

# Project Management Plan

SwRI Project No 10-24479

## Using Third Parties to Deliver Infrastructure-to-Vehicle (I2V)

May 24, 2019

FINAL

Version 1.0


### Submitted to:


University of Virginia  
On behalf of  
Connected Vehicle Pooled Fund Study

### Prepared by:

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## REVISION HISTORY

Name	Date	Version Number	Summary of Changes	Approver
Cameron Mott	3/22/2019	0.1	Initial Draft	
Cameron Mott	5/3/2019	0.2	Revised	
Cameron Mott	5/24/2019	1.0	Final	

## TABLE OF CONTENTS

1	Introduction .....	1
1.1	Background .....	1
1.2	Overview .....	1
2	Scope Management Plan .....	1
2.1	Purpose of Plan .....	1
2.2	Scope Statement.....	1
2.3	Scope Verification .....	5
2.4	Scope Control.....	5
3	Cost Management Plan.....	6
4	Communications Plan .....	6
4.1	Purpose of Communications Plan.....	6
4.2	Single Point of Contact.....	6
4.3	Stakeholder Engagement.....	6
4.4	Cooperate with Other Efforts .....	6
5	Deliverables and Milestones.....	7
5.1	Project Schedule .....	7
5.2	Deliverable Summary.....	9
6	Quality Management Plan .....	10
6.1	Purpose of Plan .....	10
6.2	Quality Planning.....	10
6.3	Quality Control.....	10
6.4	Quality Assurance .....	10
7	Human Resources Management Plan.....	10
7.1	Purpose of Plan .....	10
7.2	Roles and Responsibilities.....	10
7.3	Task Order Organizational Chart.....	11
8	Risk Management Plan .....	12
8.1	Purpose of Plan .....	12
8.2	Risk Management Approach.....	12
8.3	Risk Evaluation .....	13
8.3.1	List of Risks.....	13
8.4	Risk Response.....	14

## **1 INTRODUCTION**

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### **1.1 Background**

Infrastructure Owners and Operators (IOOs), such as state and local departments of transportation (DOTs), are responsible for data that is incredibly valuable to vehicles and the transportation community. Over the past decade, the communication of this data over Dedicated Short-Range Communication (DSRC) radios has been a focus of many of the standardization organizations and the connected vehicle (CV) community. Infrastructure-to-Vehicle (I2V) communication enables both critical safety applications as well as non-safety-critical and even informational applications. While DSRC offers low-latency broadcast communication capabilities, the anticipated mandate for DSRC to be required in light-duty vehicles has been postponed. In scenarios where low-latency is not a requirement, alternative means of communicating this valuable data to vehicles have been proposed and even offered in both research and production environments through third parties. Missing in these efforts, however, is the overarching standardization of this third party I2V communication.

The goal of this project is to develop common interfaces and data approaches for the IOOs to use to share their CV data with third party providers. This will allow the Connected Vehicle Pooled Fund Study (CV PFS) members to implement a single interface approach that will meet the needs of multiple third-party data and service providers rather than accommodating each provider separately. Additionally, these interfaces can be moved towards standardization to further encourage common deployment and usage.

### **1.2 Overview**

The focus of this project is to look at the possibilities of delivering connected vehicle related data from the IOOs to third-party providers as an alternative or supplement to DSRC. This will help mitigate the risk that DSRC may not become widespread in the future. The project will look at the types of connected vehicle data that CV PFS members and other IOOs are working with that might be of interest to third parties and work with the third parties to document consistent methods of data sharing that would be common across IOOs and again common across third party providers.

## **2 SCOPE MANAGEMENT PLAN**

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### **2.1 Purpose of Plan**

The purpose of this plan is to ensure that all of the required project activities are performed and that only the required activities are performed. This plan also discusses how activities will be defined, developed, and verified. The plan, detailed in the following subsections, defines the scope statement, the scope verification process, and the scope control process.

### **2.2 Scope Statement**

This project will be executed over eighteen (18) months, with four (4) major tasks. The tasks have been broken down further into sub-tasks.

