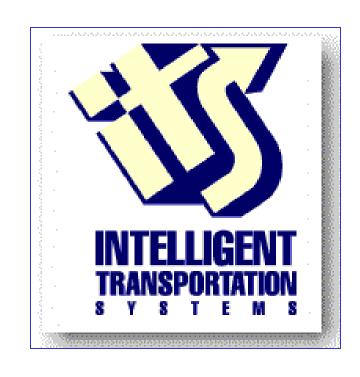
Support and Asset Inventory Management of ITS Devices

Western States Forum June 2010





Jason Shaddix, ITS Support Lead Oregon Department of Transportation The goal of this presentation is to show how ODOT has utilized a Computerized Maintenance Management System (CMMS) to help solve many of the problems we face trying to support systems that are spread around a mostly rural state.



Outline

- 1. Presenter Information
- 2. ITS Assets
- 3. ITS Support
- 4. MicroMain Overview: Client, Reports, PDA
- 5. MicroMain Web Work Requests
- 6. MicroMain Web Asset Management
- 7. Conclusion

Presenter Information

Jason Shaddix, ITS Support Lead, Oregon DOT

- Team leader for ITS field support and ITS application developers.
- 10 years working in ITS, 5 additional years working in traffic signals
- Regional ITS Support Build-out: Offices, trucks, equipment, spares
- MicroMain Implementation: Review proposals, procure, deploy, enhance
- Alternate Network Connectivity –DSL, Cellular, WiFi.
- Traffic Signals Integration

ITS Assets

- Field Devices
- Transportation Operations Centers
- Servers
- Systems / Applications
- Traffic Signals



Oregon ITS in 2000

- 12 cameras in Region 1
- 6 RWIS stations
- 1 camera in Bend
- IT has 1½ FTE committed to ITS
- 5 Servers (RWIS Data Collection)
- 1 Application (SCAN)



Oregon ITS in 2010

- Total of approx 820 Field devices
- 4 Transportation Operation Centers
- 66 Servers
- 25 Applications
- 256 Cameras
- 98 Variable Message Signs
- 142 Ramp Meters
- 142 Portable Variable Message Signs
- 79 Road Weather Information Systems
- 100 Other devices such as HAR, Weather Warning Systems, and Ramp Gates.
- ODOT has 14 FTE committed to ITS Support

Traffic Signals Integration

- ODOT owns around 1000 traffic signals
- Implementing Adaptive Traffic Control
- Implementing Central Traffic Management
- Approx 30 traffic signals online so far
- 146 planned upgrades & connections this year
- Significant changes in support needs



Cameras





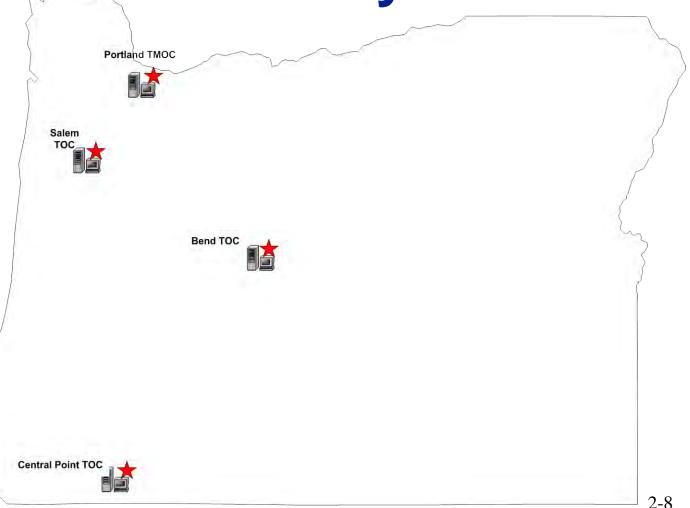






VMS

Transportation Operations
Center System



Region 1 -Portland

ODOT's Region 1 is mostly urban, including the Portland metro area. Region 1 constitutes approximately 44% of the ITS infrastructure in Oregon. ODOT-owned fiber optic communications infrastructure is available on most highway systems, and is the primary communications method employed.

- 135 Cameras
- 35 Variable Message Signs
- 142 Ramp Meters
- 34 Portable Variable Message Signs
- 14 Road Weather Information Systems
- 3 Other devices such as HAR, Weather Warning Systems, and Ramp Gates.



Region 2 -Salem

ODOT's Region 2 is the second largest area asset-wise, and is comprised of mostly rural installations, with a few urban systems.

- 40 Cameras
- 15 Variable Message Signs
- 50 Portable Variable Message Signs
- 9 Road Weather Information Systems
- 56 Other devices such as HAR, Weather Warning Systems, and Ramp Gates.



Region 3 - Medford

ODOT's Region 3 ties for the smallest area asset wise, and is comprised of mostly rural installations. Medford is the second region to build out and utilize a fiber ring for ITS and traffic systems.

- 29 Cameras
- 11 Variable Message Signs
- 19 Portable Variable Message Signs
- 10 Road Weather Information Systems
- 18 Other devices such as HAR, Weather Warning Systems, and Ramp Gates.



Region 4 -Bend

ODOT's Region 4 has the third most ITS assets, and is mostly rural. Region 4 has been a leader in using broadband internet connections and implementing adaptive traffic control systems.

- 32 Cameras
- 11 Variable Message Signs
- 23 Portable Variable Message Signs
- 37 Road Weather Information Systems
- 7 Other devices such as HAR, Weather Warning Systems, and Ramp Gates.



Region 5 -LaGrande

ODOT's Region 5 is the other area with the fewest ITS assets, and is the most rural of all the regions. No TOC.

- 20 Cameras
- 26 Variable Message Signs
- 16 Portable Variable Message Signs
- 9 Road Weather Information Systems
- 16 Other devices such as HAR, Weather Warning Systems, and Ramp Gates.

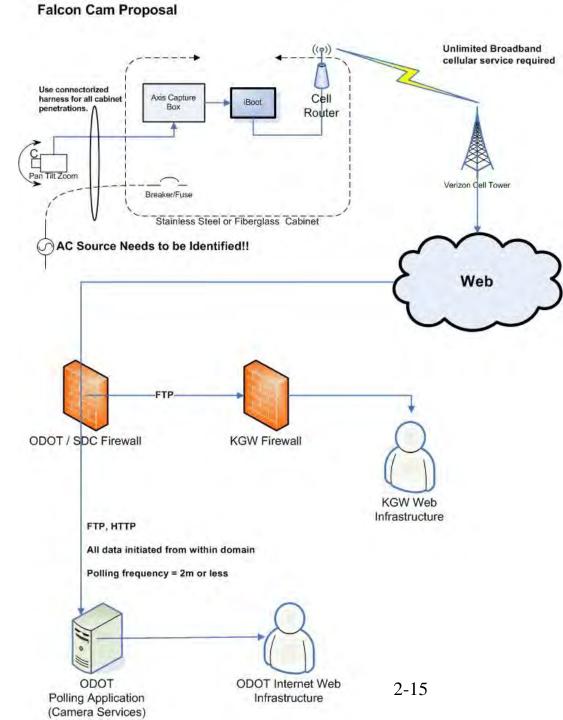


Field Device Connectivity

- Fiber Optics –ODOT Owned, leased dark fiber, bandwidth
- Frame circuits -56K, T1
- Microwave –ODOT owned
- POTS –Dialup
- Leased Lines -Serial
- Cellular –Public, Private
- Broadband –DSL, Cable



Field Device Connectivity



Network Architecture

- Each TOC has head end network gear to catch field circuits
- Devices point to their regional TOC
- Redundant (back-up) circuits between TOCs
- All public circuits are firewalled, and terminate in a DMZ
- One 3G CDMA Cellular Private Network connection, more planned



Challenges in Asset Management

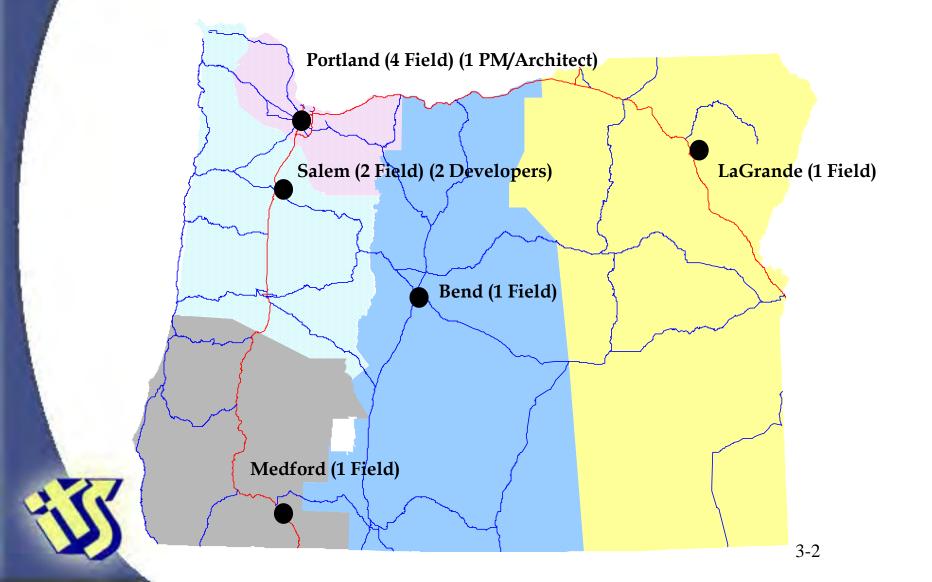
- Inventory Management
- Preventative Maintenance Scheduling and Tracking
- Asset Repair History
- Maintenance Cost Tracking
- Prioritization
- Standards



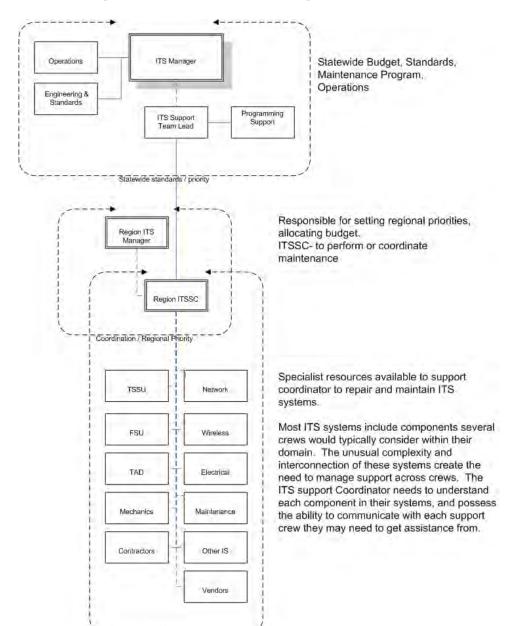
Oregon ITS Support



Regional Support Distribution



ITS Regional Organization



Service Providers

ITS Support Coordinators

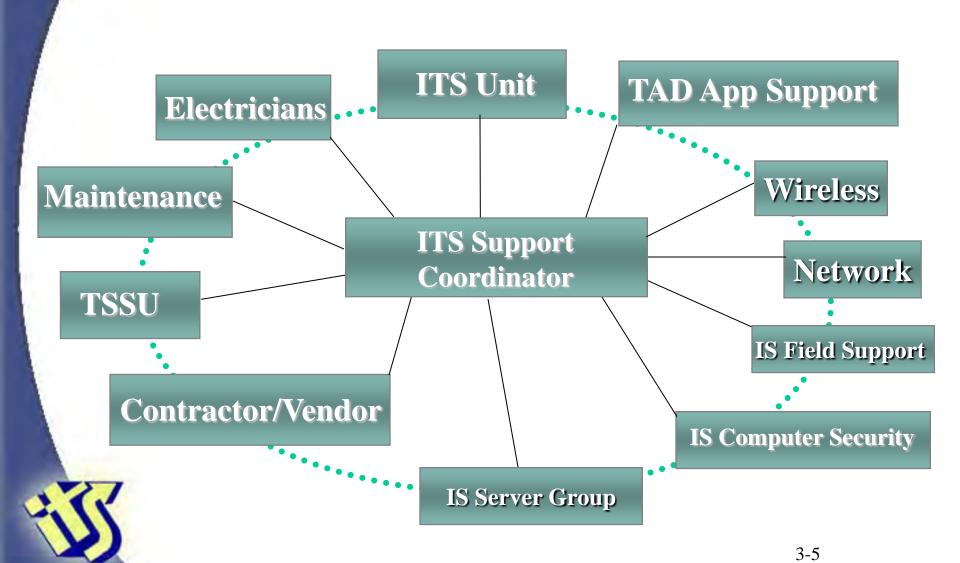
• The ITS Support Coordinator performs, evaluates, and coordinates projects and activities that support operations and maintenance of ITS systems.

• Accountable for problem resolution even though effecting a solution may require action from many support teams.



 Single point of contact for TOC and field device issues.

ITS Support Providers



Working Together





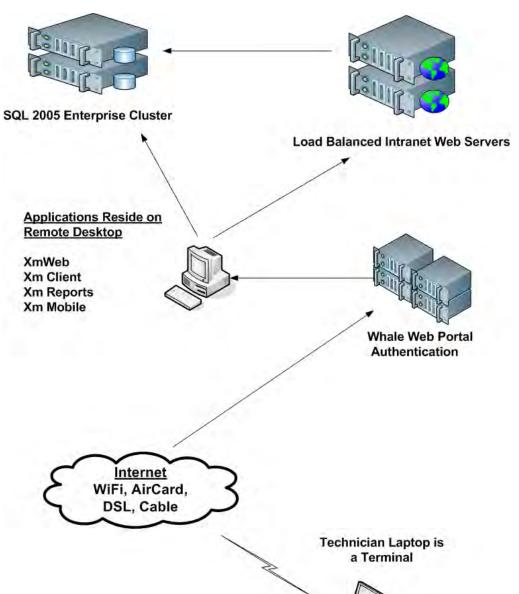
Remote Support

Technicians can access central applications from the field or home

- VPN Web Portal with Remote Desktop
- NetMotion
- Verizon Private Network / Gobi
- PDA
- Blackberry

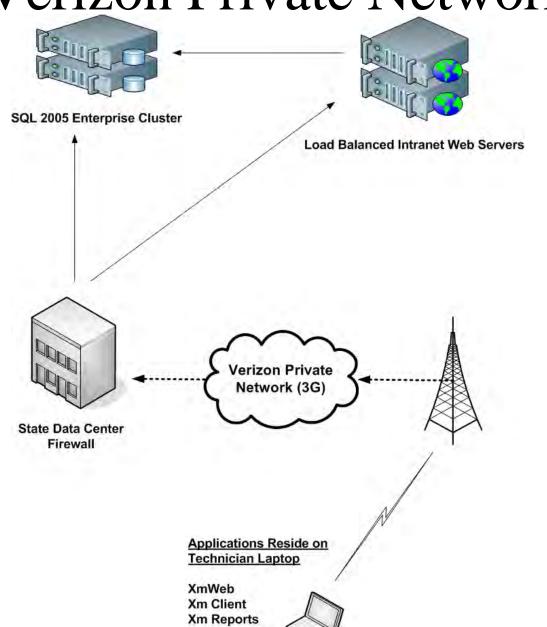


Whale Web Portal





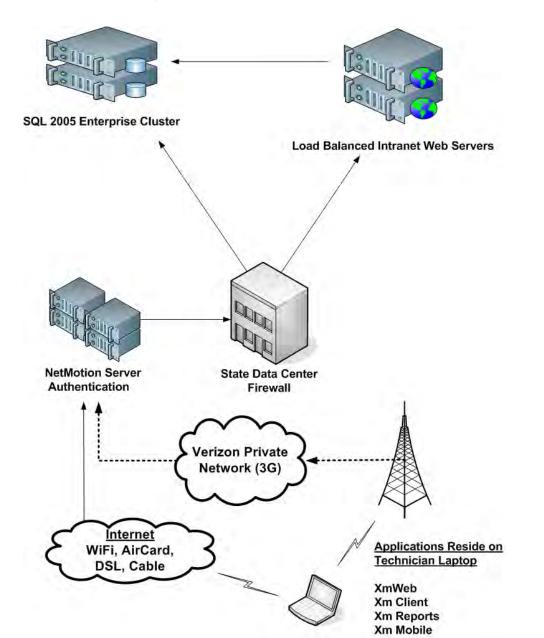
Verizon Private Network







NetMotion

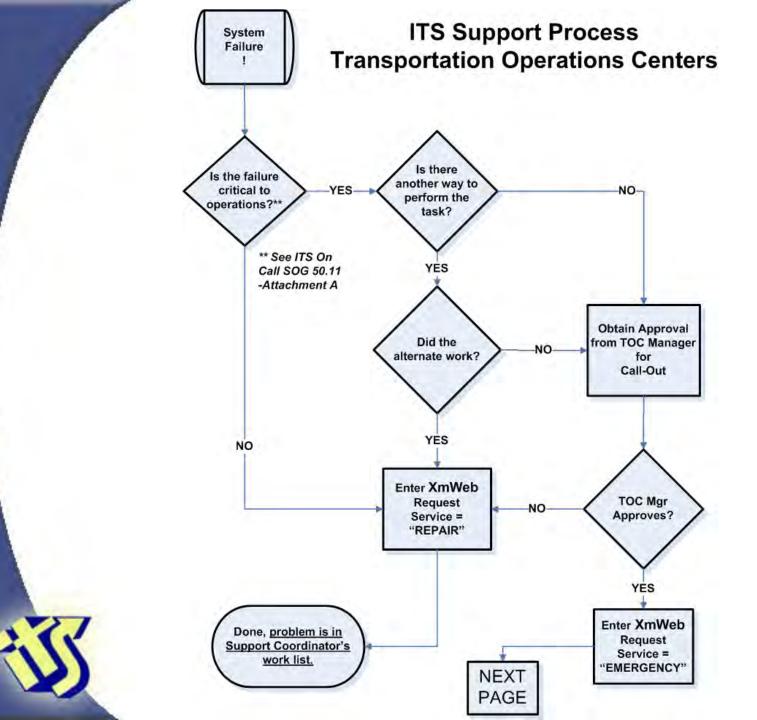


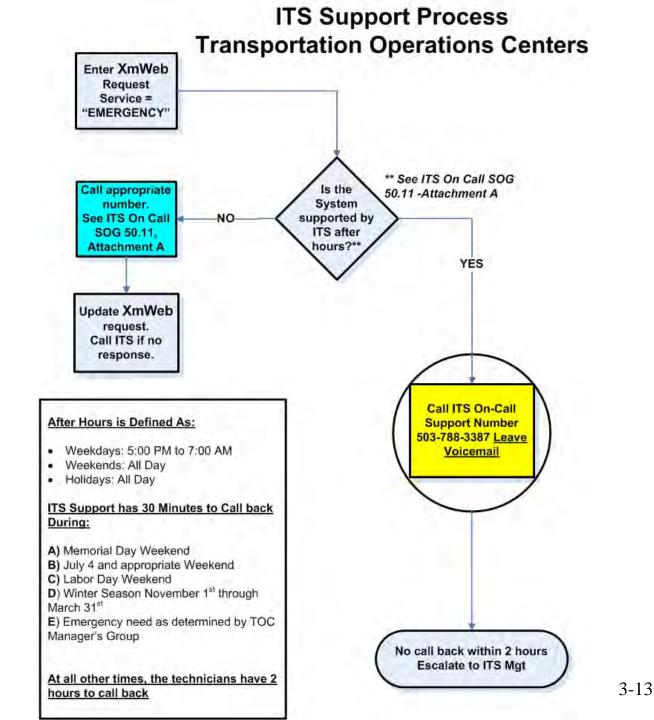


Statewide After Hours Support

Adherence to standards and using Micromain has allowed us to provide statewide after hours support

- Micromain is used by all dispatch centers
- Records problems and initiates emergency call outs very quickly
- On-Call staff, Support Coordinators, and management get auto-notifications
 - Emergency notification to On-Call staff





Regional Support Challenges

- Work Request Management and Distribution
 - Requests: Techs, Dispatch Centers, Business
 - Work Flow / Process
 - Priority
 - Change Notification
 - Coordination of Efforts
- Crew Supervision
 - Workload Management
 - Performance Measures
 - Standards Enforcement
 - Time Tracking



MicroMain Overview

ODOT ITS chose MicroMain as its
Computerized Maintenance Management
System to solve these asset management and
support challenges.

ODOT evaluated 21 CMMS Applications, and decided on MicroMain based on features, standards, cost, and source code ownership.

