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# Development Of An ITS Maintenance Guide

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# Tollway ITS History Up To 2016

More than 1,050 CCTV cameras

45 DMS

48 PCMS + contractor message signs

250 MVDS

486 vehicles with AVL

16 RWIS sites

Five WIM sites

Three ramp queue detection systems

Travel times – I-PASS, RTMS, Sensys and Bluetooth generated

Integrated to regional ATIS – gateway

E-mail alerts to media and trucking industry



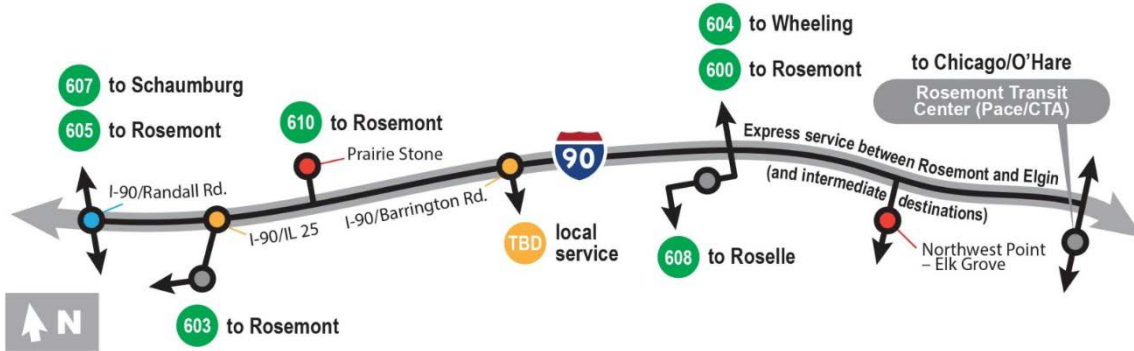
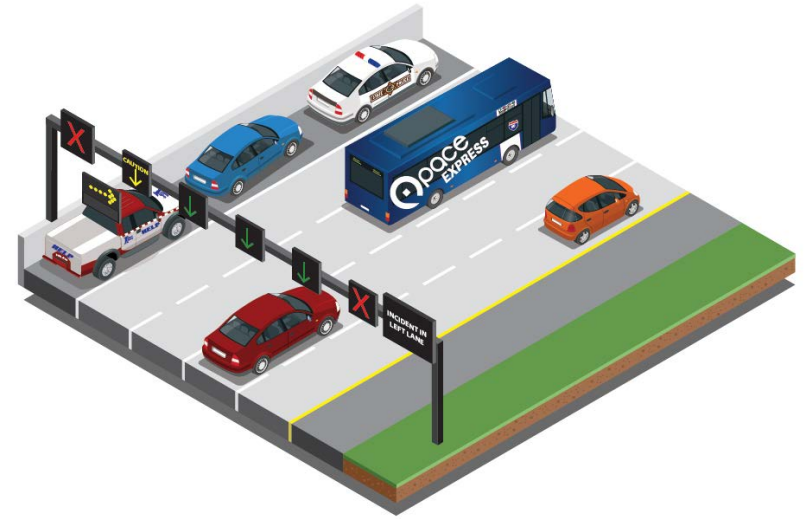
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# SmartRoad

Travel safe • Travel **smart**



- Park-n-Rides & routes debuting in 2017
- Makes additional connections at transit facility
- Stops at new Park-n-Ride Station
- Stops at existing Park-n-Ride
- New and Expanded Pace Routes

# ITS Devices 2016 To 2017

## CCTV

- Additional 90 cameras

## DMS

- Increased from 45 to 54

## MVDS

- Increased from approximately 250 to 355

## WIM

- Increased from five to seven

## Lane control signs (ATM)

- Approximately 375 new signs added



# Communications Network 2016 To 2017

54 IPDCs added

29 new ATM gantries

- New Cisco switches
- IP relays
- IPDC equipment
- Generators



In addition to existing fiber backbone and new power

Frequent access to power and communications



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# ITS Maintenance Staff

## Tollway

- ITS deployment engineer
- Network engineer
- ITS inventory manager
- 2 ITS technicians (new contract adds one contractor)

## ITS network and maintenance administration contract

- Provides oversight of ITS field device maintenance contract
- Additional three staff to support ITS maintenance

## ITS field device maintenance contract

- Field repairs

## Traffic Operations Center

- Increased staff from four to eight



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# Need To Create ITS Maintenance Guidelines

Already had existing manuals and requirements documents

Already performing ITS maintenance systemwide

Adding significantly more devices and new ATM system

**NEED** to put all assumptions and requirements into writing and clarify processes

**NEED** to develop formal workflow decision matrix



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# Process To Create ITS Maintenance Guide

