



Transportation Systems Management & Operations

***Project Systems Engineering Management Plan for  
Central Florida Regional Integrated Corridor  
Management System***

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**Project Systems Engineering Management Plan for Central Florida Regional  
Integrated Corridor Management System**

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**List of Acronyms and Abbreviations**

AST	Agency for State Technology
ASTLog	R-ICMS-ASTLog.xls
ATP	Acceptance Test Procedure
CAP	Corrective Action Plan
CD	Critical Design
CDR	Critical Design Review
CFP	Cost Feasible Plan
CMMI	Capability Maturity Model Institute
ConOps	Concept of Operations
COTS	Commercial Off the Shelf
CPM	Critical Path Method
DFE	Data Fusion Environment
DMDD	Data Model Description Document
DOT	Department of Transportation
DSS	Decision Support System
ECO	Engineering Change Order
ECR	Engineering Change Request
FDOT	Florida Department of Transportation
FHWA	Federal Highways Administration
HWU	Hot Wash Up
ICD	Interface Control Document
IEN	Information Exchange Network
ITN	Invitation to Negotiate
ITS	Intelligent Transportation System
LD	Liquidated Damages
MOE	Measure of Effectiveness
MOP	Measure of Performance
MSR	Monthly Status Report
MTR	Minimum Technical Requirement
NTP	Notice to Proceed
O&M	Operations and Maintenance
OM&S	Operations, Maintenance and Support
PD	Preliminary Design
PDR	Preliminary Design Review
PERT	Project Evaluation and Review Technique
PITSA	Project Intelligent Transportation System (ITS) Architecture
PM	Project / Program Manager
PMI	Program Management Institute
PSEMP	Project Systems Engineering Management Plan
QA	Quality Assurance
QAR	Quality Assurance Representative
QC	Quality Control
QM	Quality Management
R-ICMS	Regional Integrated Corridor Management System
RITSA	Regional Intelligent Transportation System (ITS) Architecture
RR	Risk Register

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RTVM .....	Requirements Traceability Verification Matrix
SCHED .....	Schedule
SCM.....	Software Configuration Management
SDD .....	Software Design Document
SEMP.....	(Florida’s Statewide) Systems Engineering Management Plan
SEP .....	Systems Engineering Process
SIQA .....	System Input and Quality Analysis
SITSA .....	Statewide Intelligent Transportation System (ITS) Architecture
SOS.....	Scope of Services
SOW .....	Statement of Work
SRS .....	Software Requirement Specification
SWAM.....	Standard Written Agreement Modification
TE .....	Test Execution
TMC.....	Traffic Management Center
TRR.....	Test Readiness Review
TSP .....	Technical Special Provision
WBS .....	Work Breakdown Structure

# ***Project Systems Engineering Management Plan for Central Florida Regional Integrated Corridor Management System***

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## **1. Scope**

This document is the Project Systems Engineering Management Plan (PSEMP) for the Regional Integrated Corridor Management System (R-ICMS), contract BE521. It documents certain processes and procedures for the technical management, procurement, installation, and acceptance of the project. The document satisfies the requirement for a PSEMP for high risk intelligent transportation projects.

### ***1.1 Document Overview***

This PSEMP is organized as follows:

- Section 1 Scope
- Section 2 Systems Engineering Processes
- Section 3 Project Management and Control
- Section 4 User Definitions

### ***1.2 Need for a Project Systems Engineering Management Plan***

The Florida Department of Transportation (FDOT) requires high-risk intelligent transportation systems (ITS) projects using federal funds to use a SEP.<sup>1</sup> The PSEMP documents how systems engineering will be used for ITS project management.

Florida's Statewide Systems Engineering Management Plan (SEMP) is used as a reference guide in the creation of this PSEMP.

#### ***1.2.1 Project Identification***

Project Name: Central Florida Regional Integrated Corridor Management System.

Agreement Number: BE521

Financial Project Identification: 436328-1-82-01

Federal Aid Project Number: Not Applicable.

#### ***1.2.2 Purpose and Scope***

The R-ICMS will consist of, but not be limited to; commercial off-the-shelf (COTS) modeling software (provided by the DEPARTMENT), a custom built Decision Support System (DSS), a

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<sup>1</sup> FDOT Procedure titled Systems Engineering and ITS Architecture (Topic No 750-040-003). Available online at <http://www.dot.state.fl.us/proceduraldocuments/procedures.shtm>.

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custom built Information Exchange Network (IEN) subsystem that includes dashboards and other user interfaces to the system, and a Data Fusion Environment (DFE) to host data sources for both the R-ICMS and other external users and applications.

## ***1.2.3 Technical Project Summary Schedule***

Schedule overview:

- Advertisement ..... February 10, 2017
- Letting / Notice to Proceed..... March 14, 2018
- Development..... March 14, 2018 to March 2020
- Unit / Subsystem Tests ..... January 2020
- System Acceptance Tests..... January 2020 to February 2020
- Training ..... March 2020
- Operation, Maintenance and Support Year 1..... March 2020 to March 2021
- Operation, Maintenance and Support Year 2..... March 2021 to March 2022
- Operation, Maintenance and Support Year 3 (unfunded) .... March 2022 to March 2023

## ***1.2.4 Relationship to Other Plans***

*To be provided by Department*

### ***1.2.4.1 Relationship to Florida’s Ten-Year ITS Cost Feasible Plan***

*To be provided by Department*

### ***1.2.4.2 Relationship to Florida’s Statewide ITS Architecture***

*To be provided by Department*

## ***1.2.5 Relationship to Other “On-project” Plans***

This PSEMP refers to other documents that will be produced during the course of the project. These include:

R-ICMS-SCHEDProject Schedule that shows activities through the life of the project.

R-ICMS-RTMVProject Requirements Traceability Verification Matrix that shows bi-directional traceability from user needs statements to Acceptance Test Cases.

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R-ICMS-ACTLOG The ACTLOG is a spreadsheet that contains multiple sheets relevant to this PSEMP including: Action Item List, Change Management Log, Communications Log, Risk Register, etc.

## **1.3 Applicable Documents**

The following documents, of the exact issue shown, form a part of this document to the extent specified herein. In the event of a conflict between the contents of the documents referenced herein and the contents of this document, this document shall be considered the superseding document.

<i>Standard Written Agreement, Agreement Number BE521</i>	<i>FDOT District 5 Procurement. A copy is maintained on the Project SharePoint Site.</i>
<i>ITN-DOT-16-17-5004-ICMS</i>	<i>FDOT District 5 Procurement. A copy is maintained on the Project SharePoint Site.</i>
Systems Engineering and ITS Architecture (Topic No 750-040-003)	<a href="http://www.dot.state.fl.us/proceduraldocuments/procedures.shtm">http://www.dot.state.fl.us/proceduraldocuments/procedures.shtm</a>

## **2. Systems Engineering Processes**

This section describes the Systems Engineering Processes to be used in execution of BE521.

### ***2.1 Developing the Project Intelligent Transportation System Architecture***

*To be provided by Department*

### ***2.2 High-Level Functional Requirements (System)***

FDOT District 5 Traffic Operations developed a Concept of Operations and High Level Functional Requirements which is published in the procurement document ITN-DOT-16-17-5004-ICMS. The former is captured in Exhibit B Scope of Services, the latter are captured in Exhibit B System/Subsystem Minimum Technical Requirements for the Central Florida R-ICMS. The System level requirements will be reviewed during a weeklong requirements walkthrough and documented in a SwRI produced System Requirements Specification.

### ***2.3 Detailed (Subsystem) Requirements***

FDOT District 5 Traffic Operations developed Detailed or Subsystem Requirements which is published in the procurement document ITN-DOT-16-17-5004-ICMS Exhibit B System/Subsystem Minimum Technical Requirements for the Central Florida R-ICMS. The detailed or subsystem level requirements will be reviewed during a weeklong requirements walkthrough and documented in a SwRI produced System Requirements Specification.

