

CHECKLIST TO DESIGNATE AREAS OF EVALUATION FOR REQUESTS FOR PROPOSAL (RFP)

	REQUISITION NUMBER	DUE DATE	TIME DUE
MDOT PROJECT MANAGER	JOB NUMBER (JN)	CONTROL SECTION (CS)	
DESCRIPTION			
MDOT PROJECT MANAGER: Check all items to be included in RFP WHITE = REQUIRED ** = OPTIONAL Check the appropriate Tier in the box below		CONSULTANT: Provide only checked items below in proposal	
<input type="checkbox"/> TIER I (\$50,000 - \$150,000)	<input type="checkbox"/> TIER II (\$150,000-\$1,000,000)	<input type="checkbox"/> TIER III (>\$1,000,000)	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Understanding of Service **
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<i>Innovations</i>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Organizational Chart
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Qualifications of Team
Not required as part of Official RFP	Not required as part of Official RFP	<input type="checkbox"/>	Quality Assurance/Quality Control **
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Location: The percentage of work performed in Michigan will be used for all selections unless the project is for on-site p=inspection or survey activities, then location should be scored using the distance from the consultant office to the on-site inspection or survey activity.
N/A	N/A	<input type="checkbox"/>	Presentation **
N/A	N/A	<input type="checkbox"/>	Technical Proposal (if Presentation is required)
3 pages (MDOT Forms not counted) (No Resumes)	7 pages (MDOT Forms not counted)	14 pages (MDOT forms not counted)	Total maximum pages for RFP not including key personnel resumes. Resumes limited to 2 pages per key staff personnel.

PROPOSAL AND BID SHEET EMAIL ADDRESS – mdot-rfp-response@michigan.gov

GENERAL INFORMATION

Any questions relative to the scope of services must be submitted by e-mail to the MDOT Project Manager. Questions must be received by the Project Manager at least five (5) working days prior to the due date and time specified above. All questions and answers will be placed on the MDOT website as soon as possible after receipt of the questions, and at least three (3) days prior to the RFP due date deadline. The names of vendors submitting questions will not be disclosed.

MDOT is an equal opportunity employer and MDOT DBE firms are encouraged to apply. The participating DBE firm, as currently certified by MDOT's Office of Equal Opportunity, shall be listed in the Proposal.

MDOT FORMS REQUIRED AS PART OF PROPOSAL SUBMISSION

5100D – Request for Proposal Cover Sheet

5100J – Consultant Data and Signature Sheet (Required only for firms not currently prequalified with MDOT)

(These forms are not included in the proposal maximum page count.)

REQUEST FOR PROPOSAL

The Michigan Department of Transportation (MDOT) is seeking professional services for the project contained in the attached scope of services.

If your firm is interested in providing services, please indicate your interest by submitting a Proposal, Proposal/Bid Sheet or Bid Sheet as indicated below. The documents must be submitted in accordance with the latest (Consultant/Vendor Selection Guidelines for Services Contracts” and “Guideline for Completing a Low Bid Sheet(S)*, if a low bid is involved as part of the selection process. **Reference Guidelines are available on MDOT’s website under Doing Business > Vendor/Consultant Services >Vendor/Consultant Selections.**

RFP SPECIFIC INFORMATION

ENGINEERING SERVICES BUREAU OF TRANSPORTATION PLANNING OTHER

THE SERVICE WAS POSTED ON THE ANTICIPATED QUARTERLY REQUESTS FOR PROPOSALS
 NO YES DATED _____ THROUGH _____

<input type="checkbox"/> Prequalified Services – See the attached Scope of Services for required Prequalification Classifications.	<input type="checkbox"/> Non-Prequalified Services – If selected, the vendor must make sure that current financial information, including labor rates, overhead computations, and financial statements, if overhead is not audited, is on file with MDOT’s Office of Commission Audits. This information must be on file for the prime vendor and all sub vendors so that the contract will not be delayed. Form 5100J is required with Proposal for firms not currently prequalified with MDOT
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Qualifications Based Selection – Use Consultant/Vendor Selection Guidelines

For all Qualifications Based Selections, the selection team will review the information submitted and will select the firm considered most qualified to perform the services based on the proposals. The selected firm will be asked to prepare a priced proposal. Negotiations will be conducted with the firm selected.

For a cost plus fixed fee contract, the selected vendor must have a cost accounting system to support a cost plus fixed fee contract. This type of system has a job-order cost accounting system for the recording and accumulation of costs incurred under its contracts. Each project is assigned a job number so that costs may be segregated and accumulated in the vendor’s job-order accounting system.

Qualification Based Selection / Low Bid – Use Consultant/Vendor Selection Guidelines. See Bid Sheet instructions for additional information.

For Qualification Review/Low Bid selections, the selection team will review the proposals submitted. The vendor that has met established qualification threshold and with the lowest bid will be selected.

Best Value – Use Consultant/Vendor Selection Guidelines, See Bid Sheet Instructions below for additional information. The bid amount is a component of the total proposal score, not the determining factor of the selection.

Low Bid (no qualifications review required – no proposal required.) See Bid Sheet Instructions below for additional instructions.

BID SHEET INSTRUCTIONS

Bid Sheet(s) must be submitted in accordance with the “Guidelines for Completing a Low Bid Sheet(s)* (available on MDOT’s website). Bid Sheet(s) are located at the end of the Scope of Services. Submit bid sheet(s) with the proposal, to the email address: mdot-rfp-response@michigan.gov. Failure to comply with this procedure may result in your bid being rejected from consideration.

PARTNERSHIP CHARTER AGREEMENT

MDOT and ACEC created a Partnership Charter Agreement which establishes guidelines to assist MDOT and Consultants in successful partnering. Both the Consultant and MDOT Project Manager are reminded to review the [ACEC-MDOT Partnership Charter Agreement](#) and are asked to follow all communications, issues resolution and other procedures and guidance’s contained therein.

**NOTIFICATION
MANDATORY ELECTRONIC SUBMITTAL**

Proposals submitted for this project must be submitted electronically.

The following are changes to the Proposal Submittal Requirements:

- Eliminated the Following Requirements:
 - Safety Program
 - Communication Plan
 - Past Performance as *a separate section*
 - Separate section for DBE Statement of goals. Include information in Qualification of Team section

- Implemented the Following Changes:
 - All proposals require an Organization Chart
 - Resumes must be a maximum of two pages
 - Only Key (lead) staff resumes may be submitted
 - Tier III proposal reduced from 19 to 14 pages
 - Forms 5100D, 5100I, and 5100G combined – 5100D
 - Forms 5100B and 5100H combined – 5100B
 - RFP's will be posted on a weekly basis -- on Mondays

The following are Requirements for Electronic Submittals:

- Proposals must be prepared using the most current guidelines
- The proposal must be bookmarked to clearly identify the proposal sections (See Below)
- For any section not required per the RFP, the bookmark must be edited to include “N/A” after the bookmark title.
Example: Understanding of Service – N/A
- Proposals must be assembled and saved as a single PDF file
- PDF file must be 5 megabytes or smaller
- PDF file must be submitted via e-mail to MDOT-RFP-Response@michigan.gov
- MDOT's requisition number and company name must be included in the subject line of the e-mail. The PDF shall be named using the following format:
 - Requisition#XXX_Company Name.PDF
- MDOT will not accept multiple submittals
- Proposals must be *received* by MDOT on or before the due date and time specified in each RFP

If the submittals do not comply with the requirements, they may be determined unresponsive.

