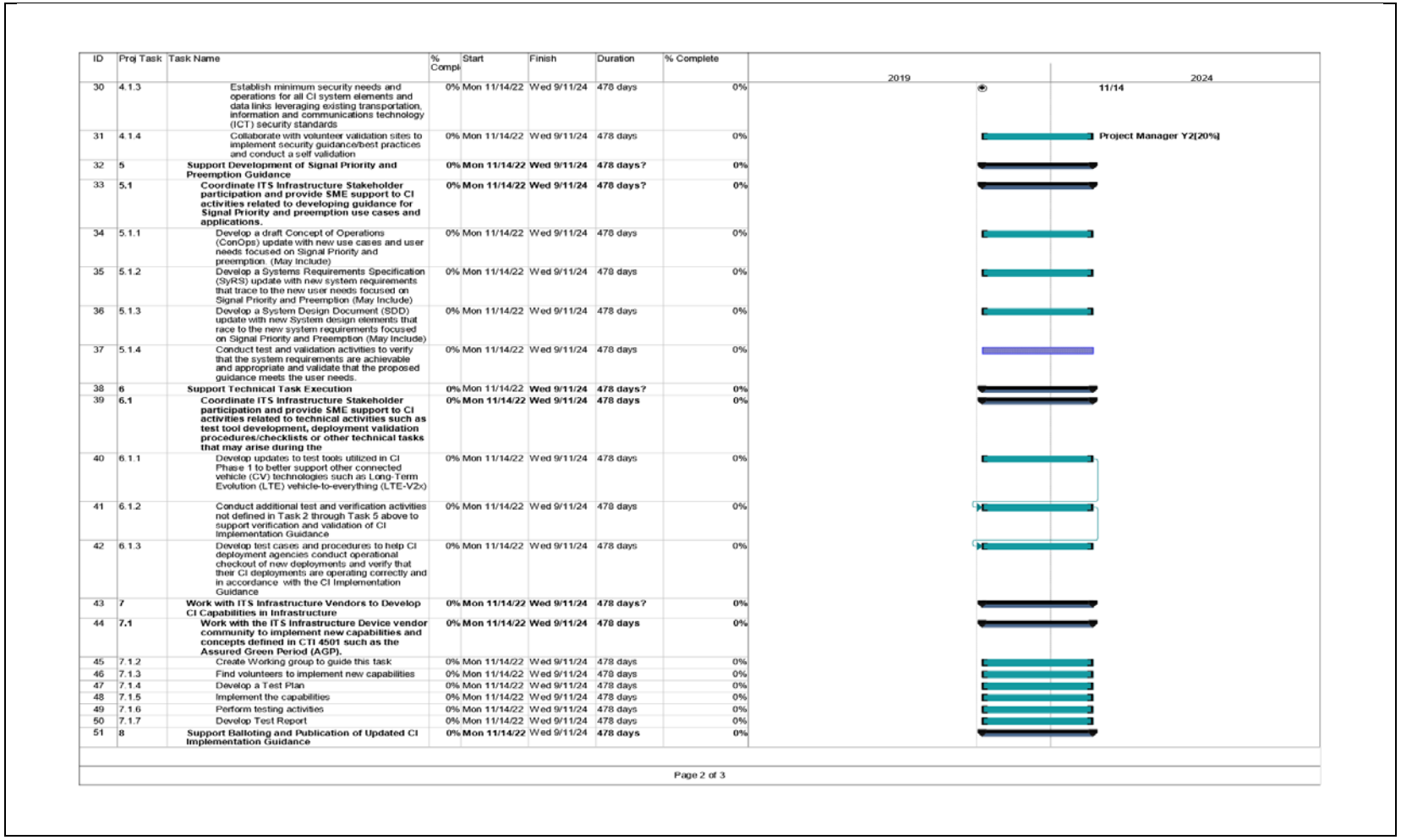
The Gantt Chart in Figures 2 through 6 provides the CI Phase 2 project schedule. Project tasks and deliverables that correspond to an explicit task included in the TOPR are identified. Deliverables are identified by a diamond shape (◆). Teleconferences are identified by a diamond shape within a circle (◈). Face-to-face meetings are identified by solid circle (●).