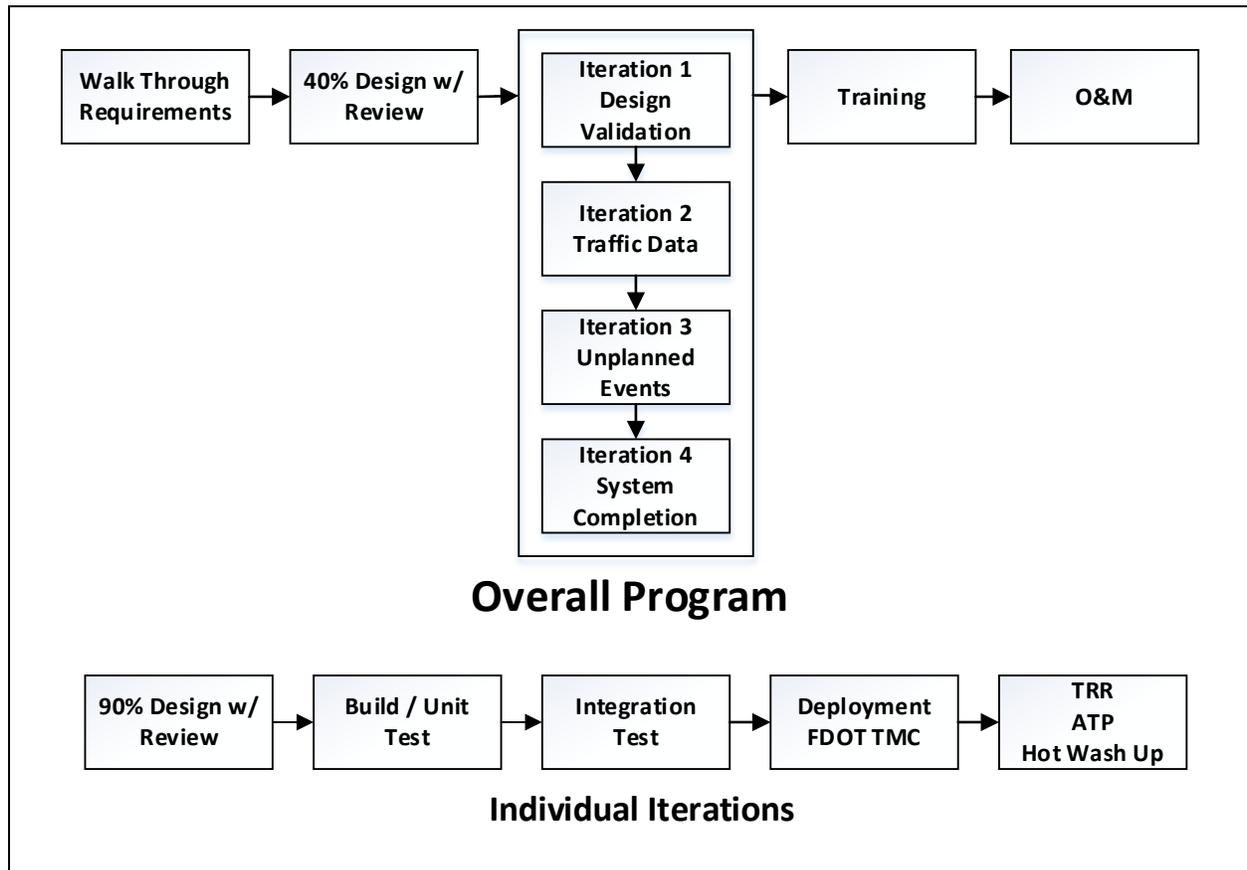
### ***2.4 Perform Trade-off Studies, Gap Analyses, or Technology Assessments***

*To be provided by Department*

### ***2.5 Perform Technical Reviews***

The overall project schedule showing timing of the technical reviews is shown in Figure 1.

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**Figure 1 — Overall Project Flow Showing Technical Reviews**

The following technical reviews are planned for this project.

- *Requirements Walkthrough* – A one week meeting in DEPARTMENT facilities to walk through the requirements to assure common understanding.
- 40% or Preliminary Design Review – At the completion of the single 40% Design phase SwRI shall perform a Preliminary Design Review (PDR) to obtain verification / approval of the system architecture design. The goals of the PDR are to:
  - a) Verify the technical content of the architectural design document and its interfaces are complete and traceable to requirements;
  - b) Ensure the selected design methodology has been followed in producing the architectural design; and
  - c) Obtain approval from the DEPARTMENT Project Manager to proceed into detailed design.
- 90% or Detailed Design Review —For each of the four iterations, after completion of approximately 90% of the detailed design and prior to system build, a Critical Design Review (CDR) shall be conducted by SwRI to ensure the design fulfills the requirements.

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The CDR will serve as a baseline for all deliverables, and there will be no deviation from the final CDR without change requests being approved by the DEPARTMENT. The goals of the CDR are to:

- a) Verify the technical content of the System Design Document are complete and its functions are traceable to requirements.
  - b) Ensure the selected design methodology has been followed in producing the detailed design.
  - c) Obtain approval from the DEPARTMENT Project Manager; the team will proceed into the implementation phase.
- *Test Readiness Review* —SwRI shall hold a two-hour, in-person, Test Readiness Review meeting prior to each major testing event. The purpose of the Test Readiness Review is to provide the DEPARTMENT with the assurance that the software has undergone a thorough integration process and is ready for the next test phase. The scope of the Test Readiness Review is to inspect the test products and test results from the completed integration phase for completeness and accuracy, and to verify that the test cases, test scenarios, test scripts, environment, and test data have been prepared for the next test phase. Each of the Iterations contributing to the overall R-ICMS will hold Test Readiness Reviews for the Iteration.
  - *Hot Wash Up* —SwRI shall attend a hot wash-up meeting in person at the conclusion of the test execution for each iteration. Unverified requirements will be discussed to facilitate the development of the Corrective Action Plan
  - *Document Deliverable Reviews* – Each document is subject to a review of the outline prior to developing the document content, and then the completed draft document is subject to FDOT review cycle.

### ***2.6 Identify, Assess and Mitigate Risk***

Risk Management is the process for identifying, analyzing, and mitigating risks. This strategy addresses the specific actions and management approach used to apply and control the risk management program. This includes identifying the sources of risk, the scheme used to categorize risks, and the parameters used to evaluate, bound and control risks for effective handling.

The R-ICMS project will utilize the Risk Log tab of the ASTProjectLogWorkbookTemplateV1.1-2017-1-10 Excel spreadsheet to record and track risks. The spreadsheet will be kept on the DEPARTMENT hosted project SharePoint site. SwRI persons who have access to the SharePoint site will have read access to the spreadsheet; write access will be limited to SwRI PM, System Architect, and Lead Developer.

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## ***2.6.1 Risk Planning***

Risk Planning is the process for identifying possible sources of risks, defining the scales used to rate the impact and probability and how those will be combined to identify risks that need to be addressed.

## ***2.6.2 Risk Sources***

Many sources of risk are accepted without adequate planning. Early identification of both internal and external risk can lead to early identification and mitigation of actual risks. The following are possible internal and external sources examined to identify risks.

- Uncertain requirements
- Continually changing requirements
- Continually changing FDOT priorities
- Poorly chosen and defined or politicized FDOT priorities
- Unprecedented efforts - estimates are unavailable
- Infeasible design
- Unavailable technology
- Unrealistic schedule estimates or allocation
- Inadequate staffing and skills
- Cost or funding issues
- Uncertain or inadequate subcontractor capability
- Uncertain or inadequate vendor capability
- Inadequate communication with actual or potential customers or with their representatives
- Disruptions to continuity of operations

## ***2.6.3 Risk Parameters***

The AST spreadsheet identifies parameters for evaluating, categorizing, and prioritizing risks as described in the following paragraphs.

### ***2.6.3.1 Risk Probability Categories***

The probability of the risk shall be determined. Risk Probability Categories are defined as:

- 4: High Likely: The risk has a 76% to 100% chance of occurring.
- 3: Likely: The risk has a 51% to 75% chance of occurring.
- 2: Somewhat likely has a 26 to 50% chance of occurring.
- 1: Unlikely / improbable: The risk has a 0 to 25% chance of occurring.

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### **2.6.3.2 Risk Impact Categories**

Risk Impact Categories are defined as:

- 4: Critical” Threatens the viability of the project
- 3: Severe: Threatens project / severely reduces benefit
- 2: Moderate: May delay project / reduce project benefits
- 1: Minimal/ Minor: Minimal or no impact on project

### **2.6.3.3 Risk Score**

Risk score is calculated as the product of Risk Probability and Risk Impact. Risk score is tracked to help prioritize risks.

### **2.6.3.4 Risk Priority**

R-ICMS will use the Risk Score to derive Risk Priority as follows:

- High criticality risks (Risk Score > 8 ) have a high priority. Mitigation plans shall be explicitly discussed with the FDOT in the event the risk becomes a problem. During mitigation planning, resources are first allocated to high criticality risks to mitigate their threats.
- Moderate criticality (4 < Risk Score <= 8) risks have a moderate priority. SwRI will discuss mitigation plans with the FDOT.
- Low criticality (Risk Score < 5) risks have a low priority. No action planning or risk tracking is necessary. However, the risk shall be periodically reviewed to ensure risk probability and risk impact conditions have not changed.

This is better illustrated in Table 1; yellow representing Low Priority, orange representing Medium Priority and Red representing High Priority.

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**Table 1 — Risk Priority Matrix**

	<b>High Probability 4</b>	<b>Medium Probability 3</b>	<b>Low Probability 2</b>	<b>Very Low Probability 1</b>
Negligible Impact 1	4	3	2	1
Marginal Impact 2	8	6	4	2
Critical Impact 3	12	9	6	3
Catastrophic Impact 4	16	12	8	4

## ***2.6.4 Identify and Analyze Risks***

The following methods will be used to identify risks.