The Consultant's will receive an e-mail reply/notification from MDOT when the proposal is received. Please retain a copy of this e-mail as proof that the proposal was received on time. **Consultants are responsible for ensuring the MDOT receives the proposal on time.**

****Contact Contract Services Division immediately at 517-373-4680 if you do not get an auto response****

Required Bookmarking Format:

- I. Request for Proposal Cover Sheet Form 5100D
 - A. Consultant Data and Signature Sheet, Form 5100J (if applicable)
- II. Understanding of Service
 - A. Innovations
- III. Qualifications of Team
 - A. Structure of Project Team
 - 1. Role of Firms
 - 2. Role of Key Personnel
 - B. Organization Chart
 - C. Location
- IV. Quality Assurance / Quality Control Plan
- V. Resumes of Key Staff
- VI. Pricing Documents/Bid Sheet (if applicable)

2/14/12

**NOTIFICATION
E-VERIFY REQUIREMENTS**

E-Verify is an Internet based system that allows an employer, using information reported on an employee's Form I-9, Employment Eligibility Verification, to determine the eligibility of that employee to work in the United States. There is no charge to employers to use E-Verify. The E-Verify system is operated by the Department of Homeland Security (DHS) in partnership with the Social Security Administration. E-Verify is available in Spanish.

The State of Michigan is requiring, under Public Act 200 of 2012, Section 381, that as a condition of each contract or subcontract for construction, maintenance, or engineering services that the pre-qualified contractor or subcontractor agree to use the E-Verify system to verify that all persons hired during the contract term by the contractor or subcontractor are legally present and authorized to work in the United States.

Information on registration for and use of the E-Verify program can be obtained via the Internet at the DHS Web site: <http://www.dhs.gov/E-Verify>.

The documentation supporting the usage of the E-Verify system must be maintained by each consultant and be made available to MDOT upon request.

It is the responsibility of the prime consultant to include the E-Verify requirement documented in this NOTIFICATION in all tiers of subcontracts.

9/13/12

Michigan Department of Transportation

**SCOPE OF SERVICE
FOR
DESIGN SERVICES
Intelligent Transportation Systems
Asset Management System Hosting, Maintenance and Enhancements**

CONTROL SECTION: TBD

JOB NUMBER: TBD

PROJECT LOCATION: Statewide

DESCRIPTION OF WORK:

This work consists of hosting, maintaining, providing; hardware, software, hardware/software enhancements, and data collection/inputting on the MDOT ITS Asset Management System statewide.

PRIMARY PREQUALIFICATION CLASSIFICATION:

Intelligent Transportation System – Design and System Manager

SECONDARY PREQUALIFICATION CLASSIFICATION:

None

ANTICIPATED START DATE : November 1, 2013

ANTICIPATED COMPLETION DATE: November 1, 2023

MDOT PROJECT MANAGER: Michele Mueller
Michigan Department of Transportation
Detroit Operations Service Center
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Detroit, MI 48226
Email: muellerm2@michigan.gov
Tel: (313)-256-9803
Fax: (313)-256-9036

DBE REQUIREMENT: 0%

The Consultant shall contact the MDOT Project Manager prior to beginning any work on the project.

The Consultant's project manager shall be an engineer licensed in the State of Michigan with relevant experience in ITS systems engineering and design services. The Consultant project manager shall be an employee of the primary consulting firm responding to the RFP and not a sub consultant or Consultant.

QUESTIONS:

All questions from firms concerning the RFP shall be submitted in writing to the MDOT Project Manager no later than 12:00 pm EST on October 26, 2013. All questions shall be submitted in writing either via fax or email to the MDOT project manager. The answers to all questions will be posted to the Contract Services Division web site, where the RFP was posted.

MDOT will not respond to telephone inquiries or visitation by bidders or their representatives. All questions are to be put in writing and must be submitted by the United States Postal Service or other commercial delivery service, or electronically and sent as an attachment in MS Word 2002 or Rich Text Format (RTF). Answers to questions will be prepared and made available on the MDOT website. The answers to the questions will supersede the original issue pertaining to the question(s) of the RFP.

GENERAL INFORMATION:

The consultant will need to have substantial ITS conception, design background and experience. The consultant shall also demonstrate a high level of experience with software/program design of this type.

The Michigan Department of Transportation (MDOT) - Intelligent Transportation System continues to expand at a rapid rate. In an effort to keep up with growing demands, reduce costs and operate the system more efficiently, an asset management system was developed for the MDOT statewide ITS system. The asset management system also provides the ability to support the maintenance of the ITS devices statewide with the ability to generate and track work orders.

There are various locations across the state where the asset information is still being collected and needs to be input into the system. The consultant will be expected to assist with inputting all information from assets into the system, as directed by the Project Manager.

The Michigan Department of Transportation (MDOT) is currently upgrading their existing ITS Asset Management System (Phase 1) from a locally-hosted Microsoft Access database to a SQL Server database hosted in the Cloud (Phase 2). Currently under development, phase 2 will comply with Michigan Department of Technology, Management & Budget (DTMB) database standards, but will not reside on the State of Michigan (SOM) Network. The Graphic User Interface (GUI) will be through a web-browser, and integrates Responsive Web Design. Further details about the ongoing development are available for viewing in the Final Design Document which is attached to this RFP for reference.

The Consultant shall furnish all services and labor necessary to conduct and complete the services described herein. The Consultant shall also furnish all materials, licenses, equipment, supplies, and incidentals necessary to perform the work, and check and/or test the materials, equipment, supplies, and incidentals as necessary in carrying out this work. The Services shall be performed to the satisfaction of the Department consistent with applicable professional standards.

The Services described herein are financed with public funds. The Consultant shall comply with all applicable Federal and State laws, rules, and regulations. The Consultant shall perform field operations in accordance with MIOSHA regulations and accepted safety practices. The consultant staff shall conduct themselves with professionalism in carrying out their duties.

The Consultant will notify the MDOT Project Manager, in writing, prior to any personnel changes from those specified in the Consultant's original approved proposal. Any personnel substitutions are subject to review and approval of the MDOT Project Manager.

The MDOT Project Manager shall be the official MDOT contact person for the Consultant and shall be made aware of all communications regarding this project. The consultant must either address or send a copy of all correspondence to the MDOT Project Manager. This includes all sub-Consultant correspondence and verbal contact records.

All materials submitted in response to this RFP become the property of MDOT, proposals and supporting materials will not be returned to consultants. MDOT reserves the right to reject any or all proposals.

CONSULTANT RESPONSIBILITIES:

The Consultant will provide engineering services for the hosting, maintaining, data collection and upgrades of the ITS Asset Management System under this contract. The Consultant's activities may include, but not be limited, to the following activities as directed by the MDOT Project Manager:

1. Host the ITS Asset Management System
 - a. The Consultant shall include a high level architecture design for the system in their proposal submittal with the expectation a detailed architecture design of the system, will be required to be provided to the MDOT Project Manager once a firm is selected.
 - b. The consultant shall provide any and all of the equipment but not limited to computer, IT equipment, storage and tools necessary to host the ITS Asset Management System
 - c. The hosted environment (not limited to...i.e. Cloud, Server, etc.) shall be accessible at all times by MDOT employees and their designated partners (internal and external to MDOT). Any limitations on number of users accessing system at any given time shall be provided.