ID	Proj Task	Task Name	% Compl	Start	Finish	Duration	% Complete
1	**Proj Task**	**Connected Intersections Phase 2(CI Phase 2)**	**0%**	**Mon 9/12/22**	**Wed 9/11/24**	**523 days?**	**0%**
2		**Project Authorization to Proceed**	0%	Mon 9/12/22	Mon 9/12/22	1 day	0%
3	**1**	**Project Management [PWS Task 1]**	**0%**	**Mon 9/12/22**	**Wed 9/11/24**	**523 days?**	**0%**
4	1.1	Kick-off Meeting	0%	Mon 10/31/22	Mon 10/31/22	1 day	0%
5	**1.2**	**Monthly Progress Reporting [PWS Task 1.1]**	**0%**	**Mon 10/24/22**	**Wed 9/11/24**	**493 days**	**0%**
6	1.2.1	Monthly Progress Report Preparation	0%	Mon 10/24/22	Wed 9/11/24	492 days	0%
7	1.2.2	Deliver Monthly Progress Report [PWS Deliverable]	0%	Mon 10/24/22	Wed 9/11/24	492 days	0%
8	**1.3**	**Project Management Plan (PMP) [PWS Task 1.2]**	**0%**	**Mon 10/24/22**	**Wed 9/11/24**	**493 days**	**0%**
9	1.3.1	Develop Draft PMP	0%	Fri 10/14/22	Mon 11/14/22	22 days	0%
10	1.3.2	Deliver Draft PMP	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
11	1.3.3	USDOT Review and Comment on PMP	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
12	1.3.4	PMP Review Meeting with USDOT	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
13	1.3.5	Update Draft PMP Per USDOT Review	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
14	1.3.6	Deliver PMP [PWS Deliverable]	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
15	1.3.7	ATP for CI Development	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
16	**2**	**Support Development of Updated and Enhanced Positioning Guidance**	**0%**	**Mon 11/14/22**	**Wed 9/11/24**	**478 days?**	**0%**
17	2.1	Develop best practices/guidelines for implementing and putting into operations Radio Technical Commission for Maritime Services (RTCM) position corrections) [PWS Task 2.1]	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
18	2.2	Develop guidance on determining positional accuracy and how to evaluate both positional accuracy and the application of RTCM corrections	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
19	2.3	Develop guidance for positioning techniques other than from Global Navigation Satellite Systems (GNSS)	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
20	**3**	**Support Execution of Additional Verification and Validation Activities**	**0%**	**Mon 11/14/22**	**Wed 9/11/24**	**478 days?**	**0%**
21	**3.1**	**Test and validate signal timing through the full CI Data flow**	**0%**	Mon 11/14/22	**Wed 9/11/24**	**478 days?**	**0%**
22	3.1.1	Determine how close the signal timing at the signal controller is to the signal phase and timing (SPAT) message processes by the vehicle	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
23	3.1.2	Analysis of the latency of each link of the CI Data Flow and across including multiple device vendors and CI configurations	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
24	3.2	Conduct analysis to determine whether an external mechanism is necessary to determine SPAT message validity (similar to a conflict monitor in an ITS cabinet)	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
25	3.3	Test and validate MAP message contents generated via multiple MAP message generation methods (May include)	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
26	**4**	**Support Development of Updated and Enhanced Security Guidance**	**0%**	**Mon 11/14/22**	**Wed 9/11/24**	**478 days?**	**0%**
27	**4.1**	**Coordinate ITS Infrastructure Stakeholder participation and provide SME support to CI activities related to updating and enhancing guidance related to security capabilities, guidance and best practices within CI applications and use cases**	**0%**	**Mon 11/14/22**	**Wed 9/11/24**	**478 days?**	**0%**
28	4.1.1	Develop expanded security guidance for message that are received by infrastructure equipment (Basic Safety Message (BSM) or Signal Request Messages (SRM) for traffic signal priority and preemption applications	0%	Mon 11/14/22	Wed 9/11/24	478 days?	0%
29	4.1.2	Develop additional security guidance and best practices based on responses to the Security Questionnaire in CI Phase 1 Validation Activity	0%	Mon 11/14/22	Wed 9/11/24	478 days?	0%