- Team reviews
- Peer reviews
- Feasibility studies
- Prototypes
- Examining each element of the project work breakdown structure
- Interviews of subject matter experts
- Reviewing risk management efforts of similar projects
- Examining lessons-learned documents or databases
- Examining design specifications and agreement requirements
- Brainstorming

Upon identification, risk management staff will enter the risk into the Risk Log of the AST Spreadsheet.

## ***2.6.5 Avoid, Mitigate and Transfer Risks***

SwRI staff responsible for risks (risk owners) work with the SwRI PM and management to develop plans to handle identified risks. SwRI will include plans for avoidance, mitigation and transference on the worksheets for high criticality risks.

### **2.6.5.1 Risk Avoidance**

It is possible to develop plans to avoid the occurrence of many risks. This consists of careful planning of actions to be taken at defined events during the execution of a project. By defining and implementing these plans, specific occurrences of risks can be avoided. Example: by refusing

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to accept new or changed requirements without providing the FDOT with cost and schedule impacts, SwRI can avoid the issues of scope creep which can lead to project cost overruns and schedule delays.

### **2.6.5.2 Risk Transference**

It is possible to develop plans to transfer risks to other organizations. This consists of careful planning of actions to be taken at the occurrence of some risks. By defining and implementing these plans, specific occurrence of risks can be avoided. Example: by identifying an adverse impact an external organization is having on a project (withholding a critical resource, failure to meet schedule to deliver a required test tool or jig, etc.) and requesting assistance from the FDOT to resolve the issue, the risk is transferred to FDOT.

### **2.6.5.3 Develop Risk Mitigation Plans**

SwRI staff members who are owners of identified risks will work with the SwRI PM and management to develop risk mitigation plans. These plans are typically in the form of “if x happens, SwRI will respond by doing y.” Risk mitigation plans often reflect decisions and choices that have been made in advance to reduce the impact of risk occurrence. Example: If it is apparent that a staff member is not making sufficient progress in their task, then SwRI will reallocate staff to help the staff member accomplish their goal.

## ***2.7 Requirements Traceability Verification Matrix***

### ***2.7.1 Requirements Management***

After submission and approval of the SRS, SwRI will enter all the system / subsystem requirements into the Atlassian RMSIS requirements management tool. This tool is integrated into the Atlassian toolset and supports cross tool referencing to the Jira issues tracking tool, BitBucket Source Code Control System tool, and other Atlassian tools. SwRI will expose the Atlassian tool to the FDOT through the public internet and provide licenses and login credentials to the FDOT for use of the tool.

SwRI will maintain the RTVM in the RMSIS tool supporting bi-directional linkages from User Needs through the intermediate steps to test cases and test reports. In this manner, FDOT will have immediate access to the current state of the RTVM at all times. Additionally, SwRI will provide baseline snapshots of the RTVM in TBD (Excel, pdf, etc.) formats at key delivery points of the software development lifecycle. These snapshot will be stored on the SharePoint site.

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### ***2.7.2 Create and Maintain the RTVM***

SwRI will create a requirements traceability verification matrix (RTVM) from BE521 Exhibit C System / Subsystem Minimum Technical Requirements for the Central Florida Regional Integrated Corridor Management System Version 2.0. Exhibit C provides the following information which will be used to initially populate the RTVM

- User Needs Statements
- Business Requirements derived from the User Needs Statements
- System Performance Requirements derived from the User Needs Statements
- Physical Requirements
- Subsystem Requirements

SwRI will use the existing requirements tables to produce the RTVM. The RTVM will be a bi-directional trace from user needs to acceptance test cases.

The RTVM will be modified during the lifetime of the project.

- Requirement Analysis Phase: create the RTVM as part of the System Requirements Specification (SRS). The SRS will consist of the requirements from Exhibit C as modified or augmented by the efforts during and following the Requirements Walkthrough.
- 40% Design Phase: allocate requirements to specific architectural design artifacts. This assures that all requirements have been considered during the physical architecture of the system.
- 90% Design Phase: further allocate requirements to specific software modules or other software artifacts e.g. database tables, interfaces, etc.
- Unit Test: add unit test case identifiers to verify that allocated requirements were tested
- Integration Test: add integration test case identifiers to verify that allocated requirements were tested during the integration test phase
- Acceptance Test: add acceptance test case identifiers to verify that the system satisfies system requirements

## ***2.8 Performance Measure Metrics***

To be provided by Department (the following text is taken from the contract section Performance Measures)

Payments shall be achieved and become eligible for payment in accordance with BE521, Exhibit B Method of Compensation Table 1. SwRI shall submit with each invoice certification that all requirements of each milestone have been completed and approved by the Department.

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Milestone requirements are detailed in Exhibit “A” Scope of Services. The Department shall verify that all deliverables meet the requirements of the Contract Documents.

### ***2.9 System Testing, Integration, Verification, and Acceptance Planning***

The SwRI Team will test the R-ICMS at several levels to assure quality. The following summarizes the comprehensive development and testing approach that will be used for this project:

- **Unit Testing:** Software developers will define and run unit tests during development. Once a module has successfully completed unit testing, the product will be promoted into the integration stream.
- **Integration Testing:** Project staff will test modules in the integration stream using defined integration tests. Integration tests will be against derived requirements and will verify the performance of the software with other modules, such as the integration of a subsystem with its User Interface (UI). Upon successful completion of integration testing, the software will be promoted into the Acceptance Test Procedure (ATP) stream. The results of R-ICMS Interface Test Cases will be provided to FDOT D5.
- **Acceptance Testing:** Project staff will perform “dry-runs” of the System Acceptance Test Procedures prior to submittal of the software for acceptance testing. The development team will run performance tests on the completed system. Failures of the ATP dry run will be noted, and the software returned to the developer for correction. The software is not ready for ATP until the ATP dry run completes without issues.
- **Performance Testing:** Project staff will perform load/performance testing of the R-ICMS.

Prior to a release, the SwRI Team will perform configuration management audits to ensure the integrity of the software. The multi-step process consists of retrieving the source code from the software configuration management (SCM) tool, building the software from the retrieved code, creating installers from the build, installing the software on a representative target system, and running acceptance tests against a newly installed system. This process will assist in providing assurance that the release contains the functionality expected and meets requirements.

### **3. Project Management and Control**

The SwRI Team applies defined and proven system engineering and project management processes to ITS projects. These processes have been independently assessed at CMMI Level 5 (highest level). CMMI is the process improvement and system engineering approach recommended by the Federal Highway Administration (FHWA) in its System Engineering Guidebook for ITS, and closely aligns with the Project Management Institute's (PMI) Project Management Body of Knowledge (PMBOK) of best practices for project management.

SwRI has defined practices and standards for project management, development of project management plans, schedule development, cost tracking, configuration management, and systems engineering, to name a few. The SwRI Team will also perform quality assurance and quality control for all subcontractor developed products to ensure the quality of the final delivered products. These procedures will ensure the SwRI Team successfully executes the project and completes required functionality on-time and within budget.

Throughout the project life cycle, the SwRI Team will use national industry standards, open documented interfaces, and object oriented design to create modular solutions for the R-ICMS to facilitate integration of COTS products and accommodate new requirements and technology.

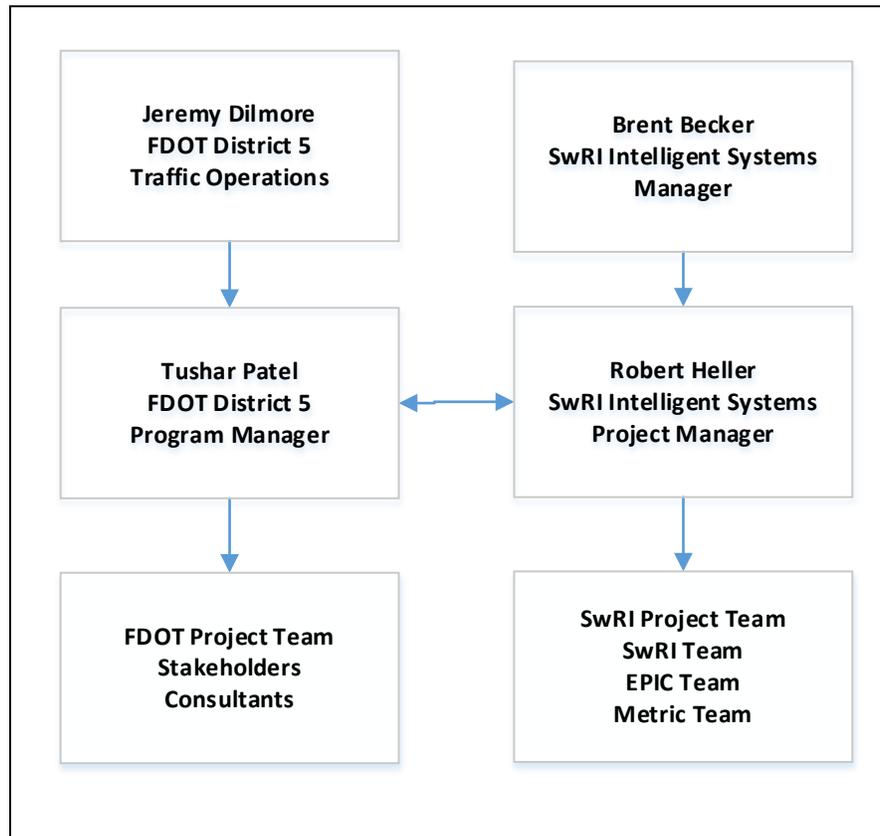
#### ***3.1 Organization Structure***

This section describes the organizational structure of the project team. The section describes the organization of the team in three subsections, the relationship between the DEPARTMENT and SwRI, the structure of the DEPARTMENT team and then the structure of the SwRI team.