The structure of the work is broken down into the following task and sub-tasks:

**Task 1 – Project Management**

- Subtask 1.1 – Develop a Project Management Plan (PMP)
- Subtask 1.2 – Prepare a Project Schedule
- Subtask 1.3 – Participate in a Project Kick-off Meeting
- Subtask 1.4 – Schedule and Participate in Monthly Project Status Calls
- Subtask 1.5 – Develop and Submit Monthly Progress Reports
- Subtask 1.6 – Project Closeout Meeting

**Task 2 - Survey of the Current Status**

- Subtask 2.1 – Identify Stakeholders
- Subtask 2.2 – Conduct Stakeholder Interviews
- Subtask 2.3 – Deliver Status Summary Reports

**Task 3 – Development of Common Interfaces and Data Approaches**

- Subtask 3.1 – Concept of Operations
- Subtask 3.2 – System Requirements
- Subtask 3.3 – Interface Control Document
- Subtask 3.4 – Consensus Recommendation

**Task 4 - Submission of Recommendations to Standard Development Organization**

- Subtask 4.1 – Create a Draft Technical Memo on Standardization Needs
- Subtask 4.2 – Create a Final Technical Memo on Standardization Needs
- Subtask 4.3 – Work with Standards Organizations Towards Adoption

Table 1 describes the proposed approach and deliverables for each task.

**Table 1. List of Tasks with approach to address the task and deliverables for each task**

Task	Approach	Deliverables
Task 1: Project Management	<ul style="list-style-type: none"> <li>• An initial draft PMP including a schedule of milestones will be submitted for review by the CV PFS group for feedback and guidance</li> <li>• The PMP will include plans for: Scope Management, Cost Management, Quality Management, Human Resources Management, Communications Management and Risk Management</li> <li>• A detailed Project Schedule will be provided with a list of planned tasks and milestones</li> <li>• Update the PMP and Project Schedule based on feedback and provide a revised and final PMP, Project Schedule and Comment Resolution Report</li> <li>• Participate in meetings with team members and stakeholders as needed throughout the project and provide Agendas and Summaries as appropriate</li> <li>• Develop Briefing Materials and hold closeout meeting</li> </ul>	<ul style="list-style-type: none"> <li>• DRAFT PMP and Project Schedule</li> <li>• Briefing Materials, Kick-Off Meeting</li> <li>• REVISED PMP, Project Schedule and Comment Resolution Report</li> <li>• FINAL PMP and Project Schedule</li> <li>• Monthly Progress Reports</li> <li>• Monthly Project Status Call associated Agendas, Presentation Slides, and Minutes</li> <li>• Team Meeting Agendas and Summaries</li> <li>• Briefing Materials, Closeout Meeting</li> </ul>
Task 2: Survey of the Current Status	<ul style="list-style-type: none"> <li>• Work with the CV PFS team to identify the potential stakeholders for providing and consuming CV data and provide Draft list</li> <li>• Review the list with CV PFS members and identify Stakeholder Outreach Strategy, finalize list</li> <li>• Generate a list of questions to be answered by each stakeholder based on experience and guidance from CV PFS as well as established deployments such as those offered through DriveOhio and Traffic Technology Services</li> <li>• Conduct inquiries with each stakeholder identified in the Final list based on the Stakeholder Outreach Strategy</li> <li>• Generate a Draft status summary report detailing the status of existing I2V information data exchanges</li> <li>• Generate a final Status Summary Report based on feedback from Draft</li> </ul>	<ul style="list-style-type: none"> <li>• Draft List of Stakeholders</li> <li>• Final List of Stakeholders</li> <li>• Draft Status Summary Report</li> <li>• Final Status Summary Report and Comment Resolution Report</li> </ul>

