9. OPERATIONS AND MAINTENANCE PLAN

9.1 Introduction

Operations and maintenance planning is a critical component to any transportation system, especially in the case of ITS where new and complex technologies are being deployed. To promote the successful use of these technologies, consideration needs to be made for operations and maintenance aspects of ITS during the planning and implementation of projects. This section of the strategic plan focuses on the purpose of operations and maintenance planning.

9.2 Purpose of Operations and Maintenance Planning

With an operations and maintenance (O&M) plan, an organization has in-place a process to help ensure that installed ITS elements are properly operated and maintained. Proper operation and routine maintenance can provide early detection of equipment problems and may lower repair and replacement costs. More importantly, it may also help prevent equipment malfunctions and minimize system downtime. With a proper O&M plan along with required documentation, an organization may have an affirmative defense in the case of an equipment or system failure.

Having an O&M plan is also important in helping develop the long-term resource requirements for an ITS project, including the total cost and required man-hours. Estimating the total cost of ITS improvements is more difficult compared to traditional infrastructure improvements. This is due to ITS improvements incurring a greater proportion of their costs as continuing operation and maintenance costs rather than up front capital costs. In addition, ITS equipment typically has a shorter anticipated useful lifespan compared with many traditional improvements, and requires replacement as it reaches obsolescence.

9.3 Project Operations Planning

A typical operations plan contains information on the proper operation of ITS systems and equipment. Operating parameters, once defined, are an important indicator whether a system or equipment is operating as designed. Examples of operating parameters may include temperature ranges or drastic temperature changes, pressure ranges or pressure drops, and error rates. An operating parameter can be initially defined, and later modified, by the organization based on operations experience.

An operations plan should contain an operations log that records operations parameters that are outside the defined limits. Operating parameters outside the operating limits are not generally a problem unless repeated and ignored.

9.4 Project Maintenance Planning

A typical maintenance plan contains information on the proper maintenance of ITS systems and equipment. This includes maintenance procedures to be performed and suggested frequency of routine maintenance. Examples of maintenance procedures may include inspections, cleanings, lubrications, adjustments, replacements, or recalibrations. A maintenance plan can initially be defined and modified later by the organization based on past maintenance experience.

For example, a maintenance plan for a DMS deployment may include information detailing inspection and routine maintenance procedures including frequency by which they are to be performed: A

maintenance plan should contain a maintenance log that records both routine and non-routine maintenance on an ITS system or equipment.

9.5 Costs and Resource Estimates

O&M costs consist of two components: 1) equipment maintenance costs [such has equipment replacements, upgrades, etc.], and 2) man-hour costs. Developing an O&M cost estimate requires defining the annual equipment maintenance cost and the required person-hours to perform the maintenance tasks. Part of defining the person-hours requirements includes developing a general position description that outlines the required skill sets to perform the necessary tasks. It is important to remember that new equipment typically has a warranty against malfunctions within the first year(s) of operation. The warranty helps reduce the overall O&M cost of equipment during the warranty period.

9.5.1 Skill Set Definitions

Included below is a list of skills sets required for different aspects of ITS systems and equipment O&M. Skill sets include advanced knowledge in the following areas:

- Computer administration: includes, but is not limited to, computer system administration, computer security setup and maintenance, hardware installation and configuration
- Local Area Network (LAN) administration: includes, but is not limited to, LAN systems administration, LAN security setup and maintenance, hardware installation and maintenance
- Electric power: includes, but is not limited to, electric power systems
- Fiber optics: includes, but is not limited to, fiber optic cable installation and maintenance
- ITS standards: includes, but is not limited to, familiarity of current and developing ITS standards
- Marketing: includes, but is not limited to, public outreach techniques and tools

From the list of defined skill sets, specific ITS O&M job positions can be defined. They include:

- Computer systems administrator
- Communications engineer
- Field engineer
- Marketing coordinator
- Training coordinator

9.5.2 High Priority Project O&M Costs

Below is a compilation of the identified high priority statewide ITS projects and an estimated O&M cost, including an estimated resource requirement for each project.

Project title: **Work Zone Training**
Brief description: Would build on existing training programs, such as those administered by the USDOT Work Zone Mobility and Safety Program
General position description: training coordinator
Estimated full-time employees: 0.1
Estimated O&M costs: $18,000 annual cost for three (3) training sessions per year and updating training materials

Project title: **Satellite Radio Traffic Information Service**
Brief description: Satellite radio distribution of highway freight related information (include as additional data output).

General position description: computer systems administrator
Estimated full-time employees: 0.1
Estimated O&M costs: $8,000 per year to update and maintain the link.

Project title: **Illinois Statewide Information Hub**
Brief description: Provide a collection point for statewide transportation information (outside of Northeastern Illinois).
General position description: computer system administrator
Estimated full-time employees: 0.5
Estimated O&M costs: $60,000 per year for the operations and maintenance. This work includes maintaining the server and performing integration functions as well as hardware and software upgrades.