MicroMain Components

- Server component: SQL database
- Xm Client
- Xm Reports
- Xm Mobile
 - Handheld (Win CE or Palm)
 - -PC
- Xm Web



Application Details

- MicroMain Xm Enterprise SQL
- Purchase included source code
- Licenses are concurrent
- All user interfaces connect to central SQL
 DB



ODOT Server Environment

- ODOT Network Domain
- MS Windows Server 2008 64Bit
- MS SQL Enterprise 2005 (Clustered)



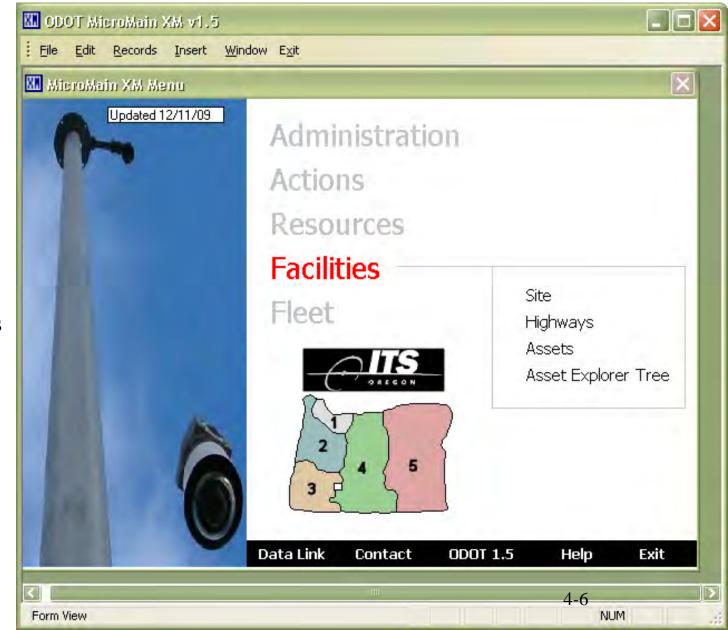
ODOT PC Environment

- Windows XP Professional, SP3
- MS Office 2003
- MicroMain Xm Client –MS Access
- MicroMain Xm Reports –MS Access
- .Net Web client
- IE Explorer V7
- .Net PDA client

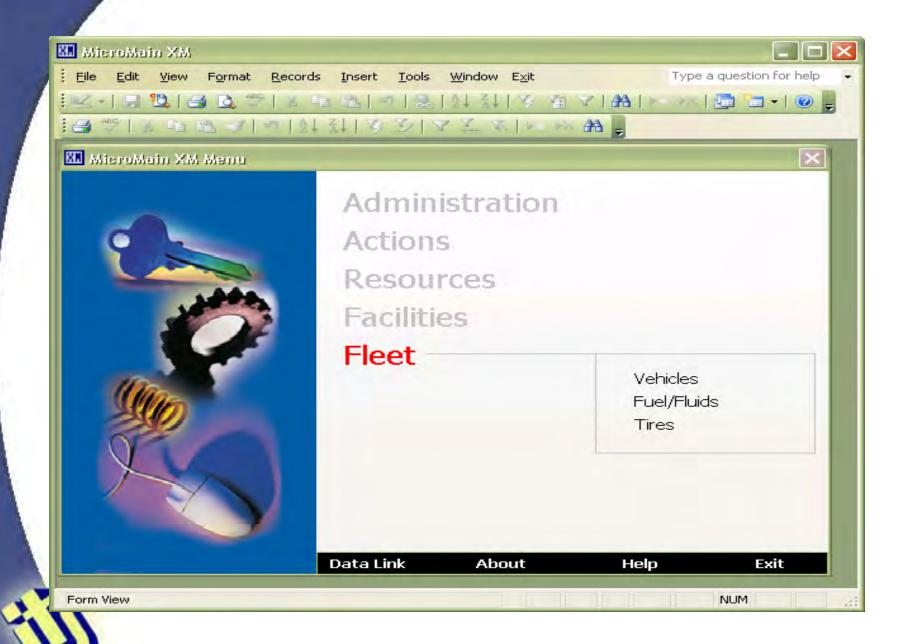


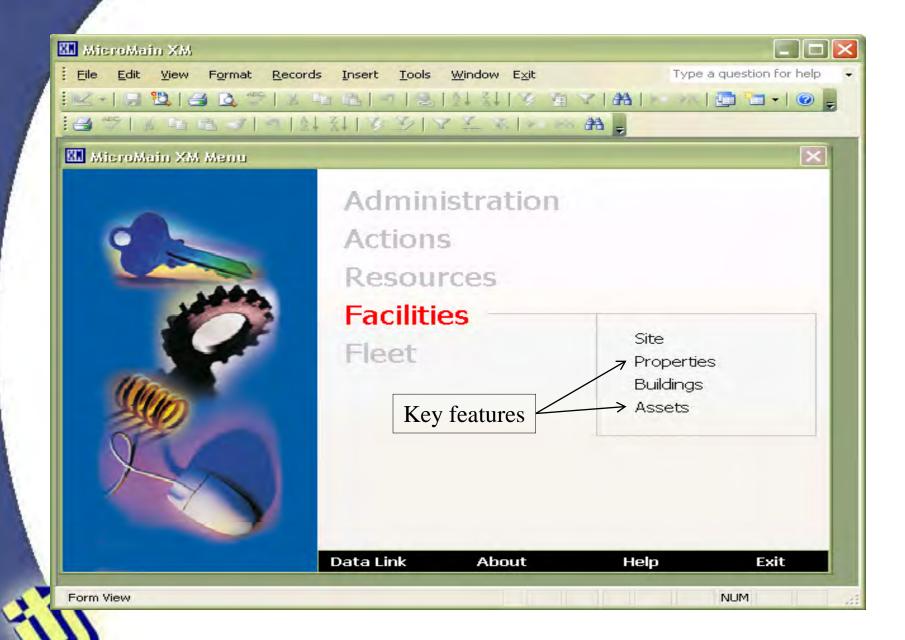
Xm Client

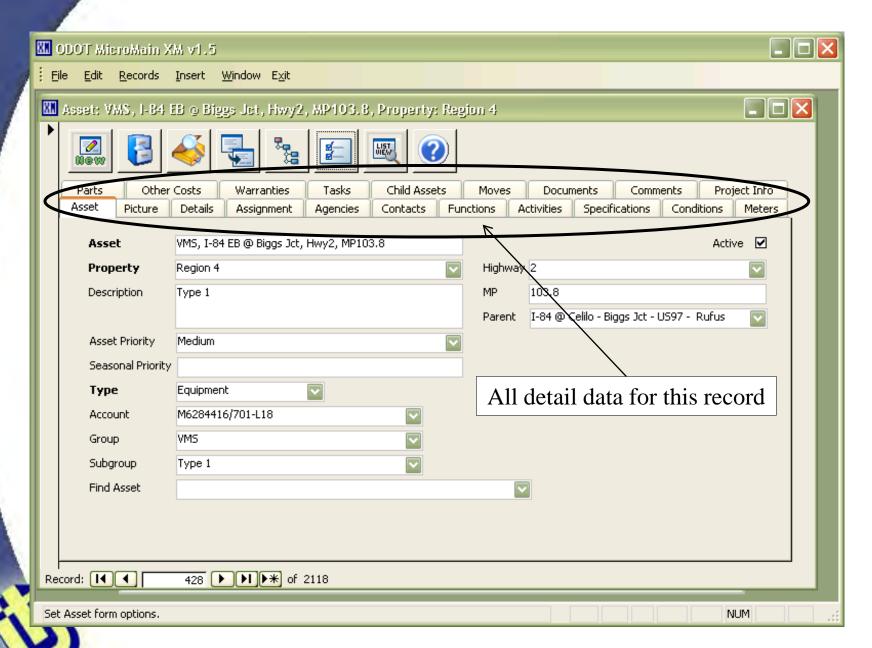
- •Quick Summary
- •MS Access
- •Linked Tables
- Accidental Changes
- Used by Admin

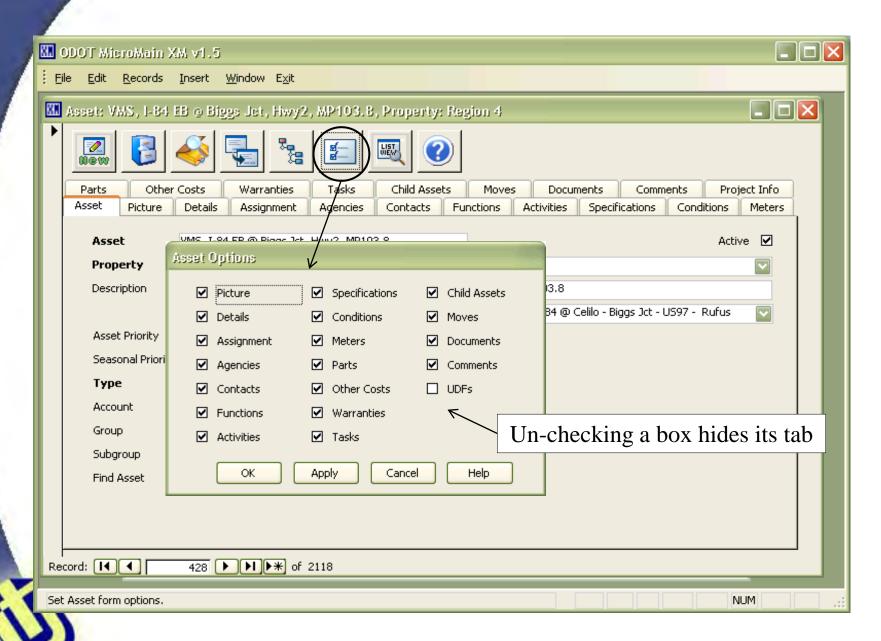


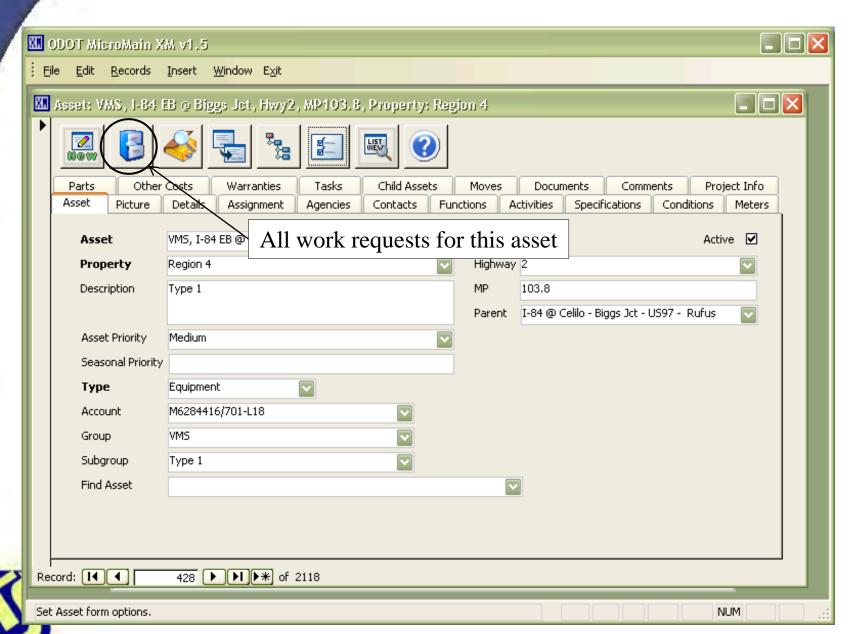












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Total Cost Total Work Order

1,731,50

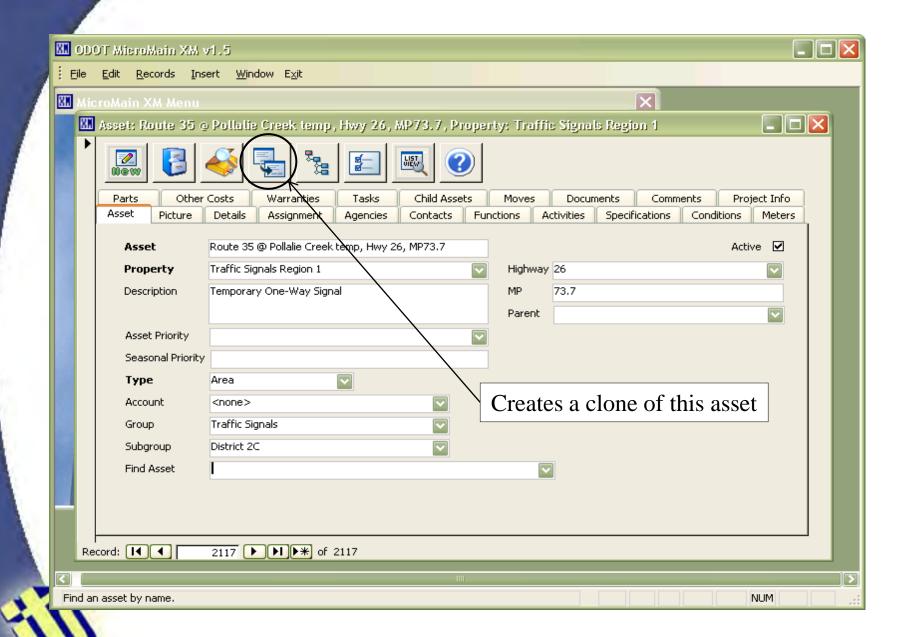
Date from 5/24/2009 • to 5/24/2010 • Report

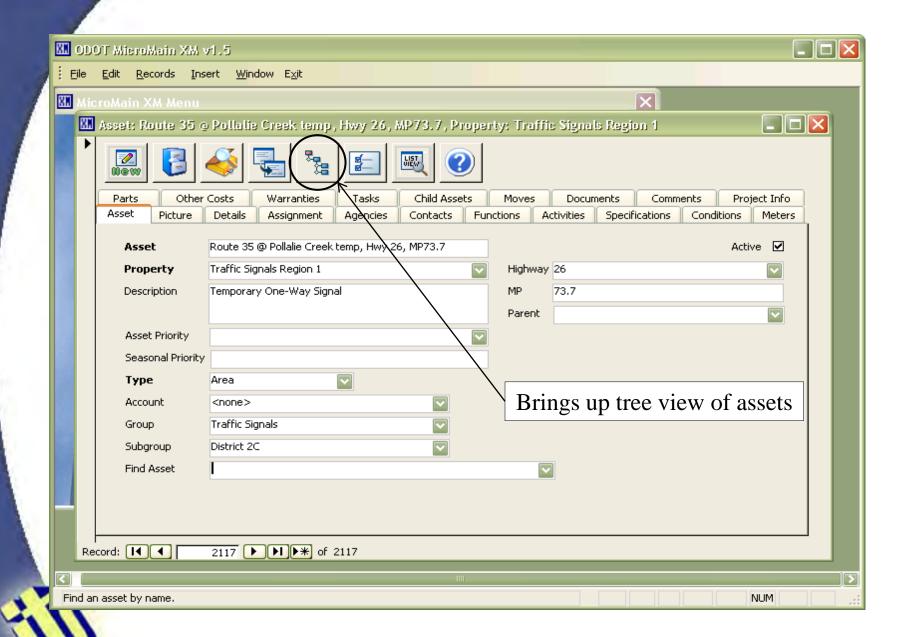
03/31/2006 1000hrs Ken S, on site to check into problems. The LIPS was turned off and we found the batteries were connected

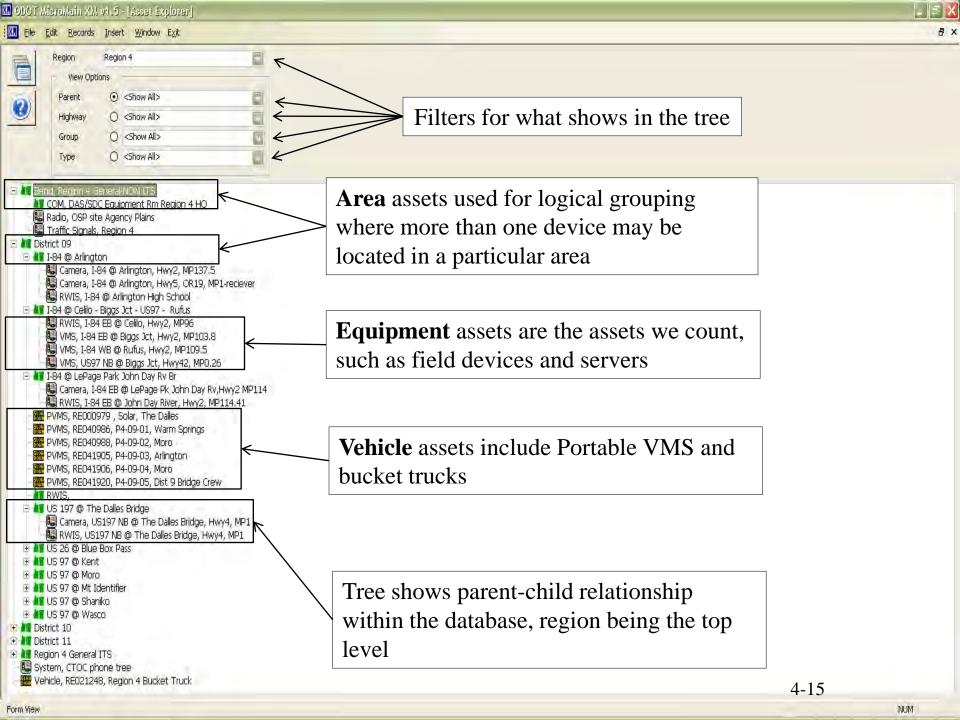
	WO Numbe	Service	Description	Status	Requested	Issued	Completed	Cost P	rimary Failure	Comments
	14456	Annual PM, VM5, 5/13/2010	Autogenerated annual VMS PM. Inspect Mounting Hardware - Ensure Mounting Hardware, esp bolts are tight, and in good condition	Requested	4/11/2010 3:52:14 PM			0,00		
	11688	Failed Inspection Point(s) from WO 10009	POINT: Sign enclosure fan operation ACTION: Observe sign housing fan operation, Troubleshoot thermostat, fan	Requested	8/19/2009 9:40:16 AM			0,00		81809 JT fan on pyc black pipe by door is out. Any question call me. POINT: Sign enclosure fan operation Comments: Observe sign housing fan operation.
	10009	VMS PM, Annual (Region 4), 3/13/2009	Autogenerated annual VMS PM, Inspect Mounting Hardware - Ensure Mounting Hardware, esp bolts are tight, and in good condition	Completed	3/13/2009 1:59:57 PM	8/19/2009 9:56:49 AM	8/19/2009 3:46:27 PM	432,00 No	o Failure	81809 JT JAWS pm sign failed fan behind power suplys middle pvc tube left side facing sign.
	8509	rfw	polled sign, gave 'service A' message, shows message on.	Canceled	10/22/2008 9:41:16 AM	7/27/2009 9:12:38 AM		0.00		
	6395	VM5 PM, Annual (Region 4), 11/14/2008	Autogenerated annual VMS PM, Clean Lexan: - Clean Lexan inside and out	Completed	3/10/2008 10:19:37 AM	9/15/2008 8:00:38 AM	9/17/2008 4:55:43 PM	162,00		9/15/08 GRB & JJS Annual PM,
	5213	Repair	Do you know that we have to go thru Standalone to activate this sign?	Completed	12/7/2007 12:00:20 PM	12/10/2007 7:25:06 AM	12/10/2007 7:25:12 AM	27.50 O	perator Error	12/10/07 0715hrs - JAW5 - Checked operation with Launcher and was successful, Confirmed with operator what occurred and found operator only attempted once then went to Skyline.
	5182	Repair	Re-install UPS at this location VMS would not work, Standalone came back ring no answer.	Open	12/2/2007 9:01:33 PM	4/16/2008 11;22;08 AM		67,50		11/25/08 JAWS - Have not been able to find the UPS that was repaired and returned per ups tracking below. Need to find UPS and re-install at this location.
	3669	VMS PM; Annual (Region 4), 8/31/2007	Preventative Maintenance for permanent Variable Message Signs Inspect Mounting Hardware - Ensure Mounting Hardware, esp holts are tight, and in good condition	Completed	6/13/2007 6:14:11 PM	9/25/2007 4:55:30 PM	9/25/2007 4:56:09 PM	405.00 No	o Failure	9/19/07 GRB & JJT Annual PM. Cleaned and checked filters. Station 4 contacted the sign and installed and removed a message. Good comms. Bearons were activated and de-activated.
	1256	VMS PM, Annual (Region 4), 8/31/2006	Preventative Maintenance for permanent Variable Message Signs	Canceled	6/12/2006 1:08:58 PM			0,00 No	o Failure	100000000000000000000000000000000000000
Þ	848	Repair	While in area requested that TOC test VMS. Found that communication was not possible. 1500brs on site found controllers and power off. 1 IPS failed to	Completed	5/23/2006 8:46:55 AM	11/1/2007 5:10:48 PM	11/1/2007 5:19:47 PM	582,50 Pa	art Failure	10/24/07 GRB & DA Checked charging, all ok, Performed conductance testing, Results follow, BAT 1 2 3 4 236 236 224 230 mhns
	573	Emergency Repair	Sign not working,	Completed	3/30/2006 5:44:01 PM	4/5/2006 9:08:10 AM	4/5/2006 9:08:24 AM	55,00 Ut	tilities	2200 Z200 ZZT Z20100005

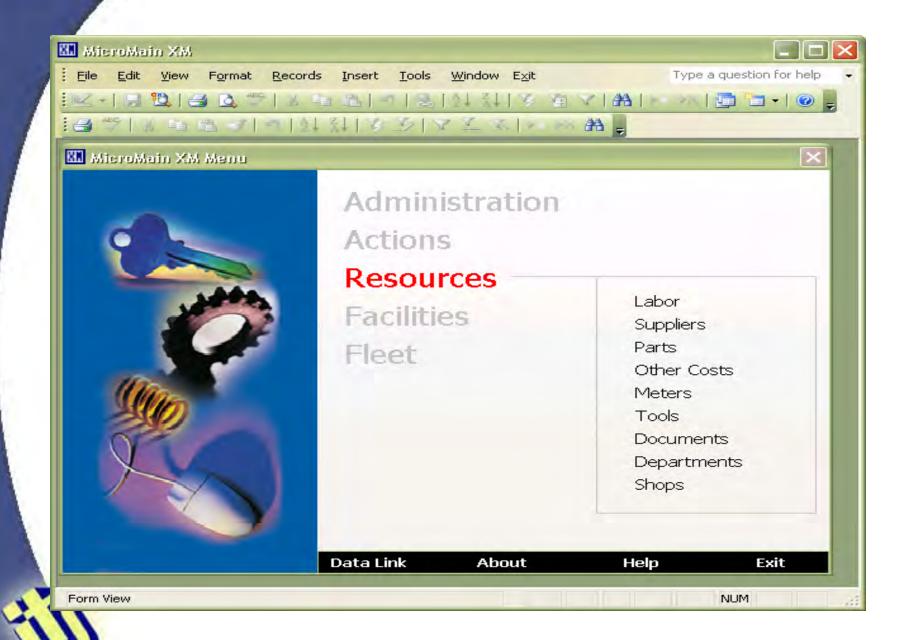
Record: []