Task	Approach	Deliverables
Task 3: Development of Common Interfaces and Data Approaches	<ul style="list-style-type: none"> <li>• Develop a Draft ConOps document reflecting users, user needs, features or functions the developed interfaces should support, operational scenarios, constraints, and context diagram(s)</li> <li>• Gather initial feedback from CV PFS group and stakeholders</li> <li>• Conduct an in-person ConOps Walkthrough</li> <li>• Update the ConOps based on feedback and provide a Final with Comment Resolution Report</li> <li>• Generate a Draft System Requirements Document for an I2V data portal that will meet the needs of IOOs and third-party providers</li> <li>• Gather initial feedback from CV PFS group and stakeholders</li> <li>• Conduct an in-person SysReq Walkthrough</li> <li>• Update the SysReq based on feedback and provide a Final with Comment Resolution Report</li> <li>• Develop an ICD that identifies and defines all interfaces necessary to meet ConOps and system requirement needs. The ICD will include a traceability matrix indicating from where interface components originated</li> <li>• Gather initial feedback from CV PFS group and stakeholders</li> <li>• Conduct an in-person ICD Walkthrough</li> <li>• Update the ICD based on feedback and provide a Final with Comment Resolution Report</li> <li>• Generate a Draft consensus recommendation summarizing the results of the ConOps, System Requirements Document, and ICD with a list of action items to move the I2V data portal interface forward</li> <li>• Provide a Final Consensus Recommendation Document and Comment Resolution Report based on feedback from CV PFS group</li> </ul>	<ul style="list-style-type: none"> <li>• Draft Concept of Operations</li> <li>• ConOps Walkthrough</li> <li>• Final Concept of Operations and Comment Resolution Report</li> <li>• Draft System Requirements Document</li> <li>• Requirements Walkthrough</li> <li>• Final System Requirements Document and Comment Resolution Report</li> <li>• Draft Interface Control Document</li> <li>• Interface Design Walkthrough</li> <li>• Final Interface Control Document and Comment Resolution Report</li> <li>• Draft CV PFS Consensus Recommendation Document</li> <li>• Final CV PFS Consensus Recommendation Document and Comment Resolution Report</li> </ul>

Task	Approach	Deliverables
Task 4: Submission of Recommendations to Standard Development Organization	<ul style="list-style-type: none"> <li>• Produce a Draft Tech Memo that identifies the portions of the common interfaces and data approaches that will be needed to facilitate standardization</li> <li>• Gather comments and feedback to provide a Final Tech Memo with Comment Resolution Report</li> <li>• Additionally, recommended wording for correspondence with the selected SDO(s) will be drafted for review by the CV PFS group</li> <li>• Work with appropriate SDOs and incorporate feedback from CV PFS group to further the standardization of the I2V communication interfaces as identified in previous tasks</li> <li>• Provide a Final version and Comment Resolution Report</li> </ul>	<ul style="list-style-type: none"> <li>• Draft Tech Memo on Standardization Needs</li> <li>• Final Tech Memo on Standardization Needs and Comment Resolution Report</li> <li>• Draft Standards Material (if needed)</li> <li>• Final Standards Material and Comment Resolution Report (if needed)</li> </ul>

As execution of many of the tasks depend on the results of the preceding tasks, careful attention will need to be paid to ensure that the resulting deliverables can be utilized as the input for future tasks.

### 2.3 Scope Verification

The following techniques will be utilized to ensure each deliverable will meet the needs of the CV PFS group.

- For deliverables without separate stakeholder walk-through:
  - Provide Draft version of deliverables and then provide two (2) weeks for CV PFS to provide comments. Review the comments and agree upon any that require resolution, then update the deliverable incorporating the agreed upon comments into a Final version within two weeks after comments are provided. These deliverables are labeled as Draft and Final in the deliverables list in Section 5.2.
- For deliverables that involve a separate stakeholder feedback:
  - CV PFS group members and stakeholders will be provided the same two weeks for review of all Draft versions. A stakeholder walkthrough will occur after the two-week review period and will be scheduled in coordination with the CV PFS group. A Final version will be provided within four weeks after stakeholder walkthrough.

### 2.4 Scope Control

Any new requested work items that are identified as out of scope will be discussed with the Project Champion and if it is agreed that the item is out of scope but desired, the new work must be approved by the CV PFS group and executed as a modification to the current agreement.



### **3 COST MANAGEMENT PLAN**

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As this project is a fixed cost project, cost management efforts are focused on achieving the milestones and deliverables within the allotted budget. During the execution of the project, the project manager will monitor for variance in each of the project tasks to ensure that each of the tasks are operating within budget and can be completed for the remaining budget.

### **4 COMMUNICATIONS PLAN**

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#### **4.1 Purpose of Communications Plan**

The purpose of the Communications Plan is to establish ground rules and expectations for communications between the CV PFS project team and external project stakeholders to facilitate the flow of information while avoiding confusion and redundancy.