##### ***3.1.1 The Project Team***

The project team is based on the BE521 agreement issued by the DEPARTMENT to SwRI. The contract describes the responsibilities of the DEPARTMENT and SwRI, those are reproduced here. The organization of the project team is depicted in Figure 1.

# Project Systems Engineering Management Plan for Central Florida Regional Integrated Corridor Management System



**Figure 2 — High Level Team Structure**

## 3.1.2 DEPARTMENT Team

This section describes the DEPARTMENT team structure and responsibilities.

### 3.1.2.1 DEPARTMENT Team Organization

To be provided by the DEPARTMENT

### 3.1.2.2 DEPARTMENT Team Responsibilities

BE521 lists the DEPARTMENT responsibilities as follows:

- Designate a project manager
- Form a project steering committee
- Provide all existing documentation in the DEPARTMENT's possession on the equipment and systems required to interface with R-ICMS
- Coordinate the documentation for an interface with other projects. Acquire an Interface Control Document from other projects, if required

## ***Project Systems Engineering Management Plan for Central Florida Regional Integrated Corridor Management System***

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- Review, Comment, and Approve the documentation and other deliverables
- Monitor the project's implementation progress and schedule
- Provide facility access and staff support
- Participate in requirements reviews, integration testing, acceptance testing, implementation, training, and status meetings
- Acquire all off-the-shelf hardware and software required to implement the functional capabilities of the PROJECT
- Provide hardware, commercial software, and communication infrastructure
- Provide all data interface APIs and Static Data required for the R-ICMS
- Create and maintain a project SharePoint site during the contract period to:
  - Update project progress
  - Post documentation
  - Post meeting agendas, minutes, and action items
- Provide an integration testbed environment for testing all software functions. Performance, security, and other system functions will be tested in a controlled pre-production environment during the system test phase which will mirror the production environment.
- Provide test systems and simulators to support the unit and system testing of the R-ICMS.
- Provide the COTS modeling engine
- Develop and maintain the necessary traffic models (macroscopic, mesoscopic, microscopic)
- Develop, maintain, and configure response plans, rules for triggering response plans and rules for selecting response plans to be evaluated

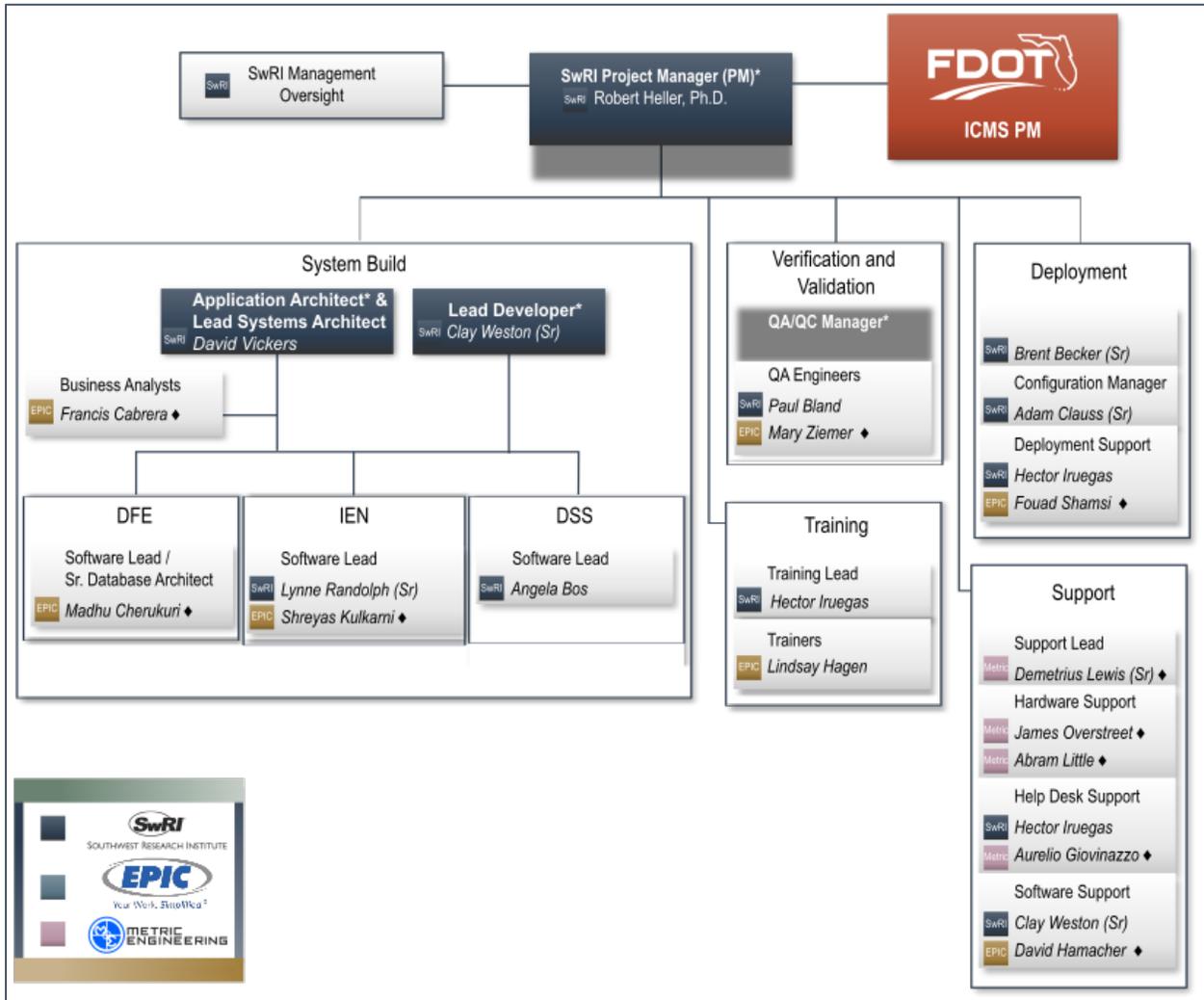
### ***3.1.3 SwRI Team***

This section describes the SwRI team structure and responsibilities.

#### ***3.1.3.1 SwRI Team Organization***

The SwRI team consists of SwRI as the prime contractor and subcontractors EPIC Engineering & Consulting Group and Metric Engineering. The organization structure of the team is depicted in Figure 3 as well as key staff members. Resumes for the identified staff are contained in SwRI's proposal.

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**Figure 3 — SwRI Team Organization**

### 3.1.3.2 SwRI Team Responsibilities

BE521 describes the SwRI team responsibilities as follows:

- Designate a project manager and key project team members
- Provide a resource loaded Microsoft Project Schedule
- Provide detailed software design and integration with complete software system design documentation
- Identify the hardware requirements for system implementation, so the DEPARTMENT can furnish the computer-related equipment and networks for system integration and testing for the TMC

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- Schedule and Coordinate with the DEPARTMENT's project manager to ensure that adequate network infrastructure and data links are provided by the DEPARTMENT
- Integrate software into an operational system
- Test functional capabilities of the system
- Provide network and workstation security
- Pack, ship, insure, and deliver all parts; training and maintenance materials; submittals; and documentation to the DEPARTMENT, as directed
- Implement a rigorous, structured integration methodology
- Implement a rigorous configuration management system
- Implement and executing a formal software development process
- Complete documentation for all hardware (as applicable) and software training, including a complete operator/administrator manual; user and service documentation; and the drawings
- Train DEPARTMENT-designated personnel
- Project management and control, including attending periodic progress meetings with and reporting to, the DEPARTMENT staff
- Maintenance and support of the system for the duration of the contract
- Standard warranty services for the duration of the contract
- Post implementation maintenance support for delivered software within the contract period, renewable in one year increments
- Provide a list of licenses for public domain software used in the CONTRACT before the project award. SwRI shall provide the DEPARTMENT with related licenses
- Provide a means to bulk-load response plans, response plan confirmation authorities, and decision plan rules.

### ***3.2 Work Breakdown Structure and Work Plan***

The WBS consists of the following tasks that are described in terms of required inputs, activities and outputs.