Page 1 of 3

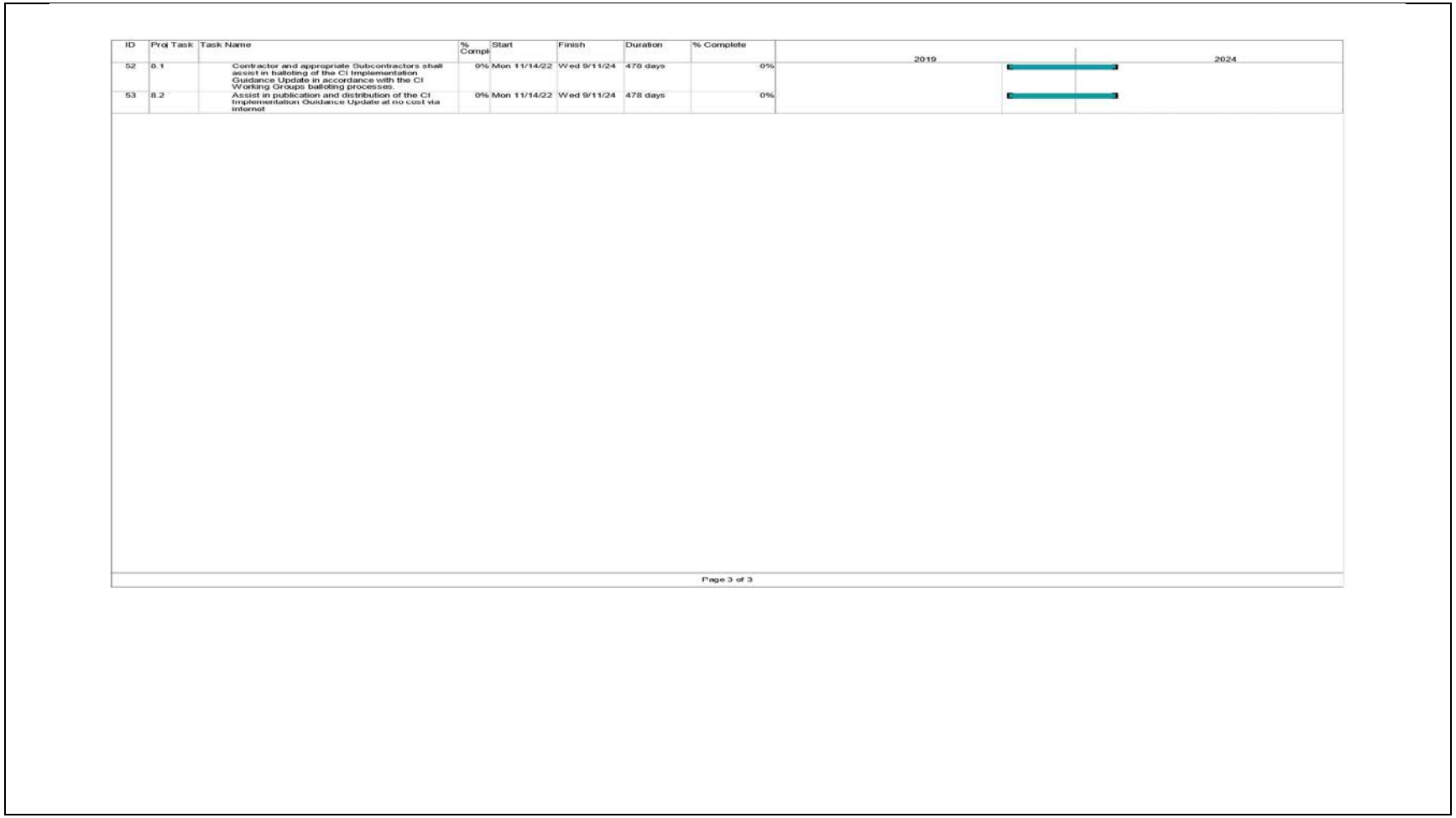
Figure 2. CI Phase 2 Project Schedule (Part 1 of 3)