#### **4.2 Single Point of Contact**

This person will be the single point of contact and the primary contact from SwRI:

Cameron Mott  
SwRI  
[cmott@swri.org](mailto:cmott@swri.org)  
+1.210.522.2583

The single point of contact and the primary contact from UVA/CV PFS is:

Hyungjun Park  
University of Virginia  
[Hjp4w@virginia.edu](mailto:Hjp4w@virginia.edu)  
+1.434.924-1651

#### **4.3 Stakeholder Engagement**

As identified in Task 2, Subtask 2, a Stakeholder Outreach Strategy will help to direct any stakeholder engagement. The following strategies are identified as potential approaches:

- Identify primary Point of Contact for stakeholders through existing contacts that are engaged in the project
- Assess existing buy-in and level of integration maturity
- Conduct outreach at CV industry events (e.g. ITSA Annual Meeting, IBTTA)

#### **4.4 Cooperate with Other Efforts**

Table 2 identifies known existing efforts that will be beneficial to coordinate with and also describes the nature of that coordination.

**Table 2. Coordination with Other Efforts**

Crosscutting Program Areas	Nature of Coordination
DriveOhio Data System Architecture Component of Statewide CV/AV	Via CV PFS group
Traffic Technology Services real-time traffic signal information	Via CV PFS group, and outreach as identified in stakeholder outreach strategy
Standards Development Organizations (IEEE, SAE)	Via participation on relevant standards organizations, and outreach as identified in stakeholder outreach strategy

## 5 DELIVERABLES AND MILESTONES

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### 5.1 Project Schedule

The following schedule has been updated based on the kickoff date of March 8, 2019. The end date for the project is September 7, 2020 based on the period of performance of 18 months. The Microsoft Project file (created from project 2010 or higher) as well as a PDF of the schedule has been provided in electronic format along with this document. In addition, Figure 1 shows a snapshot of the information provided in the Final Project Schedule. As an update to the revised schedule, the walkthrough for the System Requirement Document has been moved to correspond with the already scheduled Face-To-Face meeting Dec 10-12, 2019. This schedule is expected to be a living document and will be maintained by SwRI throughout the course of the project.

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 Final Project Management Plan  
 May 24, 2019