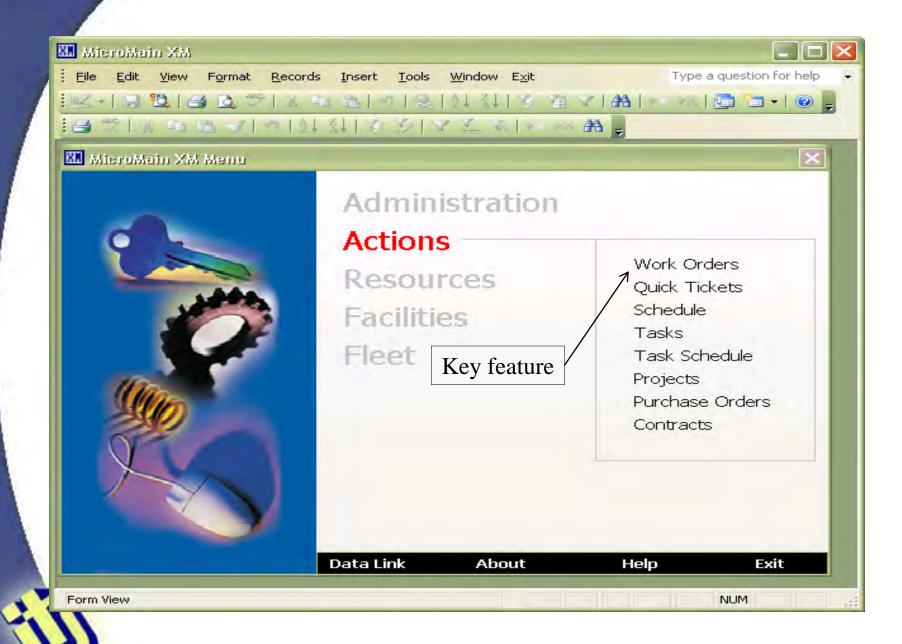


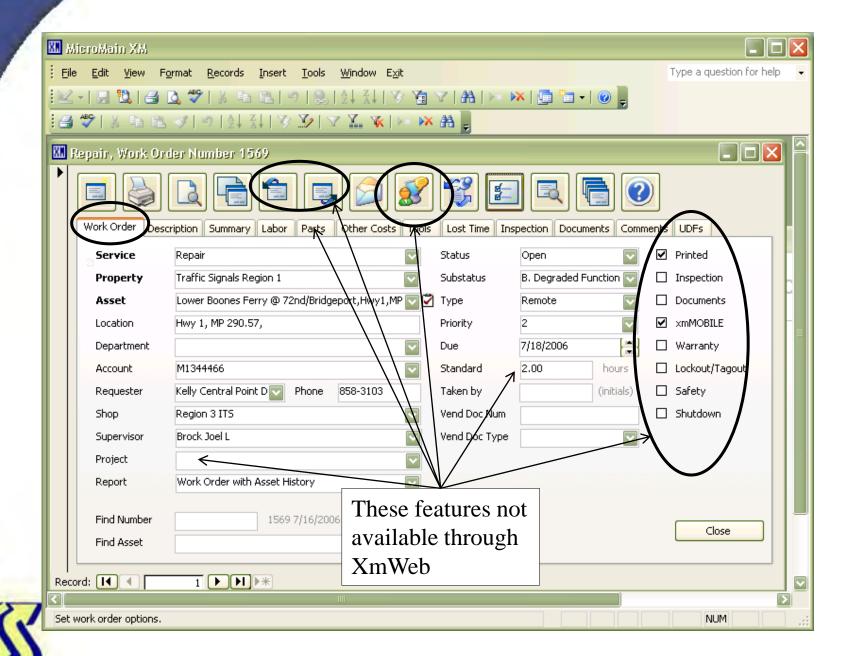


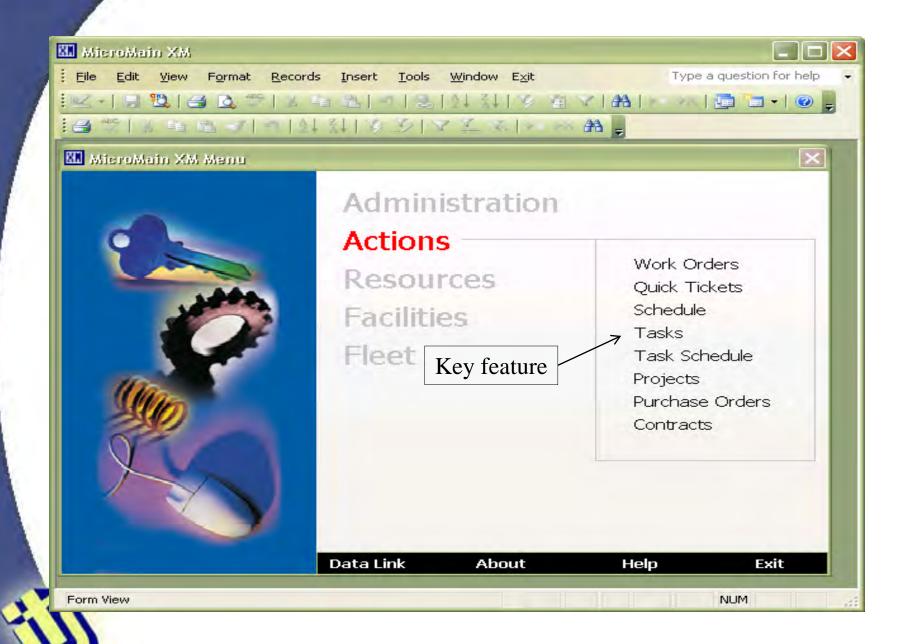


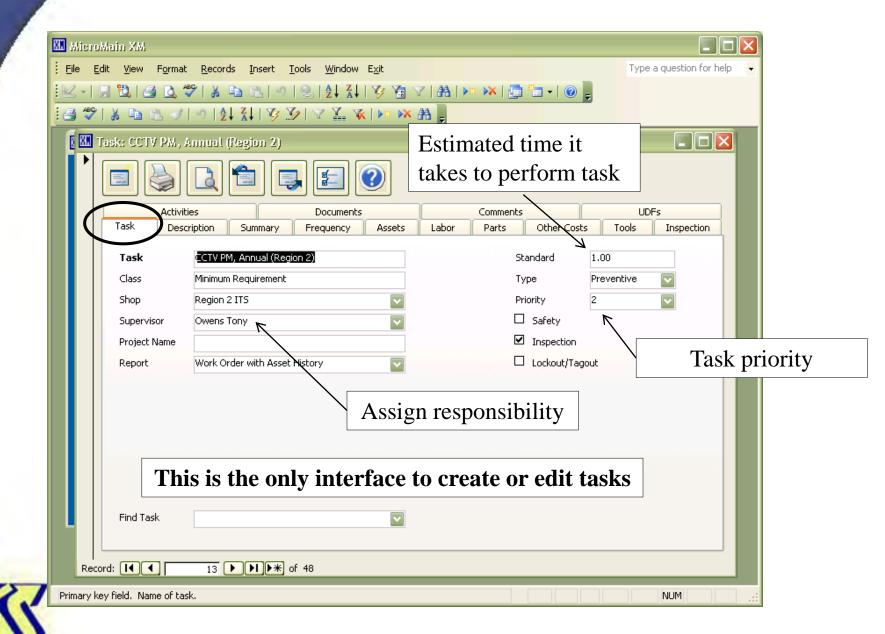


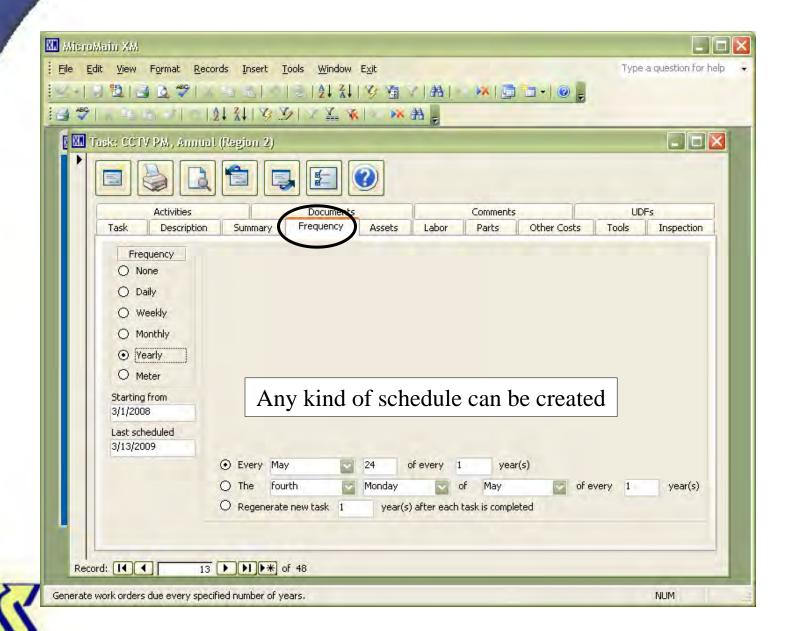


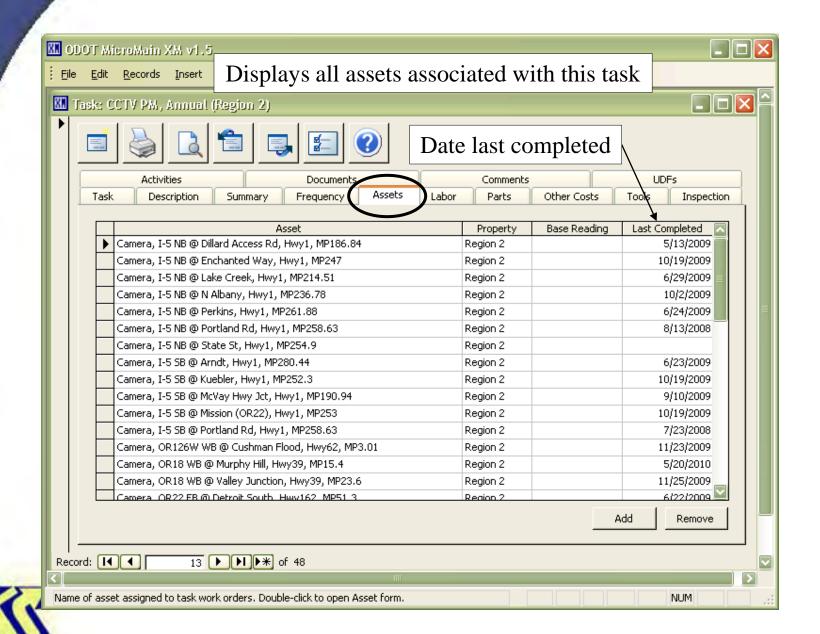


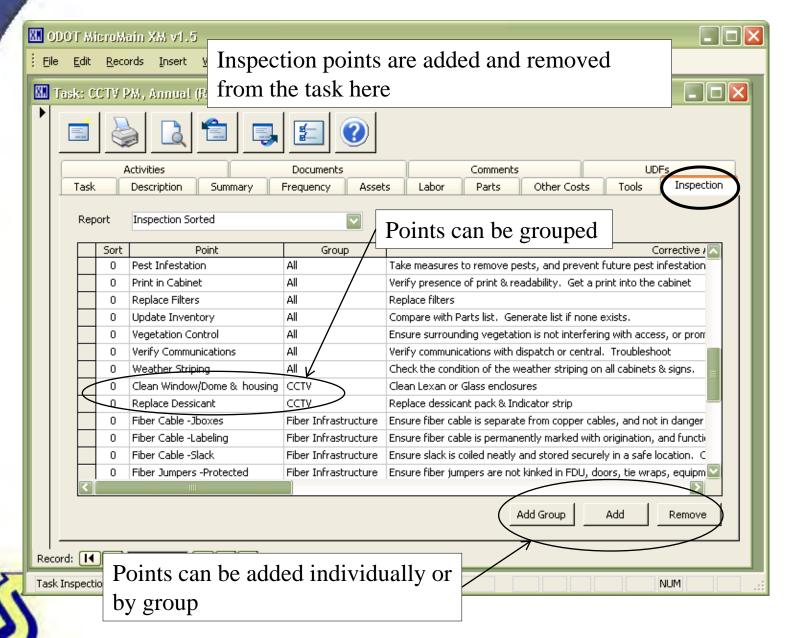


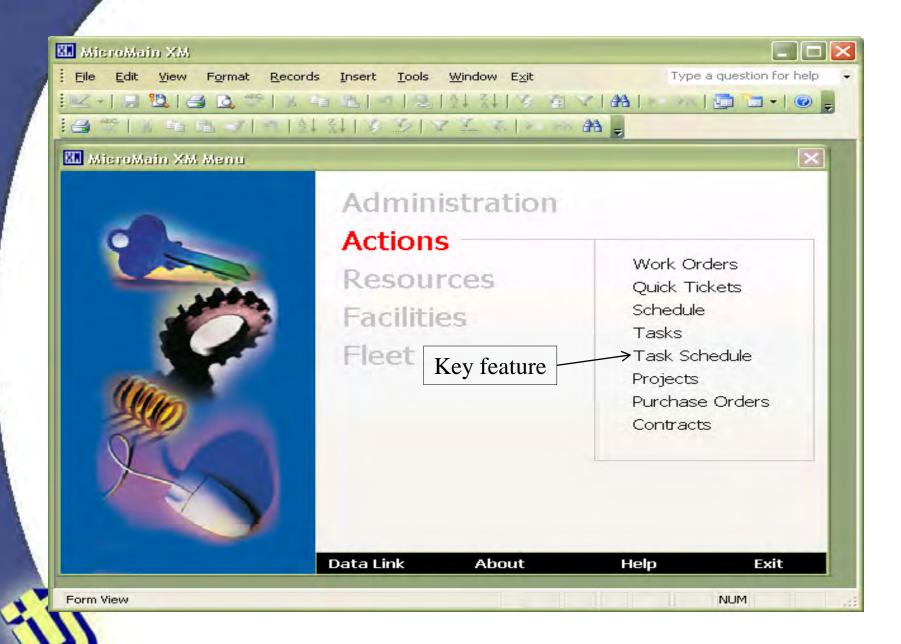


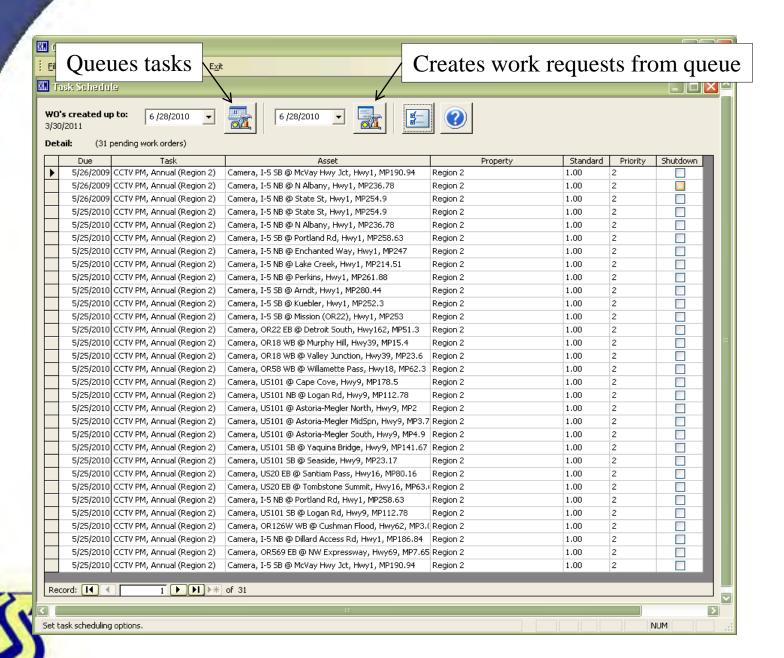


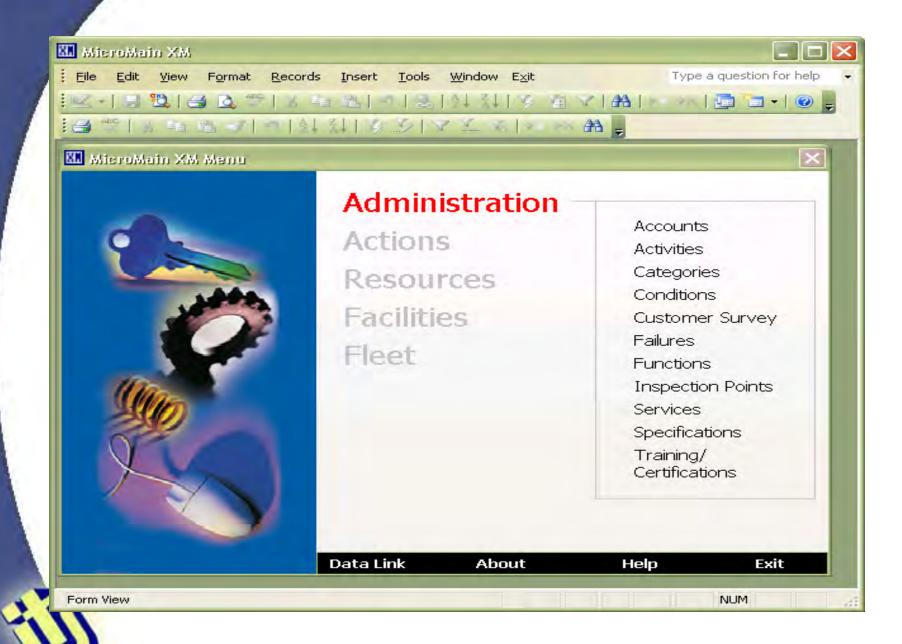






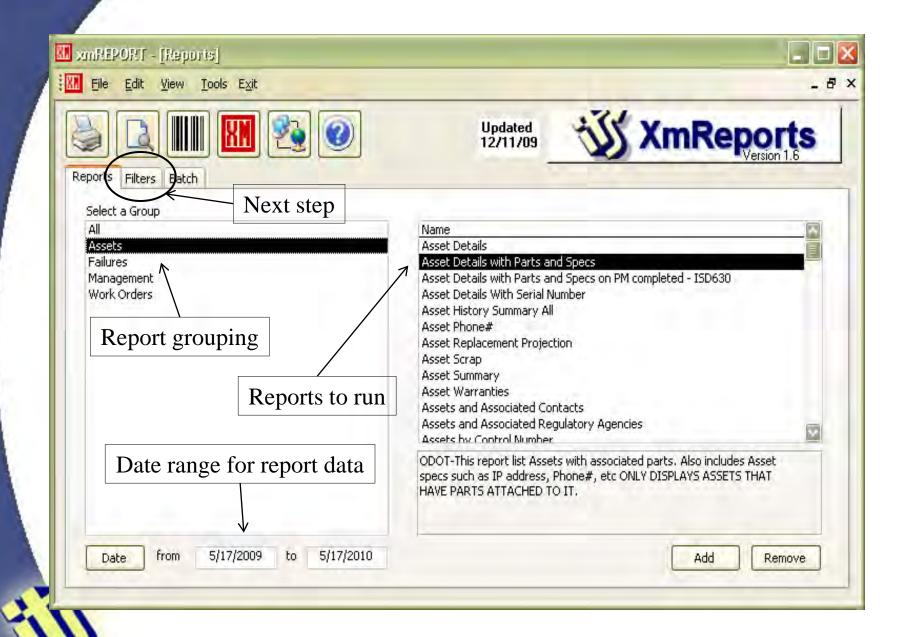




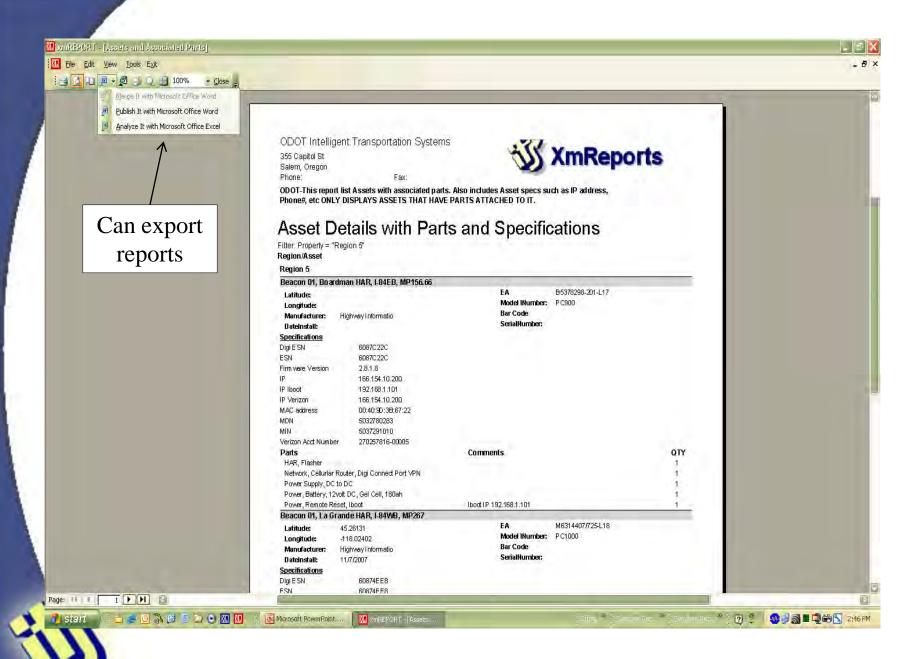


Xm Reports



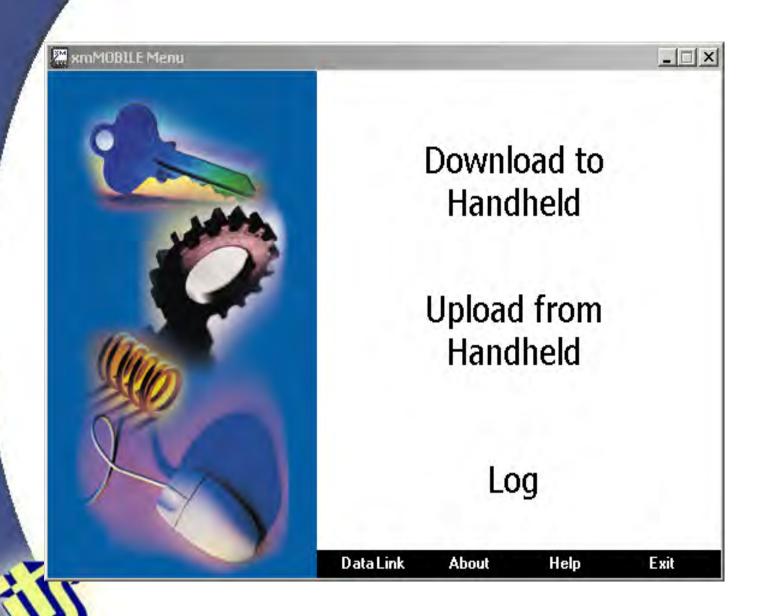


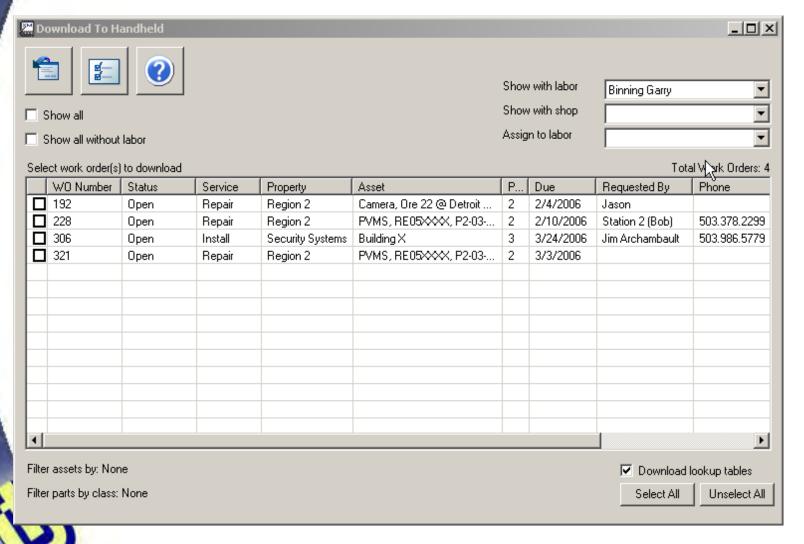




Xm Mobile







Windows CE

sn⊞ +‡x⊀	€ 9:17						
Emergency Repair	<u>^</u>						
Region 4	*						
Camera, US 20 WB	Sister ▼						
Open ▼							
	*						
	/2006 ▼ Cancel						
Details Description	Comments						
Work Order							
	Emergency Repair Region 4 Camera, US 20 WB Open Due 3/16 OK Details Description						

Xm Web

ODOT has heavily modified the XmWeb interface. It's now the primary interface used by technicians and dispatch operators for:

- Work Requests and Assignments
- Repair and Maintenance Documentation
- Asset Inventory Management
- After Hours Communications and Notification