- d. The hosted server's physical environment shall be secured to ensure that it is not comprised in any way.
 - e. The Consultant shall pay any and all associated costs with hosting the ITS Asset Management System and its components for 1 year with annual options for renewal up to 10 years.
 - i. The annual renewal options will be at MDOT's discretion and there is no guarantee for renewal.
 - ii. The Consultant shall identify how all of the components of the ITS Asset Management System will be transferred to MDOT/DTMB (including but not limited to; database, software, etc.) if the renewals do not take place or the contract is terminated.
 - f. The consultant shall submit a detailed plan in their proposal on how they will handle hosting of the system. This shall include capacity, hosting environment, costs, access, requirements, renewal, facilitation, scalability, disaster recovery, network security, etc. Consultant must show a defined plan and architecture to show all of these aspects.
2. Maintain the ITS Asset Management System and Components
- a. Maintenance of the asset management system is defined as tasks that will take less than 8 hours and shall include but not be limited to;
 - i. All equipment and hosting environment for the ITS Asset Management System and components
 - ii. Fixing any bugs that exist in the Asset Management system that effect usage and/or performance
 - iii. Edits to existing pages, scripts, tables, procedures, etc. within the asset management system.
 - iv. Edits to reporting functions within the asset management system.
 - v. Training and assistance on the database or host environment for MDOT employees and/or their designees.
 - vi. OS patches and upgrades on servers (these should be kept current)
 - vii. Updated virus control on servers
 - viii. Database engine patches and upgrades
 - ix. 3rd party software patches or releases
 - x. A process to reporting and tracking problems with the system and their resolution
 - xi. System and data backups (details should include how long, where they will be stored and it should specify how often MDOT will receive periodic backups.
 - xii. Maintain compatibility with DTMB workstation software standards
 - xiii. Maintain user accounts and user access based on their roles within the system (user-based roles). Passwords shall be maintained by the users.
 - xiv. Provide system logs, as requested by MDOT-M, to MDOT for auditing purposes

- b. The consultant shall submit a detailed plan in their proposal on how they will handle maintenance of the asset management system. This shall include all aspects; requests for changes/upgrades, tracking of the requests, outcome of each request, problem and aspect, etc.
 - c. The Consultant shall define the maintenance window for the system (Hours of the day, days of the week, etc.). This shall not be during peak times in the operations center and shall minimize disruption.
 - d. The Consultant shall define how maintenance to the system will impact accessibility to the system.
3. Enhancements to ITS Management System and Components
- a. Enhancements to the Asset Management system are defined as tasks that take 8+ hours to complete and shall include such things as;
 - i. Work flow revisions or additions
 - ii. Redesign or re-development of the system or host environment
 - iii. New reporting functions
 - iv. Any changes outside of “bug type fixes”
 - b. Releases of the software after enhancements shall be approved and coordinated with the MDOT Project Manager. A task-order for the approved work will be issued to the Consultant by the MDOT Project Manager
 - c. The consultant shall submit in their proposal a detailed plan on how they will address, handle and facilitate enhancements to the Asset Management system.
 - d. The Consultant shall include and provide a detailed action plan for how the enhancements to the software will be tested prior to going into production (live). The Consultant shall include if there is a testing or development environment that mirrors the production environment.
 - e. To facilitate sharing of data with other MDOT systems, standard database naming conventions (to be provided) will be followed.
 - f. Change (release) management
 - i. Release information (detailing changes, bug fixes, and enhancements)
 - ii. User test cases
 - iii. Complete source code sent to MDOT within 10 business days of MDOT testing and accepting a release
4. Data Collection and Input in the ITS Asset Management System
- a. Assist with collection of any ITS data that is needed, as directed by the MDOT Project Manager.
 - b. Inputting of data and/or device information into the database
 - c. All work under this task shall come from the MDOT Project Manager for approval.
 - d. The consultant shall submit in their proposal a detailed process on how they would handle data collection and inputting of data/device information into the system.
5. Response Time

- a. The consultant shall submit a detailed response time plan with their proposal that addresses each of the areas above in items 1-4.

6. Support

- a. Standard service level agreements (SLA)
 - i. The expected availability for this application is 7x24x365 and shall maintain 99% up-time, not including scheduled maintenance approved by the MDOT Project Manager. The consultant shall include detailed architecture documentation to MDOT as to how they will provide this.
 - ii. Help Desk/Front line support. The consultant shall include a detailed process to handle notification and remediation for system performance issues.
 - iii. Response Plan. The consultant shall provide MDOT with a detailed process to address/respond to any system performance issues.
 1. Response plans
 - a. Duration to respond shall not exceed 10 minutes from initial notification.
 - b. Duration to fix shall not exceed 60 minutes from initial notification.

MDOT RESPONSIBILITIES:

MDOT shall provide the Consultant with all relevant documentation needed to complete the tasks assigned and approved by the MDOT Project Manager.

Attached as appendices to this RFP is the Final Design Document and the Final Requirements Document that is currently being used to complete the software development.

DELIVERABLES:

The Consultant shall deliver a fully functioning system as outlined above and any necessary information for the system upon request at any time.

SCHEDULE:

For scheduling purposes, it is anticipated that this project shall begin on **November 1, 2013** and shall end on **November 1, 2023 if all annual renewals are enacted.**

Services to be rendered by the Consultant, as herein described, will commence upon written notice from the Professional Services Administrator and will be completed within approximately three (3) years from the date of such notice.

CONSULTANT PAYMENT:

Compensation for this project shall be on an **actual cost plus fixed fee** basis. This basis of payment typically includes an estimate of labor hours by classification or employee, hourly labor rates, applied overhead, other direct costs, subconsultant costs, and applied fixed fee. The fixed fee for profit allowed for this project is 11.0% of the cost of direct labor and overhead.

All billings for services must be directed to the Department and follow the current guidelines. The latest copy of the "Professional Engineering Service Reimbursement Guidelines for Bureau of Highways" is available on MDOT's website. This document contains instructions and forms that must be followed and used for billing. Payment may be delayed or decreased if the instructions are not followed.

Payment to the Consultant for services rendered shall not exceed the maximum amount unless an increase is approved in accordance with the contract with the Consultant. Typically, billings must be submitted within 60 days after the completion of services for the current billing. The final billing must be received within 60 days of the completion of services. Refer to your contract for your specific contract terms.

Direct expenses, if applicable, will not be paid in excess of that allowed by the Department for its own employees in accordance with the State of Michigan's Standardized Travel Regulations. Supporting documentation must be submitted with the billing for all eligible expenses on the project in accordance with the Reimbursement Guidelines. The only hours that will be considered allowable charges for this contract are those that are directly attributable to the activities of this project.

For projects advertised May 1, 2013, or later, MDOT will reimburse the CONSULTANT for vehicle expenses and the costs of travel to and from project sites in accordance with MDOT's Travel and Vehicle Expense Reimbursement Guidelines, dated May 1, 2013. The guidelines can be found at http://www.michigan.gov/documents/mdot/Final_Travel_Guidelines_05-01-13_420289_7.pdf?20130509082418. MDOT's travel and vehicle expense reimbursement policies are intended primarily for construction engineering work. Reimbursement for travel to and from project sites and for vehicle expenses for all other types of work will be approved on a case by case basis.

The use of overtime hours is not acceptable unless prior written approval is granted by the MDOT Region Engineer/Bureau Director and the MDOT Project Manager. Reimbursement for overtime hours that are allowed will be limited to time spent on this project in excess of forty hours per person per week. Any variations to this rule should be included in the priced proposal submitted by the Consultant and must have prior written approval by the MDOT Region Engineer/Bureau Director and the MDOT Project Manager.

For projects advertised May 1, 2013, or later, MDOT will pay overtime in accordance with MDOT's Overtime Reimbursement Guidelines, dated May 1, 2013. The guidelines can be found at http://www.michigan.gov/documents/mdot/Final_Overtime_Guidelines_05-01-13_420286_7.pdf?20130509081848. MDOT's overtime reimbursement policies are intended primarily for construction engineering work. Overtime reimbursement for all other types of work will be approved on a case by case basis.

