Statewide Transportation Management Center Software Library System

Detailed Work Plan

STMCSLS-WP-1.0.0-Draft

October 16, 2003

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TABLE OF CONTENTS

Page

REVISION HISTORY iii

1.0 SCOPE 1
1.1 Project Identification 1
1.2 Project Overview 1
1.3 Related Documents 2
1.4 Acknowledgments 2

2.0 DETAILED WORK BREAKDOWN STRUCTURE 3
2.1 Release 1 Work Breakdown Structure 3
2.2 Release 2a Work Breakdown Structure 4
2.3 Release 2b Work Breakdown Structure 4
2.4 Deployment Work Breakdown Structure 5
2.5 Support Work Breakdown Structure 5

3.0 RELEASE 1 DETAILED WORK PLAN 6
3.1 Project Management Activities 6
3.1.1 PM/SPM/DPM Activities 6
3.1.2 Client Meetings 6
3.1.3 Process Documents 7
3.1.4 Configuration Management 7
3.2 Requirements Development 7
3.3 High-Level Design 8
3.4 Process Viewer 8
3.5 Status Logger 8
3.6 TransGuide Port 9
3.7 Database 9
3.8 Map 10
3.9 User Interface 10
3.10 CCTV Subsystem 10
3.11 Traffic Detection Subsystem 12
3.12 DMS Subsystem 12
3.13 Incident Management Subsystem 12
3.14 General Integration and Documents 13
3.15 Testing 14
3.16 Deployment Preparation 14
3.17 Training 15
3.18 Bond 15

4.0 RELEASE 2A DETAILED WORK PLAN 16
4.1 Project Management Activities 16
4.1.1 PM/SPM/DPM Activities 16
4.1.2 Client Meetings 16
4.1.3 Process Documents 16

4.1.4 Configuration Management 17
4.2 Database....17
4.3 Map....17
4.4 User Interface 17
4.5 CCTV....17
4.6 Center-to-Center (C2C) 18
4.7 Ramp Metering....18
4.8 FDOT Central Office Configuration 18
4.9 RWIS 19
4.10 Archive Data 19
4.11 HAR 20
4.12 Web Server....20
4.13 Emergency Evacuation 20
4.14 General Integration and Documents 21
4.15 Testing....21
4.16 Deployment Preparation 22
4.17 Training....22
5.0 RELEASE 2B DETAILED WORK PLAN 23
5.1 Project Management Activities 23
5.1.1 PM/SPM/DPM Activities 23
5.1.2 Client Meetings....23
5.1.3 Configuration Management 23
5.2 Inventory and Maintenance 24
5.3 General Integration and Documents....24
5.4 Testing 24
5.5 Deployment Preparation....25
5.6 Training 25
6.0 DEPLOYMENT....26
6.1 Deployment Locations....26
6.2 Deployment Activities....26
7.0 SUPPORT....27
7.1 Support Years 27
7.2 Support Activities 27
APPENDIX A - ACRONYMS

REVISION HISTORY

Revision	Date	Changes
1.0.0-Draft	October 16, 2003	Initial Release.

1.0 SCOPE

1.1 Project Identification

This document serves as the Detailed Work Plan for the Statewide Transportation Management Center Software Library System (STMCSLS).

1.2 Project Overview

The Florida Department of Transportation (FDOT) is conducting a program that is developing a STMCSLS. The STMCSLS is a set of Intelligent Transportation System (ITS) software that allows the control of roadway devices as well as information exchange across a variety of transportation agencies. The goal of the STMCSLS is to have a common software base that can be deployed throughout the state of Florida. The STMCSLS development effort is based on ITS software available from both the states of Texas and Maryland; significant customization of the software is being performed as well as the development of new software modules. The following figure provides a graphical view of the software to be developed:

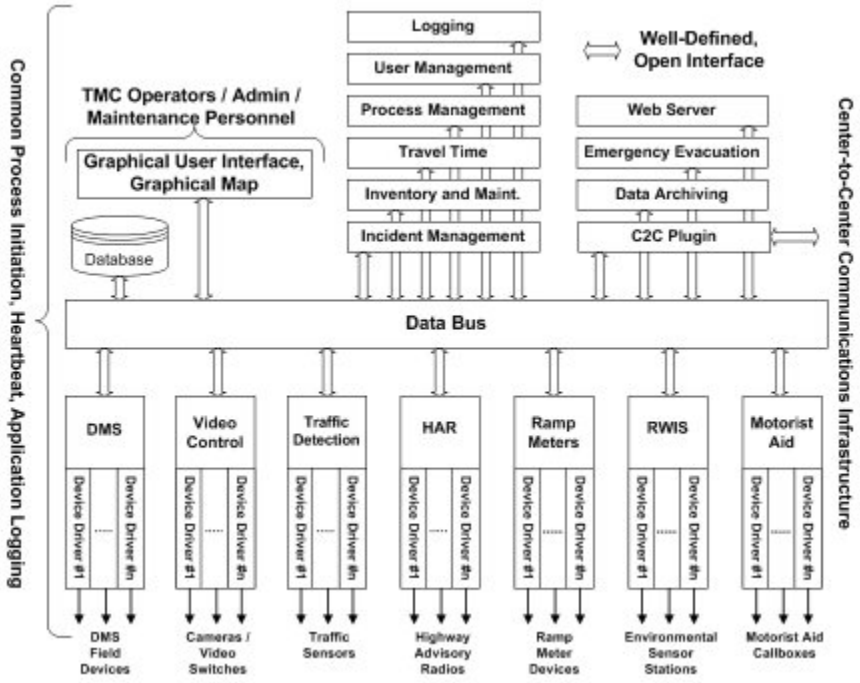

Figure 1. High-Level Architectural Concept

The STMCSLS development effort spans approximately two years. After the development, the software will be deployed to a number of cities throughout Florida and support activities will be performed.