Project title: **Implement Commercial Vehicle Information Exchange Window (CVIEW)**
Brief description: Implement Commercial Vehicle Information Exchange Window (CVIEW) to allow timely information sharing of critical data between agencies
General position description: computer system administrator
Estimated full time employees: 0.5
Estimated O&M costs: $85,000 for operations and maintenance/upgrades/communications (assumes one half-time operations staff)

Project title: **Electronic One-Stop Shopping (EOSS) for Commercial Vehicle Interstate Credentials**
Brief description: Provide a business portal for on-line permitting and registration of commercial vehicles
General position description: computer system administrator
Estimated full-time employees: 0.5
Estimated O&M costs: $50,000 per year for operations and maintenance. This assumes $40,000 for half-time employee and $10,000 for system maintenance and upgrades.

Project title: **IDOT Central Office – Chicago Fiber Link**
Brief description: Provide a Gigabit Ethernet network connection from the IDOT District 1 Communication Center and IDOT Program Office to the IDOT Central Office in Springfield.
General position description: communications engineer
Estimated full-time employee: 0.25
Estimated O&M costs: $30,000 per year for the operations and maintenance. This work includes maintaining the fiber communication link and performing integration functions as well as any hardware and software upgrades.

Project title: **Statewide Dynamic Message Signs (DMS) Deployment**
Brief description: The project implements Dynamic Message Signs (DMS) at system interchanges and other key statewide decision points.
General position description: Field engineer, communications engineer
Estimated full-time employees: 0.3 for planned Stage I deployment, 0.7 for planned Stages I & II deployment (assumes 0.1 per participating district)
Estimated O&M costs: $3,000 per year per DMS for maintenance. $1,000 per year per DMS for operations (this assumes that current dispatchers deploy DMS messages). For planned stage I deployment of eleven (11) DMS, total estimated O&M cost of $44,000. For planned stage II deployment of sixteen (16) DMS, total estimate O&M cost (including stage I & II) of $108,000.

Project title: **Chicago Information Hub**
Brief description: Provide a collection point for Northeastern Illinois transportation information.
General position description: computer system administrator

Estimated full-time employees: 0.25
Estimated O&M costs: $30,000 per year for operations and maintenance. This work includes maintaining the server and performing and integration functions as well as any hardware or software upgrades.

Project title: **Special Event Training**
Brief description: Develop and conduct training for how agencies can manage traffic during special events.
General position description: training coordinator
Estimated full-time employees: 0.1
Estimated O&M costs: $20,000 per year for two (2) training sessions and updating training materials.

Project title: **Rockford Fiber Link**
Brief description: Provide a Gigabit Ethernet connection from IDOT District 1 and the IDOT Program Office and to the City of Rockford.
General position description: communications engineer
Estimated full-time employees: 0.1
Estimated O&M costs: $15,000 per year for the operations and maintenance. This work includes maintaining the fiber communication link and performing any integration functions as well as any hardware or software upgrades.

Project title: **IDOT Station One Upgrade**
Brief description: Upgrade the existing IDOT Station One Communications Center to support statewide ITS functions
General position description: computer system administrator
Estimated full-time employees: 0.5
Estimated O&M costs: $65,000 per year for operations and maintenance. This assumes $40,000 for a half-time employee for operations staff and $25,000 for system maintenance and upgrades.

Project title: **Configuration Management Guidelines**
Brief description: Develop standard transportation system configuration management guidelines
General position description:
Estimated full-time employees: 0.1
Estimated O&M costs: $8,000 per year to update and distribute the guidelines.

Project title: **Develop Statewide Data Exchange Standards**
Brief description: Develop traffic data exchange standards for agencies in Illinois
General position description:
Estimated full-time employees: 0.1
Estimated O&M costs: $8,000 per year to update and circulate materials.

Project title: **Peoria Fiber Link**
Brief description: Provide a Gigabit Ethernet connection from IDOT District 4 to IDOT District 1 and IDOT Program Office and to the IDOT Central Office.
General position description: communications engineer
Estimated full-time employees: 0.1
Estimated O&M costs: $15,000 per year for the operations and maintenance. This work includes maintaining the fiber communication link and performing any integration functions as well as any hardware or software upgrades.

Project title: **Work Zone Best Practices Study and Pilot**

Brief description: Study to provide guidance for work zone training
General position description:
Estimated full-time employees: 0.1
Estimated O&M costs: $10,000 for annual maintenance.

Project title: **Single State Registration System (SSRS) Credentialing Automation**
Brief description: Automate Single State Registration System (SSRS) authorized renewals
General position description:
Estimated full-time employees: 0.1
Estimated O&M costs: $45,000 to $80,000 per year for operations and maintenance. This includes $40,000 to $75,000 per year for vendor contract fees.

Project title: **Automated Oversize/Overweight (OS/OW) Permitting**
Brief description: Procure and install an automated Oversize/Overweight Permitting system for on-line permit processing
General position description:
Estimated full-time employees: 0.1
Estimated O&M costs: $45,000 to $75,000 per year for operations and maintenance. This includes $40,000 to $70,000 per year for vendor contract fees.