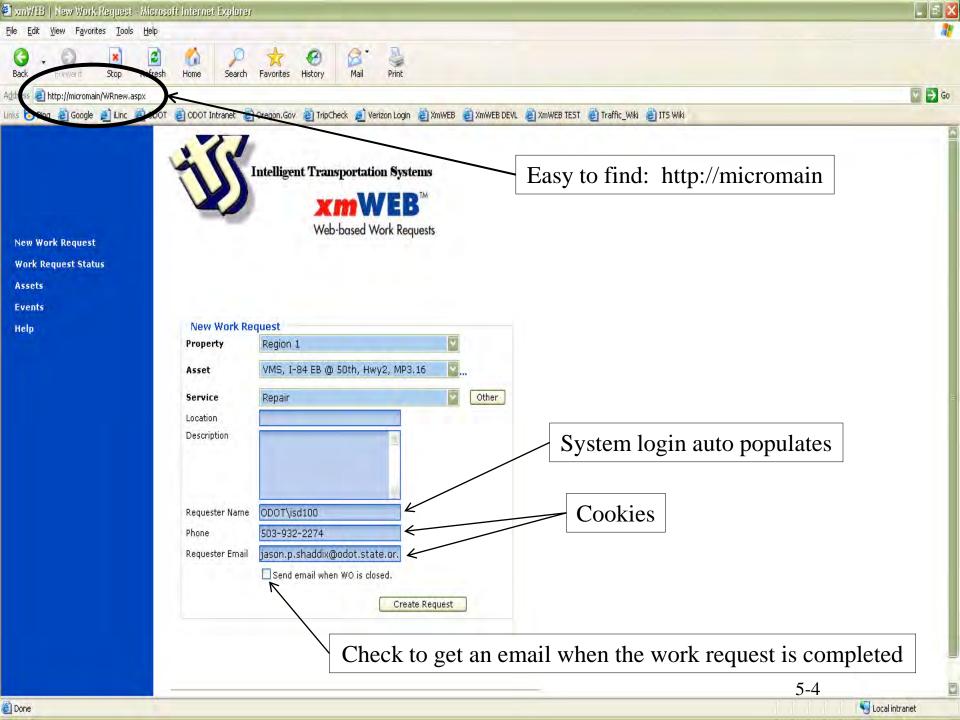
XmWeb Work Requests

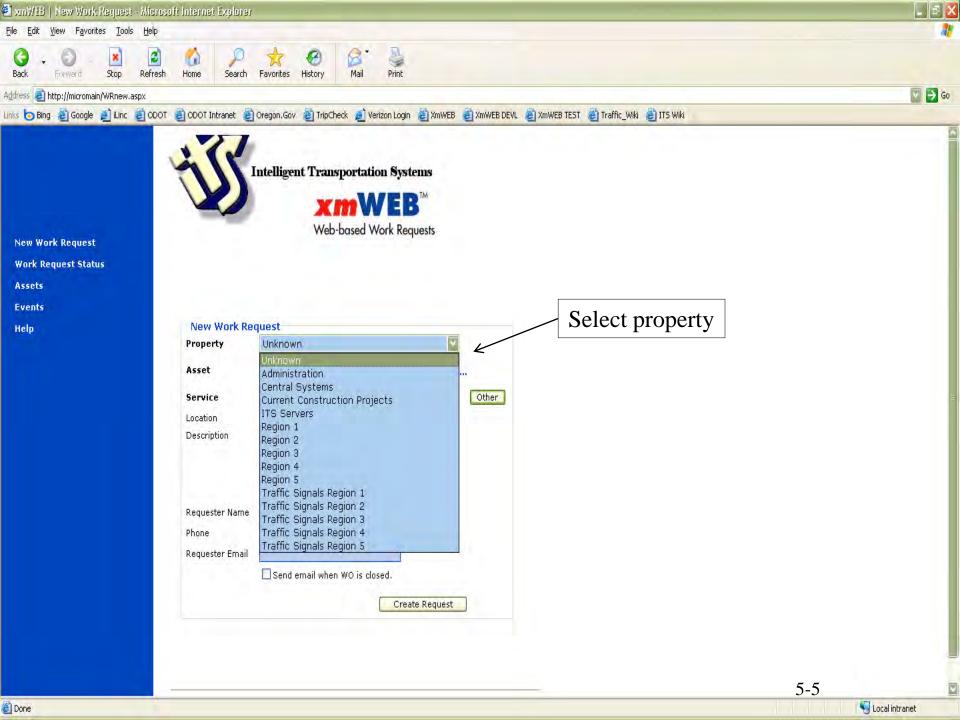
- Create Work Requests
- Edit Work Requests
- Search Work Requests for Status
- Labor Entry