MDOT ITS ASSET DATABASE PHASE II FINAL DESIGN DOCUMENT

FINAL

PREPARED FOR

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PREPARED BY

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DISCLAIMERS

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PRIVACY INFORMATION

This document may contain information of a sensitive nature. This information should not be given to persons other than those who are involved in the MDOT ITS Asset Database Phase II project or who will become involved during the project lifecycle.

TRADEMARKS

N/A

VERSION HISTORY

Version	Author(s)	Description	Date Completed
Initial Draft	A. Kavanagh M. Bieberitz	Internal review	5/8/2013
Review	E. Morris	Review comments	5/9/2013
Update	A. Kavanagh M. Bieberitz	Review edits	5/15/2013
Final Draft	A. Kavanagh M. Bieberitz	Internal review	6/11/13
Review	E. Morris	Internal review	6/12/13
Update	A. Kavanagh M. Bieberitz	Review edits	6/13/13
Review Comments	A. Kavanagh M. Bieberitz	Review comments added to Appendix F	6/28/13
Final Complete	E. Morris	Submitted to MDOT for sign-off	6/28/2013

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1 INTRODUCTION

As the MDOT Metro Region expands the Intelligent Transportation System (ITS) network throughout the region, effective asset management becomes critical to efficiently managing operational and maintenance activities and costs. With the I-275 project from I-75 to I-96/M-14, MDOT is expanding the ITS network by adding 25 ITS sites and nearly 30 miles of fiber optic network including cable, conduit and handholes. This expansion also adds a significant number of ITS assets for the MDOT to manage in the Department's daily operations.

Because of this expansion, MDOT desires to upgrade the functionality of their existing MDOT ITS Asset Database (known as Phase 1). While the upgrade is borne out of a project need, the system will be designed for enterprise deployment to maximize the value of the system for MDOT.

1.1 Purpose and Scope

The Final Design Document describes the system requirements, operating environment, system and subsystem architecture, files and database design, input formats, output layouts, user interfaces, detailed design, processing logic, and external interfaces with other systems. Specifically, this scope of services will provide the following:

- Upgrade of the existing Phase 1 database;
- Ability to edit asset information using web-based forms;
- Expanded capabilities of the Asset Management website, including enhanced mapping and dashboard functionality;
- Preventative maintenance and cost management modules; limited ability to forecast capital and O&M costs based on current system and planned future system;
- A fully web-based replacement for MaintStar for the purposes of managing work orders, reporting, and inventory control.

1.2 Document Overview

The following is a breakdown of content by chapter:

- Chapter 1 – Introduction
- Chapter 2 – System Architecture
- Chapter 3 – Database Design
- Chapter 4 – User Interface
- Chapter 5 – Detailed Design
- Chapter 6 – External Interfaces
- Chapter 7 – Deployment Release Schedule
- Chapter 8 – Workflow Process Diagrams
- Appendix A – Data Model
- Appendix B – Data Dictionary
- Appendix C – Data Indexes
- Appendix D – Contractor Datasheet
- Appendix E – Items Out of Scope

1.3 Design and Implementation Constraints

This section describes any constraints in the system design and includes any assumptions made by the project team in developing the system design. The following design and implementation constraints are applicable

- Reliance on the 3rd party software platforms and APIs to meet functional requirements
 - Solarwinds
 - ArcGIS
 - ProjectWise

1.4 Future Contingencies

This section describes any contingencies that might arise in the design of the system that may change the development direction. The following future contingencies apply

- Hosting platform (Amazon vs. DTMB)
- ArcGIS Version (10.1)

1.5 Design Standards

The following documents were referenced in the design of this document:

- wT_User_Interface_Standards.2.02.Sept.2012.pdf
- IntergralBlue_PM_Checklist.pdf (4/25/2013)
- SEMTOC Spare parts 12-7-12.xlsx (4/4/2013)
- Chapter_9_ops_manual__10-19-05.doc
- MDOT AbbreviationStandards.pdf (4/22/2013)
- DTMB DataStandards.doc (4/19/2013)
- Writing Work Order Quick Guide.doc (9/10/2012)
- MSTAR.pdf (3/11/2010)
- Final_Forecast_AssetMgmt_2011-07 Final Document for Requirements.pdf

1.6 References

This section provides a bibliography of key project references and deliverables that have been produced before this point.

- <https://www.itsmdotdb.com>
- New_ITS_Inventory_DataEntry-v2012-05-11.xlsx (5/11/2012)
- MDOT_ITS_Asset_DB_be.accdb (6/27/2012)
- MDOT_ITS_Asset_DB.accdb (6/27/2012)
- MDOT_ITSDatabase_DevelopmentAdminGuide.docx (2/2/2012)

1.7 Glossary

- API (Application Programming Interface) – An API is a protocol intended to be used as an interface by software components to communicate with each other.

- AWS (Amazon Web Services) – Amazon’s cloud computing platform.
- Data Model – A view of data related to applications. A fully developed data model specifies entity classes, relationships between entities, integrity rules and operations on the entities.
- DLL (Dynamic Link Library) – a collection of small programs, any of which can be called when needed by a larger program running in a computer.
- EC2 – Elastic Compute Cloud (Amazon’s application hosting service)
- GIS – Geographic Information System: an organized collection of computer hardware, software, geographic data, and personnel designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced information.
- Graphical User Interface (GUI) – A graphical method of controlling how a user interacts with a computer to perform various tasks.
- Hardware – The physical components of a computer system.
- Https – hypertext transfer protocol secure.
- RDBMS – Relational database management system.
- Spatial Data – Information about the location and shape of, and relationships among, geographic features, usually stored as coordinates and topology.
- Standards – In computing, a set of rules or specifications which, taken together, define the architecture of a hardware device, program, or operating system.
- TCP/IP – The Transmission Control Protocol (TCP) is a communication protocol layered above the Internet Protocol (IP). These are low-level communication protocols which allow computers to send and receive data.
- Topology – The description of how spatial features are connected to each other. A method of determining spatial relationships in vector data models (tells computer what is inside or outside a polygon or which nodes are connected by arcs). Turns vector nodes, arcs, and polygons into intelligent maps.

2 SYSTEMS ARCHITECTURE

This section describes the systems architecture for the project. Systems architecture is the overall model that defines the structure and behavior of system components. The major components of system architecture are deployment, software, database, security, and authentication.

2.1 Deployment

Deployment defines the physical hosting environment, including CPUs, memory, storage devices, and other hardware and network devices

2.1.1 Amazon Web Services (AWS)

AWS is a collection of web services that comprise Amazon's cloud computing platform. Amazon's Elastic Compute Cloud (EC2) is a central part of AWS which allows users to deploy virtual machines, "instances", which can be accessed remotely and configured as needed.

The following diagram shows the application web site and database running in the Amazon cloud and connecting to services provided by DTMB and SEMTOC through APIs (Application Program Interfaces).