WBS-1 Kick-off Meeting.

Inputs: NTP, Proposal, Contract.

Activities: Coordinate meeting content, publish agenda, conduct meeting, publish minutes.

Outputs: Meeting Agenda, Minutes, Presentation Slides.

WBS-2 Project Management.

Inputs: NTP

Activities: Plan, document planning and manage the project.

Outputs: Numerous – see subtasks.

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WBS-2.1.1 Project Systems Engineering Management Plan.

Inputs: Contract

Activities: PSEMP skeleton development and approval

Outputs: Approved PSEMP

WBS-2.1.2 Risk Register.

Inputs: ACTLOG spreadsheet, risks identified in SwRI proposal, kickoff meeting

Activities: Input of risks into the risk register, approval of the proposed risk register.

Outputs: Risk Register populated with the initial risks.

WBS-2.1.3 Project Schedule.

Inputs: Contract schedule, proposal schedule, CDRL

Activities: Plan and schedule the activities of the contract.

Outputs: Project schedule showing start and end dates, predecessors and successors, critical path.

WBS-2.1.4 Software Development Plan.

Inputs: PSEMP, SRS

Activities: Plan software development, specify resources

Outputs: Software development plan

WBS-2.1.5 Software Coding Guidelines.

Inputs: SDP, knowledge of industry standard practices, corporate experience

Activities: Survey corporate practices and industry for standard coding guidelines for proposed use languages.

Outputs: Software Coding Guidelines

WBS-2.1.6 Manage Project.

Inputs: PSEMP, SDP, Schedule, Contract

Activities: Actively track schedule, progress and cost. Change Management, Configuration Management, Cost Management, Risk Management, Schedule Management, Status Reporting, Subcontractor Management, etc

Outputs: Status updates, ACTLOG (risk register, action items, ECRs, etc.)

WBS-3 Design

WBS-3.1.1 Requirements Analysis.

Inputs: Contract requirements

Activities: Requirements Walkthrough, requirements refinement and creation and initial population of the Requirements Traceability Verification Matrix.

Outputs: RTVM and the SRS

WBS-3.1.2 Preliminary Design.

Inputs: SRS, CONOPS

Activities: developing the 40% design, documenting the 40% design, and conducting the Preliminary Design Review

Outputs: PD, updated RTVM

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### WBS-3.1.3 Develop 90% Design Iteration 1.

Inputs: 40% Design, Requirements

Activities: Subsystem / module design, specific interfaces, design data models, etc.

Outputs: ICDs, DMDD, CD, updated RTVM

### WBS-3.1.4 Iteration 1 Design Validation

Inputs: ICDs, DMDD, CD, RTVM

Activities: Develop Iteration 1, conduct Unit test, Develop test procedures

Outputs: Iteration 1 software, successful integration test

## WBS-4 System Build Iterations

### WBS-4.1.1 Iteration 2 - Traffic

#### WBS-4.1.1.1 Develop 90% Design Iteration 2

Inputs: 40% Design, Requirements

Activities: Subsystem / module design, specific interfaces, design data models, etc.

Outputs: ICDs, DMDD, CD, updated RTVM

#### WBS-4.1.1.2 Iteration 1 Design Validation

Inputs: ICDs, DMDD, CD, RTVM

Activities: Develop Iteration 1, conduct Unit test, Develop test procedures

Outputs: Iteration 1 software, successful integration test

### WBS-4.1.2 Iteration 3 - Events

#### WBS-4.1.2.1 Develop 90% Design Iteration 3

Inputs: 40% Design, Requirements

Activities: Subsystem / module design, specific interfaces, design data models, etc.

Outputs: ICDs, DMDD, CD, updated RTVM

#### WBS-4.1.2.2 Iteration 1 Design Validation

Inputs: ICDs, DMDD, CD, RTVM

Activities: Develop Iteration 1, conduct Unit test, Develop test procedures

Outputs: Iteration 1 software, successful integration test

### WBS-4.1.3 Iteration 2 – Planned Events

#### WBS-4.1.3.1 Develop 90% Design Iteration 4

Inputs: 40% Design, Requirements

Activities: Subsystem / module design, specific interfaces, design data models, etc.

Outputs: ICDs, DMDD, CD, updated RTVM

#### WBS-4.1.3.2 Iteration 1 Design Validation

Inputs: ICDs, DMDD, CD, RTVM

Activities: Develop Iteration 1, conduct Unit test, Develop test procedures

Outputs: Iteration 1 software, successful integration test

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## WBS-4.1.4 System Test Plan & System Test Procedure

Inputs: SRS, RTVM

Activities: Plan system test by accumulating test procedures from 4 iterations into one coherent test activity

Outputs: Approved System Test Plan and Test Procedure

## WBS-4.1.5 Test Readiness Review

Inputs: SRS, RTVM, Unit Test Reports, Integration Test Reports

Activities: Conduct Test Readiness Review by review of SRS, RTVM, Unit Test Reports, Integration Test Reports

Outputs: Approval for System Test

## WBS-4.1.6 System Final Test

Inputs: System Test Plan, System Test Procedure

Activities: Conduct System Testing

Outputs: System Test Report

## WBS-4.1.7 Corrective Action Plan

Inputs: System Test Report

Activities: Develop correction action report including correction of deficiencies, requirements waivers, etc. Implement Corrective Actions.

Outputs: Approved system.

## WBS-5 Deployment

### WBS-5.1.1 Develop Hardware Failure Resolution Plan

Inputs: Hardware and software system.

Activities: Plan actions for hardware failure.

Outputs: Hardware Failure Resolution Plan

### WBS-5.1.2 Hardware / COTS Software Deployment Activities

Inputs: Installed system hardware and COTS software.

Activities: Verify system installation, network connectivity, install R-ICMS system on hardware software.

Outputs: Operational System

### WBS-5.1.3 Installation Verification

Inputs: Installed R-ICMS System

Activities: Verify functionality of system

Outputs: Production system

## WBS-6 System Training

### WBS-6.1.1 Develop Training Manuals

Inputs: ICMS software

Activities: Develop user materials for training.

Outputs: Software User Manual, Admin Training Materials, User Training Materials, Developer Training Materials

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### WBS-6.1.2 Develop Training Plan

Inputs: Software User Manual, Admin Training Materials, User Training Materials, Developer Training Materials

Activities: Develop plan for conducting training including “floating” agendas, required resources, etc.

Outputs: Approved Training Plan

### WBS-6.1.3 Develop Training Schedule

Inputs: Training Plan, DEPARTMENT specified locations

Activities: Develop training schedule taking into account training plan, DEPARTMENT resources, DEPARTMENT timetable

Outputs: Meeting invites for training with Agenda

### WBS-6.1.4 Training Workshops (On site)

Inputs: Training Schedule

Activities: Conduct training

Outputs: Trained operations, training report.

## WBS-7 Operations, Maintenance and Support 3 Years

### WBS-7.1.1 System Acceptance / Start O&M

Inputs: System Acceptance, Training Report

Activities: Plan Operations, Maintenance and Support of system.

Outputs: OM&S

### WBS-7.1.2 Weekly O&M Status Meeting Year 1

Inputs: Weekly trouble reports

Activities: Conduct weekly meetings reviewing trouble reports, response time reports, etc.

Outputs: Weekly OM&S reports with LD computations

### WBS-7.1.3 Weekly O&M Status Meeting Year 2

Inputs: Weekly trouble reports

Activities: Conduct weekly meetings reviewing trouble reports, response time reports, etc.

Outputs: Weekly OM&S reports with LD computations

## WBS-8 Contract End

Inputs: Contract End Date

Activities: Close Out Meeting

Outputs: Lessons Learned Report

### ***3.3 Detailed Schedule***

A detailed schedule for the project is maintained as a separate deliverable and may be found in the project SharePoint site. The project schedule shows tasks at a level consistent with the WBS and WP described in Work Breakdown Structure and Work Plan.

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**3.4 Cost Management**

The method of compensation for this project is Lump Sum. SwRI will invoice FDOT according to the Milestone table included as part of BE521 which is reproduced in Table 2. SwRI and its subcontractors will monitor actual costs on a periodic basis (no less than monthly) but not report actual costs incurred to the DEPARTMENT.