Stakeholder input

Lessons learned

Assumptions/decisions

Criticality

Workflow



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# Stakeholders

Many subgroups within Tollway

Most Tollway, some consultants or contractors

Include Legal and other administrative stakeholders

	ITS Equipment										Related Equipment			
	Mainline Detection	Ramp Detection	Closed Circuit Television (CCTV) Cameras	Dynamic Message Signs (DMS)	Lane-Use Control Sign (LCS)	Portable Changeable Message Signs (PCMS)	Road Weather Information Systems (RWIS)	Virtual Weigh-in-Motion (VWIM) Stations	ITS Network	Power	Communications	ATM Gantry (Structure)	IPDC (Structure)	
Tollway ITS Maintenance	■	■	■	■	■	■	■	■	■	■				
Tollway Roadway Electric									■					
Tollway Fiber Optic										■				
Tollway TIMS Traffic Operations Center (TOC)														
Tollway Incident Management														
Tollway Central Dispatch Center														
Tollway Information Technology (IT)										■				
Tollway Roadway Maintenance											■			
Tollway Business Systems														
Toll Audit and Security														
Construction Management						■								
Tollway Facilities Management												■		
Tollway Fleet Maintenance														
Tollway Risk Management														
Tollway ITS Maintenance Contractor	■	■	■	■	■	■	■	■						
Tollway ITS Network and Maintenance Administrator								■						

Key:  
 ■ Responsible for Maintenance  
 ■ Impacted by Maintenance Process



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# Industry Lessons Learned

## Contacted

- Washington State DOT
- Virginia DOT
- Minnesota DOT
- Wisconsin DOT
- Caltrans
- City of Toronto

## Main Lessons Learned

- Need for spare parts inventory
- Lane closures weekly
- Mix of contracted and internal staff
- Mix of priorities and operations
- Pros/cons of outsourcing
- Many stress-preventive maintenance



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# Key Issues

LCS are the only devices that require a lane closure overnight

DMS may require a shoulder closure or an outside lane closure, which is allowed off-peak

Warranty issues with LCS for the first 12 months



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# Preliminary Decisions

## Based on stakeholder interviews and internal committee discussions

- ITS technicians over the long-term getting new trucks with buckets; will be able to pre-position at maintenance yards
- ITS deployment engineer is the critical decision-maker for Tollway on maintenance items and issues
- One panel out on an LCS is minimum for repair ticket
- Tollway maintenance staff will provide lane closures (expect when covered by a contract)



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# Four Levels Of Criticality

## Emergency

- 4-hour on-site response
- Repaired 7 days a week, 365 days a year

## Critical

- 24-hour response time Monday through Friday

## Standard

- 72-hour response time Monday through Friday

## Preventive

- Repair next time you are at the site for other reasons



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# Criticality By Device

Addressed each type of device and expected failures

Devices that can achieve emergency critical level under certain conditions

- LCS
- DMS in SmartRoad corridor
- CCTV that view LCS

Most devices go to standard



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# Workflow

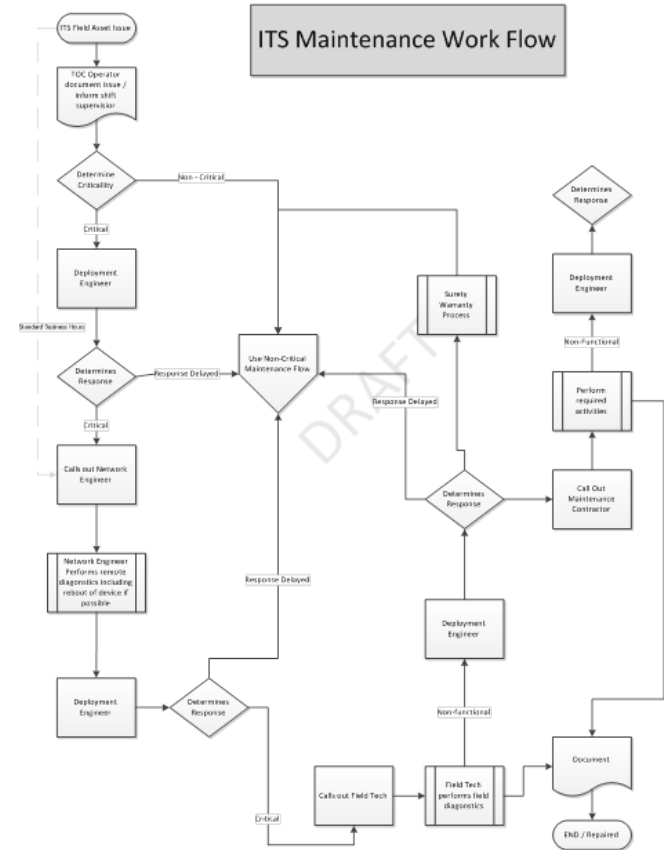
Critical Tollway staff is the ITS deployment engineer

Several decision points where the repair can be queued

Other related workflows for warranty equipment and standard repairs



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# Summary

**ITS Maintenance Guidelines assembled in a relatively short time**

**Used lessons learned from agencies that include other ATM systems**

**Addressed some issues identified by stakeholders**

**Key decisions had to be made by critical staff**

**Final guide is in line with or exceeds most others within the industry**



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**THANK YOU**