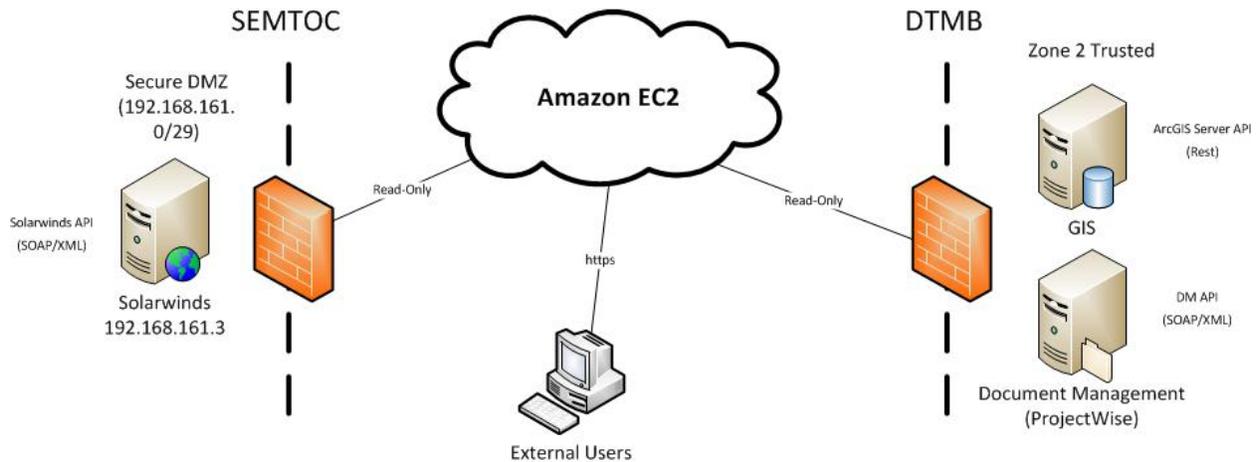


Figure 1 – Amazon Hosting

2.1.2 Hardware Configuration

- Application Server – Medium Instance (3.75GB memory, 2CPU, 410GB storage, Moderate I/O)
- Load Balancing – 1 extra server spun up, 10 hours per day, Monday – Friday
- SQL Server Database – Medium Instance (3.75GB memory, 2 CPU, Moderate I/O capacity)
- Storage – 80 GB of storage
- CloudWatch – Standard 7 metrics, 10 alerts per month

- Amazon Simple Email Service (SES) (beta)

2.2 Software

2.2.1 Asset Management Web Site

The following tools and technologies will be used to develop the web solution:

- Visual Studio 2012
- ASP.NET MVC 4 with Razor View Engine
- ASP.NET Web API
- C# Programming Language
- Entity Framework 5.x
- SQL Server 2008 R2
- jQuery & Knockout
- iTextSharp

2.2.2 Visual Studio 2012

Visual Studio is an integrated development environment (IDE) from Microsoft used to develop applications.

2.2.3 ASP.NET MVC 4

MVC 4 is a framework for building scalable, standards-based web applications using a Model-View-Controller design pattern.

2.2.4 C# Programming Language

C# is a modern, object-oriented programming language developed by Microsoft.

2.2.5 Entity Framework

Entity Framework is Microsoft's recommended data access technology for developing new web applications. It is an object-relational mapper that facilitates working with relational data using domain-specific objects.

2.2.6 SQL Server 2008 R2

SQL Server is an enterprise-level, relational database management system (RDMS) developed by Microsoft.

2.2.7 ASP.NET Web API

WebAPI is a framework for creating RESTful services, which can run inside of an MVC application, in its own project, or self-hosted outside of IIS. WebAPI will be deployed as its own project and maintained separate from the Asset Management website. Web API will be used to create HTTP services to deliver JSON (a text-based open standard for data interchange).

2.2.8 jQuery & Knockout

jQuery is a JavaScript library to enable client-side scripting of HTML, selection of DOM (Document Object Model) elements, event handling, and Ajax (Asynchronous JavaScript and XML) functionality. Knockout is a JavaScript library for creating responsive user interfaces (UI) that update dynamically in response to data model changes.

2.2.9 iTextSharp

iTextSharp is a C# library for creating PDF documents (reports).

2.3 Database

2.3.1 Relational Database Management System

The following tools and technologies will be used to manage the database solution:

- SQL Server 2008 R2 Enterprise Edition
- SQL Server Integration Services (SSIS)
- Microsoft Access 2010

2.3.2 SQL Server 2008 R2 Enterprise Edition

SQL Server Enterprise Edition includes both the core database engine and add-on services, with tools for creating and managing a SQL Server cluster.

2.3.3 SQL Server Integration Services (SSIS)

SSIS is a component that can be used to perform data migration tasks; and is a platform for data integration and workflow applications. SSIS is available as part of the “Standard” and “Enterprise” additions of Microsoft SQL Server.

2.3.4 Microsoft Access 2010

Microsoft Access is a database management system from Microsoft that combines the relational Microsoft Jet Database Engine with a graphical user interface and software-development tools. It is a member of the Microsoft Office suite of applications. Access will be used as a disconnected method for collecting data in the field.

2.4 Security

2.4.1 Authentication, Authorization, User Accounts, and Roles

Microsoft’s ASP.NET membership framework will be used to manage authentication, authorization, user accounts, and roles in the application. The framework will be configured to provide the following functionality:

- Identify and log users in to a website
- Use ASP.NET’s Membership framework to manage user accounts

- Create, update, and delete user accounts
- Limit access to a web page, directory, or specific functionality based on the logged in user
- Use ASP.NET's Roles framework to associate user accounts with roles
- Manage user roles
- Limit access to a web page, directory, or specific functionality based on the logged in user's role
- Customize and extend ASP.NET's security web controls to include properties specific to the ITS Asset Database

2.5 Authentication

2.5.1 User Roles

To function effectively as a statewide tool, the application will need to be available to a variety of users, both MDOT and non-MDOT. Those users have been identified to include:

- Application Administrator – highest level of access and responsible for administration and maintenance of the application
- Asset Management Editor – editing privileges to features within the Asset Management module
- Asset Management Viewer – read-only access to features of the Asset Management module
- Break Fix Viewer – read-only access to features of the Break Fix module
- Cost Management Editor – editing privileges to features within the Cost Management module
- Cost Management Viewer – read-only access to features of the Cost Management module
- ITS Coordinator – the ITS Operations Engineer or ITS Coordinator in each MDOT Region will be the “gatekeeper” between the data and the database in the Region
- Maintenance Contractor – local and statewide maintenance contractors will need access for device maintenance purposes
- Maintenance Technician – local and statewide maintenance contractor technicians will need limited access for device maintenance purposes
- MDOT Engineer – responsible for data entry or report generation but not administrative tasks
- MDOT Management – MDOT Management is concerned with program level information. In particular, this includes the project planning and financial forecasting features
- Preventative Maintenance Viewer – read-only access to features of the Preventative Maintenance module
- Security Administrator – responsible for managing user security and roles within the application
- TOC Operators – responsible for data entry and work orders

2.5.2 View and Edit Permissions

All users will have the ability to view all data for all regions; however, only users belonging to a particular region(s), and with the appropriate user-level permissions for that region, will be able to edit data for that region(s). For example, the University Region has a DMS job programmed where several devices will be installed in Ionia County (i.e. Grand Region). The “Job” needs to belong to University Region for planning/cost purposes, but the Devices should belong to the appropriate region.

User Permissions	User Roles													
	Preventative Maintenance Viewer	Break Fix Viewer	Cost Management Viewer	Preventative Maintenance Viewer	Asset Management Editor	Cost Management Editor	ITS Coordinator	Maintenance Technician	Maintenance Contractor	MDOT Engineer	MDOT Management	TOC Operator	Application Administrator	System Administrator
View AM Module	X	X	X	X	X	X	X	X	X	X	X	X	X	X
View WO Module	X	X	X	X	X	X	X	X	X	X	X	X	X	X
View CM Module	X	X	X	X	X	X	X	X	X	X	X	X	X	X
View PM Module	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Import/Export					X									
Edit Lookup Values													X	
Edit AM Module					X		X		X	X	X			
Edit GIS Data					X		X							
Create Work Order												X		
Assign Work Order									X			X		
Perform Work Order								X	X			X		
Close Work Order												X		
Edit PM Checklist							X		X					
Create Project Cost Profile						X	X							
Create Reports	X	X	X	X	X	X	X	X	X	X	X	X		
Delete Reports													X	
View Admin Module													X	
Manage User Security														X

Table 1 – User Permissions

3 DATABASE DESIGN

The section describes the final design of all database management system (DBMS) files and the non-DBMS files associated with the system under development. Refer to the section (or related appendixes) for comprehensive data dictionary showing data element name, type, length, source, validation rules, maintenance (create, read, update, delete (CRUD) capability), data stores, outputs, aliases, and description.