1.3 Related Documents

The following documents were used to develop this document:

- SwRI Qualification Response: *Response to the Invitation to Negotiate (ITN): Statewide Transportation Management Center Software Library System, Negotiation Number: ITN-DOT-02/03-9025-RR,* SwRI Proposal No. 10-35924, dated: November 18, 2002.
- SwRI Technical Proposal: *Technical Proposal for Invitation to Negotiate (ITN): Statewide Transportation Management Center Software Library System, Negotiation Number: ITN-DOT-02/03-9025-RR,* SwRI Proposal No. 10-35924, dated: January 31, 2003.
- SwRI Cost Proposal: *Cost Proposal for Invitation to Negotiate (ITN): Statewide Transportation Management Center Software Library System, Negotiation Number: ITN-DOT-02/03-9025-RR, ,* SwRI Proposal No. 10-35924, dated: January 31, 2003.
- SwRI BAFO letter: *Southwest Research Institute® Proposal No. 10-35924, "Invitation to Negotiate (ITN): Statewide Transportation Management Center Software Library System", Reference: Negotiation Number: ITN-DOT-02/03-9025-RR*, dated: May 5, 2003.
- FDOT procurement document: *Invitation To Negotiate (ITN), Negotiation Number: ITN-DOT-02/03-9025-RR, Statewide Transportation Management Center Software Library System*, dated: October 21, 2002.
- FDOT Scope of Services: *Statewide Transportation Management Center Software Library System: Scope of Services,* September 19, 2003.
- FDOT Requirements Document: *Statewide Transportation Management Center Software Library System: Requirements Specification,* June 3, 2003.

1.4 Acknowledgments

Southwest Research Institute® (SwRI®) acknowledges the contributions of our subcontractor PB Farradyne (PBF) to this document.

2.0 DETAILED WORK BREAKDOWN STRUCTURE

The following sections provide the Work Breakdown Structure (WBS) that FDOT has reviewed and approved through the contract negotiations.

2.1 Release 1 Work Breakdown Structure

The following is the WBS for the Release 1 phases of the program. The estimated costs include both travel and labor costs.

Project Management Activities	
PM/SPM/DPM Activities	$330,129
Client Meetings	$231,321
Process Documents	$38,560
Configuration Management	$20,471
Requirements Analysis	$119,328
Design	$329,735
Process Viewer	$32,733
Status Logger	$19,203
TransGuide Port	$214,315
Database	$120,273
Map	$99,019
Browser User Interface	$71,800
Closed Circuit Television (CCTV)	
General Structure	$116,249
Camera: NTCIP	$131,618
Switch: American Dynamics (2050)	$70,167
Traffic Detection	
General Structure	$53,407
BiTrans 238I-95	$99,480
Dynamic Message Sign (DMS)	
General Structure	$39,340
NTCIP (Upgrade to Florida MIB)	$52,210
Mark IV (version 2.5)	$52,504
Incident Management	$488,986
General Integration/Documents	$168,923
Testing	
Integration Testing	$92,290
Acceptance Testing Plan (ATP)	
ATP Preparation	$79,834
ATP Execution	$35,450
Deployment Preparation	
Installation CDs/Documentation	$41,837
Client Reviews	
Milestone Demo (in Florida)	$21,226
Test Readiness Review	$4,696

Training	$17,401
Bond	$15,548

2.2 Release 2a Work Breakdown Structure

The following is the WBS for the Release 2a phases of the program. The estimated costs include both travel and labor costs.

Project Management Activities	
PM/SPM/DPM Activities	$223,772
Client Meetings	$100,363
Configuration Management	$15,446
Database	$25,946
Map	$39,440
Browser User Interface	$39,900
CCTV	
Camera: SunGuide	$87,348
Center-to-Center	$48,053
Ramp Meters	$346,254
FDOT Central Office	$9,578
RWIS	$95,437
Archive Data	$67,635
HAR	$107,410
Web Server	$230,281
Emergency Evacuation	$226,016
General Integration/Documents	$77,437
Testing	
Integration Testing	$158,525
Acceptance Testing	
ATP Preparation	$41,280
ATP Execution	$63,428
Deployment Preparation	
Installation CDs/Documentation	$47,288
Client Reviews	
Test Readiness Review	$4,954
Training	$18,485

2.3 Release 2b Work Breakdown Structure

The following is the WBS for the Release 2b phases of the program. The estimated costs include both travel and labor costs.

Project Management Activities	
PM/SPM/DPM Activities	$73,354
Configuration Management	$4,106
Client Meetings	$18,215
Inventory and Management	$32,794
General Integration/Documents	$7,569

Testing	
Integration Testing	$14,246
Acceptance Testing	
ATP Preparation	$9,571
ATP Execution	$20,064
Deployment Preparation	
Installation CDs/Documentation	$17,709
Client Reviews	
Test Readiness Review	$4,954
Training	$42,729

2.4 Deployment Work Breakdown Structure

The following is the WBS for the deployment phases of the program. The estimated costs include both travel and labor costs.

Broward County	$79,076
Miami	$76,811
Orlando	$32,332
Jacksonville	$30,668
Turnpike	$35,871
Pensacola	$29,772
Tallahassee	$30,277
Fort Meyers	$27,395
Sarasota	$27,545
Tampa	$27,545

2.5 Support Work Breakdown Structure

The following is the WBS for the support phases of the program. The estimated costs include both travel and labor costs.