**Table 2 — BE521 Milestone Payment Table**

<b>BE521 Scope Reference</b>	<b>Task Name</b>	<b>Milestone Date (days after NTP)</b>	<b>Total Cost</b>
3.5.1	Task 1: Project Management (Accepted PMP, PSEMP documents)	45	\$160,026
3.5.2	Task 2: System Design (Accepted documents)	105	
	Requirements Analysis		\$292,434
	Preliminary Design		\$252,374
	Critical Design		\$510,549
	Design Validation		\$481,523
3.5.4.1	Thread 1 Build	392	
	Thread 1 DFE Acceptance		\$180,440
	Thread 1 IEN Acceptance		\$478,551
	Thread 1 DSS Acceptance		\$278,177
	Thread 2 Build		
	Thread 2 DFE Acceptance		\$177,665
	Thread 2 IEN Acceptance		\$502,474
	Thread 2 DSS Acceptance		\$415,682
	Thread 3 Build		
	Thread 3 DFE Acceptance		\$207,055
	Thread 3 IEN Acceptance		\$557,514
	Thread 3 DSS Acceptance		\$272,094
	System Integration System Acceptance		\$492,843
3.5.6	Task 6: System Training	759	\$160,913
	System Deployment		\$262,002
3.5.7	Task 7: Operations, Maintenance, and Support***	760	\$1,191,551 (Total) \$49,648 (Monthly)
	<b>Grand Total Cost</b>		<b>\$6,873,867</b>

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### ***3.5 Procurement Management***

*To be provided by Department*

### ***3.6 Risk Management***

SwRI identified the following risks as part of the proposal development. These risks should be evaluated as part of the risk management activity for continue applicability, those that are applicable should then be entered into the Risk Register.

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<b>Risk</b>	<b>Mitigation Approach</b>
Components are included which are not customizable and the source code is not accessible.	Provide a modular end-product allow non-customizable components to be swapped out if needed at a later time. With the exception of the modeling engine that is off-the-shelf, SwRI will develop software on a work-for-hire basis. The architecture and components will be modular with well-defined documented interfaces.
Application does not scale to other areas of FDOT.	The SwRI Team will work with the FDOT D5 to create a design for a modular, customizable solution.
Difficult to get design/development agreement from the large # of stakeholders.	Early stakeholder engagement and inclusion in design meetings. Have a communication plan with appropriate actions when disputes arise.
Execution of response plans may be impacted by stakeholders not agreeing.	Negotiate understandings and agreements with stakeholders at different points in lifecycle. Ensure software is flexible allowing removal non-responsive agencies from response plans.
Performance goals may be too ambitious/un-realistic to meet with current technology.	Current state of the technology may not meet the performance goals, but modularity will allow swapping in new components at a later time.
Getting real time data from signal systems relies on vendors to provide interfaces to their proprietary software for turning counts and other details needed.	The SwRI Team will work with the FDOT PM & and other stakeholders to convince vendors to provide this information.
Traffic data from ATMS and third parties are not sufficient to build a working / deployable model within the given schedule timeline (performance goal).	May be necessary for FDOT D5 to prioritize schedule or fulfillment of all requirements. A custom modeling engine could take advantage of all data, but would could impact schedule and cost. The COTS products do not incorporate all the inputs that impact requirements.
Project management is complicated by having many subcontractors to manage.	SwRI chose subcontractors to reduce risk. SwRI will use process that engages subcontractors to evaluate schedule, cost, and the quality of deliverables and services.
Integration with an existing/under development DFE and System Input and Quality Analysis (SIQA) of which we have limited familiarity with or influence over.	SwRI has added team members with familiarity with the DFE project. Can alternatively perform our own SIQA cleansing
Inconsistencies or misinterpretations in the stated ITN requirements could result in dissatisfaction.	The SwRI Team will use the requirements management process to validate the consistency of and remove ambiguity in the requirements.
The ITN includes a requirement to produce timing signal plans. This is a significant cost driver, and plan approval requires a traffic engineer.	FDOT could elect to modify priority and deliver in a later or future release of the system after the R-ICMS has already been implemented, deployed, and proven.

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## ***3.7 Subcontractor Management***

SwRI uses a formalized Subcontracting Management process; the following subsections describe the subcontracting process. During SwRI's preparations to respond to the ITN, SwRI formed a team that consisted of proposed subcontractors with expertise or experience that spanned the tasks described in the original Scope of Services. SwRI entered into exclusive teaming agreements with those proposed subcontractors. Upon completion of negotiations and contract execution, SwRI began its process to subcontract work with two of those team members. The subcontracting process used in that process is described in subsequent paragraphs.

### ***3.7.1 Subcontract Process***

SwRI issues subcontracts using the following summarized process:

1. SwRI develops a Statement of Work for the agreed work scope based on the contract negotiations, original teaming agreements, and final Prime contract.
2. SwRI PM works with the subcontractor PM to develop a milestone payment schedule that aligns with the Prime contract milestone payment schedule.
3. SwRI PM provides SwRI Purchasing (subcontracts specialist) with a Statement of Work and subcontractor point of contact; included its justification for using a specified subcontractor rather than entering a competitive procurement process.
4. SwRI purchasing subcontract specialist provides a draft Statement of Work (SOW) to subcontractor, requests a cost estimate and milestone payment schedule.
5. Subcontractor provides a cost estimate (proposal) to SwRI subcontract specialist.
6. SwRI subcontract specialist forwards the cost estimate to SwRI PM and requests approval.
7. DRAFT subcontract is developed with DRAFT SOW and subcontractor proposal and provided to subcontractor.
8. SwRI receives comments and resolves issues with subcontractor; finalizes contract; all parties agree to subcontract.
9. Subcontract issued

### ***3.7.2 Subcontractor Invoices***

The subcontractor has provided a milestone payment schedule as part of their subcontract that was developed in coordination with the milestone payment schedule of the prime contract. When milestones are reached and approved by the DEPARTMENT, the subcontractor invoices SwRI, the invoice is sent to the SwRI PM for approval, the SwRI PM approves the invoice for payment, and the invoice is processed for payment.

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## ***3.7.3 Special Services***

Section 3.6 of the prime contract provides for a mechanism to allow the DEPARTMENT to add additional services to the prime contract. The SwRI PM will review the requested services and determine which of the SwRI team members should provide the requested services. If the SwRI PM determines part or all of the services should be provided by one of the SwRI subcontractors, the SwRI PM will develop a Statement of Work for the requested services and the subcontracting process of 3.7.1 will be followed.

## ***3.8 Engineering Specialty Integration***

*To be provided by Department*

### ***3.8.1 Integrated Logistics Support and Maintenance Engineering***

*To be provided by Department*

## ***3.9 Deliverable Management and Approval Process***

SwRI will follow the Developed Document Deliverables process as outlined in BE521. The process is described in two phases.

### ***3.9.1 Phase 1 —Document Content Approval.***

Where document templates are available on the DEPARTMENT's Systems Engineering website, the template shall be used and may be tailored by SwRI in developing the document unless an alternative is agreed to by the DEPARTMENT. Where a specific document template is not available, SwRI shall use the DEPARTMENT's non-specific technical memorandum document template and include the sections and information specified in the scope item at a minimum.

1. SwRI and the DEPARTMENT agree on deadlines for the document deliverable submittal activities (described below) that fit within the project schedule.
2. SwRI submits a document shell or outline for the DEPARTMENT's review and approval following the submittal procedure below. The document shell shall contain the outline of the document and may contain notes to guide the development of the document content.
3. The DEPARTMENT shall email SwRI that the outline has been accepted.

### ***3.9.2 Phase 2 —Document Deliverable Submittal and Review Procedure:***

Once a document template has been accepted SwRI will develop a DRAFT of the deliverable.

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1. SwRI delivers draft deliverable to the DEPARTMENT by the draft deliverable due date.
2. DEPARTMENT reviews the deliverable and provides comments to SwRI by the deliverable review due date. Comments will be provided as comment balloons and tracked changes if using Microsoft Word; else, a comments table will be provided that will track each comment's text, reference location within the deliverable, and a place for SwRI's response, and a status of the comment.
3. SwRI addresses comments by modifying the submittal and answering questions by the revision due date. Changes to the deliverable shall be tracked using the tracked changes feature of Microsoft Word if the deliverable is in that format, else, a list of changes made to the deliverable shall be provided with the comments responses.
4. DEPARTMENT reviews SwRI's comment responses and deliverable changes by the revision review due date. All comments shall be marked as completed using the "Mark as Completed" function of the comment balloon if using Microsoft Word, else by indicating in a comments table.
5. *Steps 3 and 4 will repeat until the DEPARTMENT marks all comments as completed.*

### ***3.9.3 Other Deliverables***

Other deliverables that are not formatted as a Microsoft Office document will be submitted in a fashion described in the other plan documents.

## ***3.10 Communications Management Plan***

This section addresses tracking of communications between SwRI and the DEPARTMENT, issue elevation, and SwRI contractual commitment.

### ***3.10.1 Communications Tracking.***

SwRI will track and record in the ASTLog spreadsheet all formal project communications between the DEPARTMENT and the SwRI team. The ASTLog spreadsheet contains multiple tabs for that purpose, each to record a different type of communication. In the case where it is not clear if an entry belongs in one tab or another, the SwRI PM will use best judgement to determine "best fit" for an entry in choice of tabs; i.e. an entry could easily be either an Action Item or an Issue.

- RiskLog – is used to record risks as they are exposed and defined by the project team. Section 2.6 describes the use of the RiskLog.
- ActionItemLog – is used to record Action Items that need to be addressed outside the context in which they arise. An example of an Action Item might be to have SwRI develop and provide sizing estimates for a SQL Server database.