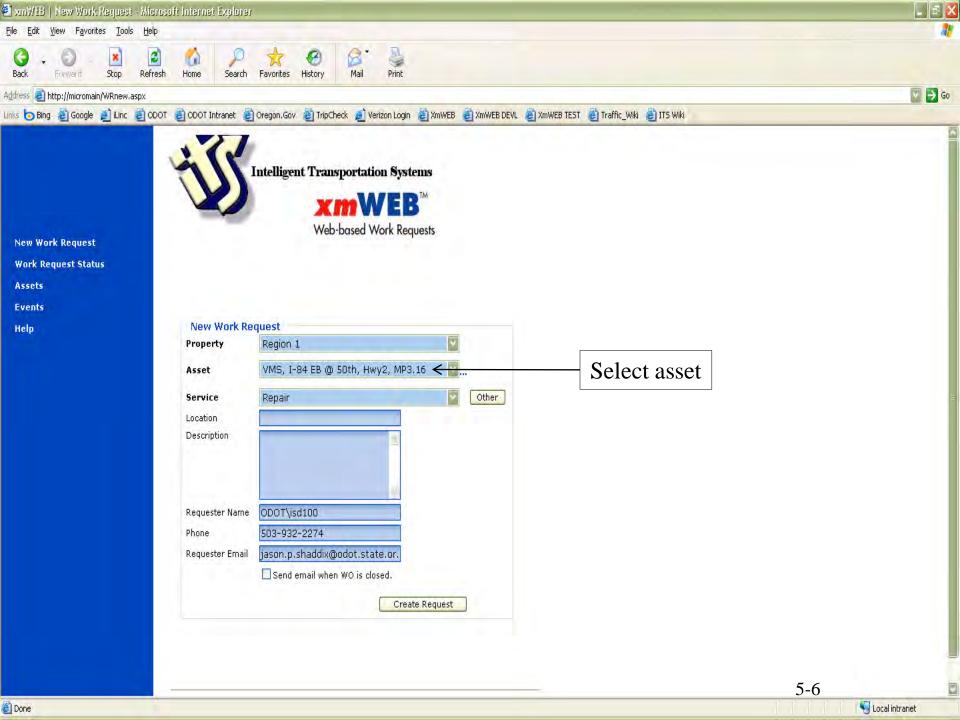


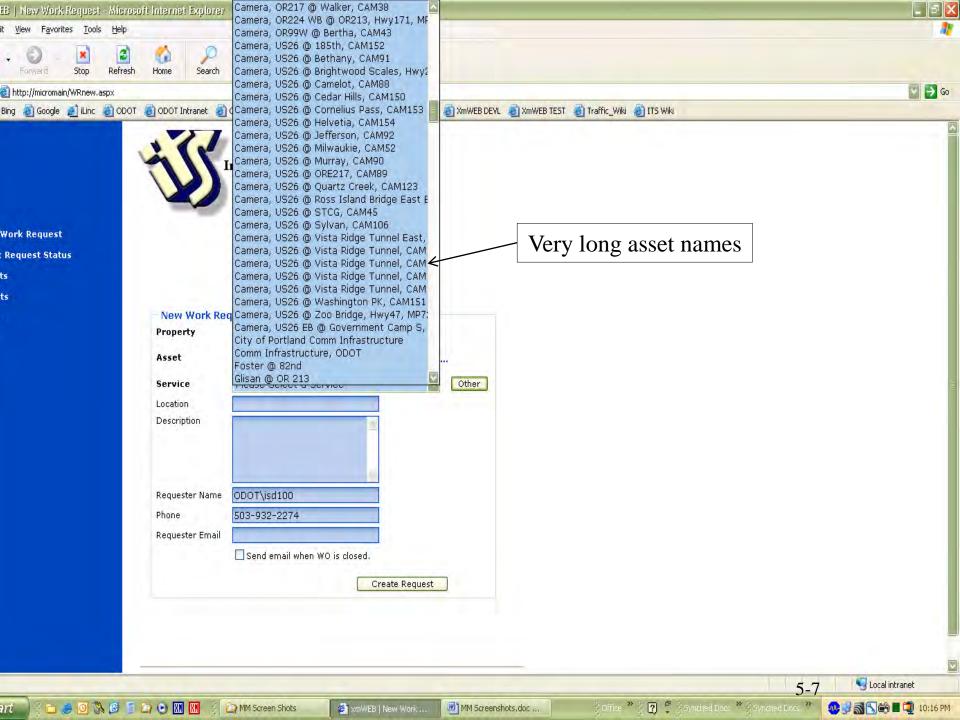
Live Demo XmWeb Work Requests

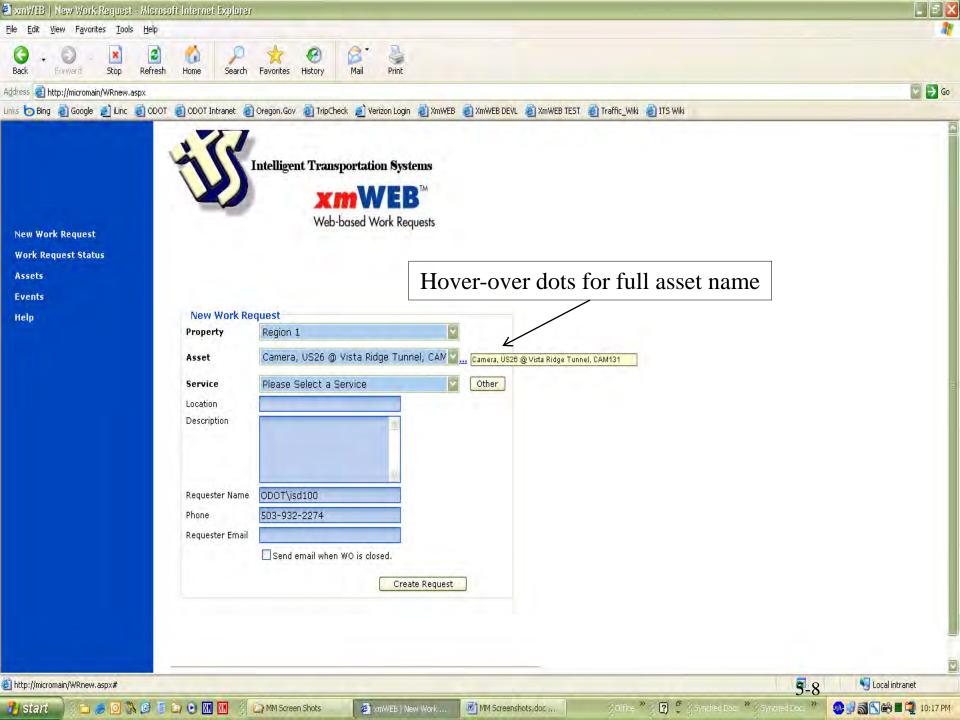


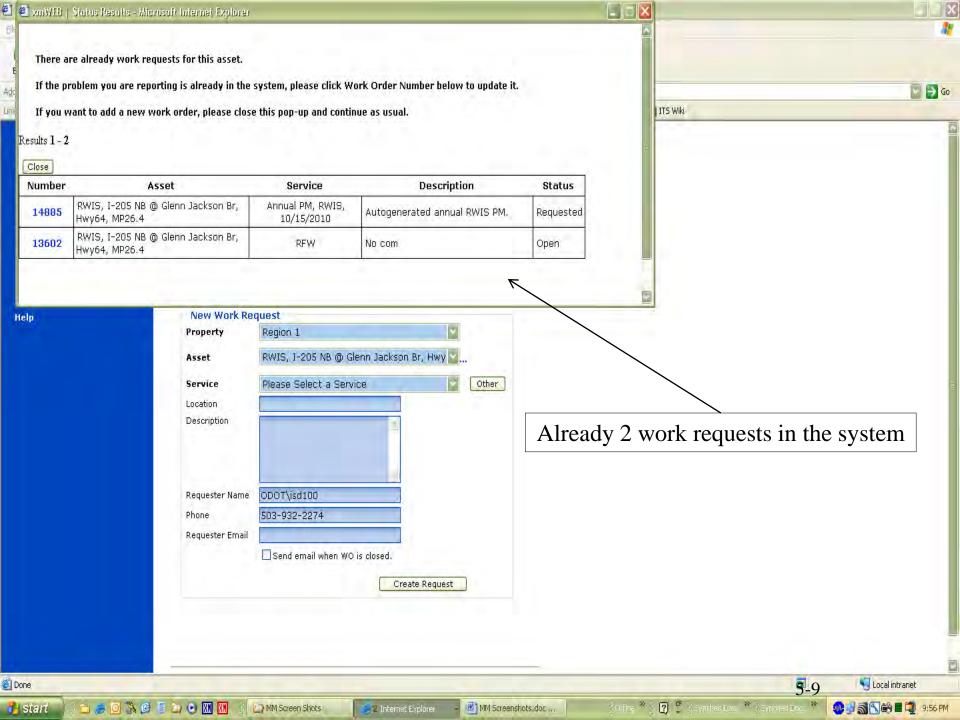


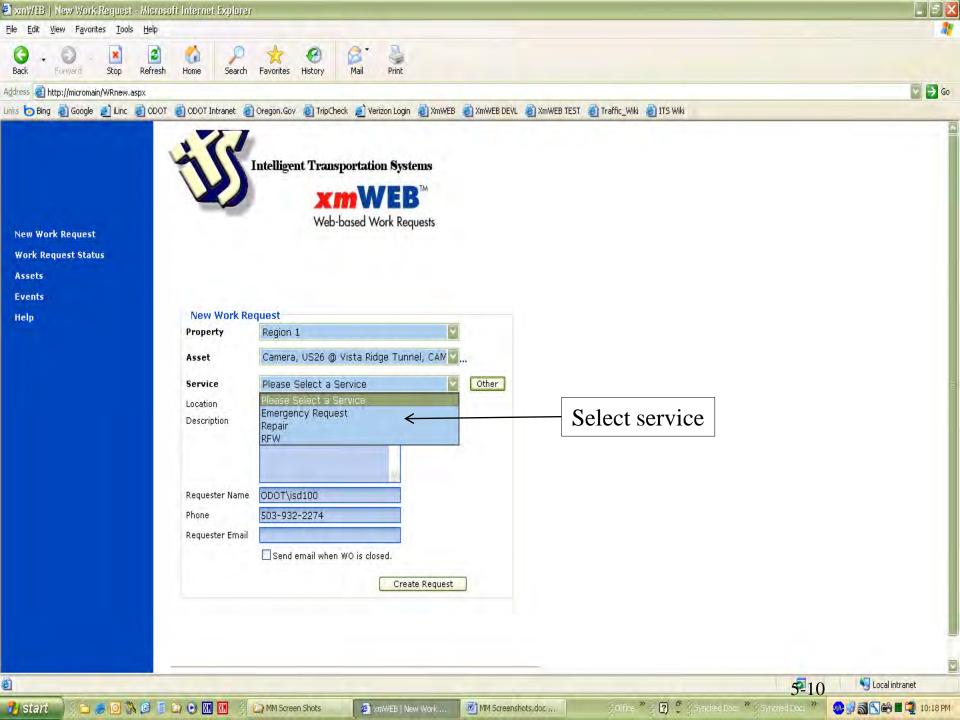


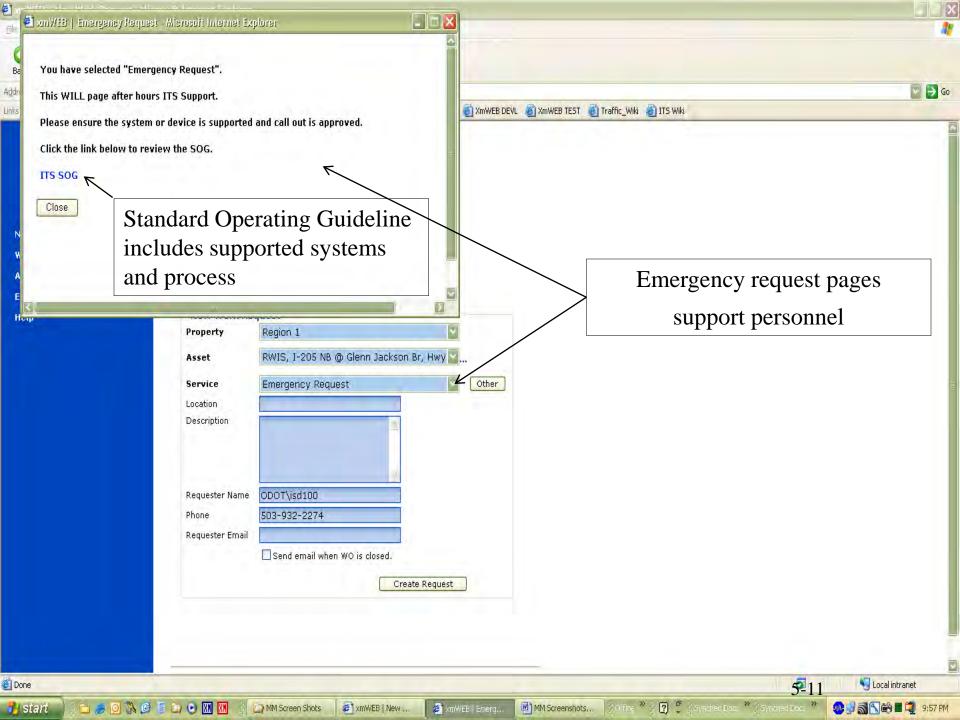


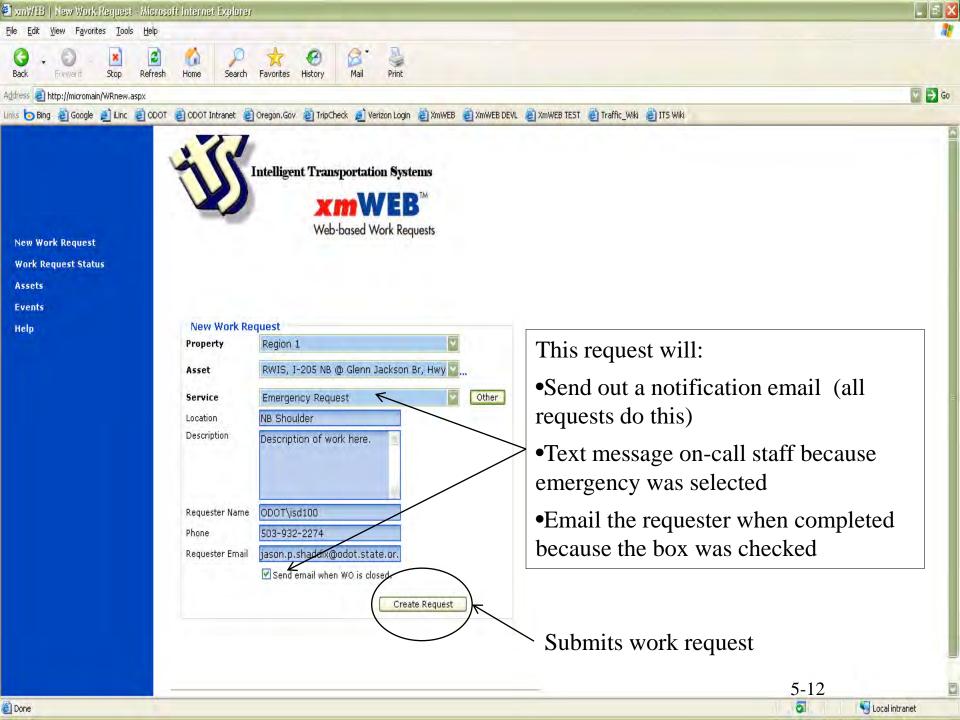


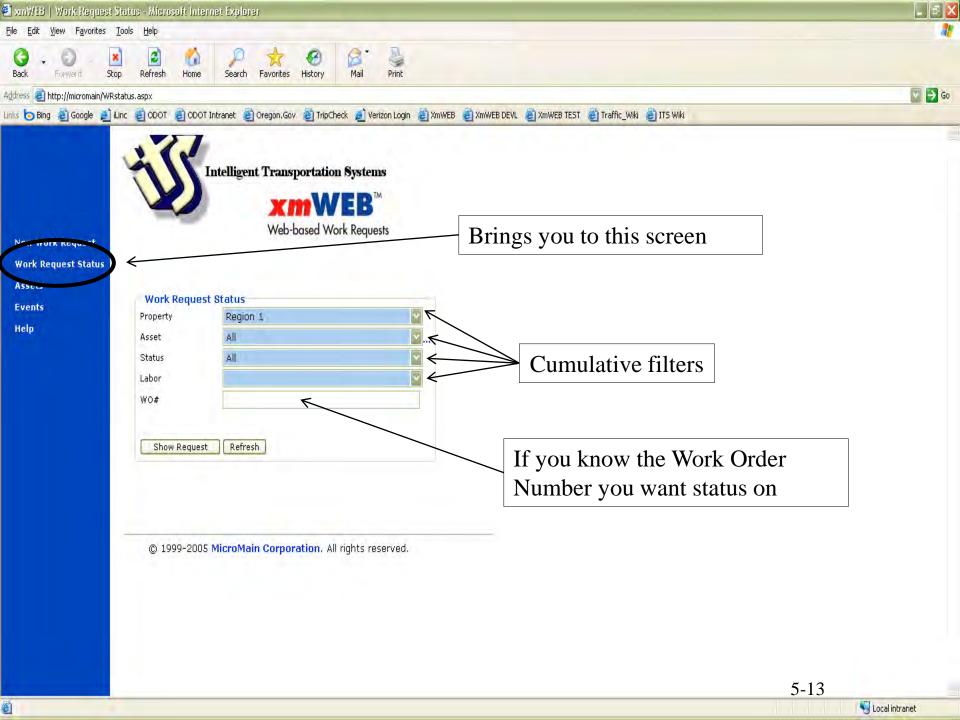


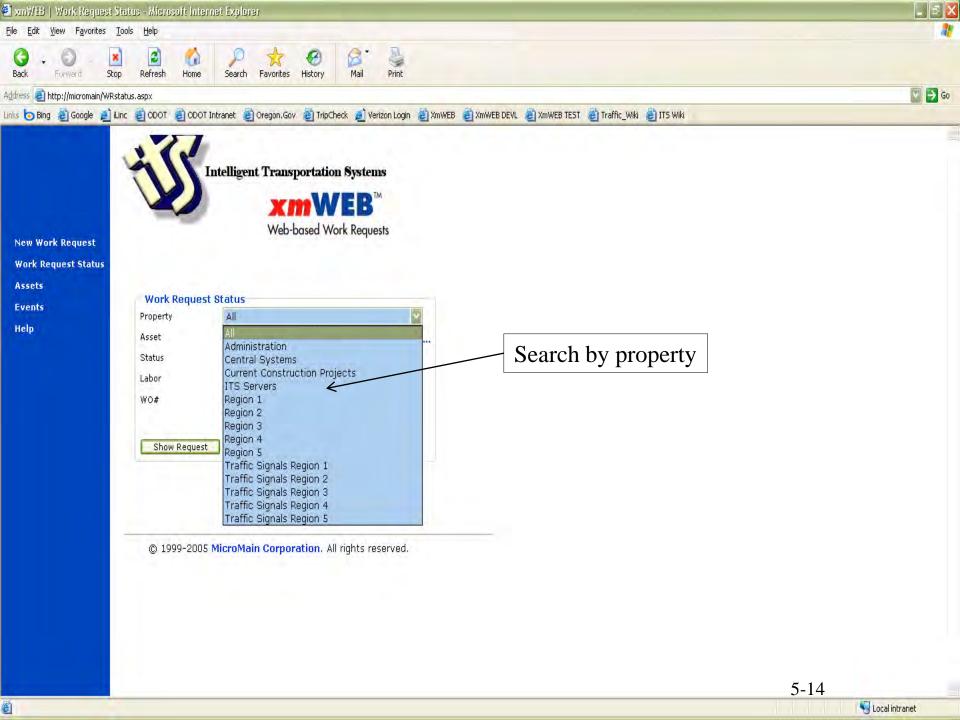


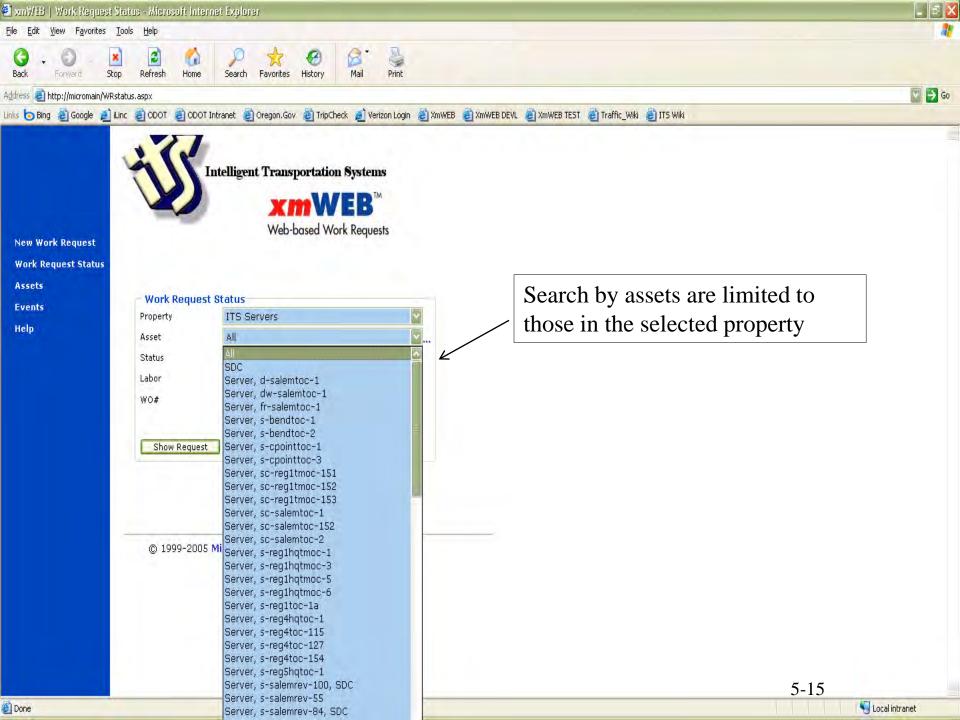


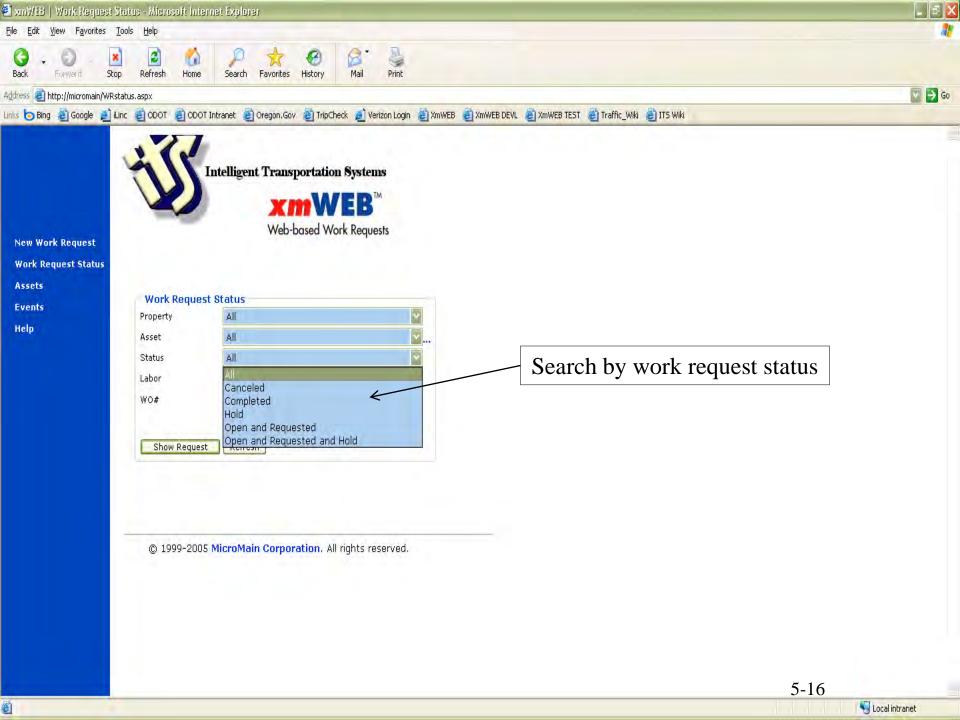


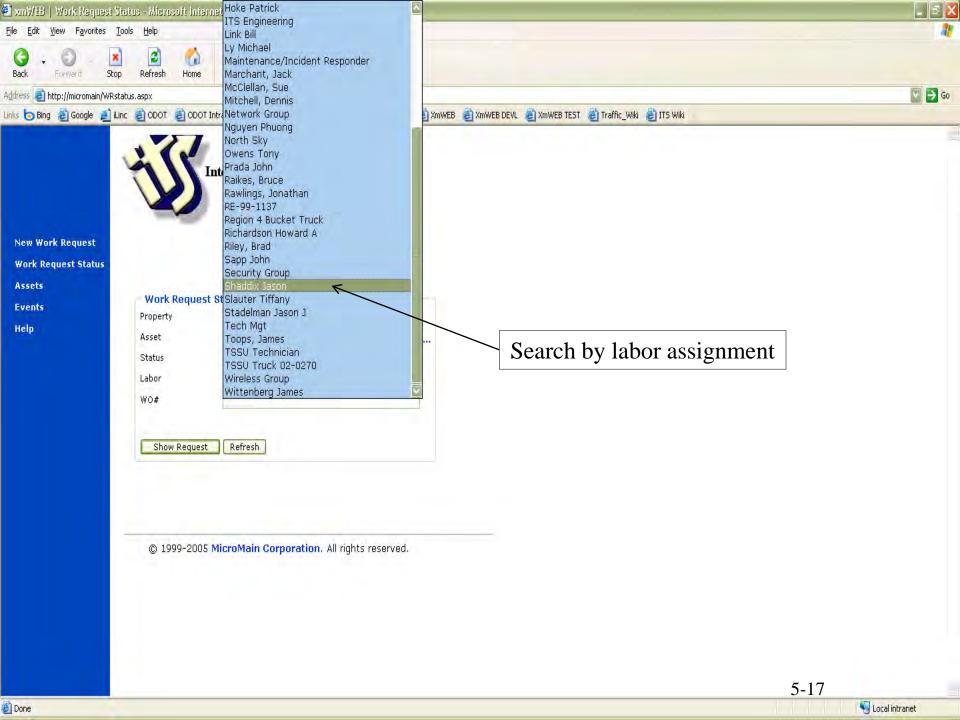


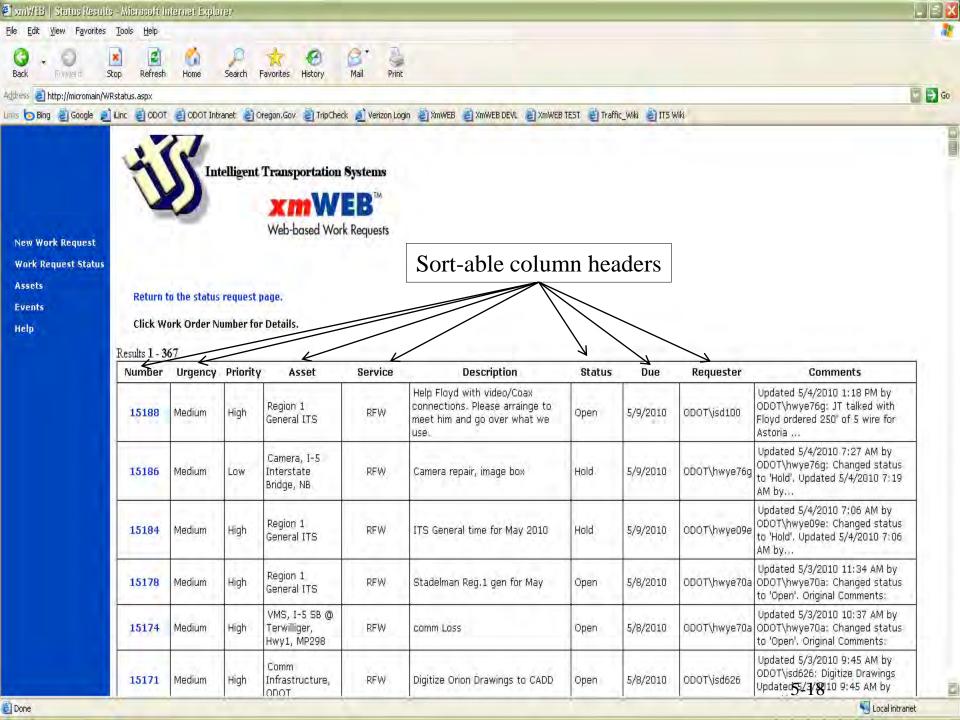