July 2004-June 2005	$62,924
July 2005-June 2006	$66,245
July 2006-June 2007	$72,572
July 2007-June 2008	$140,203
July 2008-June 2009	$122,420
July 2009-June 2010	$152,526
July 2010-June 2011	$162,426
July 2011-June 2012	$189,968

3.0 RELEASE 1 DETAILED WORK PLAN

The following sections provide additional detail about each of the Release 1 WBS items identified in the cost and technical proposal that SwRI provided to FDOT during negotiations.

3.1 Project Management Activities

The following sections describe the project management WBS items.

3.1.1 PM/SPM/DPM Activities

The following activities will be performed by the Project Manager (PM), Software Project Manager (SPM), and Deputy Project Manager (DPM) or their designated staff as part of the routine project management activities:

- Project Startup Activities
- Project Planning/Software Development Plan (SDP) Development
- Project Team Review/Project Kickoff Meeting
- SDP Revisions
- Project Tracking and Oversight
    - SwRI Technical Project Management
    - PBF Technical Project Management
- Status Reports
    - Status Report Preparation
    - Monthly Progress Reports
- Financial Administrative Assistant
- Software Subcontract Management
- Monthly Project Team Meetings
- Monthly Management Review Meetings
- Software Quality Assurance (SQA) Reviews

3.1.2 Client Meetings

The following meetings with FDOT are included in the project management activities WBS items. For each meeting with FDOT, an agenda will be published prior to the meeting, presentation material will be forwarded to FDOT, and meeting minutes will be provided (FDOT will be provided a comment period on the meeting minutes). The following activities will be performed:

- Client Review Meetings
    - Kickoff Meeting Preparation
    - Kick-Off Meeting Materials
    - Kickoff meeting
    - Status Meeting preparation
    - Administrative Review Presentation Materials
    - Monthly Status Meetings
    - Meeting Minutes (contains Action Items)
- Outreach Presentations (includes travel and labor)

3.1.3 Process Documents

The following documents will be produced as part of the Process Documents activities work item:

- Detailed Work Plan Draft (pre kickoff)
- Detailed Work Plan Final (post kickoff)
- Staffing Plan (derived from SDP)
- PERT Schedule (derived from SDP)
- Gantt Summary Schedule (derived from SDP)
- Risk Mitigation Plan Draft (pre kickoff)
- Risk Mitigation Plan (post kick off)
- Risk Mitigation Plan Revision (as needed)
- Software Development Plan Draft
- Software Development Plan Final
- Software Configuration Management Plan Draft
- Software Configuration Management Plan Final
- Software Quality Assurance Plan Draft
- Software Quality Assurance Plan Final
- Software Security Plan Draft
- Software Security Plan Final

3.1.4 Configuration Management

Configuration Management (CM) is a key component to the success of the STMCSLS project. A Configuration Manager will be appointed by the PM to addresses the CM requirements of the project, Activities to be performed include:

- Weekly verification of the CM repository
- Perform Functional Configuration Audits

3.2 Requirements Development

The requirements WBS item includes the development of a Concept of Operations (COO) document as well as a Software Requirements Specification (SRS). The following activities will occur as part of the Requirements work item:

- Concept of Operations:
    - Review existing FDOT documentation
    - Develop draft COO
    - Peer Review
    - Discuss COO during FDOT status meeting
    - Finalize COO
- Requirements:
    - Build requirements in Requisite Pro
    - Software Requirements Specification Draft
    - Software Requirements Specification Final
    - Output from Requisite Pro
    - Peer Review
    - Requirements Review Meeting

  - Preparation of material
  - Requirements Review Meeting

3.3 High-Level Design

- High-Level Design
  - Architectural/High-Level Design
  - Software Design Document (SDD) Preparation
  - Peer Review
- ICD Development
  - Data Bus
  - Subsystem Outline
  - Driver Interfaces
  - Peer Review
  - Interface Control Document (ICD)
  - Interface Design Specification (IDS) - draft
  - Interface Design Specification - final
- Development
  - Data Bus
  - Subsystem Framework
  - Driver Framework
  - Code Reviews (Peer Reviews)
  - Unit Test
- Client Reviews
  - Preliminary Design Review (PDR) Preparation
  - Software PDR (4 months out)
  - Final Design Review (FDR) Preparation
  - Software FDR (7 months out)

3.4 Process Viewer

An executive handling subsystem (for process initiation, termination, restart, and heartbeat monitoring) will exist within the STMCSLS. This subsystem will be based on the Texas Department of Transportation (TxDOT) Process Viewer component that has been utilized in a number of TxDOT implementations. This subsystem will be implemented using C++. Activities include:

- Enhancements (remote starting)
- Testing
- Documentation Updates

3.5 Status Logger

A logging subsystem (for errors and informational messages) will exist within the STMCSLS. This subsystem will be based on the TxDOT Status Logging component that has been utilized in a number of TxDOT implementations. This subsystem will be implemented using C++. Activities include:

- Enhancements (new flags, file structure)
- Testing
- Documentation Updates

3.6 TransGuide Port

Some of the subsystems (e.g. CCTV, Traffic Detection) are based on the TxDOT TransGuide system. This system is implemented using Sun Solaris and C. This software will be converted to a Windows environment for use in various subsystems of the STMCSLS. Activities include:

- Port Common Libraries
    - Port Data Server Application Program Interface (API)
    - Port Realtime Library
    - Port Shared Memory Library
    - Port Shared Memory Manager Library
    - Port Socket Library
    - Port Status Logger API
    - Port Utilities Library
    - Port Debug Library
    - Port Server Framework Interface Library
    - Port Server Framework Library
    - Port SocketCommunications Library
    - Modify Common Library Documentation
- Port Administration Subsystem
- Port Administration Database Library
- Port Administration Master Process
- Port Incident Management Subsystem
- Port CCTV Subsystem
- Port CCTV Database Library
- Port CCTV Master Process
- Port Detection Subsystem
- Port Detection Database Library
- Port Detection Master Process
- Port Detection Driver Process
- Port Detection Pollserver Process
- Integrate Process Status
- Integrate Status Logger

3.7 Database

An Oracle database will be developed that contains configuration information as well as snapshots of the data that is produced, monitored, and controlled by the STMCSLS. The data stored will include traffic conditions data (volume, speed occupancy), current device settings (e.g., current message displayed), incident information, etc. The database will also serve as the archive repository for the data that is to be stored long term by the data archive subsystem. This subsystem will be implemented using Oracle. Activities include:

- Design (using Oracle Designer)
- Implementation
- Logical Database Design

3.8 Map

The mapping subsystem will be based on the TxDOT browser-based graphical map. The map will display primary and secondary roads along with the status information available from the Data Bus. The map will connect to the Data Bus and will be capable of displaying traffic conditions, incidents, lane closures, and device (e.g., DMS, CCTV) status in a real-time fashion. The displayed components will be color coded so that trouble spots can be easily identified by observing a graphical view. The operator will be able to pan and zoom the map so that regions of interest can be expanded or shrunk depending on the operator's needs. Icons will be displayed for field equipment locations, incidents, and lane closures; an operator can access the field equipment by selecting the icon. The map background will be generated using shape files as the data source. The map subsystem provides a graphical view of the data that is available from the STMCSLS. This subsystem will be implemented using browser technology, Hypertext Markup Language (HTML), Scalable Vector Graphics (SVG), and Hypertext Preprocessor (PHP). Activities include:

- Design
- Implementation
- Peer Review
- Testing

3.9 User Interface

The Graphical User Interface (GUI) will be based on the TxDOT browser based user interface. The GUI will provide access to various subsystems (e.g., DMS, CCTV, incident management, etc.) using industry standard browser techniques. The approach of a browser implementation provides users the ability to configure their view of the data while providing a flexible user interface. This subsystem will be implemented using browser technology, HTML and PHP. Activities include:

- Design
- Development
- Peer Review
- Testing

3.10 CCTV Subsystem

The CCTV subsystem will be based on the TxDOT CCTV software. The CCTV subsystem provides for control of cameras as well as video switches. SwRI assumes the video switches will "drive" a video wall and/or video cubes. The STMCSLS software will allow a user to switch a CCTV input to a video output, this could be a video monitor, video wall/cube or a PC monitor display if the hardware supports the video feed. The first release of the CCTV subsystem will support NTCIP (National Transportation Communications for ITS Protocol) CCTV devices, a Cornet switch and the American Dynamics Model 2050 switch. The SwRI proposal does not

include effort to design and implement the hardware necessary to support a video subsystem. This subsystem will be implemented using Java and C/C++. Activities include:

- Standard Device Interface
  - Camera
  - Video Switch
- Camera Control
  - Design
  - Development
  - Peer Review
  - Testing
- Video Wall
  - Design
  - Development
  - Peer Review
  - Testing
- Real-time video control (switching)
  - Design
  - Development
  - Peer Review
  - Testing
- NTCIP CCTV Device Deriver:
  - Development Activities:
    - Review latest NTCIP CCTV Specifications and related vendor information
    - Acquire and install NTCIP CCTV equipment or simulator
    - Design NTCIP CCTV Driver
    - Peer Review
    - Testing
  - Testing and Integration Activities:
    - Test with live equipment
    - Integrate and Test into STMCSLS
- Switch - American Dynamics 2050
  - Development Activities:
    - Review existing American Dynamics driver in terms of specifications and STMCSLS software architecture
    - Design
    - Development
    - Peer Review
    - Testing
  - Testing and Integration Activities:
    - Test with live equipment
    - Integrate and Test into STMCSLS

3.11 Traffic Detection Subsystem

The traffic sensor subsystem will be based on the TxDOT Traffic Sensor subsystem. This subsystem acquires data from field devices to determine traffic conditions (e.g., speed, volume, and occupancy). The first release of this subsystem will support NTCIP-compliant traffic detection devices. This subsystem will be implemented using C/C++. Activities include:

- General structure:
  - Design/modifications
  - Coding
  - Testing
- BiTrans Device Driver:
  - Development Activities:
    - Review existing BiTrans driver in terms of Specifications and STMCSLS software architecture
    - Design
    - Development
    - Testing
  - Testing and Integration Activities:
    - Test with live equipment
    - Integrate and Test into STMCSLS

3.12 DMS Subsystem

The DMS subsystem will be based on the TxDOT DMS subsystem. The DMS subsystem allows users to control and monitor DMS devices. The DMS subsystem can receive display requests from external subsystems (such as incident management) for display of messages. The first release will support FDS NTCIP compliant devices (version 3.21.14) and Mark IV devices (version 4.15). This subsystem will be implemented using Java and C/C++. Activities include:

- Modifications for FDOT
  - Design
  - Development
  - Peer Review
  - Testing
- NTCIP DMS (already supported) - firmware revisions
  - Design
  - Implement
  - Test
- Mark IV Protocol - Florida Specific
  - Design
  - Implement
  - Test

3.13 Incident Management Subsystem

The incident detection subsystem will be based on the TxDOT incident detection subsystem. This subsystem utilizes monitoring algorithms that evaluate information from field devices (through the traffic sensor subsystem) to determine if traffic anomalies have arisen. The

algorithm utilizes a rolling average that can be weighted by historical data to determine when traffic anomalies occur. When anomalous situations are detected, an alarm will be sent to the incident management software to indicate that a potential problem needs to be evaluated by the operator. An incident information screen will be displayed to collect additional data from the operator. The screen may also be entered manually so that incidents from non-automated sources (e.g., cell phones or 911) can be entered into the subsystem. This subsystem will be implemented using C++ and Java.

The incident management subsystem will be based on the Maryland CHART II incident management subsystem. The subsystem will be modified to receive indicators of traffic congestion and recommend solutions, i.e., how traffic control devices should be altered. The subsystem will utilize data from the incident detection alarm and operator input to determine solution scenarios to recommend to the operator. After operator approval, the requests to update the traffic control devices will be sent to the appropriate STMCSLS subsystem for implementation. This subsystem will be implemented using Java and C++.

- Detection (based on Traffic Detection module)
    - Evaluate detection algorithm utilized in the Texas software
    - Modify the detection algorithm:
        - Design
        - Development
        - Testing
    - Interface between Traffic Detection and Incident Management:
        - Design
        - Development
        - Testing
- General Incident Management Effort
    - Incident Management (CHART based) Module
        - Integrate with Detection Subsystem
        - Determine requirements for device/scenario recommendation
        - Design
        - Development
        - Testing
    - Interface to command devices
        - Review interface for commanding devices
        - Design
        - Develop
        - Test

3.14 General Integration and Documents

The general integration work item involves overall integration and testing of the STMCSLS prior to deployment. These activities are to occur in the SwRI development laboratories and will be performed by utilizing real, physical devices. Activities include:

- Software integration
- Testing
- Verification (against SRS and ATP)
- Integration Testing

- Software Integration and Tuning
  - SwRI System Integration Support
  - PBF Testing Support

The following documents will be developed and delivered as part of this WBS item:

- Software Design Document Draft (HTML Based)
- Software Design Document Final (HTML Based)
- Software Integration Plan Draft
- Software Integration Plan Final
- Software Integration Case Procedures Draft (expanded unit test)
- Software Integration Case Procedures Final (expanded unit test)

3.15 Testing

The testing work item is included to perform acceptance testing at both the SwRI development laboratories and the FDOT deployment sites. Activities include:

- Acceptance Testing
  - Software Test Procedures Draft
  - Peer Review
  - Software Test Procedures Final
  - Dry Run (in the SwRI development laboratory)
- Documents to be developed:
  - Software Acceptance Test Plan Draft
  - Software Acceptance Test Plan Final
- On-site Testing
  - Final Acceptance Test Readiness Review
  - ATP Execution
  - Software Test Reports
  - System Acceptance Testing Support
  - Hot Wash-Up Minutes
  - Software Acceptance Test Report (Comments)

3.16 Deployment Preparation

Prior to executing the ATP, deployment media must be prepared. The first step of the ATP will be to install the STMCSLS components that are to be deployed to the servers and workstations that will be used for the acceptance testing. The purpose of this activity is to assure that the installation documentation as well as the installation media correctly reflects the system under test. Activities include:

- Installation CDs
  - Development
  - Testing
- Documentation
  - Software Version Description Document
  - Software User's Manual

- Client Reviews
  - Milestone Demos (1 demo: 3 days setup, 1 day demo)
  - Final Acceptance Test Review (for Release 1) – at SwRI laboratories

3.17 Training

The following activities will be performed to meet the training requirements specified in the FDOT scope of service and the SwRI proposal:

- Training Artifacts
  - Training Plan Draft
  - Training Materials Development:
    - System Design/Maintenance
    - System Administration/Deployment
    - Operator/User Interaction
  - Peer Review of Training Material
- Training class presentation:
  - System Design/Maintenance
  - System Administration/Deployment
  - Operator/User Interaction
  - Training Plan Final
  - Training Presentation
  - Training Progress Reports

3.18 Bond

The acquisition of a performance bond (each year) is a project activity required of SwRI. The charges for this bond will be included as part of this WBS work item.

4.0 RELEASE 2A DETAILED WORK PLAN

The following sections provide additional detail about each of the Release 2a WBS items identified in the cost and technical proposal that SwRI provided to FDOT during negotiations.

4.1 Project Management Activities

The following sections describe the project management WBS items.