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- IssuesLog – is used to record Issues. Issues are topics that need discussion or consideration. An example of an Issue might be that access to a data stream has been delayed beyond the time that a driver for that data stream was to be developed for ingestion of the data into the DFE.
- DecisionLog – is used to record decisions made by the DEPARTMENT PM that affect execution of the contract. An example of a Decision is to modify the method that document identifiers are formatted.
- CommunicationLog – is used to record official communications regarding deliverables, meeting schedules, or otherwise. An example of a Communication might be the delivery date of the PSEMP, receipt of DEPARTMENT PSEMP comments, etc.
- ChangeControlLog – is used to record all proposed ECOs for the contract. Section 3.12 describes use of the Change Control Log.

### ***3.10.2 Issue Elevation.***

SwRI has identified a staff member within its organization that SwRI management believes can fulfill the role of PM. In the event that the DEPARTMENT feels the SwRI PM is not being responsive to its requests or failing to serve the best interests of the DEPARTMENT within the scope of the contract, SwRI provides the following list to which the DEPARTMENT may elevate issues. Each entry represents the next level of authority in SwRI management.

Brent Becker, Manager  
Transportation Data Infrastructure Systems Section  
[Brent.Becker@SwRI.Org](mailto:Brent.Becker@SwRI.Org)  
210-522-6718

Josh Johnson, Director  
Critical Systems Department  
[Josh.Johnson@SwRI.Org](mailto:Josh.Johnson@SwRI.Org)  
210-522-2877

Steve Dellenback, Vice President  
Intelligent Systems Division  
[Steve.Dellenback@SwRI.Org](mailto:Steve.Dellenback@SwRI.Org)  
210-522-3914

### ***3.10.3 SwRI Contractual Commitment.***

SwRI contractual commitment is through the SwRI contracts department. Contact to the SwRI contracts department is handled through Contract Specialists; the Contract Specialist assigned to this contract is Ms. Patty Cade. Her contact information is listed below.

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Patty Cade  
Contracts  
[Patty.Cade@SwRI.Org](mailto:Patty.Cade@SwRI.Org)  
[Contracts@SwRI.Org](mailto:Contracts@SwRI.Org)  
210-522-2397

### ***3.11 Monthly Project Status***

The SwRI PM will provide monthly project status to the DEPARTMENT in two parts: the Monthly Status Report and a follow up Monthly Project Status Review.

#### ***3.11.1 Monthly Status Report.***

The SwRI PM will prepare and submit to the DEPARTMENT Monthly Status Reports (MSR) on the 5<sup>th</sup> of each month summarizing the project accomplishments of the previous month. The MSRs will consist of the following sections.

- Executive Summary – a short summary of the accomplishments of the previous month.
- Project Activities during the Reporting Period. This should be a bulleted list of WBS elements that are actively being worked.
- Project Activities Planned for the next Reporting Period. This should be a bulleted list of WBS elements that will be active during the next month.
- Risks. This section should summarize any changes to the Risk Register.
- Action Items. This section should list any new Action Items.
- Schedule. This section should summarize any deviations from the previously approved schedule.
- Attachments. Attached to the MSR letter should be a complete pdf of the ASTLog updated for the previous month.

#### ***3.11.2 Monthly Status Review***

The Monthly Status Review will be held between the DEPARTMENT and the SwRI PM on a regularly scheduled basis after the DEPARTMENT has received and reviewed the MSR. The Monthly Status Review will be held as screen sharing teleconferences except quarterly when these meetings will be held at a District 5 designated location.

### ***3.12 Change Management***

Change Requests are used to initiate and track changes to baselined requirements. Change Requests are required to track changes to requirements, design, and implementation. The

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Change Request Repository consists of all submitted Change Requests, both open and closed. The contents of the Change Request repository will be maintained as part of the R-ICMS-ASTLog spreadsheet that is kept on the FDOT project SharePoint Site.

### ***3.12.1 Change Control Request Form***

The Change Request process is initiated by completion of a Change Request Form that is kept in the Change Request Repository and entering the Change Request into the Change Control Log. The Change Request Log is a tab in the R-ICMS-ASTLOG Excel spreadsheet and contains the following information:

- *Change Control Number* – This is a uniquely assigned sequential number assigned to the Change Request Form.
- *Priority* – time criticality of the requested change (H / M / L)
- *Originator* – who requested the change, it could be the DEPARTMENT, a Stakeholder, or SwRI.
- *Date Entered* – the date the form was completed.
- *Primary Nature of the Change*: whether this change is Scope, Quality, Schedule, Cost or some combination of the four.
- *Change Description* – is a description of the requested change. If the change is of significant complexity it may be described in a separate document that could be several pages in length which may be referred to as a mini-CONOPS. If that is the case, then a one or two sentence description should be placed here with a reference to the mini-CONOPS.
- *Reason for change* – separate from the Change Description is some motivating reason for the change.
- *Benefits of the Change* – how the change enhances the functionality of the R-ICMS project.
- *Implications of not making change* – what is the impact on the system if the change is not approved and implemented
- *Impact*: SwRI will assess the impact on R-ICMS operations with respect to the stakeholders (DEPARTMENT and other government organizations) in the areas of:
  - *Scope*: What is the Scope of the ECR? Is it within the purpose of the project or outside the required Scope? Is there a reduction in Scope that results in a credit to the DEPARTMENT that can be used to fund other ECRs?
  - *Schedule Impact*: can the ECR be implemented without change to the contract overall schedule. Does the change impact the critical path?
  - *Cost*: what is the estimated cost of the ECR? Using the rates of the contract Section 3.6, what is the estimated cost to implement the ECR.
  - *Quality / Risks*: does the ECR carry additional risk to the project or reduce the identified risks captured in the Risk Log?

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- *Resources*: does the ECR have an impact on the required hardware and software recommended to host the R-ICMS? Is additional hardware or software needed?
- *Requirements*: Does the ECR constitute new requirements that need to be documented? Does it modify or delete requirements? Make sure these are captured in the SRS and RTVM.
- *Other*: are there other impacts of the ECR that need to be documented?
- Current Status – What is the current status of the change request, possible values are defining, estimating, approving, implementing, not approved (needs to be added to ASTLog change request form)
- Change Owner – Who currently has ownership of the request; SwRI if estimating, FDOT if waiting for approval, SwRI if implementation, other if need other information, etc.
- Date Assigned – When the change was assigned to the Change Owner
- Due Date – Date when the current action is due
- Scope Change (Y/N) – Change is a Scope change (requirements)
- Cost Change (Y/N) – Change incurs cost.
- Event Driven R&C Category – Change affects R&C Category
- Linkage to Other Logs – Change is associated with entry in another worksheet
  - Risk Log #
  - Issue Log #
  - Decision Log #
  - Action Item Log #
  - Requirement #
- Date Presented – Date first presented to Approval Authority
- Approval Authority – Who is the Approval Authority
- Date of Decision – Date Approval Authority approved or denied the ECR
- Requires Contract Amendment – Does ECR require contract amendment
- Date of Contract Amendment – Date of contract amendment
- Link to Change Control Form – link to Change Control Form (Worksheet)

### ***3.12.2 Change Control Process Flow***

SwRI will follow the three step process described below.

- 1) SwRI will complete the form and notify the DEPARTMENT PM of the new form via email (the email will be entered into the Communication Log of the R-ICMS-ASTLog spreadsheet).
- 2) The DEPARTMENT will coordinate with stakeholders to consider the change and make a decision to accept or reject the change request.
- 3) If accepted, SwRI shall propose contractual changes (contract updates or contract amendments) necessary to implement the change. SwRI will update the Change Request Log and the Change Request Form in the ASTLog spreadsheet.

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### ***3.13 Quality Management***

The SwRI Quality Assurance Representative (QAR) will perform surveillances of the SwRI project. The purpose of the surveillance is to document compliance and identify non-compliance of the project with the organization process. Compliance with the organization process ensures enhanced product to the FDOT as it requires the development of this plan, which requires identification of Software Development Life Cycle, testing, coding standards, peer reviews, etc.

#### ***3.13.1 Initial Surveillance***

The QAR meets with the SwRI PM or designee and conducts an initial project surveillance within 30 days of contract award. The QAR utilizes the initial project surveillance checklist<sup>2</sup> (see Attachment A) to verify compliance with the organization process. Items of non-compliance are documented within the SwRI QA system and tracked to closure.

#### ***3.13.2 Periodic Surveillances***

The QAR meets with the SwRI PM or designee and conducts periodic project surveillances every 90 days. The QAR utilizes the periodic project surveillance checklist (see Attachment A) to verify compliance with the organization process. Items on non-compliance are documented within the SwRI Quality Assurance (QA) system and tracked to closure.

#### ***3.13.3 Coding Standards***

SwRI will develop a set of coding standards for use during the project. The coding standards are a separated deliverable due at 90% Design Review.