ID	Proj Task	Task Name	% Compl	Start	Finish	Duration	% Complete
30	4.1.3	Establish minimum security needs and operations for all CI system elements and data links leveraging existing transportation, information and communications technology (ICT) security standards	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
31	4.1.4	Collaborate with volunteer validation sites to implement security guidance/best practices and conduct a self validation	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
32	5	**Support Development of Signal Priority and Preemption Guidance**	**0%**	**Mon 11/14/22**	**Wed 9/11/24**	**478 days?**	**0%**
33	5.1	**Coordinate ITS Infrastructure Stakeholder participation and provide SME support to CI activities related to developing guidance for Signal Priority and preemption use cases and applications.**	**0%**	**Mon 11/14/22**	**Wed 9/11/24**	**478 days?**	**0%**
34	5.1.1	Develop a draft Concept of Operations (ConOps) update with new use cases and user needs focused on Signal Priority and preemption. (May Include)	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
35	5.1.2	Develop a Systems Requirements Specification (SyRS) update with new system requirements that trace to the new user needs focused on Signal Priority and Preemption (May Include)	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
36	5.1.3	Develop a System Design Document (SDD) update with new System design elements that race to the new system requirements focused on Signal Priority and Preemption (May Include)	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
37	5.1.4	Conduct test and validation activities to verify that the system requirements are achievable and appropriate and validate that the proposed guidance meets the user needs.	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
38	6	**Support Technical Task Execution**	**0%**	**Mon 11/14/22**	**Wed 9/11/24**	**478 days?**	**0%**
39	6.1	**Coordinate ITS Infrastructure Stakeholder participation and provide SME support to CI activities related to technical activities such as test tool development, deployment validation procedures/checklists or other technical tasks that may arise during the**	**0%**	**Mon 11/14/22**	**Wed 9/11/24**	**478 days**	**0%**
40	6.1.1	Develop updates to test tools utilized in CI Phase 1 to better support other connected vehicle (CV) technologies such as Long-Term Evolution (LTE) vehicle-to-everything (LTE-V2x)	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
41	6.1.2	Conduct additional test and verification activities not defined in Task 2 through Task 5 above to support verification and validation of CI Implementation Guidance	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
42	6.1.3	Develop test cases and procedures to help CI deployment agencies conduct operational checkout of new deployments and verify that their CI deployments are operating correctly and in accordance with the CI Implementation Guidance	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
43	7	**Work with ITS Infrastructure Vendors to Develop CI Capabilities in Infrastructure**	**0%**	**Mon 11/14/22**	**Wed 9/11/24**	**478 days?**	**0%**
44	7.1	**Work with the ITS Infrastructure Device vendor community to implement new capabilities and concepts defined in CTI 4501 such as the Assured Green Period (AGP).**	**0%**	**Mon 11/14/22**	**Wed 9/11/24**	**478 days**	**0%**
45	7.1.2	Create Working group to guide this task	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
46	7.1.3	Find volunteers to implement new capabilities	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
47	7.1.4	Develop a Test Plan	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
48	7.1.5	Implement the capabilities	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
49	7.1.6	Perform testing activities	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
50	7.1.7	Develop Test Report	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
51	8	**Support Balloting and Publication of Updated CI Implementation Guidance**	**0%**	**Mon 11/14/22**	**Wed 9/11/24**	**478 days**	**0%**

Page 2 of 3

Figure 3. CI Phase 2 Project Schedule (Part 2 of 3)



ID	Proj Task	Task Name	% Compl	Start	Finish	Duration	% Complete
52	8.1	Contractor and appropriate Subcontractors shall assist in balloting of the CI Implementation Guidance Update in accordance with the CI Working Groups balloting processes.	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%
53	8.2	Assist in publication and distribution of the CI Implementation Guidance Update at no cost via internet	0%	Mon 11/14/22	Wed 9/11/24	478 days	0%

Figure 4. CI Phase 2 Project Schedule (Part 3 of 3)

5 QUALITY MANAGEMENT PLAN

5.1 Purpose of the Quality Management Plan

This Quality Management Plan describes how quality will be managed throughout the life of the project. It includes processes and practices for ensuring quality planning, quality control and quality assurance.