4.1.1 PM/SPM/DPM Activities

The following activities will be performed by the PM, SPM, and DPM or their designated staff as part of the routine project management activities:

- SDP Revisions
- Project Tracking and Oversight
  - SwRI Technical Project Management
  - PBF Technical Project Management
- Status Reports
  - Status Report Preparation
  - Monthly Progress Reports
- Financial Administrative Assistant
- Software Subcontract Management
- Monthly Project Team Meetings
- Monthly Management Review Meetings
- SQA Reviews

4.1.2 Client Meetings

The following meetings with FDOT are included in the project management activities WBS items. For each meeting with FDOT, an agenda will be published prior to the meeting, presentation material will be forwarded to FDOT, and meeting minutes will be provided (FDOT will be provided a comment period on the meeting minutes). The following activities will be performed:

- Client Review Meetings
  - Status Meeting preparation
  - Administrative Review Presentation Materials
  - Monthly Status Meetings
  - Meeting Minutes (contains Action Items)
- Outreach Presentations (includes travel and labor)

4.1.3 Process Documents

The following documents will be produced as part of the Process Documents activities work item:

- PERT Schedule (updates as needed)
- Gantt Summary Schedule (updates as needed)
- Risk Mitigation Plan Revision (as needed)
- Software Development Plan (updates as needed)

- Software Configuration Management Plan (updates as needed)
- Software Quality Assurance Plan (updates as needed)
- Software Security Plan Draft (updates as needed)

4.1.4 Configuration Management

Configuration Management (CM) is a key component to the success of the STMCSLS project. A Configuration Manager will be appointed by the PM to addresses the CM requirements of the project, Activities to be performed include:

- Weekly verification of the CM repository
- Perform Functional Configuration Audits

4.2 Database

Activities include updates to the database to support the following subsystems:

- Center-to-Center
- Ramp Meters
- Roadway Weather Information System (RWIS)
- Archive Data
- Highway Advisory Radio (HAR)
- Web Server
- Emergency Evacuation

4.3 Map

Activities include updates to the map to support the following subsystems:

- Ramp Meters
- Roadway Weather Information System (RWIS)
- Highway Advisory Radio (HAR)
- Web Server
- Emergency Evacuation

4.4 User Interface

Activities include updates to the user interface to support the following subsystems:

- Ramp Meters
- Roadway Weather Information System (RWIS)
- Highway Advisory Radio (HAR)
- Web Server
- Emergency Evacuation

4.5 CCTV

Additional driver to support SunGuide protocol devices will be developed and integrated into the STMCSLS. These drivers will be implemented using C/C++. Activities to be performed to implement this driver include:

- Design
- Implementation

- Test (unit)
- Integrate and test with the CCTV Subsystem

4.6 Center-to-Center (C2C)

The TxDOT C2C software will be integrated. The TxDOT C2C package is the only known available C2C software that allows both status and command/control information to be exchanged between TMCs in a system independent fashion. TMCs participate in the C2C environment by developing "plugins" which are either XML or socket based interfaces. Status data includes traffic conditions, incident, lane closures, device status information and limited transit information. The command/control capability allows requests to change devices such as DMS, CCTV, video switch, traffic signals, HOV, dynamic lanes, etc. The TxDOT C2C software utilizes the ITS National Standards and XML to format and transmit the data. This subsystem will be implemented using C++. Activities include:

- Plugin Modification/Enhancement:
  - Design
  - Implementation
  - Peer Review
  - Testing

4.7 Ramp Metering

This subsystem will allow a user to view the status of a ramp meter (or ramp signal as it is sometimes called in Florida) and to change the current plan implemented at the ramp meter. The status information will be available on the Data Bus and control function will be limited to privileged users. SwRI assumes that a remote interface to the ramp meter device exists for the subsystem to communicate with in order to gather status and change control plans. Per FDOT requirements the Ramp Metering subsystem will incorporate the Fuzzy Logic Ramp Metering algorithm developed for Washington State. This subsystem will require new development using Java and C/C++. Activities include:

- Development Activities:
  - Acquire Fuzzy Logic Algorithm from Washington State
  - Design
  - Develop
  - Testing
- Integration Activities:
  - Test with live equipment
  - Integrate and Test into STMCSLS

4.8 FDOT Central Office Configuration

SwRI does not view these requirements as needing a separate subsystem, rather, the requirements in this area will be met by deploying the STMCSLS software, utilizing the functionality it provides to meet the requirements and performing appropriate training.

- Center to FDOT Central Office Communications (training)
- Remote access to database (function of dbase tools)
- Video Switching (supported in CCTV subsystem)

- Mapping capability (supported by Map subsystem)
- Travel (3 day trip for general central office training)

4.9 RWIS

The Road Weather Information System (RWIS) subsystem will interface to NTCIP sensor stations to provide weather conditions information to the STMCSLS. The data from the RWIS subsystem will be published to the Data Bus. This subsystem will require new development using C/C++. Activities include:

- NTCIP Device Driver (modeled on DMS Driver):
  - Design
  - Implementation
  - Peer Review
  - Testing
- Forecast connection
- Browser Based UI, updated for RIWS
  - Design
  - Development
  - Peer Review
  - Testing
- Data Bus Feed:
  - Design
  - Development
  - Peer Review
  - Testing
- Integration into STMCSLS framework

4.10 Archive Data

This subsystem will structure and store data for long term storage. The subsystem will be database centric and will require a significant hardware platform to execute on due to the expected large amounts of data to be generated. This subsystem will operate in conjunction with the Data Bus; the specific implementation will require new software but the concepts for implementation are based on techniques that are used throughout the Texas and Maryland software. This subsystem will be implemented using Oracle scripts and Java. Activities include:

- Development Activities:
  - Design
  - Development
  - Peer Review
  - Testing
- Integration Activities:
  - Test at PBF labs in Rockville with live equipment
  - Integrate and Test into STMCSLS

4.11 HAR

The Highway Advisory Radio (HAR) subsystem will allow the TMC operator to transmit messages to HAR devices when traffic conditions or incident management requirements dictate a new message be presented on the HAR devices. The HAR subsystem will be based on the Maryland CHART II HAR subsystem. This subsystem will be implemented using C/C++. Activities include:

- Software enhancement/development:
  - Design
  - Implementation
  - Peer Review
  - Test
- Integrate and Test into STMCSLS