3.1 DBMS

This section reveals the final design of the DBMS files and includes the following information, as appropriate (refer to Appendix B – DATA DICTIONARY for further detail):

- Database Schema names and description of schema name purpose
- Table indexes and constraints

3.1.1 Database Schemas

The following table describes database-specific schemas:

SCHEMA_NAME	SCHEMA_NAME_DESC
AM	Asset Management specific Views
App	objects related to MDOT ITS application administration
BF	Break Fix specific Views
CM	Cost Management specific Views
ContractorDS	objects specific to the Contractor Datasheet tool
dbo	generic objects. objects of unknown status
Geo	spatial objects. For use with ArcGIS Server and similar
ITS	objects related to managing ITS business
MDOT_ADMIN	objects related to database administration
MDOT_ITSOwner	owns all objects related to ITS business usage
PM	Preventative Maintenance specific Views
X	marked for deletion

Table 2 – Database Schemas

3.1.2 ITS Business Table Indexes and Constraints

This section defines unique indexes and constraints as required by system business requirements. Refer to Appendix C – DATA INDEXES for further detail.

3.2 Database Diagram

See Appendix A – DATA MODEL. Data object design and naming standards are based on standards as defined by DTMB Data Standards.

4 USER INTERFACE

This section describes the User Interface (UI) at a high-level relative to the user/operator. Detailed information pertaining to the application UI has been added to the Detail Design chapter in order to describe the functionality of each module.

4.1 Website Layout

The following diagram establishes the overall design and relationships between graphic elements and database content.

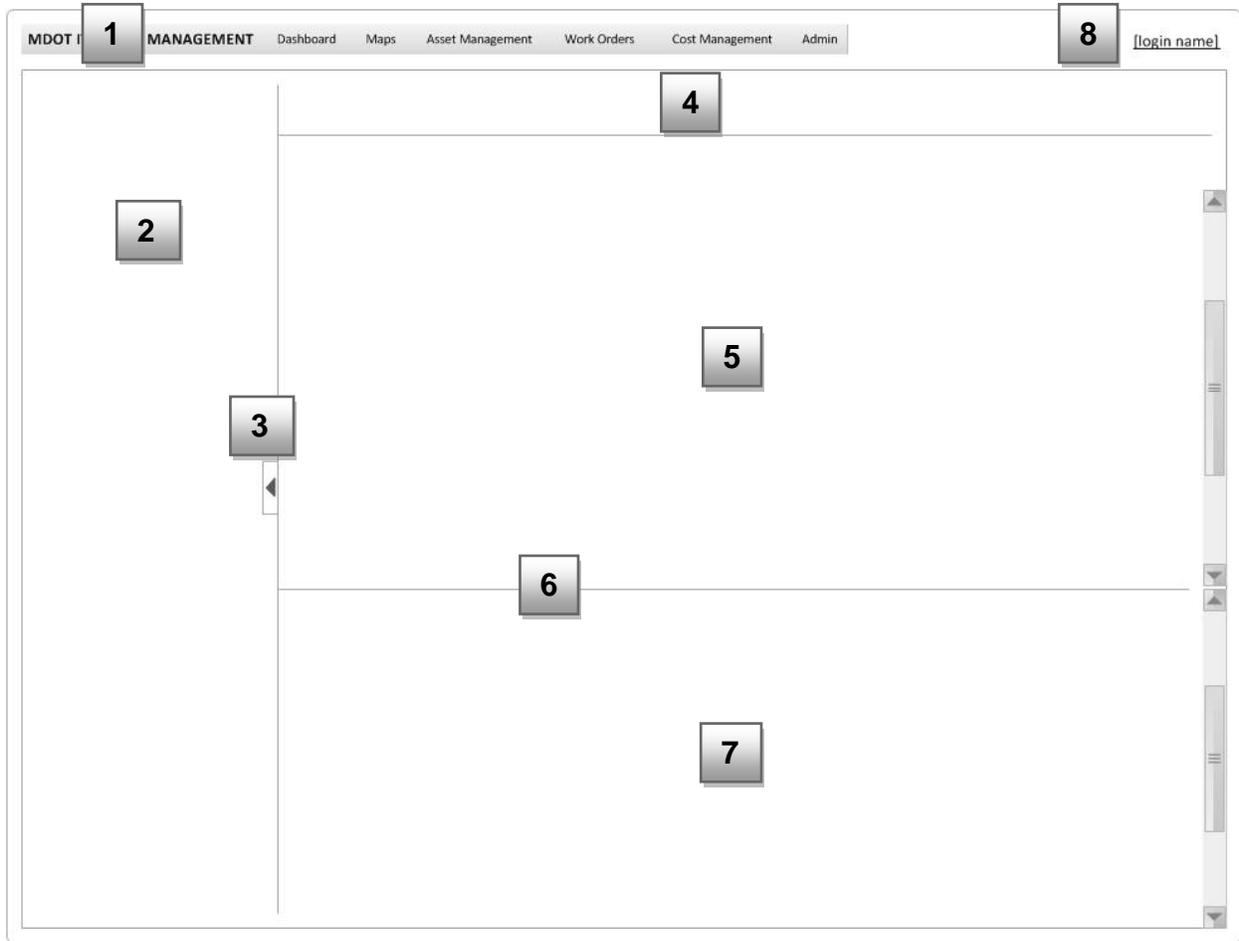


Figure 2 – Website Layout

- 1) Main Navigation Menu
- 2) Sub-Navigation Menu Collapsible Panel
- 3) Vertical Splitter
- 4) Search Panel
- 5) Search Results Panel (Grid)
- 6) Horizontal Splitter
- 7) Attributes Panel
- 8) Account Information

4.2 Responsive Design

Responsive design is a web design approach that aims at providing an optimal viewing experience on a range of different devices (from desktops to mobile phones). While it is beyond the scope of this application to design for mobile phones and tablets, there are elements of responsive design which will be incorporated into the design of the application in order to allow for use on smaller screens (such as tablet computers).

The following are elements of responsive design which will be followed to the extent possible:

- Fluid grid – page elements sized using percentages, rather than absolute units like pixels or points
- Flexible image sizes – images sized in relative units, so as to prevent them from displaying outside their containing element
- Media queries – pages set up to use different CSS style rules based on the width of the user's browser

5 DETAILED DESIGN

This section provides a narrative description of each application module, its function(s), its overall processing, logic, interfaces to other modules, and interfaces to external systems.

5.1 Dashboard

The dashboard provides high-level summary information of the ITS system. It consists of interactive controls for visual display of summarized data. It will not be possible to click on the controls and navigate to other areas of the site.