5.2 Quality Planning

To be successful, this PMP has integrated a quality system into the project tasks, project schedule, project deliverables and project team. The project relies heavily on the CI Phase 2 Working Group to perform the role of a quality review team. The CI Phase 2 Working Group is expected to be made up of subject matter experts including those from public agencies, manufacturers, software providers, and consulting firms. The CI Phase 2 Working Group will likely include operational users who provide quality input from the user's perspective. The CI Phase 2 Working Group also includes one or more technical staff from ITS JPO. This allows the ITS JPO to have quality input early in the development of project deliverables. It is the responsibility of the CI Phase 2 Working Group Co-Chairs and the Project Manager to ensure that the CI Phase 2 Working Group is made up of individuals appropriate for the quality aspects of the project. The Project Manager and ITE team have been selected for their experience with the deployment of CI Phase 1 applications, their depth of knowledge concerning CI Phase 1 standards, their particular expertise applying the systems engineering process to the development of CI Phase 1 Implementation Guide, and their track record producing quality products.

There are two types of "quality" addressed by this plan: "product quality" and "process quality." Product quality focuses on the project deliverables. The project scope description (see Section 2.1.1) identifies well-known industry standards for all document deliverables. Process quality focuses on how the project deliverables will be produced. The CI Phase 2 Project employs a formal systems engineering process. The project scope description and schedule define task and process deliverables such as document walkthroughs and multiple cycles of CI Phase 2 Working Group review, comment and comment resolution periods all directed at the aspect of quality.

5.3 Quality Control

This section describes the process for monitoring and recording the results of executing the quality activities. It applies to the project's products as opposed to its processes.

It is intended that each document will be maintained through a document-oriented process. Each document produced as a part of this PMP will maintain a Comment Matrix with a unique comment identifier, the name of the commenter, the date of the comment, the version of the document that the comment pertains to, the comment type (Editorial or Technical), the page number, the section number, the issue, the proposed solution, CI Phase 2 Working Group conclusions and the disposition (Open/Closed). For all software products of this PMP, issue/change tracking will be provided through the OSS.

The CI Phase 2 Working Group reviews of all project deliverables will be performed according to the project schedule. Additional reviews may be meet project needs. Documents will be compared to the industry standards from which they are based to ensure that critical information is not missing. Reviewers will verify that deliverable documents:

a) contain suitable material for the target audience;
b) are organized in presentation;
c) contain proper word use and English diction;
d) contain detailed illustrations;
e) are comprehensive, complete and technically correct; and
f) are edited for grammatical and editorial errors.

Project deliverables will be judged on a “suitable for purpose” basis. The CI Phase 2 Working Group may identify more items or make suggestions for changes to a document than are needed to meet the project goals. In some cases, gaining consensus on technical matters within the CI Phase 2 Working Group can be difficult and time consuming. If any undertaking by the CI Phase 2 Working Group may jeopardize the project schedule, the CI Phase 2 Working Group Co-Chairs will make decisions and recommendations on the WG’s behalf.

5.4 Quality Assurance

A Quality Checklist will be established and maintained by the Project Manager to assist in identifying specific items to be reviewed by the CI Phase 2 Working Group. A Project Issue Log will be established and maintained by the Project Manager to capture any issue regarding the project that should be addressed by the project management team including items that pertain to quality. Items for the Quality Checklist and Project Issue Log may be proposed by any member of the project team. It is up to the project management team to determine if these items should be included on these lists and if any action should be taken. The Project Management Team will discuss any quality items on a weekly basis.

6 HUMAN RESOURCES MANAGEMENT PLAN

6.1 Purpose of the Human Resources Management Plan

This Human Resources Management Plan is a tool which aides in the management of the Project Team throughout the CI Phase 2 Standard Project. It contains the team resumes, and explains the roles and responsibilities of all key individuals on the project and an organizational chart. Team resumes can be found in Appendix C.

6.2 Roles, Responsibilities and Reporting

Project management responsibilities are jointly held by SDO staff and the CI Phase 2 Working Group co-chairs. SDO staff has administrative and fiscal responsibilities. CI Phase 2 Working Group co-chairs, with assistance from SDO staff, are responsible for managing the CI Phase 2 Working Group. SDO staff with assistance from CI Phase 2 Working Group co-chairs are responsible for managing the consulting team to produce the work item technical deliverables. Both parties are responsible for meeting the agreed schedule and the success of the work item. Table 4 identifies the work item management team. The following steps will be used to manage this work item:

a) Monthly, consultants will report, via email, a summary of the hours expended and remaining by each subtask for which the consultant is assigned; and provide a brief report on the progress made on each ST during the reporting period, as well as an estimate of work to be accomplished in the subsequent reporting period (again, by subtask). The subtask number is used as identified in the work item schedule in Section 4.3. This Consultant Report is not an invoice (due separately) but a summary of work accomplished and hours logged. The Consultant Report is due the first week of the month for the preceding month's activities.
b) ITE staff will provide an indication of the percentage of each subtask completed for the work item, as part of the Monthly Progress Report, or as a revision of MS Project Schedule (included in the Monthly Progress Report). The Project Schedule is due the second week of the month for the preceding month's activities.
c) A CI Phase 2 management teleconference will be scheduled, on a recurring basis, as needed, to review schedule/progress, financial status, and troubleshoot performance. The teleconference may include: SDO staff, between SDO staff, and the CI Phase 2 Working Group co-chairs. The recurring frequency and time of the teleconference will be agreed by the management team.

The CI Phase 2 Working Group co-chairs, in consultation with SDO staff, may create subgroups of the CI Phase 2 Working Group to focus on technical specialties or to expedite the resolution of unforeseen issues, particularly during the Design Task.

The CI Phase 2 Working Group co-chairs and SDO staff will use the means of communications provided by SAE for communications with the CI Phase 2 Working Group members and interested parties.

SDO staff will notify the paid work item consultants and those participants pre-approved for travel reimbursement of the ITE policies and procedures, and seek appropriate government approval for such travel.

Table 3 identifies the CI Phase 2 Project Team supporting SAE on this project, their roles within the project, their project responsibilities and their reporting responsibilities

Table 3. CI Phase 2 Standard Project Team and Reporting

Name	Project Role	Responsibilities	Reporting
TBD	Subject Matter Expert	• Part of the Project Management Team. • Works with the ITE program manager to maintain project reporting required by the USDOT. • Prepares and maintains the PMP and MS Project schedule. • Plays a quality management function on deliverables. • Provides leadership for the rest of the consulting team. • Prepares project policies and procedures. • Organizes meetings and keeps records. • Coordinates with the Chairs of the CI Phase 2 Working Group Maintains communication and consensus building within the WG.	•
TBD	Systems Engineer	• Provides the rigor required to verify that a complete and correct product is being developed. • Develops ConOps, Requirements documents. • Develop systems engineering portions of design documents, including the traceability matrices. • Develops the ballot and published versions of the standard. • Leads walkthroughs of documents at various stages of the project.	• Provides weekly progress reports to the Project Manager per Section 4.2.
TBD	Subject Matter Expert	• Plays a quality management function on deliverables. • Develops ConOps, Requirements documents. • Develop systems engineering portions of design documents, including the traceability matrices. • Develops the ballot and published versions of the standard.	
TBD	Subject Matter Expert	• Provides feedback on the ConOps, FRS, and SDD documents. • Participates in the walkthroughs	•
Narla, Siva ITE 202-785-0060 x119 snarla@ite.org	SDO (Lead)	• Part of the Project Management Team. • Official administration and coordination of the project from a contracts perspective. • Monitors project expenditures in labor, travel expenses and capital expenses. • Official project communications channel to the COR. • Coordinates with SAE International's Project Manager	• Provides monthly progress reports to the COR per Section 4.1 including an updated Microsoft Project Schedule.