Project title: **Statewide CCTV Camera Deployment**
Brief description: Deploy Closed Circuit Television (CCTV) cameras on the interstate system throughout the state of Illinois.
General position description: Field engineer
Estimated full-time employees: 1.0 for planned Stage I deployment, 3.0 for planned Stages I & II deployment
Estimated O&M costs: $1,000 per year per CCTV camera for operations (assuming current dispatchers operate CCTV cameras) and $1,000 per year per CCTV camera for maintenance. For planned stage I deployment (40 CCTV cameras), total estimated O&M cost of $40,000. For planned stage II deployment (additional 90 CCTV cameras), total estimated O&M cost (including stage I) of $260,000.

Project title: **River Bridge Surveillance Pilot**
Brief description: Install surveillance equipment to monitor critical bridges
General position description:
Estimated full-time employees: 0.1 per location
Estimated O&M costs: $8,000 per year per location for operations (includes staff to monitor the cameras) and $20,000 per year per location for maintenance.

Project title: **Collinsville Information Node**
Brief description: Provide a collection point for St. Louis East Metro region transportation information.
General position description: computer system administrator
Estimated full-time employees: 0.1
Estimated O&M costs: $15,000 per year for operations and maintenance. . This work includes maintaining the server and performing and integration functions as well as any hardware or software upgrades.

Project title: **Peoria Information Node**
Brief description: Provide a collection point for Peoria region transportation information.
General position description: computer system administrator
Estimated full-time employees: 0.1

Estimated O&M costs: $15,000 per year for operations and maintenance. . This work includes maintaining the server and performing and integration functions as well as any hardware or software upgrades.

Project title: **Springfield Information Node**
Brief description: Provide a collection point for Springfield region transportation information.
General position description: computer system administrator
Estimated full-time employees: 0.1
Estimated O&M costs: $15,000 per year for operations and maintenance. . This work includes maintaining the server and performing and integration functions as well as any hardware or software upgrades.

Project title: **ITS Planning Integration Training**
Brief description: Develop and conduct training on how ITS can be incorporated into transportation planning and design process
General position description:
Estimated full-time employees: 0.1
Estimated O&M costs: $12,000 per year for two (2) training sessions and upgrading materials.

Project title: **Quad Cities Link**
Brief description: Provide a high-speed Ethernet connection from the Quad Cities TMC to the Illinois Statewide Transportation Information Network.
General position description: communications engineer
Estimated full-time employees: 0.1
Estimated O&M costs: $50,000 per year for the operations and maintenance of a phase I deployment (includes ~$3,400 per month for leased communications).

Table 9-1 summaries the O&M costs and resource requirements for the high priority projects identified in previous sections. These O&M costs are in 2006 dollars and reflect the total cost to operate and maintain a particular project. Note that the O&M costs repeat every year after the initial deployment of the project and continue as long as the system or equipment is in operation.

Table 9-1 - High Priority ITS Project Operations & Maintenance Costs

Project	Estimated FTE	Estimated O & M Costs (thousands)*					Total
		Year 1	Year 2	Year 3	Year 4	Year 5	
Work Zone Training**	0.1		$18	$18	$18	$18	**$72**
Satellite Radio Traffic Information Service	0.1				$8	$8	**$16**
Illinois Statewide Information Hub	0.5			$60	$60	$60	**$180**
Implement CVIEW	0.5		$85	$85	$85	$85	**$340**
EOSS for Comm. Vehicle Interstate Credentials	0.5		$50	$50	$50	$50	**$200**
IDOT Central Office - Chicago Fiber Link	0.25		$30	$30	$30	$30	**$120**
Statewide DMS Deployment (Stages 1 & 2)	0.3 (0.7)			$44	$108	$108	**$260**
Chicago Information Hub	0.25			$30	$30	$30	**$90**
Special Event Training	0.1			$20	$20	$20	**$60**
Rockford Fiber Link	0.1		$15	$15	$15	$15	**$60**
IDOT Station One Upgrade	0.5			$65	$65	$65	**$195**
Configuration Management Guidelines	0.1		$8	$8	$8	$8	**$32**
Develop Statewide Data Exchange Standards	0.1		$8	$8	$8	$8	**$32**
Peoria Fiber Link	0.1		$15	$15	$15	$15	**$60**
Work Zone Best Practices Study and Pilot**	0.1			$10	$10	$10	**$30**
SSRS Credentialing Automation	0.1				$80	$80	**$160**
Automated OS/OW Permitting	0.1				$75	$75	**$150**
Statewide CCTV Camera Deployment (Stages 1 & 2)	1 (3)				$40	$260	**$300**
River Bridge Surveillance Pilot	0.1			$28	$28	$28	**$84**
Collinsville Information Node	0.1			$15	$15	$15	**$45**
Peoria Information Node	0.1			$15	$15	$15	**$45**
Springfield Information Node	0.1			$15	$15	$15	**$45**
ITS Planning Integration Training	0.1		$12	$12	$12	$12	**$48**
Quad Cities Link (Stage 1)	0.1		$50	$50	$50	$50	**$200**
Totals:	**5.4 (7.8)**	**$0**	**$291**	**$593**	**$860**	**$1,080**	

* 2006 dollars
** Work zone enhancement projects to be addressed by the Bureau of Safety Engineering