4.12 Web Server

This subsystem will provide traffic data from the STMCSLS to be presented on a web server interface. The web server will provide traffic conditions maps (showing traffic speeds, incidents, and lane closures). The server will utilize either PHP or ASP (Active Server Pages) to create and display the images provided by the web server. This will allow the public to access the data from the Internet if the web server that is hosting the subsystem has been exposed to the Internet. The subsystem will be based on web servers that have been previously deployed. Activities include:

- Development Activities:
  - Design
  - Development
  - Peer Review
  - Test
- Integration Activities:
  - Integrate and Test into STMCSLS

4.13 Emergency Evacuation

A web-based subsystem will be developed that will provide a variety of manual entry screens for data to be entered and reviewed by users of the subsystem. Additionally, much of the external data requested in the FDOT requirements will be provided through the use of URLs (Uniform Resource Locators) to web sites that already gather and maintain the data. This subsystem will be implemented using a combination of Oracle, HTML, and PHP. Activities include:

- Emergency Evacuation Support
- Database
  - Design
  - Implementation
- Web Design
  - Create evacuation zone display
  - Zip code or counties
  - Drawing arbitrary boarders
  - Connect to weather site
  - Current transportation options

    - Lodging/Services
    - Callin system
    - Login system
    - Peer Review
    - Testing
- Integration into framework
- Documentation
    - SRS
    - SDD
    - SUM

4.14 General Integration and Documents

The general integration work item involves overall integration and testing of the STMCSLS prior to deployment. These activities are to occur in the SwRI development laboratories and will be performed by utilizing real, physical devices. Activities include:

- Software integration
- Testing
- Verification (against SRS and ATP)
- Integration Testing
- Software Integration and Tuning
    - SwRI System Integration Support
    - PBF Testing Support

The following documents will be developed and delivered as part of this WBS item:

- Software Design Document Update (HTML Based)
- Software Integration Plan Draft
- Software Integration Plan Final
- Software Integration Case Procedures Draft (expanded unit test)
- Software Integration Case Procedures Final (expanded unit test)

4.15 Testing

The testing work item is included to perform acceptance testing at both the SwRI development laboratories and the FDOT deployment sites. Activities include:

- Acceptance Testing
    - Software Test Procedures Draft
    - Peer Review
    - Software Test Procedures Final
    - Dry Run (in the SwRI development laboratory)
- Documents to be developed:
    - Software Acceptance Test Plan Draft
    - Software Acceptance Test Plan Final
- On-site Testing
    - Final Acceptance Test Readiness Review
    - ATP Execution
    - Software Test Reports

- System Acceptance Testing Support
- Hot Wash-Up Minutes
- Software Acceptance Test Report (Comments)

4.16 Deployment Preparation

Prior to executing the ATP, deployment media must be prepared. The first step of the ATP will be to install the STMCSLS components that are to be deployed to the servers and workstations that will be used for the acceptance testing. The purpose of this activity is to assure that the installation documentation as well as the installation media correctly reflects the system under test. Activities include:

- Installation CDs
  - Development
  - Testing
- Documentation
  - Software Version Description Document
  - Software User's Manual
- Client Reviews
  - Milestone Demos (1 demo: 3 days setup, 1 day demo)
  - Final Acceptance Test Review (for Release 2a) – at SwRI laboratories

4.17 Training

The following activities will be performed to meet the training requirements specified in the FDOT scope of service and the SwRI proposal:

- Training Artifacts
  - Training Plan Draft
  - Training Materials Development:
    - System Design/Maintenance
    - System Administration/Deployment
    - Operator/User Interaction
  - Peer Review of Training Material
- Training class presentation:
  - System Design/Maintenance
  - System Administration/Deployment
  - Operator/User Interaction
  - Training Plan Final
  - Training Presentation
  - Training Progress Reports

5.0 RELEASE 2B DETAILED WORK PLAN

The following sections provide additional detail about each of the Release 2b WBS items identified in the cost and technical proposal that SwRI provided to FDOT during negotiations.

5.1 Project Management Activities

The following sections describe the project management WBS items.

5.1.1 PM/SPM/DPM Activities

The following activities will be performed by the PM, SPM, and DPM or their designated staff as part of the routine project management activities:

- SDP Revisions
- Project Tracking and Oversight
  - SwRI Technical Project Management
- Status Reports
  - Status Report Preparation
  - Monthly Progress Reports
- Financial Administrative Assistant
- Software Subcontract Management
- Monthly Project Team Meetings
- Monthly Management Review Meetings
- SQA Reviews

5.1.2 Client Meetings

The following meetings with FDOT are included in the project management activities WBS items. For each meeting with FDOT, an agenda will be published prior to the meeting, presentation material will be forwarded to FDOT, and meeting minutes will be provided (FDOT will be provided a comment period on the meeting minutes). The following activities will be performed:

- Client Review Meetings
  - Status Meeting preparation
  - Administrative Review Presentation Materials
  - Monthly Status Meetings
  - Meeting Minutes (contains Action Items)
- Outreach Presentations (includes travel and labor)

5.1.3 Configuration Management

Configuration Management (CM) is a key component to the success of the STMCSLS project. A Configuration Manager will be appointed by the PM to addresses the CM requirements of the project, Activities to be performed include:

- Weekly verification of the CM repository
- Perform Functional Configuration Audits

5.2 Inventory and Maintenance

The Inventory and Maintenance subsystem will provide the user with a web-based application that supports the record keeping requirements of the maintenance shop. This subsystem will be based on the TxDOT Integrated Maintenance Database Management Systems (IMDBMS) that was initially developed for TransGuide and is currently in the process of being made a component of the TxDOT statewide software library (implemented using HTML and PHP). Activities include:

- Design
- Development
- Peer Review
- Testing
- Integration into STMCSLS framework

5.3 General Integration and Documents

The general integration work item involves overall integration and testing of the STMCSLS prior to deployment. These activities are to occur in the SwRI development laboratories and will be performed by utilizing real, physical devices. Activities include:

- Software integration
- Testing
- Verification (against SRS and ATP)
- Integration Testing
- Software Integration and Tuning
    - SwRI System Integration Support
    - PBF Testing Support

The following documents will be developed and delivered as part of this WBS item:

- Software Design Document Final (HTML Based)
- Software Integration Plan Draft
- Software Integration Plan Final
- Software Integration Case Procedures Draft (expanded unit test)
- Software Integration Case Procedures Final (expanded unit test)

5.4 Testing

The testing work item is included to perform acceptance testing at both the SwRI development laboratories and the FDOT deployment sites. Activities include:

- Acceptance Testing
    - Software Test Procedures Draft
    - Peer Review
    - Software Test Procedures Final
    - Dry Run (in the SwRI development laboratory)
- Documents to be developed:
    - Software Acceptance Test Plan Draft
    - Software Acceptance Test Plan Final
- On-site Testing

- Final Acceptance Test Readiness Review
- ATP Execution
- Software Test Reports
- System Acceptance Testing Support
- Hot Wash-Up Minutes
- Software Acceptance Test Report (Comments)

5.5 Deployment Preparation

Prior to executing the ATP, deployment media must be prepared. The first step of the ATP will be to install the STMCSLS components that are to be deployed to the servers and workstations that will be used for the acceptance testing. The purpose of this activity is to assure that the installation documentation as well as the installation media correctly reflects the system under test. Activities include:

- Installation CDs
  - Development
  - Testing
- Documentation
  - Software Version Description Document
  - Software User's Manual
- Client Reviews
  - Milestone Demos (1 demo: 3 days setup, 1 day demo)
  - Final Acceptance Test Review (for Release 2b) – at SwRI laboratories

5.6 Training

The following activities will be performed to meet the training requirements specified in the FDOT scope of service and the SwRI proposal:

- Training Artifacts
  - Training Plan Draft
  - Training Materials Development:
    - System Design/Maintenance
    - System Administration/Deployment
    - Operator/User Interaction
  - Peer Review of Training Material
- Training class presentation:
  - System Design/Maintenance
  - System Administration/Deployment
  - Operator/User Interaction
  - Training Plan Final
  - Training Presentation
  - Training Progress Reports

6.0 DEPLOYMENT

The following sections provide additional detail about each of the deployment WBS items identified in the cost and technical proposal that SwRI provided to FDOT during negotiations.

6.1 Deployment Locations

The following locations have been identified as potential deployment sites for the STMCSLS:

- Broward County
- Miami
- Orlando
- Jacksonville
- Turnpike
- Pensacola
- Tallahassee
- Fort Meyers
- Sarasota
- Tampa

6.2 Deployment Activities

Each deployment will require different levels of effort due to varied equipment installed and different deployment environments, in general, the following activities will occur for each deployment site:

- Project Management
- Implementation Plan
- Site Survey
- Develop Plan
- Installation:
    - On-site installation (1 week on-site)
    - ATP (Dry Run and execution - 1 week on-site)
    - Support (on-site: 1 week post ATP)

7.0 SUPPORT

The following sections provide additional detail about each of the support WBS items identified in the cost and technical proposal that SwRI provided to FDOT during negotiations.

7.1 Support Years

The following support years have been identified for the STMCSLS:

- July 2004 to June 2005
- July 2005 to June 2006
- July 2006 to June 2007
- July 2007 to June 2008
- July 2008 to June 2009
- July 2009 to June 2010
- July 2010 to June 2011
- July 2011 to June 2012

7.2 Support Activities

The support activities were bid as a "level of effort" – no specific activities were identified. In general, SwRI believes the following activities will need to occur for each support year:

- Project Management
- General Support:
  - Manage change requests
  - Implement enhancements
  - Testing
  - Deploy enhanced subsystems
- General Travel

APPENDIX A

ACRONYMS

ACRONYMS

Acronym	Definition
API	Application Program Interface
ATP	Acceptance Test Plan
C2C	Center-to-Center
CCTV	Closed Circuit Television
CM	Configuration Management
COO	Concept of Operations
DMS	Dynamic Message Sign
DPM	Deputy Project Manager
FDOT	Florida Department of Transportation
FDR	Final Design Review
GUI	Graphical User Interface
HAR	Highway Advisory Radio
HTML	Hypertext Markup Language
ICD	Interface Control Document
IDS	Interface Design Specification
ITN	Invitation to Negotiate
ITS	Intelligent Transportation Systems
NTCIP	National Transportation Communications for ITS Protocol
PBF	PB Farradyne
PDR	Preliminary Design Review
PHP	Hypertext Preprocessor
PM	Project Manager
RWIS	Roadway Weather Information System
SDD	Software Design Document
SDP	Software Development Plan
SPM	Software Project Manager
SQA	Software Quality Assurance
SRS	Software Requirements Specification
STMCSLS	Statewide Transportation Management Center Software Library System
SVG	Scalable Vector Graphics

Acronym	Definition
SwRI	Southwest Research Institute
TxDOT	Texas Department of Transportation
WBS	Work Breakdown Structure