Name	Project Role	Responsibilities	Reporting
Rouse, Deborah ITE drouse@ite.org	Technical Editor	• Ensures project documents contain suitable material for the target audience. • Ensures project documents are organized in presentation. • Reviews project documents for grammatical and editorial errors. • Reviews project documents for proper word use and English diction.	• Provides weekly progress reports to the Project Manager per Section 4.2.
Tavares, Nicola ITE ntavares@ite.org	SDO (Liaisons)	• Part of the Project Management Team. • Ensure conformance with SDO Procedures.	• Provides weekly progress reports to the Project Manager per Section 4.2.
Doherty, Brian NEMA Brian.Doherty@nema.org	SDO (Liaisons)	• Part of the Project Management Team.	• Provides weekly progress reports to the Project Manager per Section 4.2.
White, Robert AASHTO rwhite@aashto.org	SDO (Liaisons)	• Part of the Project Management Team.	• Provides weekly progress reports to the Project Manager per Section 4.2.
TBD	CI Phase 2 Working Group Co-Chair	• Part of the Project Management Team. • Provides leadership of the CI Phase 2 WG to carry out the work items assigned by the CI Phase 2 WG. • Presides over CI Phase 2 WG teleconferences and meetings. • Focuses the effort of the CI Phase 2 WG to review documents and provide feedback to the ITE team in a timely fashion. • Builds consensus with the WG members.	• Provides reporting on the progress of the CI Phase 2 Standard project (via CI Phase 2 Coordinator) to the CI Phase 2 Working Group. • Makes requests for assistance from the CI Phase 2 WG Chair if there are CI Phase 2 WG issues that cannot be resolved.
TBD	CI Phase 2 Working Group Co-Chair Co-Chair	• Part of the Project Management Team. • Provides leadership of the CI Phase 2 WG to carry out the work items assigned by the CI Phase 2 WG. • Presides over CI Phase 2 WG teleconferences and meetings. • Focuses the effort of the CI Phase 2 WG to review documents and provide feedback to the ITE team in a timely fashion. • Builds consensus with the WG members.	• Provides reporting on the progress of the CI Phase 2 Standard project (via CI Phase 2 Coordinator) to the CI Phase 2 Working Group. • Makes requests for assistance from the CI Phase 2 WG Chair if there are CI Phase 2 WG issues that cannot be resolved.

6.2 Management Tools and Reports

The following tools should be used for management of this work item:

Email for informal reports and messages;

- MS Word 2010 for general reports and documents;
- MS Project 2010 for schedule updates; and
- MS Access 2010 for maintaining a database of comments, their analysis and disposition.

6.3 Organizational Chart

Figure 7 shows an organizational chart for CI Phase 2 Project. The chart shows the project team including the CI Phase 2 WG due to its critical role in providing industry expertise and quality control. The project management team consists of the Project Administrator/Coordinator(s), the Project Manager and the CI Phase 2 WG Co-Chairs.

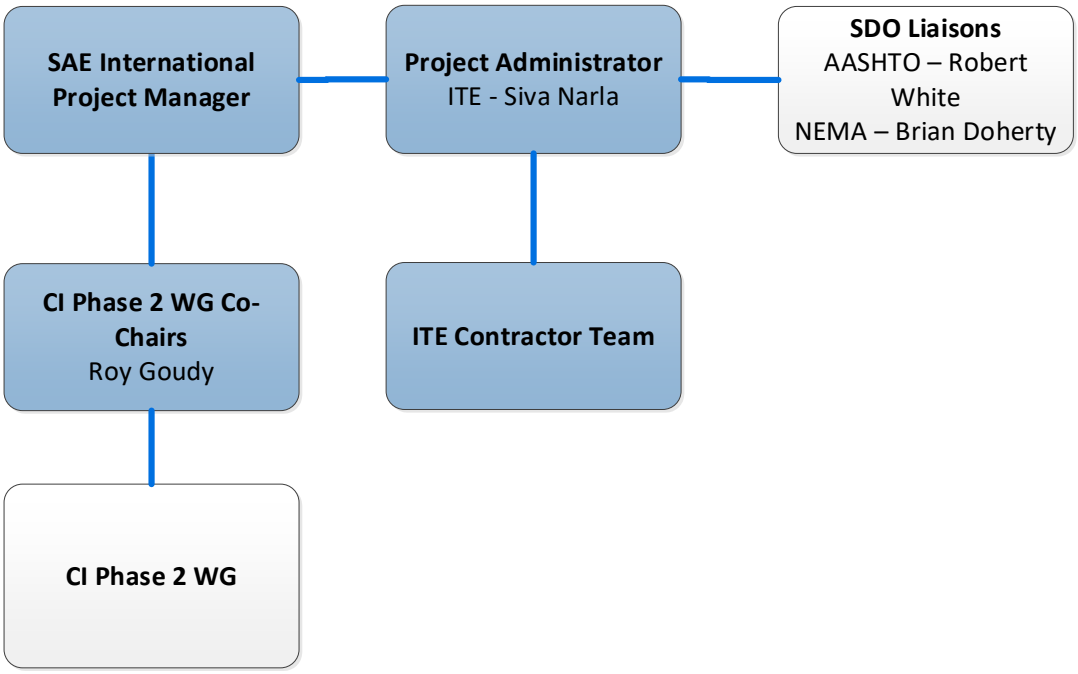


Figure 7. CI Phase 2 Project Organization

7 RISK MANAGEMENT PLAN

To be developed by SAE International.