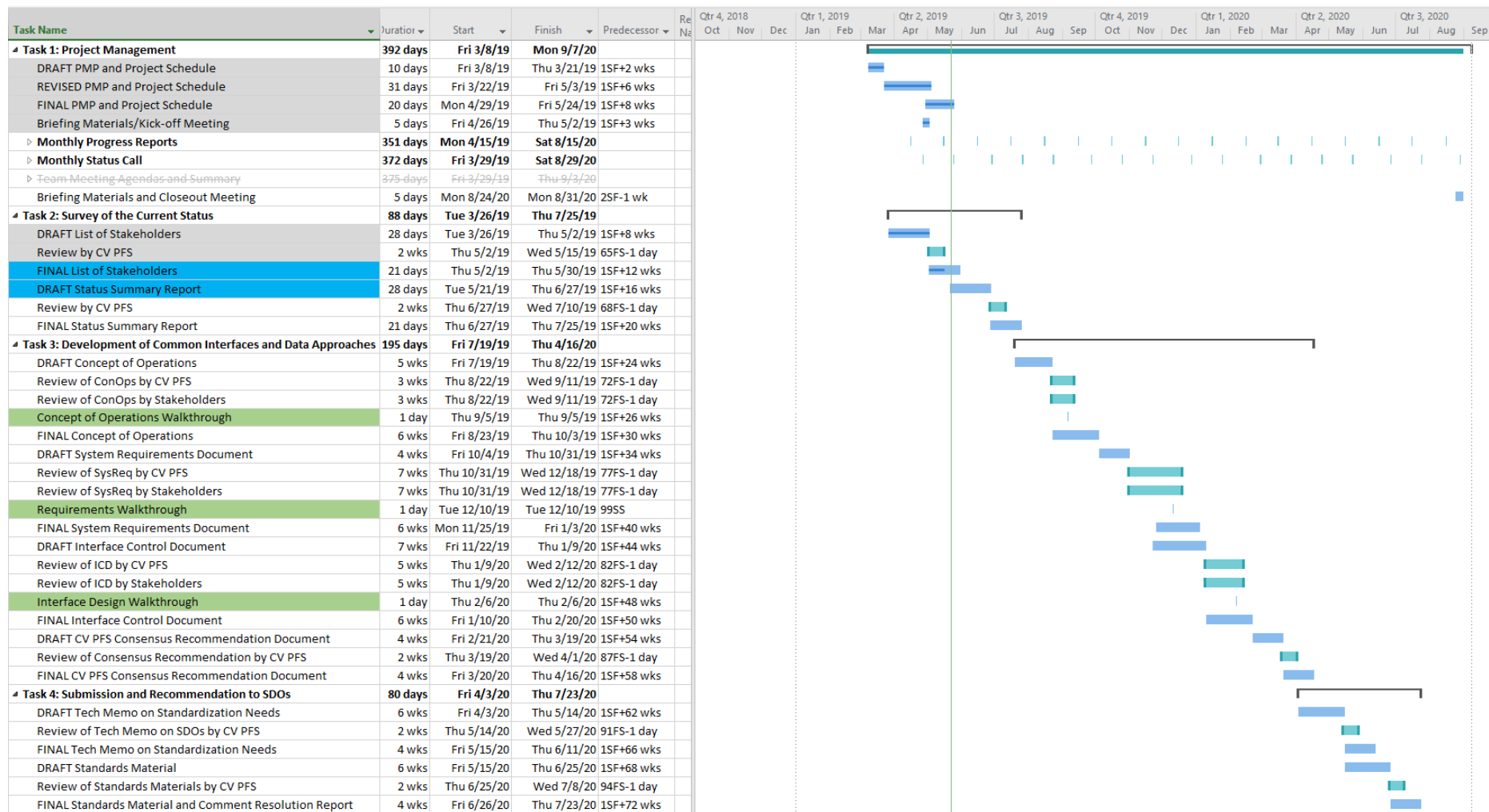


Figure 1: Snapshot of the Project Schedule

## 5.2 Deliverable Summary

Table 3 identifies planned deliverables and their associated due dates relative to the project’s start date of March 8, 2019, where applicable by task:

**Table 3. Summary of Deliverables (POP: 3/8/2019 - 9/7/2020)**

<b>TASK NAME AND DELIVERABLE</b>	<b>DUE DATE</b>
<b>Task 1: Project Management</b>	
DRAFT PMP and Project Schedule	Within 2 weeks of Award
Briefing Materials, Kick-Off Meeting	Within 3 weeks of Award
REVISED PMP, Project Schedule and Comment Resolution Report	Within 6 weeks after Award
FINAL PMP and Project Schedule	Within 8 weeks after Award
Monthly Progress Reports	15th of each month
Monthly Project Status Call associated Agendas, Presentation Slides, and Minutes	Every month
Team Meeting Agendas and Summaries	As needed
Briefing Materials, Closeout Meeting	Within 1 week before Contract ends
<b>Task 2: Survey of the Current Status</b>	
Draft List of Stakeholders	Within 8 weeks after Award
Final List of Stakeholders	Within 12 weeks after Award
Draft Status Summary Report	Within 16 weeks after Award
Final Status Summary Report and Comment Resolution Report	Within 20 weeks after Award
<b>Task 3: Development of Common Interfaces and Data Approaches</b>	
Draft Concept of Operations	Within 24 weeks after Award
ConOps Walkthrough (including Supporting Materials)	Within 26 weeks after Award
Final Concept of Operations and Comment Resolution Report	Within 30 weeks after Award
Draft System Requirements Document	Within 34 weeks after Award
Requirements Walkthrough (including supporting materials/workbooks)	Within 36 weeks after Award
Final System Requirements Document and Comment Resolution Report	Within 40 weeks after Award
Draft Interface Control Document	Within 44 weeks after Award
Interface Design Walkthrough (including supporting materials/workbooks)	Within 46 weeks after Award
Final Interface Control Document and Comment Resolution Report	Within 50 weeks after Award
Draft CV PFS Consensus Recommendation Document	Within 54 weeks after Award
Final CV PFS Consensus Recommendation Document and Comment Resolution Report	Within 58 weeks after Award
<b>Task 4: Submission of Recommendations to Standard Development Organization</b>	
Draft Tech Memo on Standardization Needs	Within 62 weeks after Award
Final Tech Memo on Standardization Needs and Comment Resolution Report	Within 64 weeks after Award
Draft Standards Material (if needed)	Within 68 weeks after Award
Final Standards Material and Comment Resolution Report (if needed)	Within 72 weeks after Award

## **6 QUALITY MANAGEMENT PLAN**

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### **6.1 Purpose of Plan**

The purpose of the Quality Management Plan is to document the approach for effectively managing the quality of the deliverables. This plan discusses the Quality Planning, Quality Control (QC), and Quality Assurance (QA) processes. Other processes that can affect the quality of a deliverable, such as assignment of the proper staff, are discussed in other sections of the Project Management Plan.