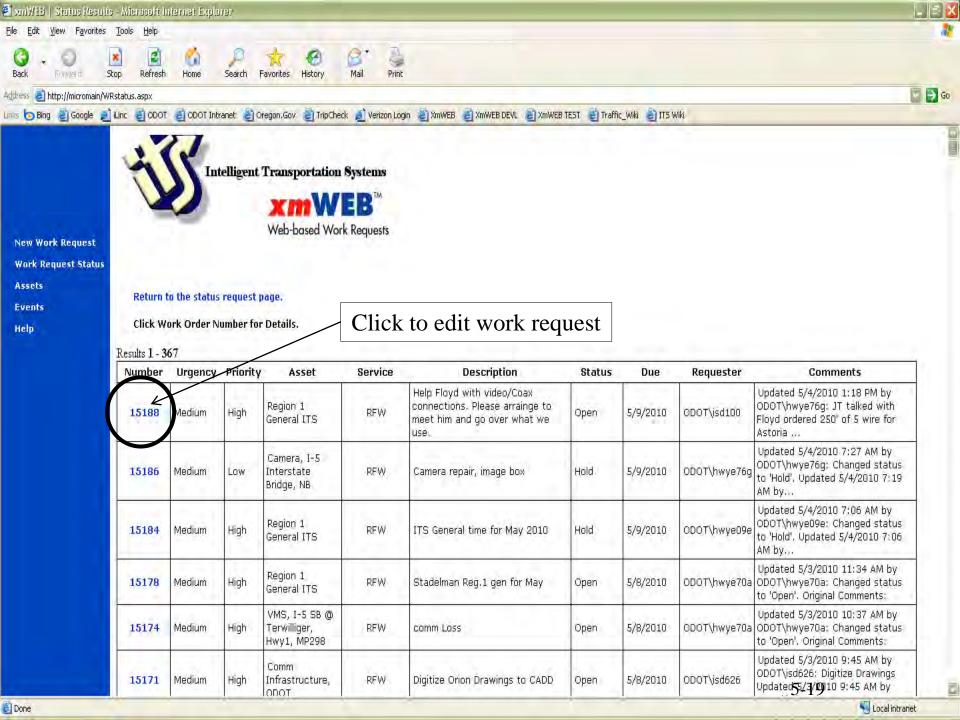


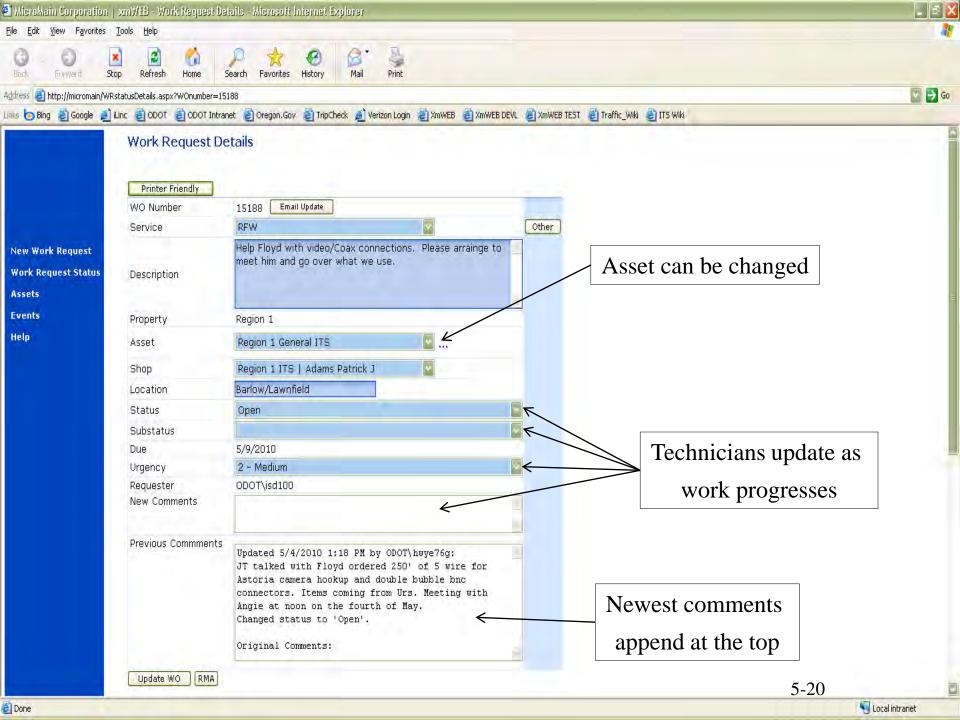


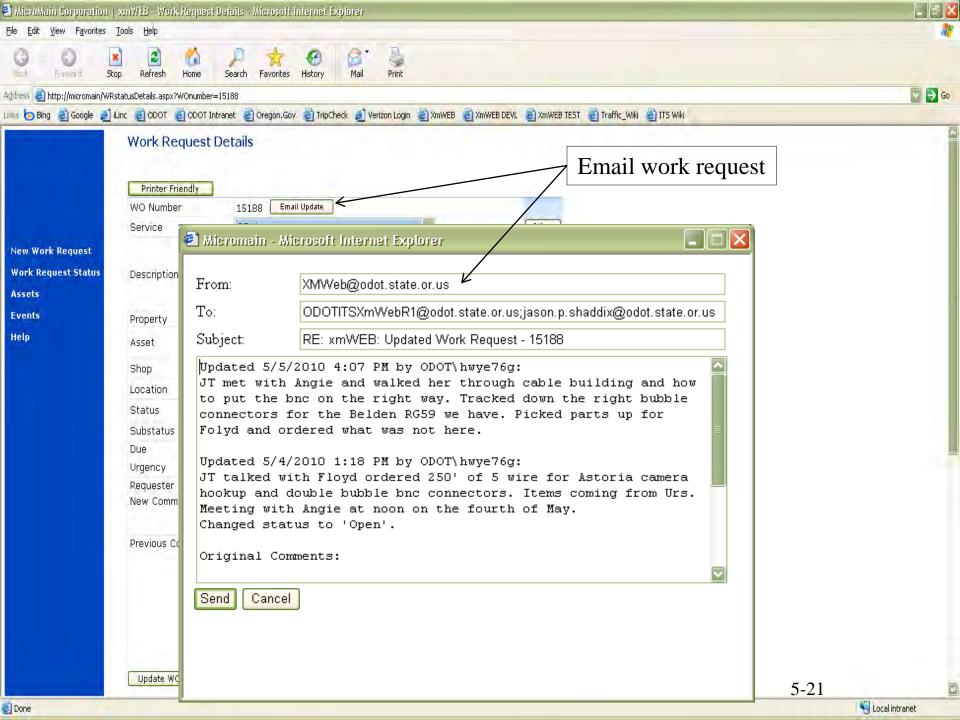


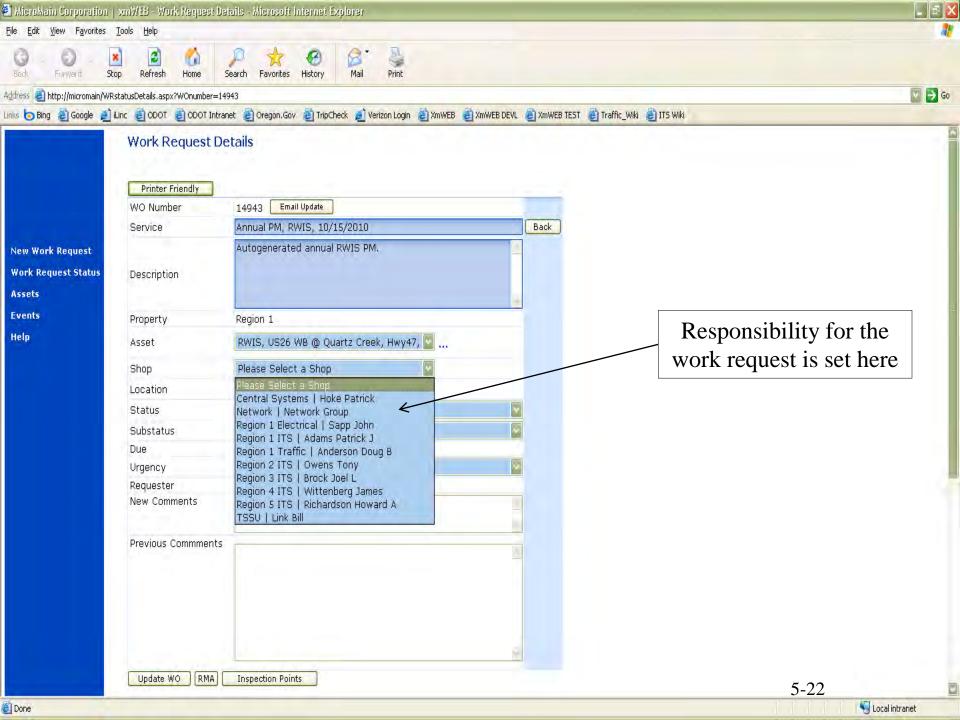


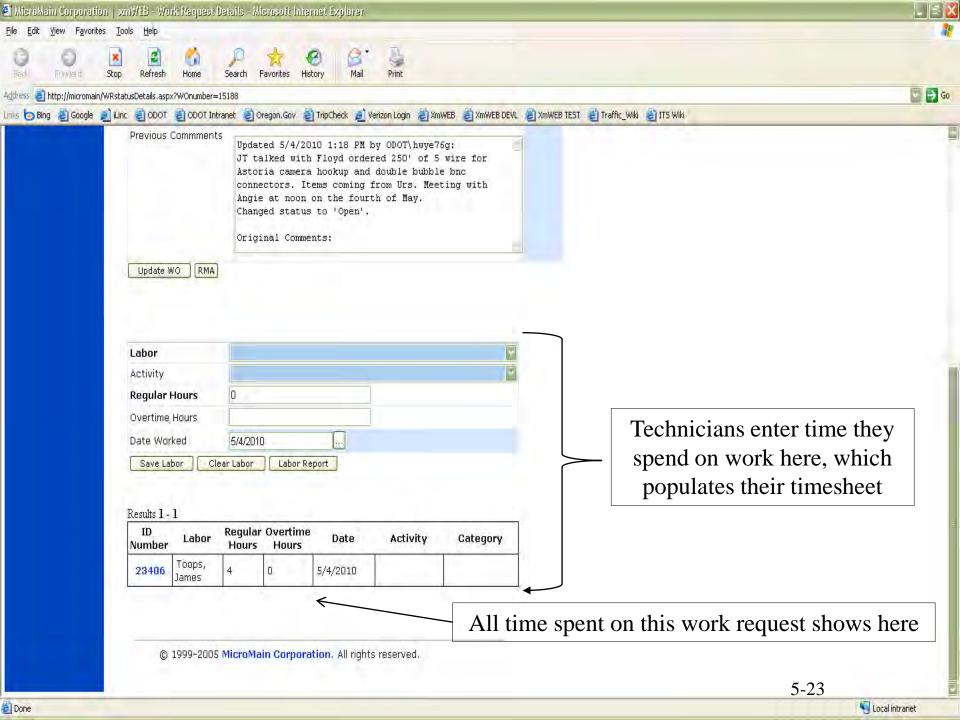


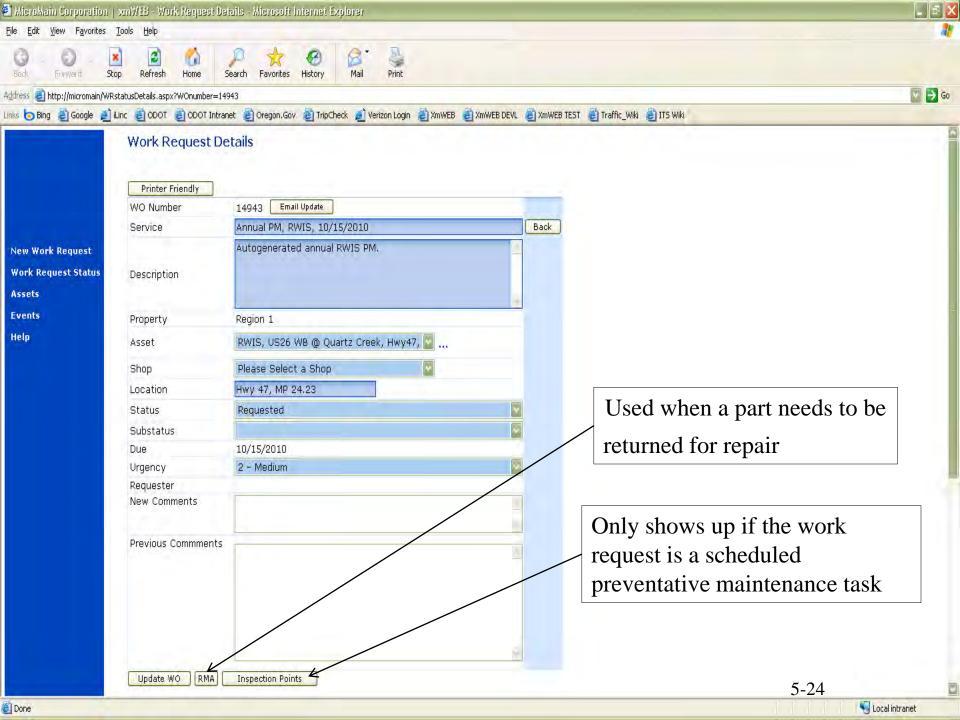


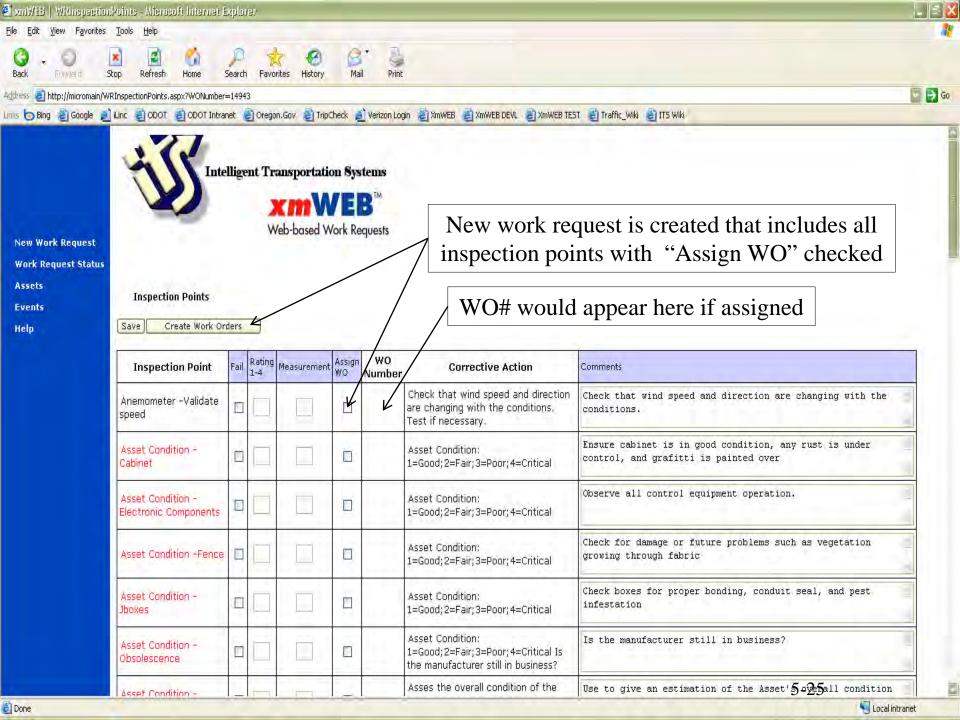


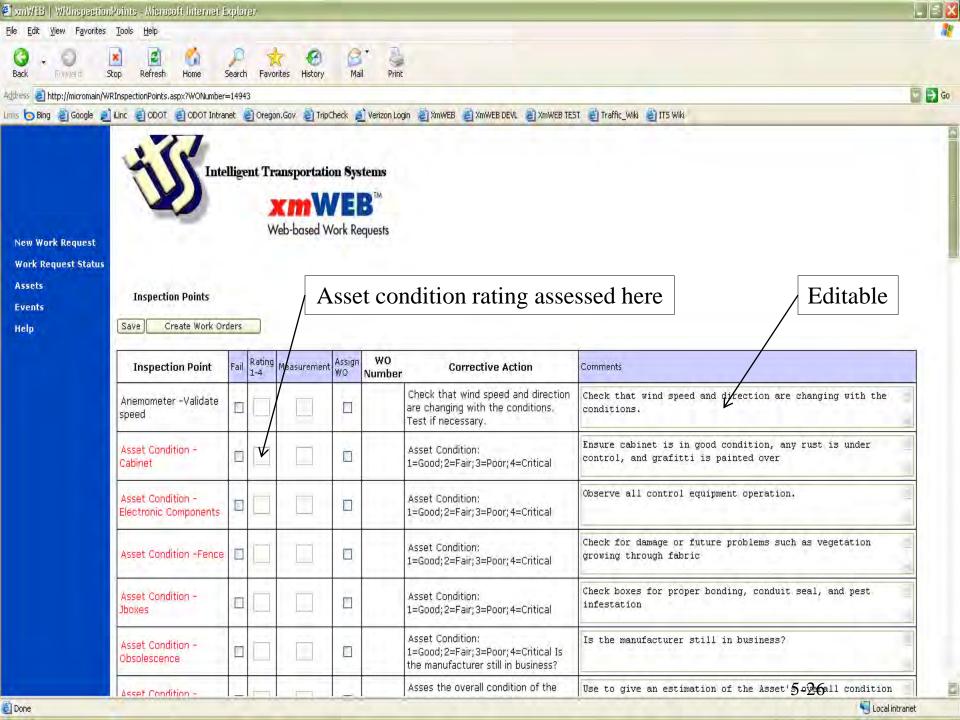


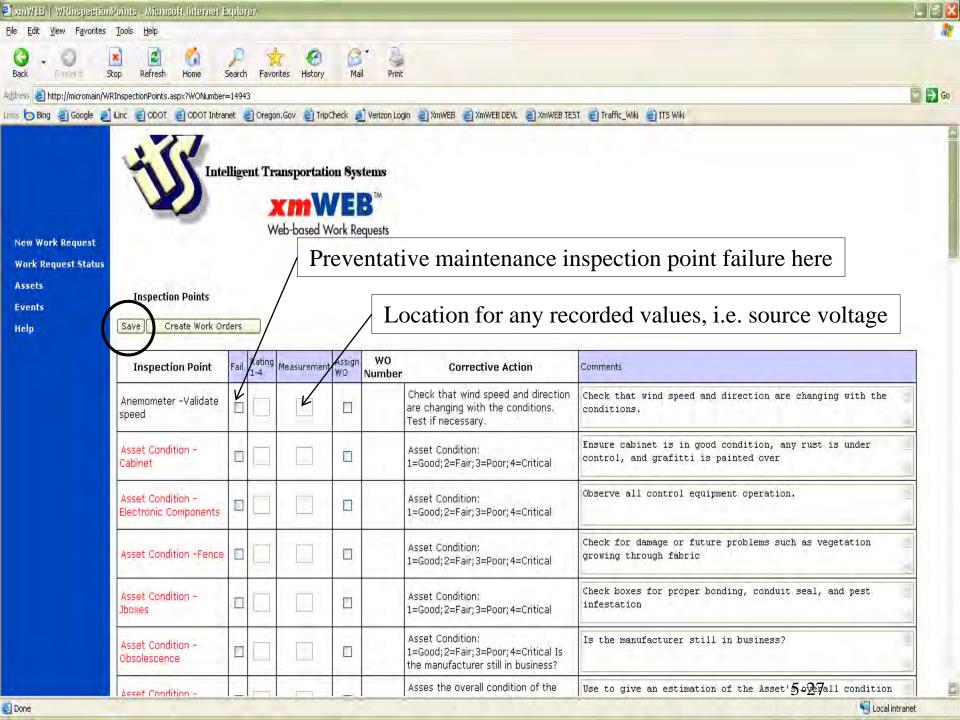












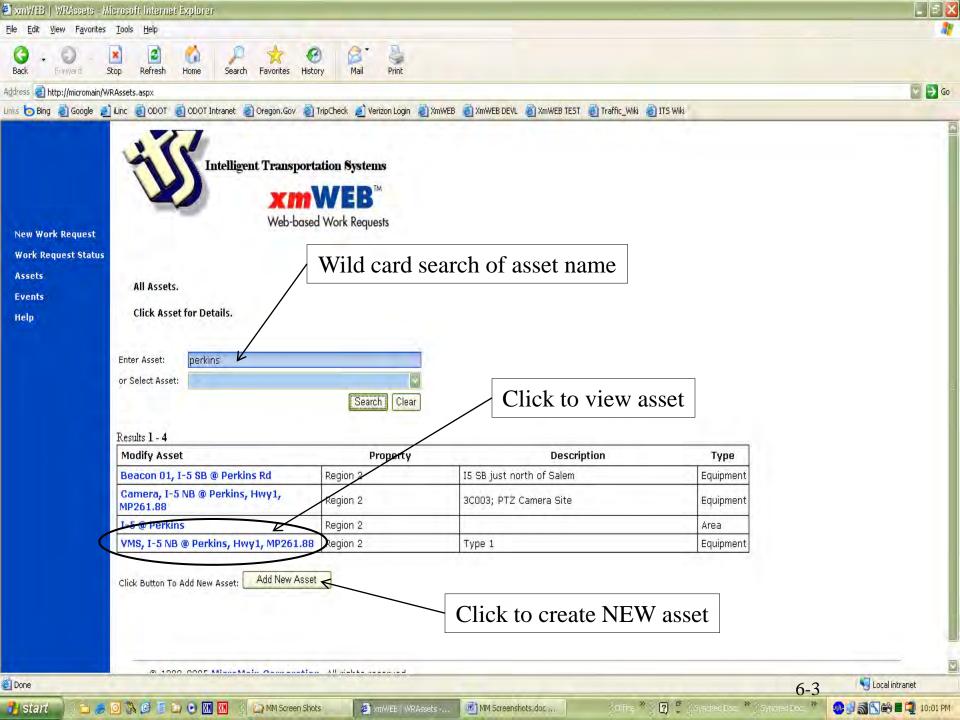
XmWeb Asset Management

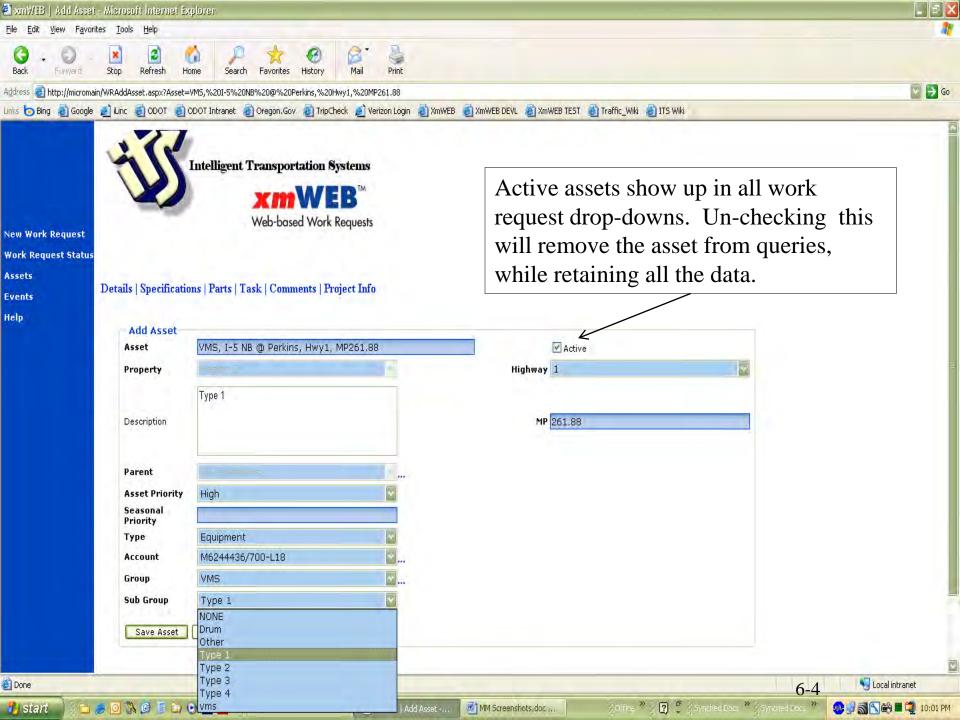
- Create New Assets
- Edit Assets
- Searching for Assets
- Asset Parts
- Asset Specifications