5.1.1 High-Level Functionality

The dashboard will show statewide information by default; users will have the option to reconfigure the dashboard to show information for a specific region. Only one region may be viewable at a time when not in the default view (statewide). The following controls will be included on the dashboard:

- Bar Chart
 - Number of devices, by device type, per region
 - Count of Open work orders per region
 - Count of Work Orders by status
- Line Charts
 - Work Orders Completed in last 30, 60, 90 days
 - Data Grid
- Preventative Maintenance Items that are Past due by 30, 60, 90 days
 - Open Cabinet Monitor Devices for All Regions
- % Operational of End-User Devices

5.1.2 Navigation

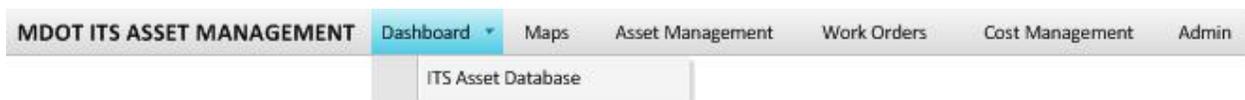


Figure 3 – Dashboard Navigation

5.1.3 Layout

Refer to the following diagram and use case:

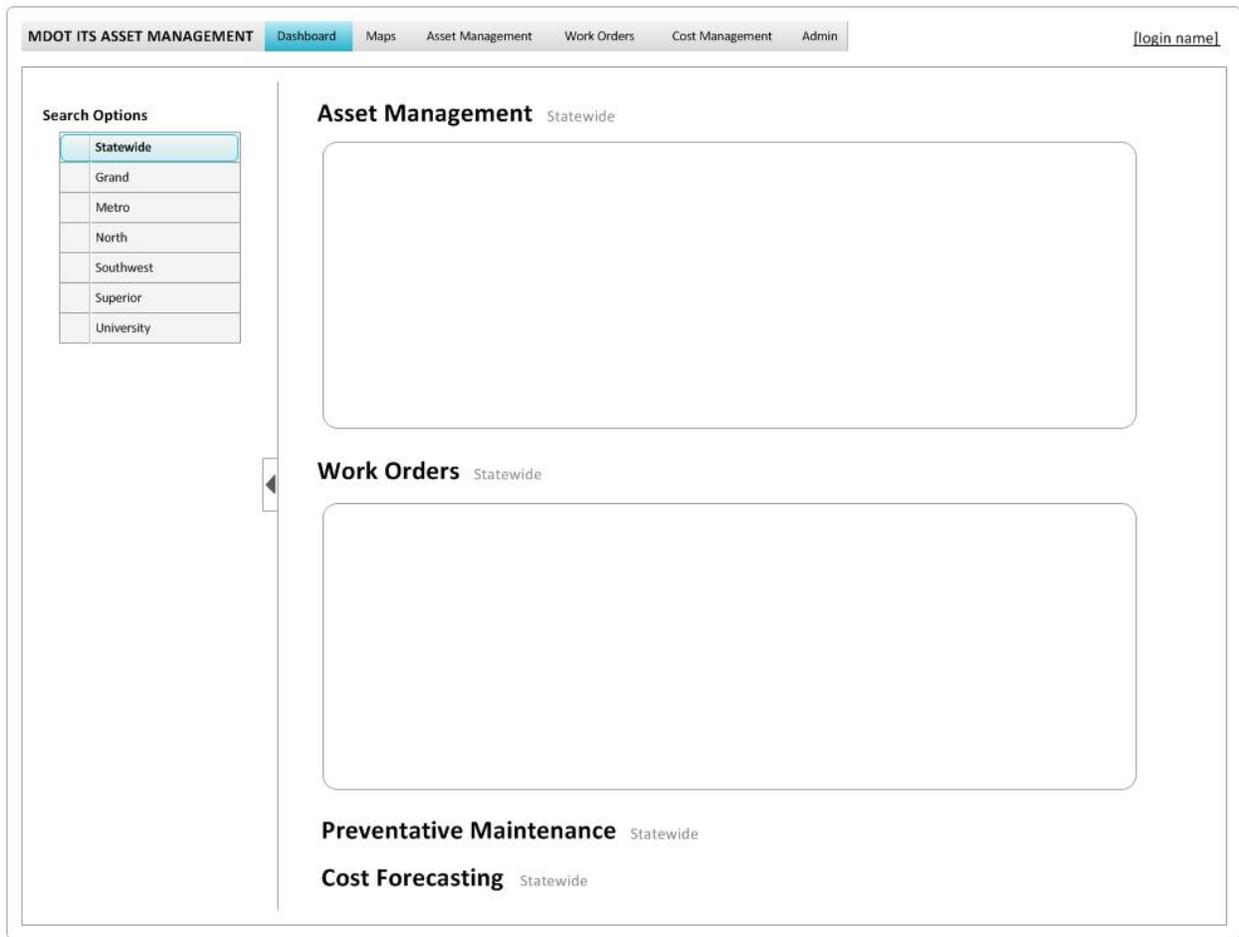


Figure 4 – Dashboard Layout

- 1) User can expand and collapse dashboard elements to maximize screen area for charts
- 2) Clicking on dashboard elements will not drill-down to more detail or subsequent pages
- 3) Dashboard elements are updated at the time when the module loads, not in real-time as data is manipulated on the site. Navigating away from and back to the dashboard will refresh the dashboard elements.

5.2 Maps

The Maps module provides access to ITS Devices through a map interface. The capabilities of the Maps module are carried over from Phase 1 of the MDOT ITS Asset Management Website.

5.2.1 High-Level Functionality

The following functionality will be available through the Maps module.

- Search
 - Device
 - Roadway

- Job
- Status
- Linework Editing
 - Add Line
 - Split Line
 - Edit Line(s) Attributes
 - Delete Line(s)
- Map Controls
 - Zoom In
 - Zoom Out
 - Pan
 - Select
- Device Editing
 - Add Device
 - Edit Device Attributes
 - Delete Device

5.2.2 Navigation

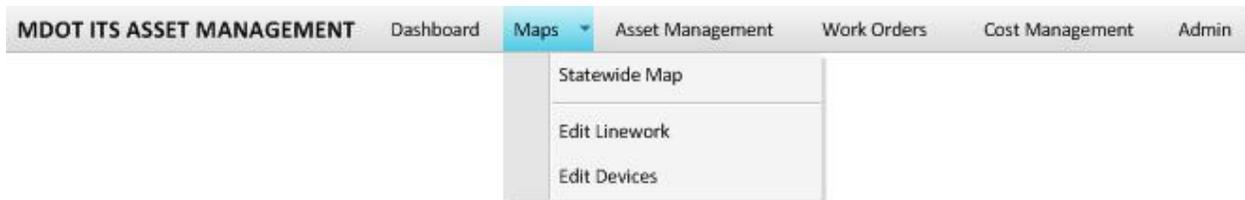


Figure 5 – Maps Navigation

5.2.3 Base Map

The layers for the base map will be provided by MDOT through an ArcGIS Server rest API. Access to the layers does not require token-based authentication to access.