### **6.2 Quality Planning**

The following approach will be utilized to ensure that each deliverable is of high quality, meets the requirements, and fulfills the goals of the Using Third Parties to Deliver Infrastructure-to-Vehicle (I2V) project:

- Provide draft deliverables and allow the CV PFS group to provide comments. Review the CV PFS group comments and agree on resolution of each comment, then update the deliverable as a Final deliverable incorporating the CV PFS group comments.
- For deliverables with separate stakeholder walk-through, this will be scheduled preferably at the end of the combined CV PFS and stakeholder review period (two weeks after Draft is delivered). Stakeholder feedback will be discussed with CV PFS team and a strategy to address will be decided upon by the team.

### **6.3 Quality Control**

The SwRI project manager will monitor the schedule, risks and deliverables throughout the project and will be communicating these monthly to the CV PFS project manager. If there are any concerns with regards to these, issues will be raised up to the CV PFS project manager as soon as possible in order to reduce any impact to the project.

### **6.4 Quality Assurance**

SwRI is a CMMI Level 5 organization and will utilize internal quality assurance personnel and processes to ensure that quality is being implemented correctly on this project. The SwRI team also understands that other agencies may serve as an Independent Verification and Validation (IV&V) consultant for this project.

In addition, SwRI management and administrative staff review each deliverable prior to providing it to the client in order to address ambiguities, high-level concerns or consistency in deliverables. This review process ensures that management is familiar with the progress and deliverable status.

## **7 HUMAN RESOURCES MANAGEMENT PLAN**

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### **7.1 Purpose of Plan**

The purpose of the Human Resources Management Plan ensure the appropriate staff are utilized on the task order, that these staff have or acquire the necessary skills and expertise, and that team activities are effectively managed.

### **7.2 Roles and Responsibilities**

Table 4 lists the key team members, their organization, along with the project activities they will be involved with:

**Table 4. Team Members and Roles for SwRI Personnel**

Team Member, Organization, and Role	1	2	3	4
<b>Cameron Mott, SwRI</b> <b>Project Manager</b> SwRI Project Manager, Connected Vehicle Technical Expert	✓	✓	✓	✓
<b>Purser Sturgeon, SwRI</b> Connected Vehicle Technical Expert		✓	✓	✓
<b>Richard Downs</b> System Engineer			✓	
<b>John Esposito, SwRI</b> C-V2X Technical Lead		✓		
<b>Amitabh Misra, SwRI</b> ATMS Team Lead			✓	
<b>Michael Brown, SwRI</b> Project Management Professional, Quality Assurance	✓			

Several support staff (e.g. programmers and technicians) will be utilized to help accomplish the tasks defined here. These personnel may shift as needed through the project’s period of performance.

### 7.3 Task Order Organizational Chart

The organization chart is shown in Figure 2, and roles for key team members are indicated in parenthesis.