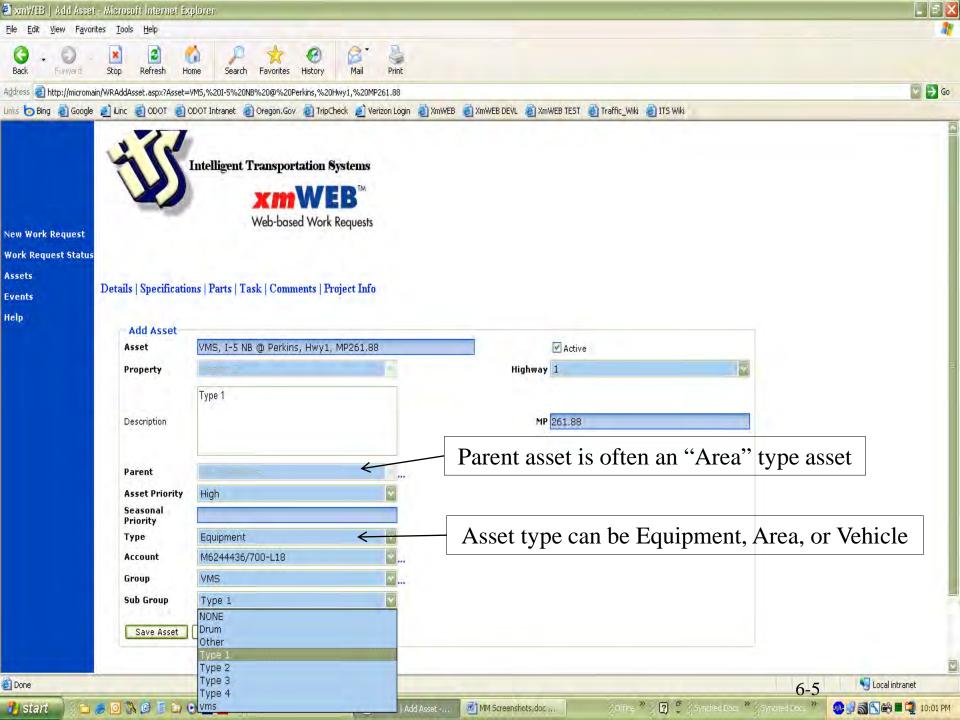


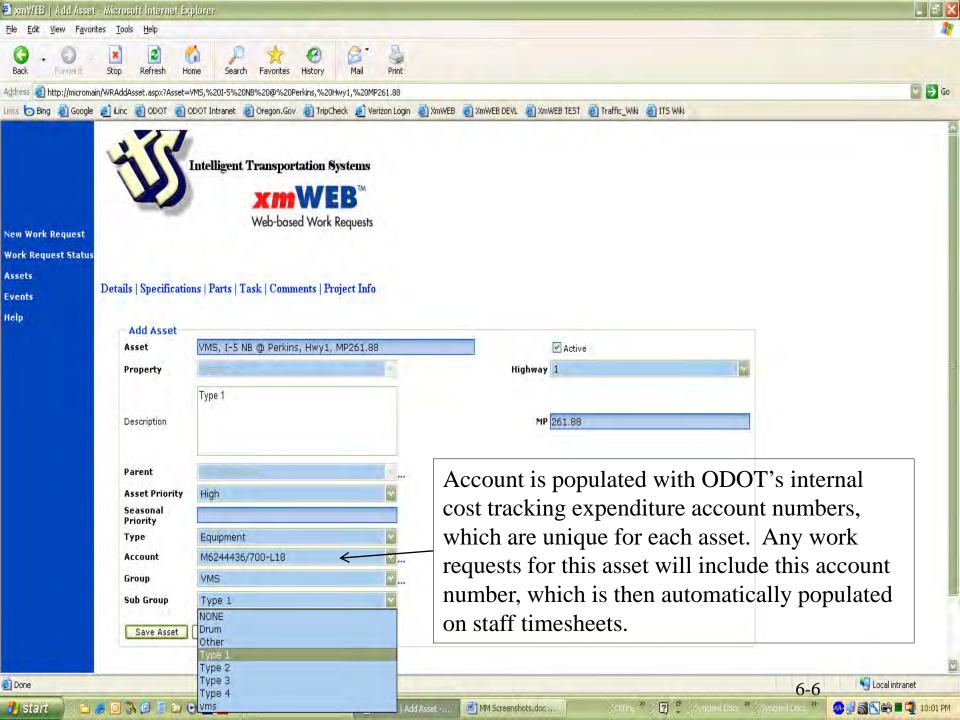
Live Demo XmWeb Assets

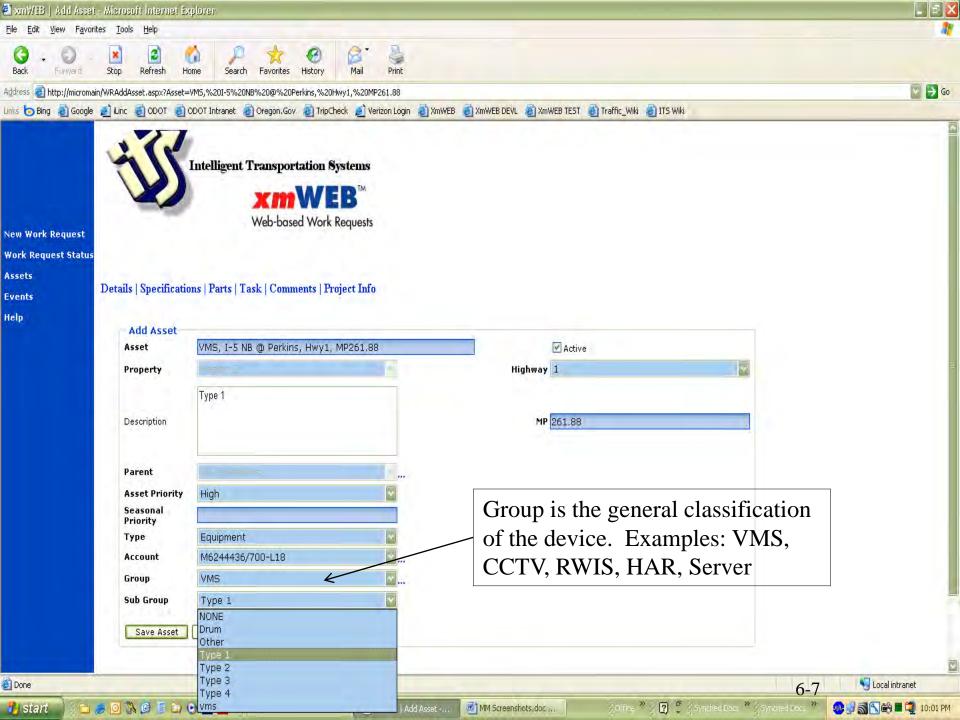


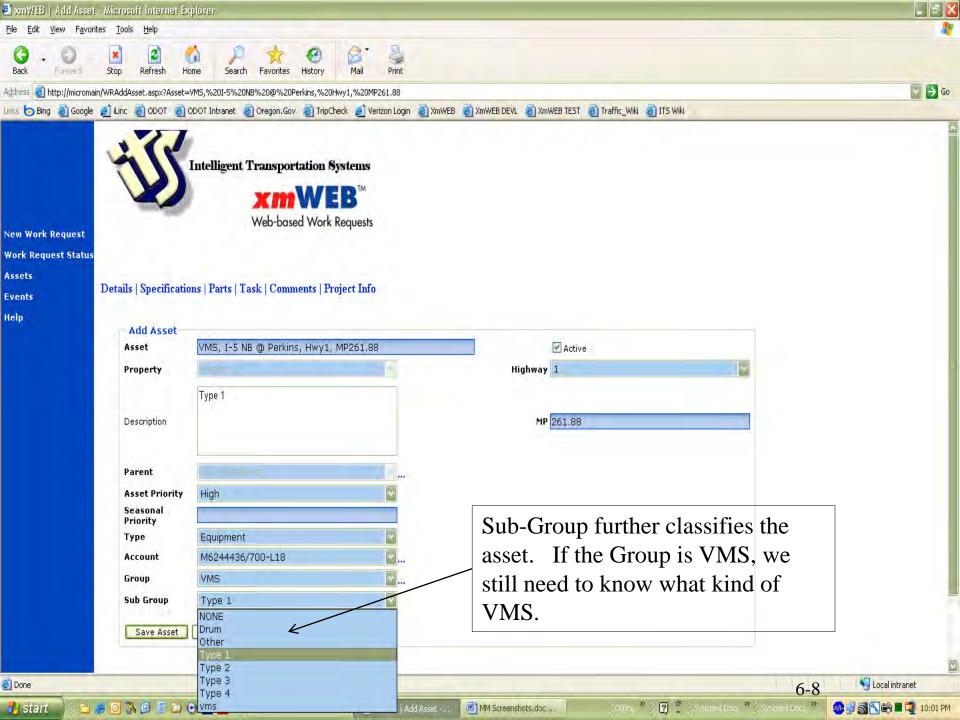


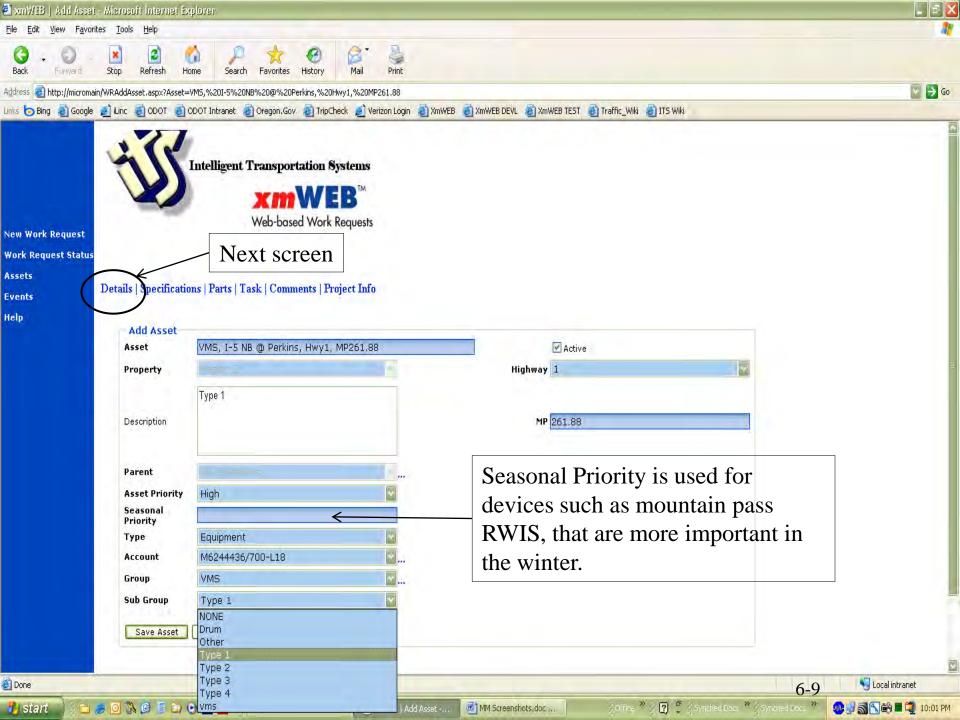


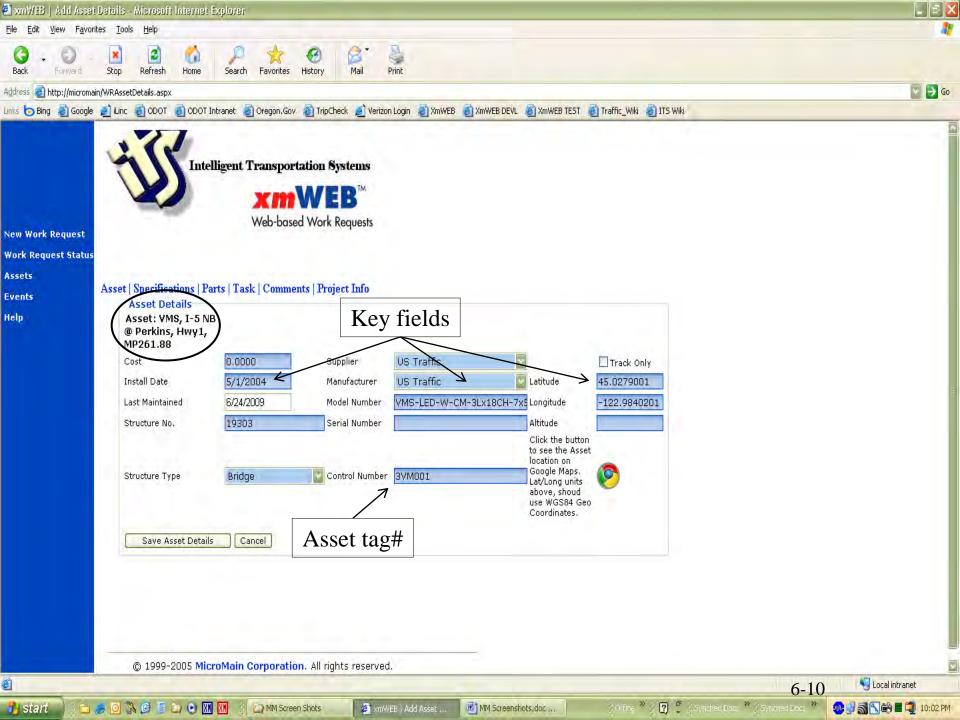


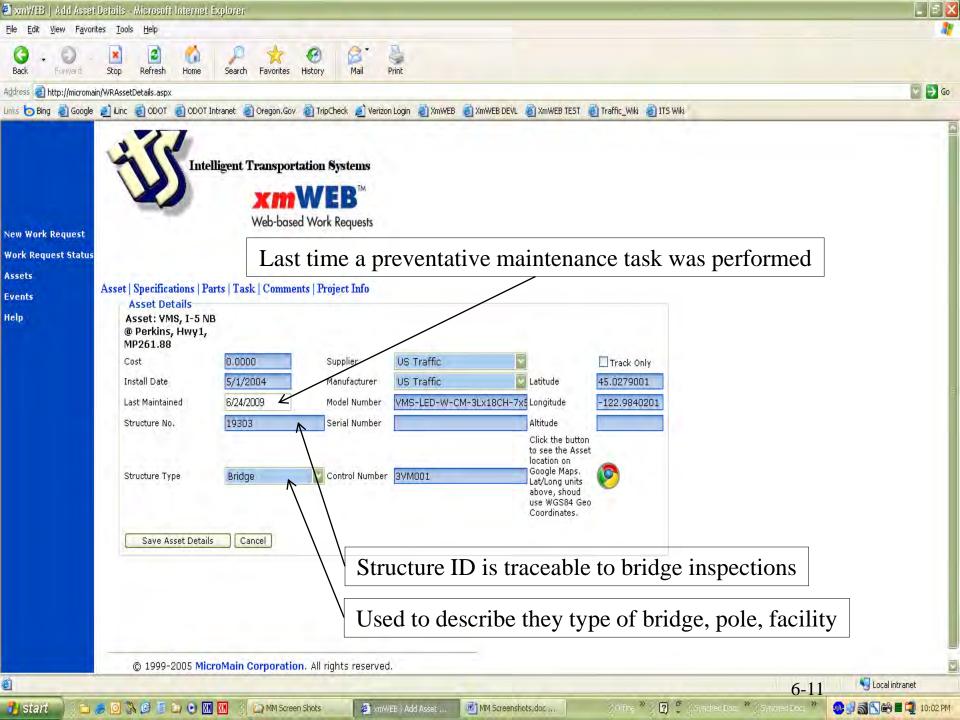


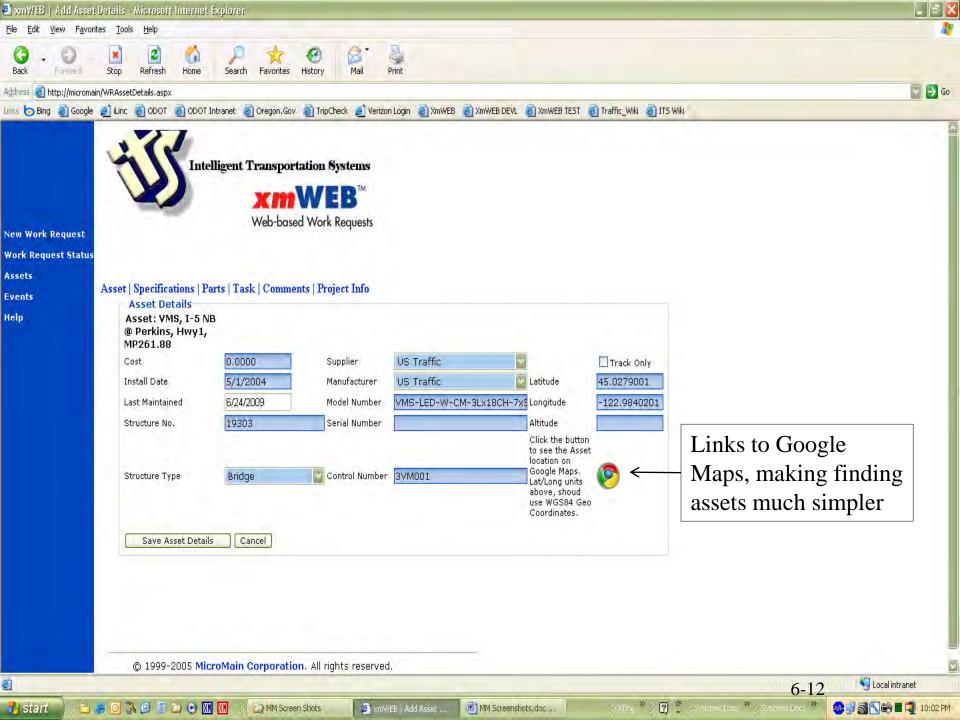


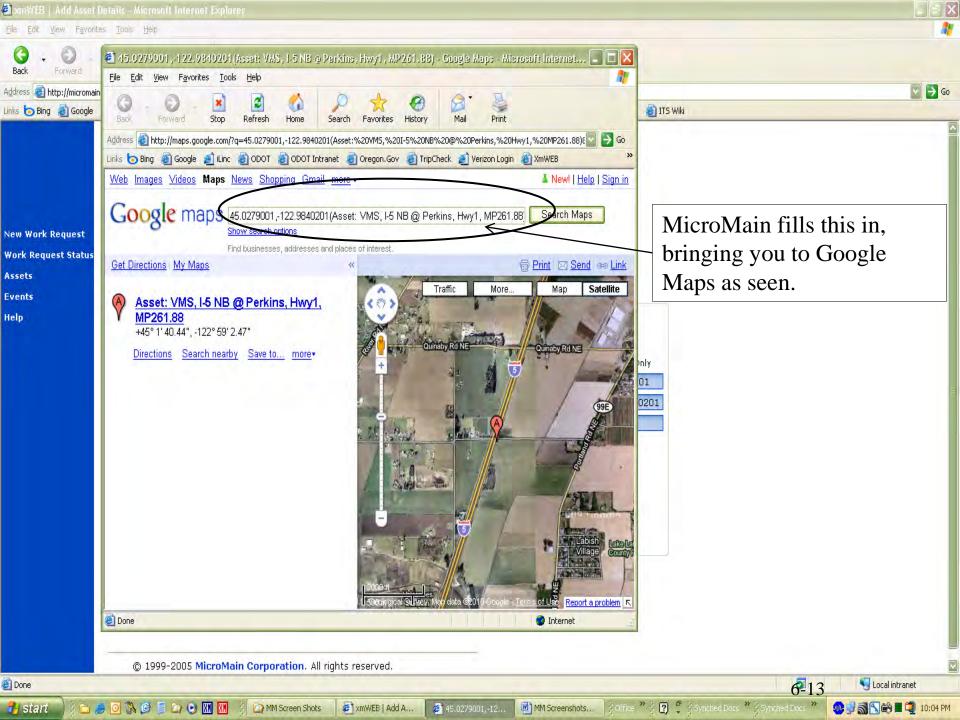


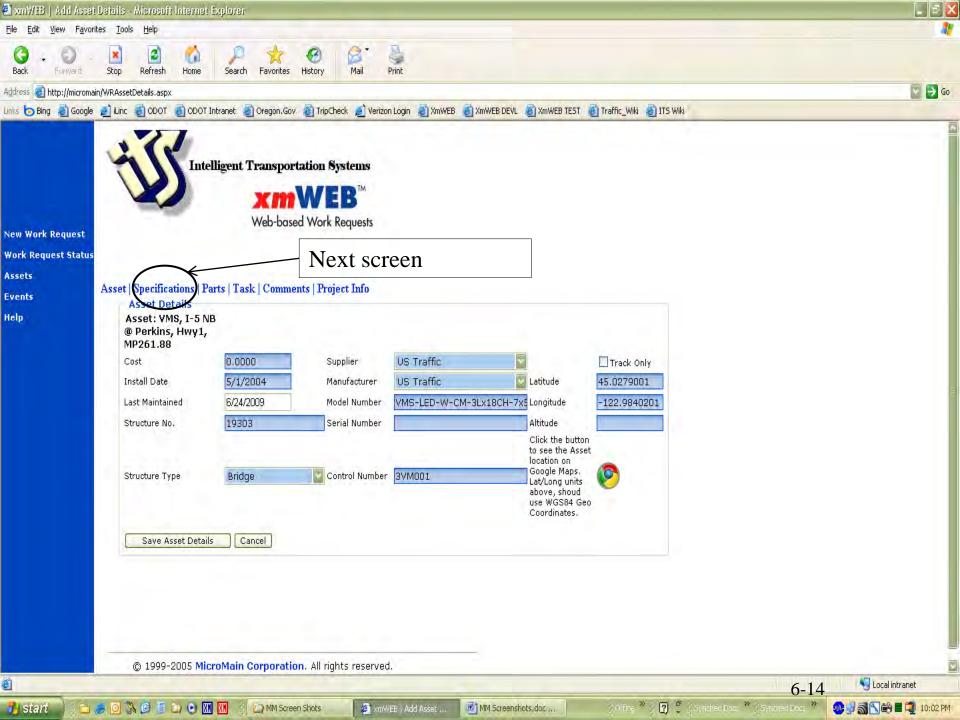


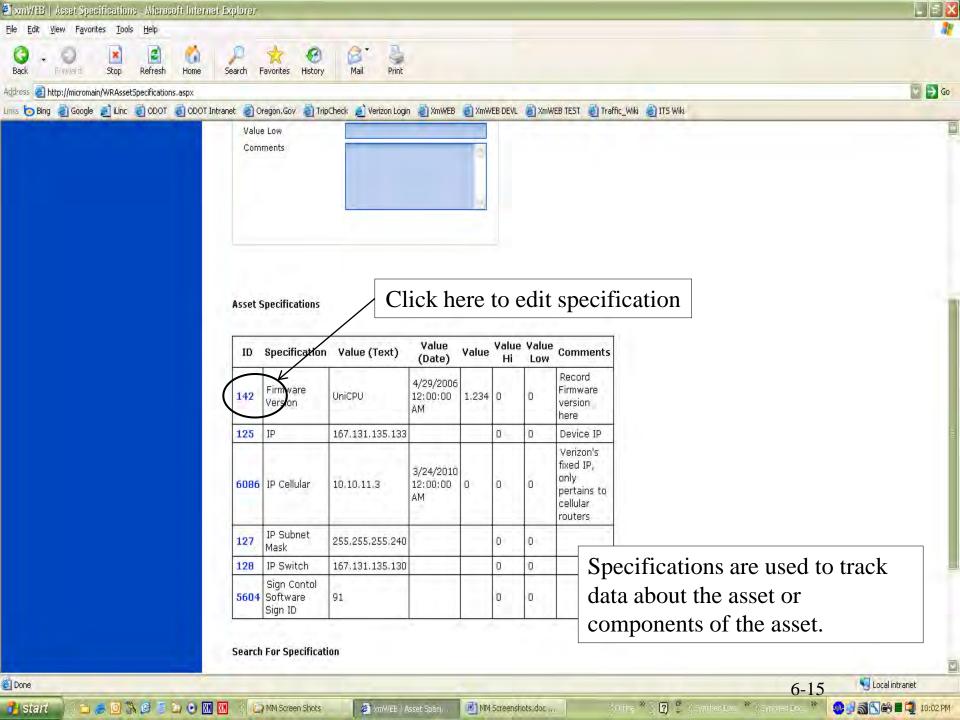


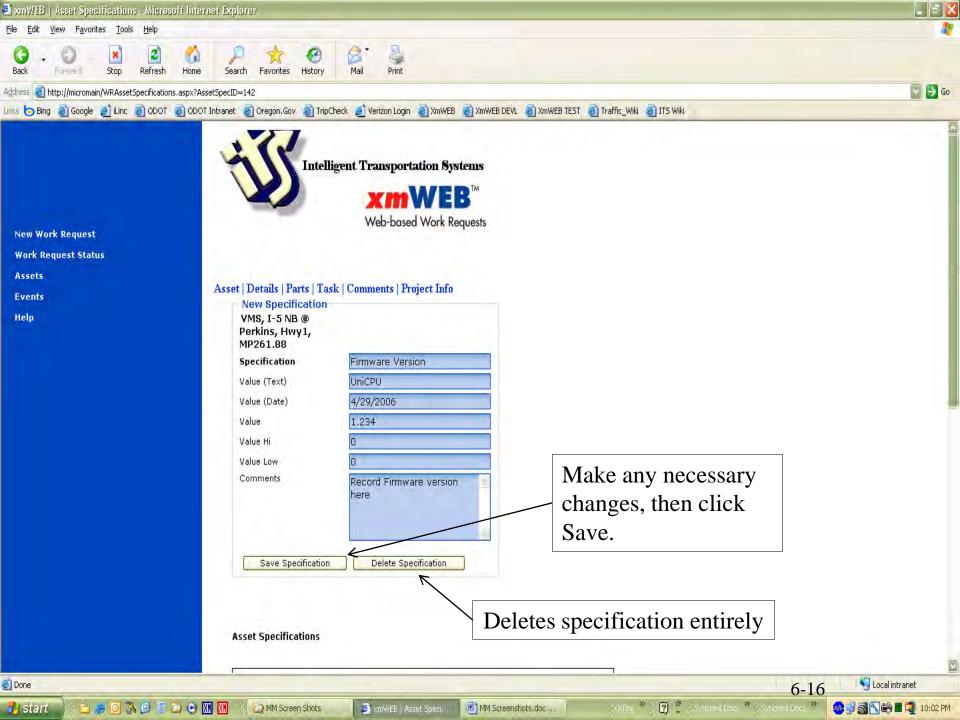


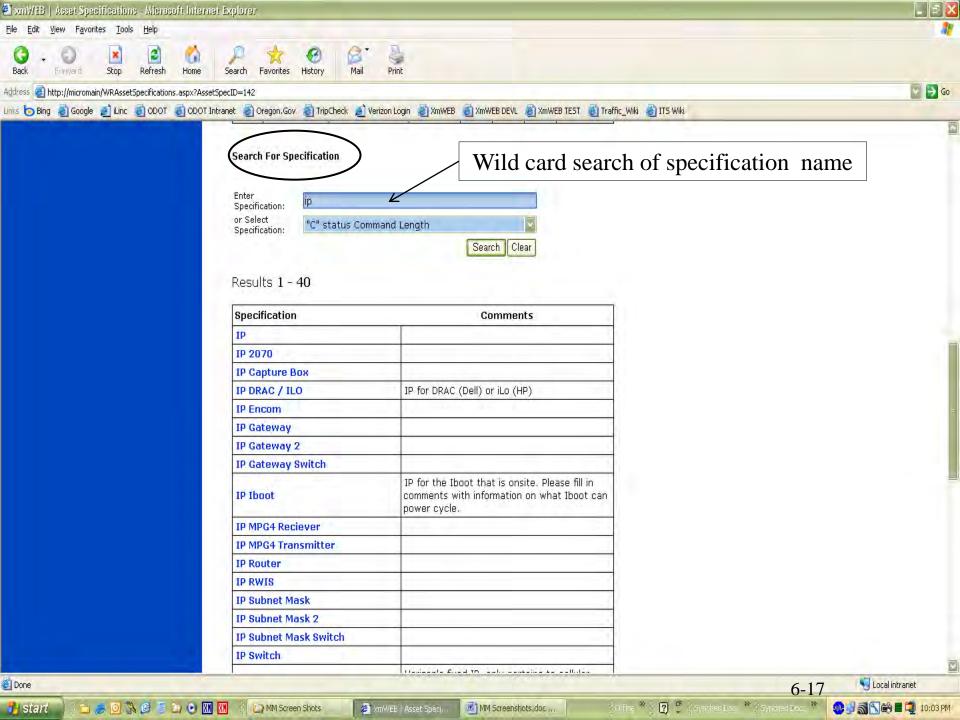


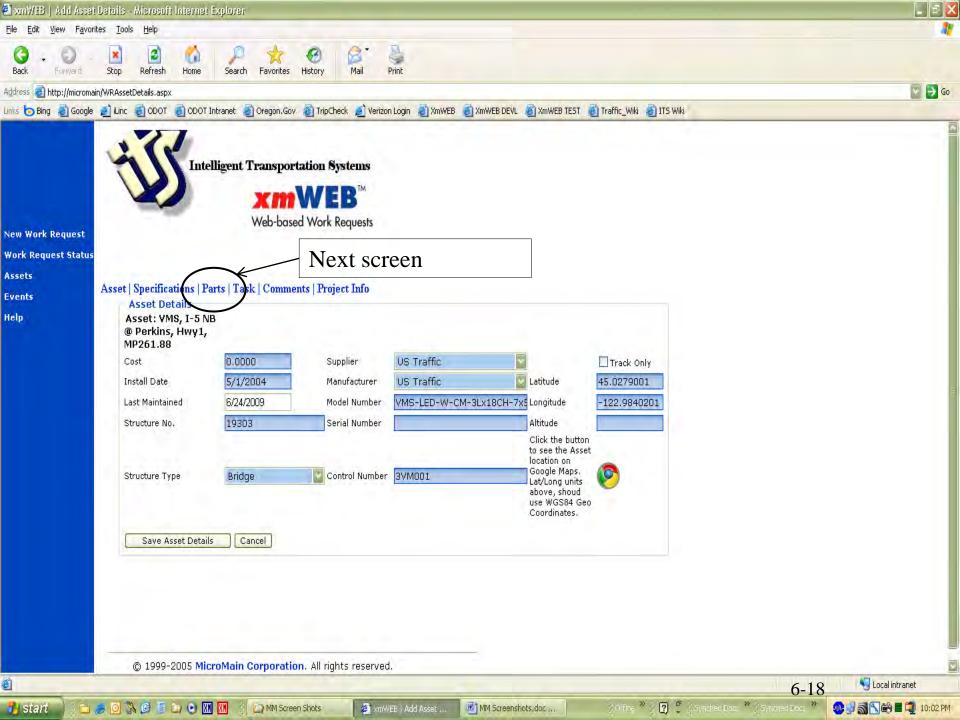


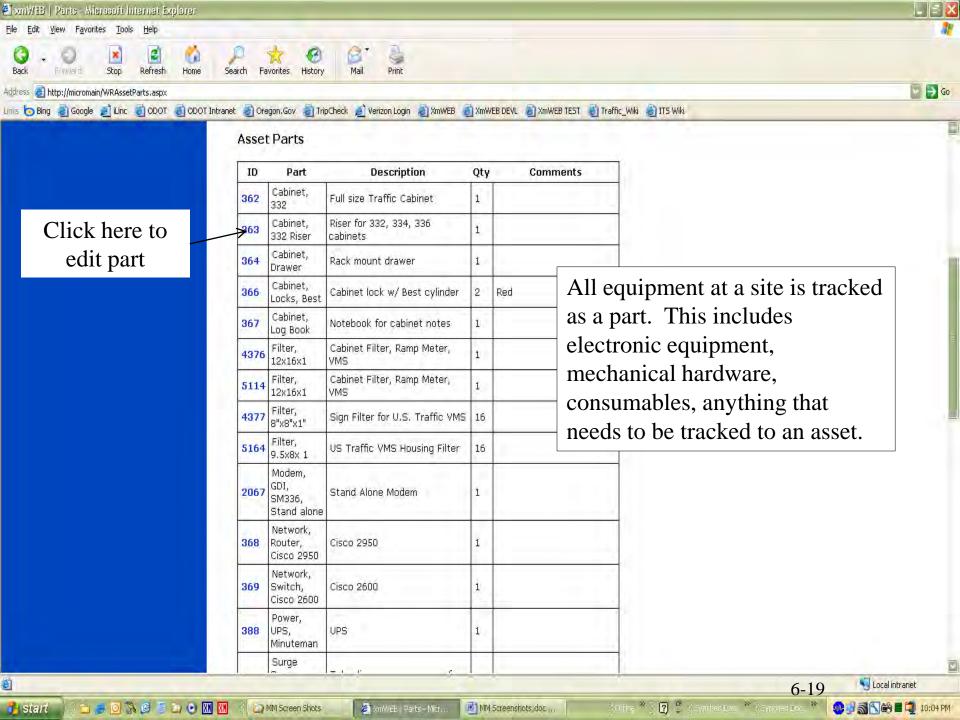


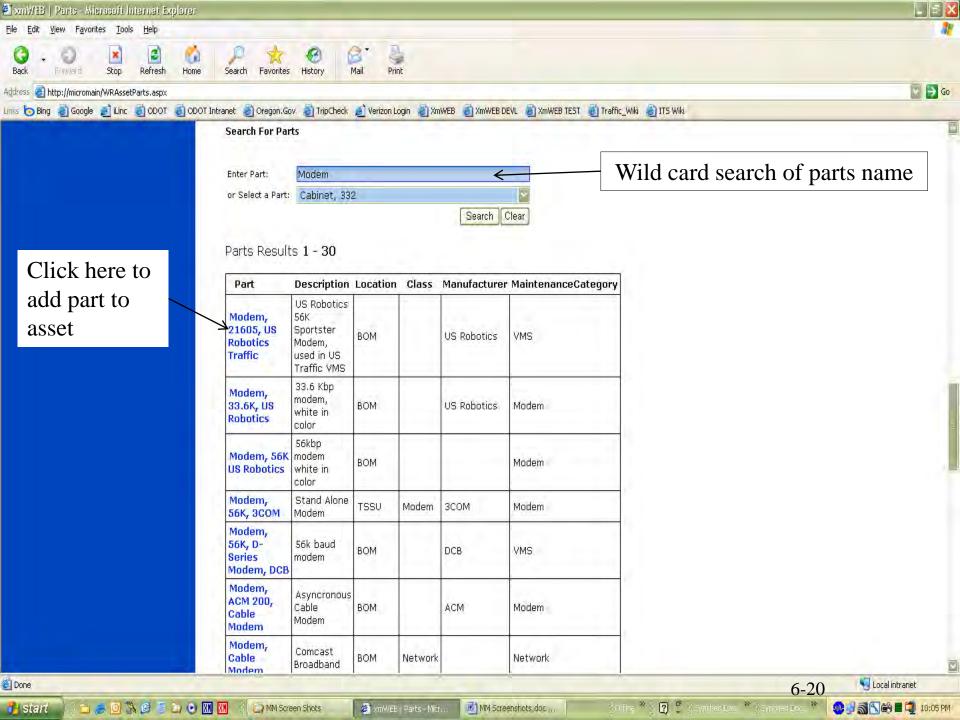


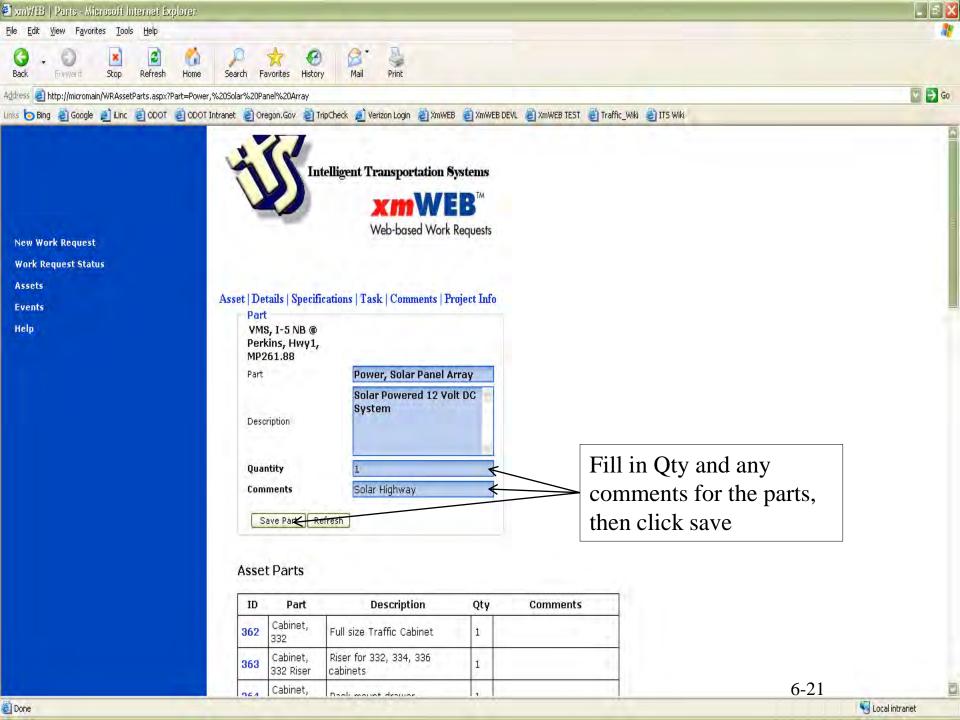


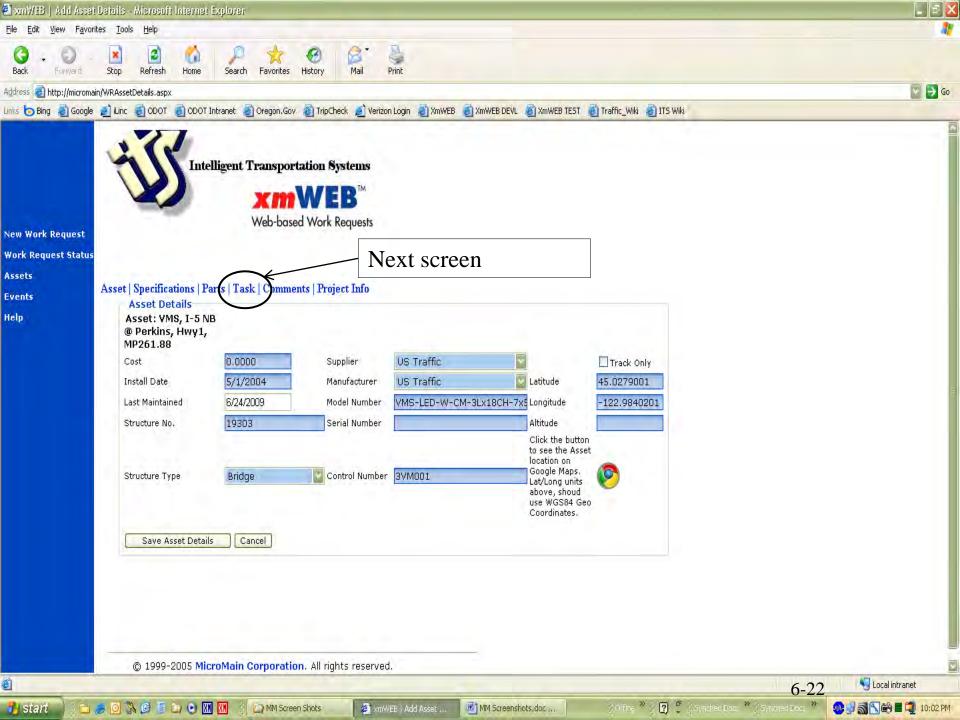


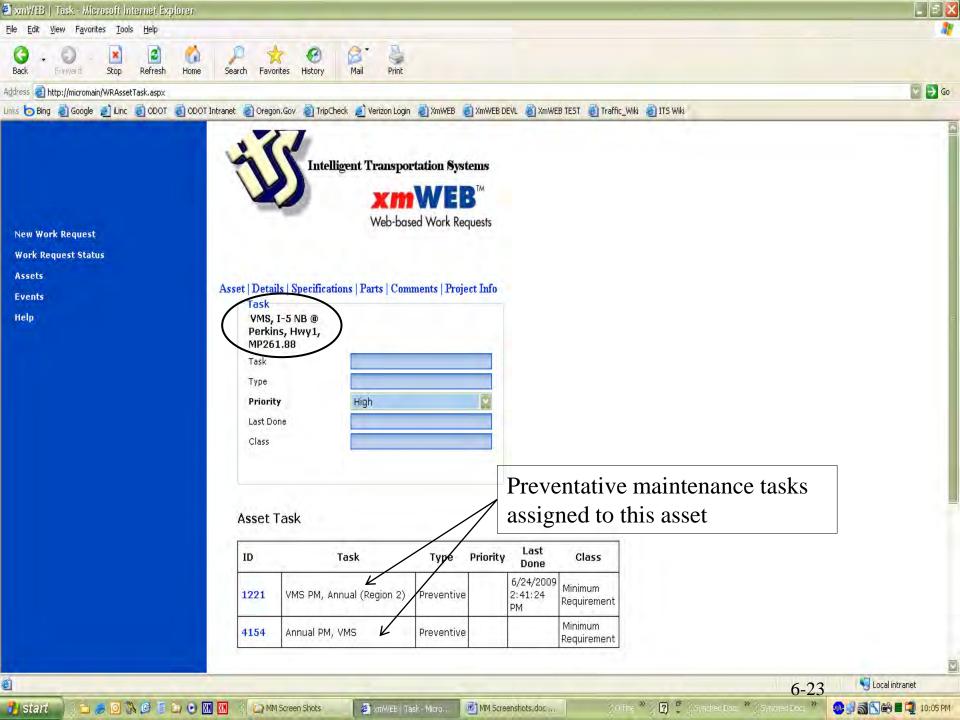


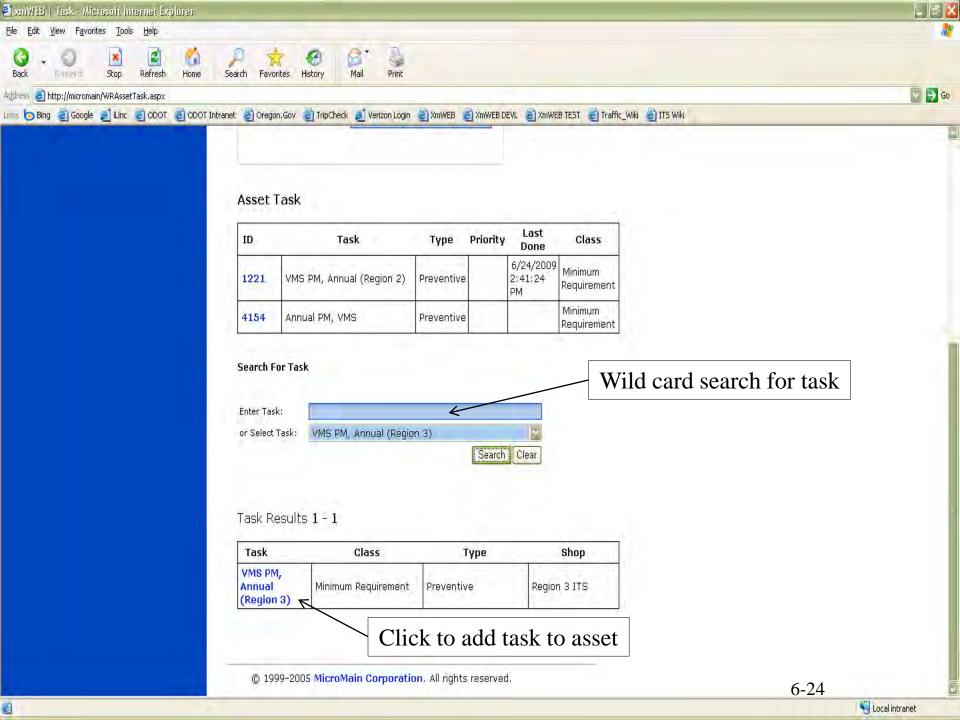


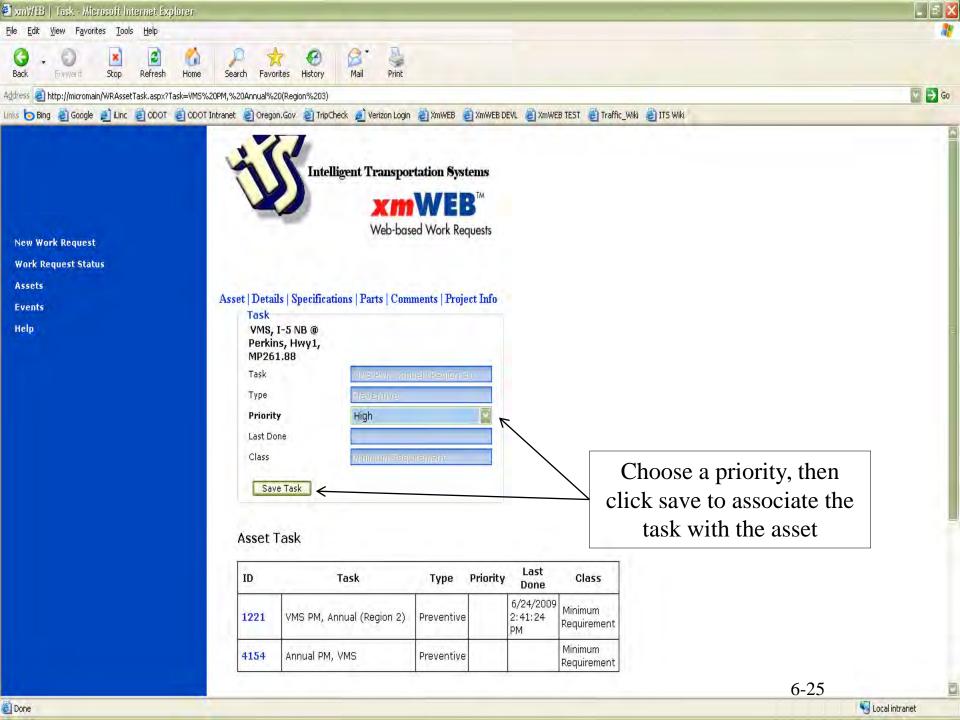


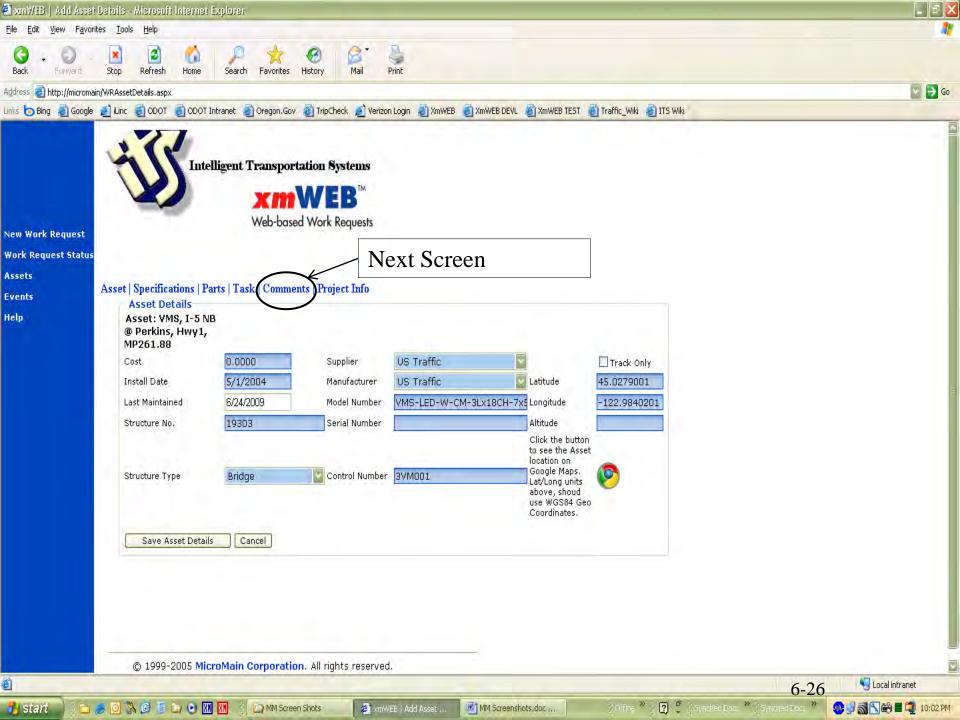


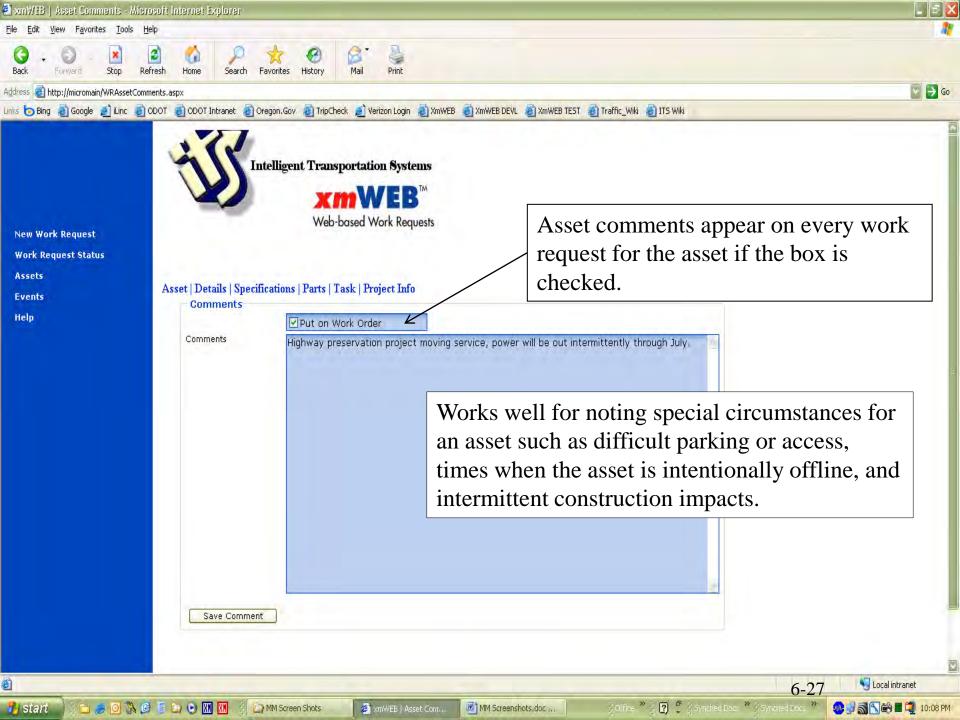


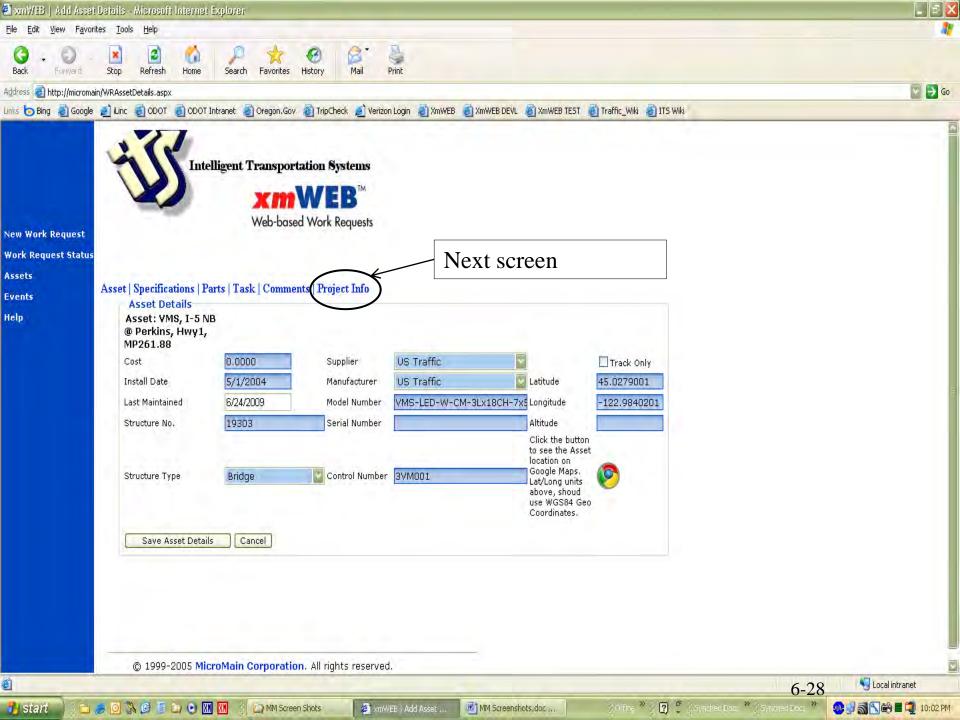


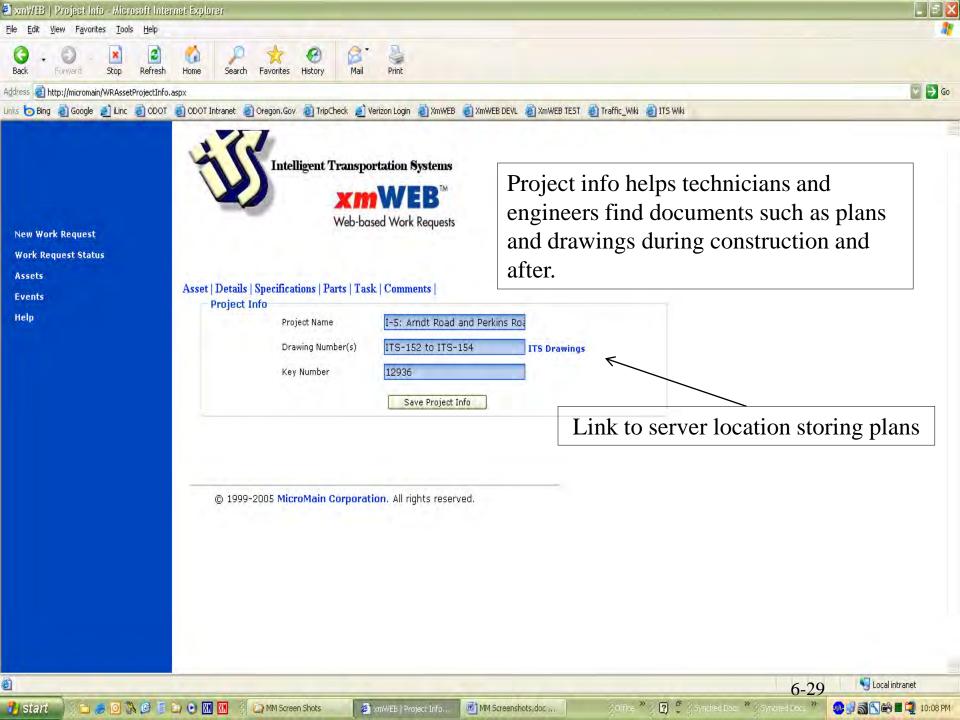


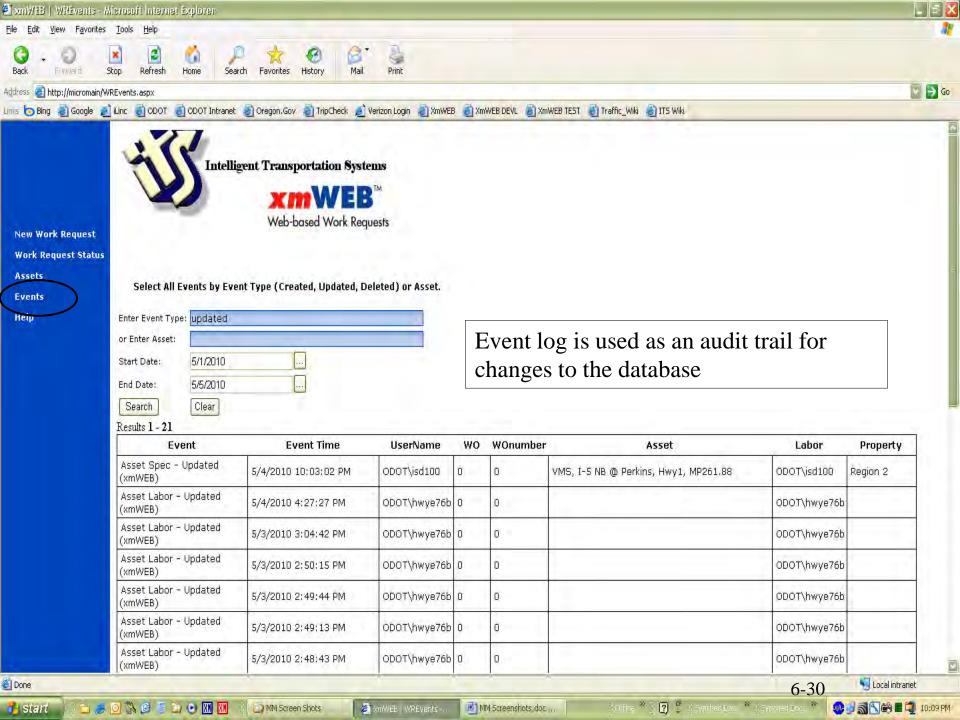


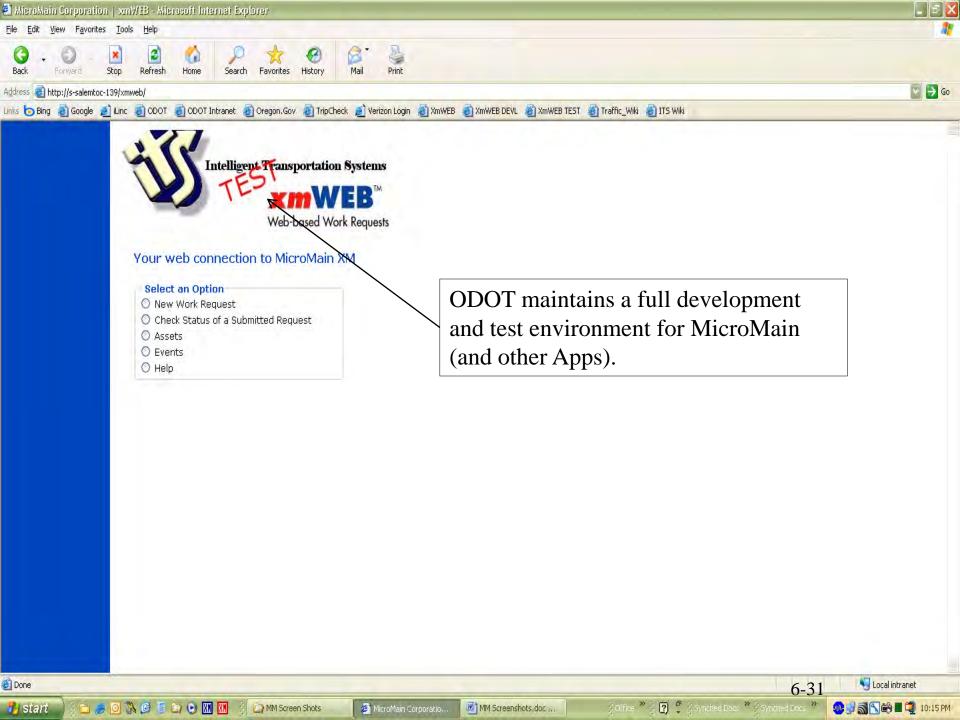












Conclusion

- Challenges Addressed
- Successful Design Decisions
- Areas ODOT Could Improve
- Areas to Avoid
- Lessons Learned



Challenges Addressed

- Work Flow & Request Process
- Communication of Work Request Status and Prioritization
- Coordination of Effort
- Workload Prioritization
- Preventative Maintenance Scheduling and Tracking
- Change Notification
- Micromain (and our adherence to standards)