APPENDIX A – REFERENCES

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APPENDIX B – GLOSSARY, ACRONYMS, AND ABBREVIATIONS

Term	Definition
AASHTO	American Association of State Highway and Transportation Officials
BSM	Basic Safety Message
CI Phase 2	Connected Intersections Phase 2
ConOps	Concept of Operations
CO	Contracting Officer
COR	Contracting Officer's Representative
CTI	Connected Transportation Interoperability
CV	Connected Vehicle
GNSS	Global Navigation Satellite Systems
IOO	Infrastructure Owner Operators
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation Systems
JPO	Joint Program Office
ICT	Information and Communication Technologies
PMP	Project Management Plan
PWS	Performance Work Statement
SAE	SAE International
SDD	System Design Details
SDO	Standards Development Organization
SLTT	State, Local, Tribal, and Territorial
SME	Subject Matter Expert
SPaT	Signal, Phase and Timing
SRM	Signal Request Messages
SyRS	System Requirements Specification
TBD	To Be Determined
USDOT	United States Department of Transportation
Walkthrough	A step-by-step presentation by the author of a document in order to gather information and to establish a common understanding of its content.

APPENDIX C – PROJECT TEAM RESUMES

This section will be updated.

APPENDIX D – WORK EFFORT BY ORGANIZATION AND INVOICING TEMPLATES

1. Invoice Reporting

ITE shall submit monthly invoices addressing work completed. Each voucher will include a breakdown of ITE's and subcontractors' hours and labor costs in accordance with invoice guidance and Billing Instructions for Cost Reimbursable Orders as described in IDIQ Exhibit J. 5.

Invoices shall be submitted directly to the Delphi system or as otherwise specified. Additionally, ITE shall submit the contract and task order invoice (if applicable) concurrently to the COR, the TOCOR (if applicable), *ITSProjects@dot.gov,* and other recipient(s) (if applicable) as directed by the COR.

2. Schedules and Performance Reporting

The Contractor shall provide:

a) Monthly Status Reports – the Contractor shall submit monthly progress reports no later than 15 days after the end of the month being reported on in the format specified by the COR. The progress report shall describe work completed during the period, anticipated work, problems encountered and and/or anticipated as well as financial status including at least hours expended and other costs.
b) Project Schedule – the Contractor shall submit, to the Government, an initial project schedule in Microsoft Project format within sixty (60) days after the effective date of the contract and updates showing the percent complete of major deliverables every thirty (30) days thereafter. The schedule shall include at a minimum, the major deliverables and milestones and adhere to the Microsoft Project template structure provided by the COR. Any changes to due dates after the initial project schedule baseline must be approved by the Government. The Contractor shall support the identification of schedule dependencies related to the project and in accordance with the Government defined process.
c) Risk Register – the Contractor shall document risks that might affect the project and the characteristics of the risk defined by the ITS-JPO. The COR will provide a Microsoft Excel-based Risk Register template for the Contractor to populate and update as necessary. Each risk shall have a unique number, probability of occurrence and impact of occurrence rating. The risk log shall be updated monthly and submitted with monthly progress reports.

The costs incurred in the administrative reporting are unallowable direct costs under the contract and, therefore, cannot be charged as direct costs to the Government. Contractor is to handle such costs in accordance with their disclosure statements/cost accounting systems.

ITS-JPO templates are available at http://www.its.dot.gov/project_mang/index.htm

3. Deliverables

The Contractor shall submit Interim and Final Deliverables concurrently to the COR, the TOCOR (if applicable) and to *ITSProjects@dot.gov* once these deliverables have been accepted by the Government. The Contractor shall include the contract number (and task order number if appropriate) in the email subject line for each deliverable. The Government may request the Contractor to include additional specified keywords in the subject line of emails containing deliverables. Additionally, the Government may request the Contractor to submit Deliverables to an electronic repository as specified by the COR.