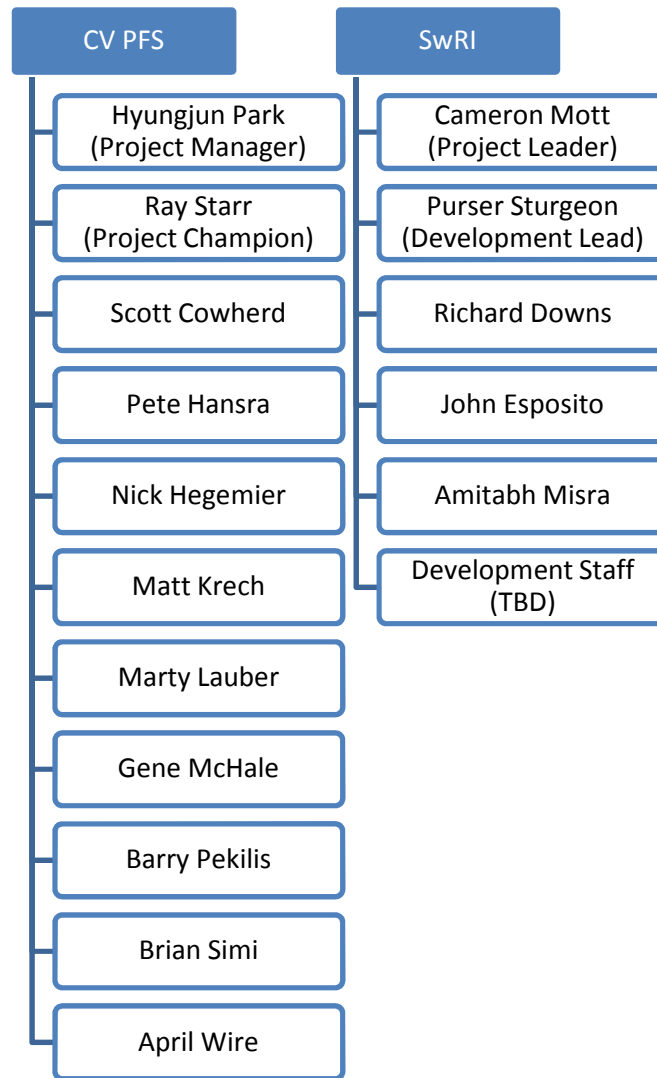


Figure 2: Project Team Structure

## 8 RISK MANAGEMENT PLAN

### 8.1 Purpose of Plan

This section documents the plan for identifying and managing the project risks in a timely and efficient manner.

### 8.2 Risk Management Approach

As part of our Risk Management process, SwRI will develop and maintain a Risk Management Log. This log will be maintained throughout the duration of the project and risk status will be included in the monthly status reports. As part of our risk management process, SwRI uses a tool that tracks risks and scores them according to the combination of probability and impact. This risk score is then used to prioritize risk response strategies and plans (e.g., mitigation, avoidance, transfer). The risk score is calculated based on a weighted value applied to the

estimated impact and probability for each risk. We will track all risks to closure but will utilize this tool to prioritize the risks to review more frequently with the CV PFS group. A draft of the risk evaluation and risk response is included in this PMP. The risk “dashboard” for this tool with these risks included is shown below in Figure 3. These were reviewed by the team during the face-to-face meeting and will be reviewed throughout the project on a regular basis.

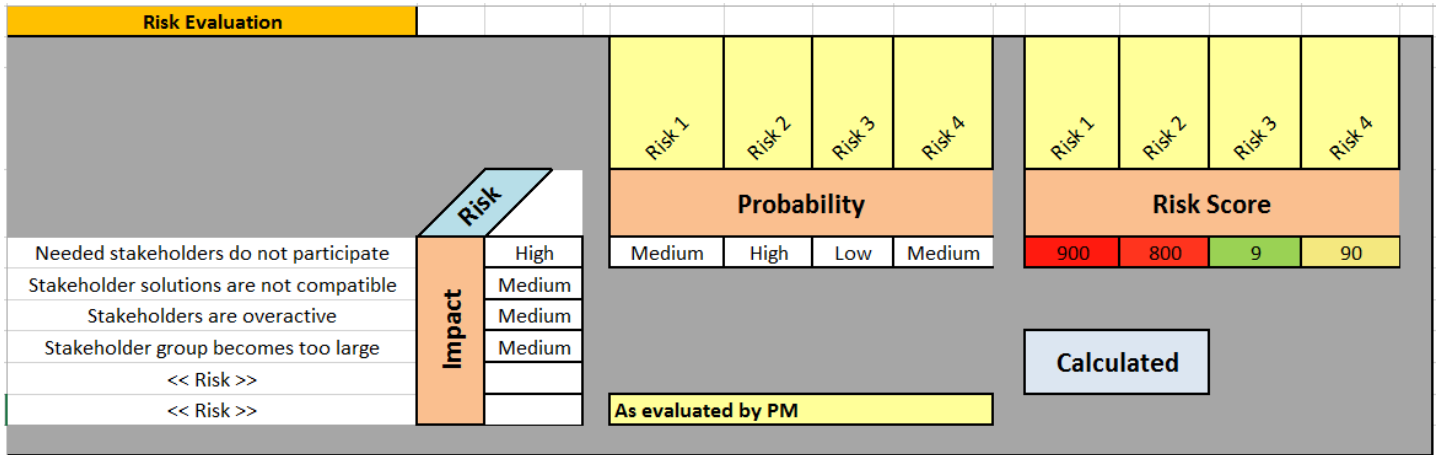


Figure 3: SwRI Risk Management "Dashboard"