 helps make statewide after hours support
 possible.

Challenges Addressed

- Asset Inventory Management
- Asset Repair History
- Asset Prioritization
- Asset Condition Rating
- Asset Expenditure Account Tracking



Successful CMMS Design Decisions

- Very simple, fast Request For Work form
 - TOC
 - Technicians on the road
- Focusing on benefits to users in requirements phase
 - Timesheets
 - Asset work history
 - Asset info availability
- Naming convention designed for quick selection

Areas of Future Focus / Improvement

- Performance Measures
- Maintenance Cost Tracking
- Asset Inventory Detail
- Database Housekeeping



Areas to Avoid / Pitfalls

- PDA
 - Synchronization
 - PDA Table updates
 - Version conflict with client
- Barcode Reader
 - Printing barcodes
 - Web form much faster
- Spare Parts Management
 - Administration



Lessons Learned

- Use the Application's Business Rules
- Keep Modifications to a Minimum
- Maintain a Separate Test Environment



Naming Convention

MicroMain	Generic ODOT	Specific Example	Template [Required], {Optional}
Site	ODOT	ODOT	[Database Owner]
Property	Region	Region 1	[Logical Divisions]
Asset (Area)	District	District 2B	[Subdivisions]
	Field		
Asset (Area)	Location	I-5 @	[Highway Name] @ [Nearest or Monument]
		Camera, I-205 @ ,	[Asset Group], [Hwy Name] [Direction of Traffic Flow]
Asset(Equipment)	Camera	Hwy64 MP19.1	@ [Nearest or Monument], {Hwy #}, {Milepoint}
		PVMS, RE052900,	
Asset (Vehicle)	PVMS	P2-03-02	[Asset Class], [Vehicle ID], [Sign Designation]
		RWIS, Flash Card,	
		6061-4042, 5025	[Asset Group], [Part Name], {Manufacturer part#},
Part	Part	ESP	{Firmware rev}