#### ***3.13.4 Reviews***

The objective of a review is to involve peers, management, and customers to examine a portion of or an entire baseline item to discover defects. The results of the review are accumulated, consolidated and recorded. At the conclusion of the review, the results are provided to the author(s) and the author is responsible for resolving the defects. It is apparent from this process that the goal is to produce a product with improved quality and reduced defect count.

##### ***3.13.4.1 Review Types***

The following paragraphs describe the different types of reviews that may occur in the review of work products developed for the FDOT.

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<sup>2</sup> The checklists provided contain references to many internal SwRI processes, procedures, documents and forms. Providing copies of those is beyond the scope of this document.

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## ***Management Review***

SwRI utilizes Management Reviews for documents developed for the FDOT. In a management review, a non-author member of the SwRI management team (usually the Section Manager responsible for the project) reviews the document, capturing comments within the document being reviewed. The author reviews the comments and corrects any defects. If there are noted defects or comments with which the author does not agree, the author shall discuss those with the reviewer and reach agreement for resolution.

## ***Buddy Check Peer Reviews***

The goals of a Buddy Check are to identify defects and issues in a work product, to point out needed improvements and to increase uniformity among work products (e.g. was the appropriate coding standard followed) within a project and the Organization. Once a work product is ready to undergo a buddy check, the following steps shall be performed.

- The author identifies a “buddy” to review the work product. The term “buddy” is not often defined other than it typically meets the following criteria: the buddy is familiar with the domain, the buddy is a SwRI employee approved to work on the project, the buddy has similar project responsibilities, there is not “reporting” relationship between the buddy and the author (neither reports to the other in the SwRI management ladder).
- The “buddy” shall review the work product.
- The “buddy” shall capture comments in the work product.
- The author shall review the comments created by the “buddy”.
- The author shall address the comments and recommendations. The author shall correct those items that the author agrees are defects if they will not impact project cost or schedule. The author shall work with the “buddy” to address items that the author believes are not actually defects and do not require a correction.

SwRI conducts Buddy Check Peer Reviews in a non-attribution manner as much as possible. In keeping with this policy, the reviews are closed to project management, organization management and the FDOT. Furthermore, the results of these reviews are not shared with the customer.

## ***Walk-Through Peer Reviews***

SwRI conducts Walk-Throughs in a lecture style format to reviewers who have not previously seen the work product, i.e. the author leads (walks) the reviewers through the work product during the review. SwRI conducts Walk-Throughs with four major roles identified:

- Work Product Author: This is the primary author of the work product or a staff member identified to represent a product which may be the result of a team development effort;

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- Peer Review Leader: A SwRI staff member trained in leading peer reviews (there is formal training), familiar with the domain and designated by the Project Manager to lead this review,
- Recorder or Scribe: Is a member of the review team chosen to record the results of the review session. The recorder may be the author, but that is typically not done as it limits the ability of the author to listen.
- Peer Reviewers: Staff familiar with the domain of the work product and not the PM or members of SwRI management.

The following shall be performed during the review.

- The author of the work product being reviewed shall present the work product in a methodical order.
- The author shall describe the work product in a lecture-type presentation.
- Reviewers shall take notes as the author presents the work product.
- As defects/issues are identified (e.g. adherence to coding standards), they shall be discussed, classified by severity, and logged by the recorder.
- The number of defects/issues shall be summarized and the review leader and/or the reviewers determine if a re-review is necessary.
- At the conclusion of the review, the author shall collect the notes from the team members and the defect/issue log from the recorder.

Following the review, the defect log is provided to the author, the author addresses the defects, the review leader ensures that the logged defects are addressed; the results are stored according in the project repository.

SwRI conducts Walk-Through Peer Reviews in a non-attribution manner as much as possible. In keeping with this policy, the reviews are closed to project management, organization management and the FDOT. Furthermore, the results of these reviews are not shared with the customer.

### ***Customer Reviews***

SwRI will participate in Customer Reviews. The customer reviews that may be required by BE521 include

- Requirements Reviews,
- Preliminary Design Reviews,
- Detail Design Reviews,
- Test Readiness Reviews,
- Hot Wash Up Reviews

These are described in more detail in Section 2.5

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**3.13.4.2 Review Plan**

For each work product, Table 3 identifies Peer review method, Rationale, and method of reporting and tracking the results of the reviews.

**Table 3 — Work Product Review Plans**

Baseline Item or Portion of Baseline Item	Review Type				Rationale	Reporting and Tracking Method for Review Results
	Buddy Check	Walk-through	Management Review	Customer Review		
Initial Risk Register	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Need EPIC review	
Project Schedule	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Need EPIC review	
PSEMP	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
MSR	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Need EPIC review	
Agenda	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Need EPIC review	
Minutes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Need EPIC review	
PD	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Client review at PDR	
SRS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Need EPIC review	
CD	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Client review at CDR	
Coding Guidelines	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Client review at CDR	
SDP	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Client review at CDR	
VDD	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Need EPIC review	
Software Modules	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	SwRI modules via buddy, EPIC modules via SWT	
STP	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Test Procedures	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

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Baseline Item or Portion of Baseline Item	Review Type				Rationale	Reporting and Tracking Method for Review Results
	Buddy Check	Walk-through	Management Review	Customer Review		
Corrective Action Plan	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
Test Report	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Deployment Plan	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Hardware Failure Resolution Plan	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
Training Plan	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
Training Manuals	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		

### 3.13.5 Testing

SwRI performs software testing to expose and correct as many defects in the software to be delivered as possible. Elimination of the defects by definition provides a better product to the DEPARTMENT.

#### 3.13.5.1 Unit Testing

Once the code is progressed to a stable state and developers believe the code is ready for unit testing, automated tests are written to test classes, methods, algorithms, and other sections of code that should be tested on a small scale. Tests are written in test cases that will traverse all code paths within the segment, including error cases. The goal of unit testing is to isolate each part of the program and show that the individual parts are correct and behave in the manner in which they were intended. Unit testing creates a bottom-up testing style approach and makes integration testing much easier. These tests add additional cost but usually end up saving money in the end by catching fundamental problems much earlier in the development process.

#### 3.13.5.2 Integration Testing

Integration Testing combines the smaller modules validated in the Unit Testing procedure and tests them as a group. Integration Testing is performed in a Top-Down Testing approach where the top integrated module (i.e. module in the group upon whose execution is dependent on other modules within the group) is tested forcing the branches of the sub-level modules to be tested

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step by step until reaching the end of the top-level module. Between Integration Testing and Unit Testing, all parts of the modules should receive sufficient testing.

The SwRI Team will conduct Integration Testing of an iteration not as a single test event, but stepwise as individual code modules successfully pass unit test. Integration Test is a piecemeal process occurring continually throughout the Development / Unit Test and Integration Test phases. Logically, the two phases occur concurrently and complete concurrently. Because of this strategy of stepwise Integration Test, the testing occurs at the development site and not according to a pre-defined schedule test event and testing is conducted by the development organizations. The SwRI Team will document the results of the Integration Testing using the RTVM and provide those results to the FDOT at Test Readiness Review.

### **3.13.5.3 System Acceptance Testing**

SwRI will conduct System Acceptance Testing of the partial or complete R-ICMS after each of the four iterations are built and integrated into a partial or complete R-ICMS. SAT is a multi-step process consisting of Test Readiness Reviews (TRR), Test Execution (TE) and Hot Wash-Up (HWU) Meetings. TRR and HWU are described in paragraph 2.5.

### **3.14 Systems Acceptance**

After the test report is finalized and accepted, and after all unverified requirements are resolved, the subsystem or system under test shall be accepted by the DEPARTMENT formalizing the completion of a major milestone of the project.

### **3.15 Operations, Maintenance, and Support**

When the system has been accepted, the project transitions to an Operations, Maintenance and Support phase. SwRI will provide support for the R-ICMS in accordance with the contract. Specifically, SwRI, EPIC Engineering and Consulting Group and Metric Engineering will provide support for the system.

- SwRI will provide a system operator, familiar with the system, administration of the system and the system OS (Windows and Linux).
  - The system operator will be full time during the first year of operation working first shift.
  - The system operator will be half time during the second year of operation, work hours will be determined prior to the start of the second year.
- SwRI will provide 24 x 7 telephone and email support for the system. Restoration of the system to operation is subject to performance goals and penalties.

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- SwRI will correct latent defects in the software for the first two years of system operation.

### ***3.16 Contract Closeout Meeting aka Lessons Learned***

Towards the end of the contract, the DEPARTMENT will host and SwRI will attend a contract closeout meeting. The contract closeout meeting will serve as a Lessons Learned and SwRI will provide minutes of the Contract Closeout Meeting. The minutes will document actions necessary by the DEPARTMENT, SwRI and other attenders to close-out the contract.

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<b>DOCUMENT REVISION HISTORY</b>			
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