### 8.3 Risk Evaluation

The following are the identified risks at this time, along with the estimated impact, the probability of the risk being realized, and the evaluated risk score based on a weighted impact and probability.

#### 8.3.1 List of Risks

1. Needed stakeholders do not participate – Since stakeholders are typically operating their third-party businesses without the need for standardization, they may not see a need to participate in the project’s efforts or comply with any standardization.
  - a. Impact: High
  - b. Probability: Medium
  - c. Risk Score: 900
2. Stakeholder solutions are not compatible – As stakeholders participate, there may be multiple solutions that are offered by different stakeholders and the solutions may not be compatible. Additionally, recommended solutions may not be compatible with existing solutions.
  - a. Impact: Medium
  - b. Probability: High
  - c. Risk Score: 800
3. Stakeholders are overactive – Stakeholders may be actively engaged to the point where their involvement causes undue churn on the project efforts.
  - a. Impact: Medium
  - b. Probability: Low
  - c. Risk Score: 9



4. Stakeholder group becomes too large – Too many stakeholders are included, to the point where keeping track of activities causes undue churn on the project efforts.
  - a. Impact: Medium
  - b. Probability: Medium
  - c. Risk Score: 90

## 8.4 Risk Response

Risks posed to the project may be in the form of an outside threat or an opportunity, some may even be both. After risks are identified and scored, Risk Responses are identified. Each response is given a unique response number for easy reference. Each Risk Response is assigned a response type, according to the nature of the response. For threats, the possible Response Types are Avoid, Transfer, Mitigate or Accept. For opportunity risks, the Response Types are Exploit, Share, Enhance and Realize.<sup>1</sup> Each Risk Response is also assigned to a responsible party that will execute the action. The action plan would be executed by the responsible party whenever the trigger condition existed. Trigger conditions include agreement by the project participants, increased risk score, external indicators or project milestones.

### **For Risk 1: Needed stakeholders do not participate**

Response: 1.1 [Avoid]

Action: *Stakeholder outreach strategy will include verbiage to indicate value of participation for stakeholders*

Responsible Party: Cameron Mott

Trigger: Deliverable

Response: 1.2 [Avoid]

Action: *CV PFS group members to indicate their commitment to the standards efforts by requiring compliance to appropriate standards in future procurement efforts*

Responsible Party: Hyungjun Park and CV PFS panel members

Trigger: Agreement from team that this should be performed

Response: 1.3 [Transfer]

Action: *Establish a Memorandum of Understanding (MoU) for critical stakeholders to commit to their participation in the project*

Responsible Party: Hyungjun Park and CV PFS panel members

Trigger: Agreement from team that this should be performed

### **For Risk 2: Stakeholder solutions are not compatible**

Response: 2.1 [Avoid]

Action: *Establish during the stakeholder outreach that the project team members will elect to move forward with recommendations for one standard*

Responsible Party: Cameron Mott

Trigger: Agreement from team that this should be performed

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<sup>1</sup> Burek, P. (2007). Collaborative tools and techniques to build the project risk plan. Paper presented at PMI® Global Congress 2007—North America, Atlanta, GA. Newtown Square, PA: Project Management Institute.

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**For Risk 3: Stakeholders are overactive**

Response: 3.1 [Enhance]

Action: *Establish a professional (technical) point of contact within each stakeholder that is vested in the project goals (through stakeholder outreach)*

Responsible Party: Cameron Mott

Trigger: Deliverable

**For Risk 4: Stakeholder group becomes too large**

Response: 4.1 [Avoid]

Action: *Prioritize stakeholder involvement based on the value of the stakeholder to the project. Lower priority stakeholders will be involved in a minimal basis. Select efficient means of communicating with large groups such as a group email address replicator.*

Responsible Party: Cameron Mott

Trigger: Active Immediately