- gis.mcgi.state.mi.us/arcgis/rest

5.2.4 Add Line

Refer to the following diagram and use case:

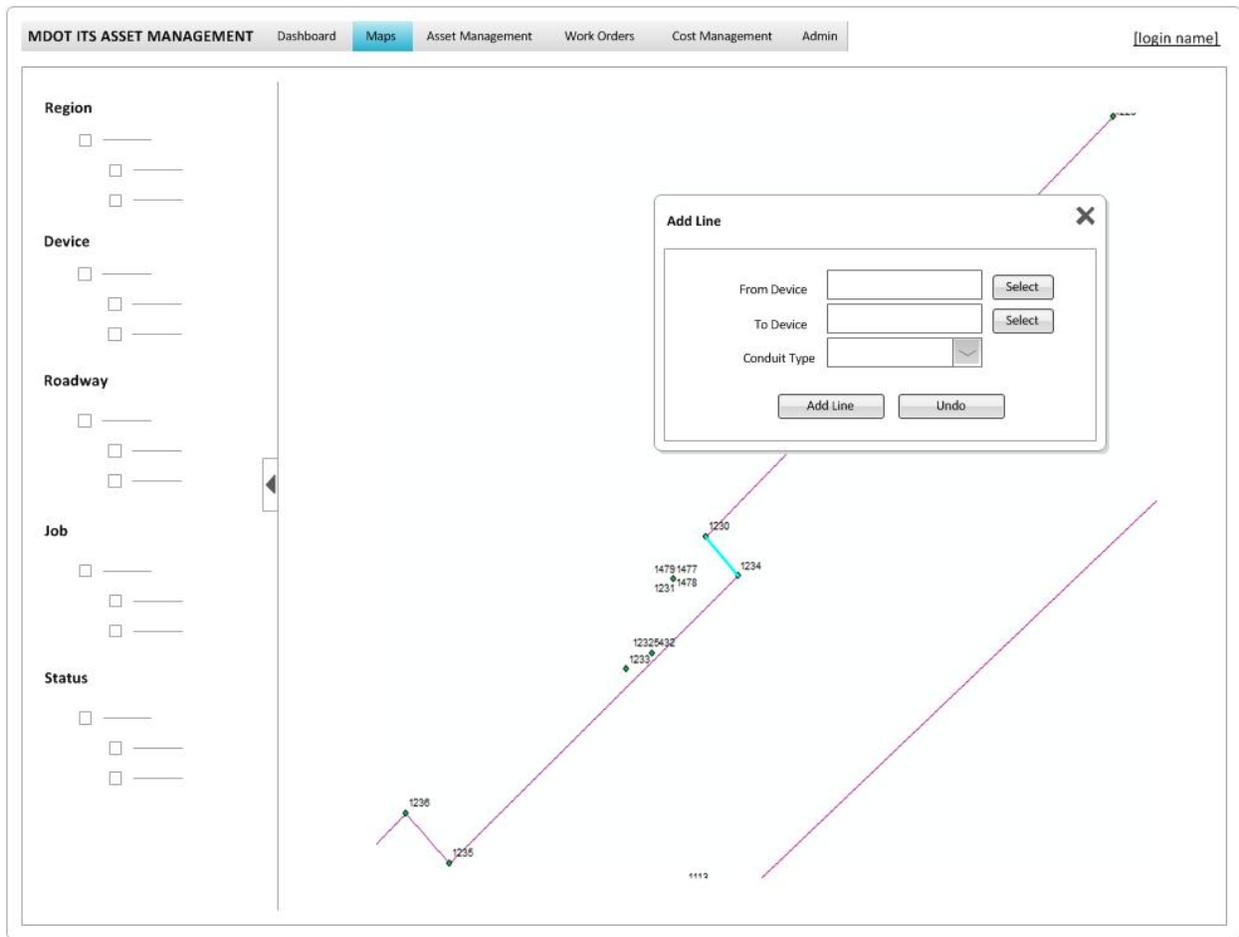


Figure 6 – Add Line

- 1) User selects one device from map. Textbox populates selected device ID from map selection
- 2) User selects a second device from map. Textbox populates selected device ID from map selection
- 3) User selects Conduit Type and Add Line
- 4) System executes stored procedure and updates map

5.2.5 Split Line

Refer to the following diagram and use case:

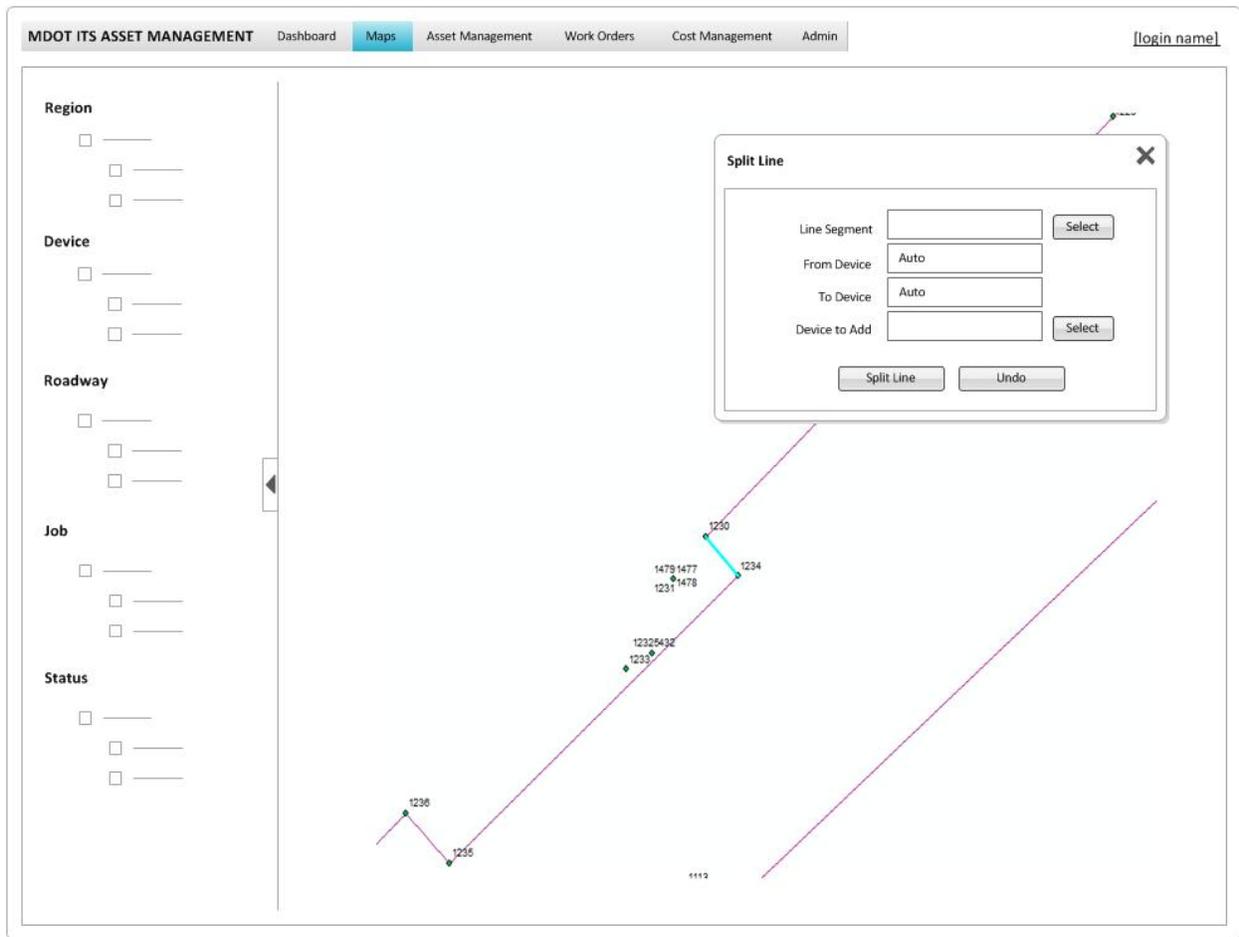


Figure 7 – Split Line

- 1) User selects on line from map. Textbox populates line ID and From/To device IDs from map selection
- 2) User selects one device from map. Textbox populates selected device ID from map selection and Split Line
- 3) System executes stored procedure and updates map

5.2.6 Edit Line(s) Attributes

Refer to the following diagram and use case:

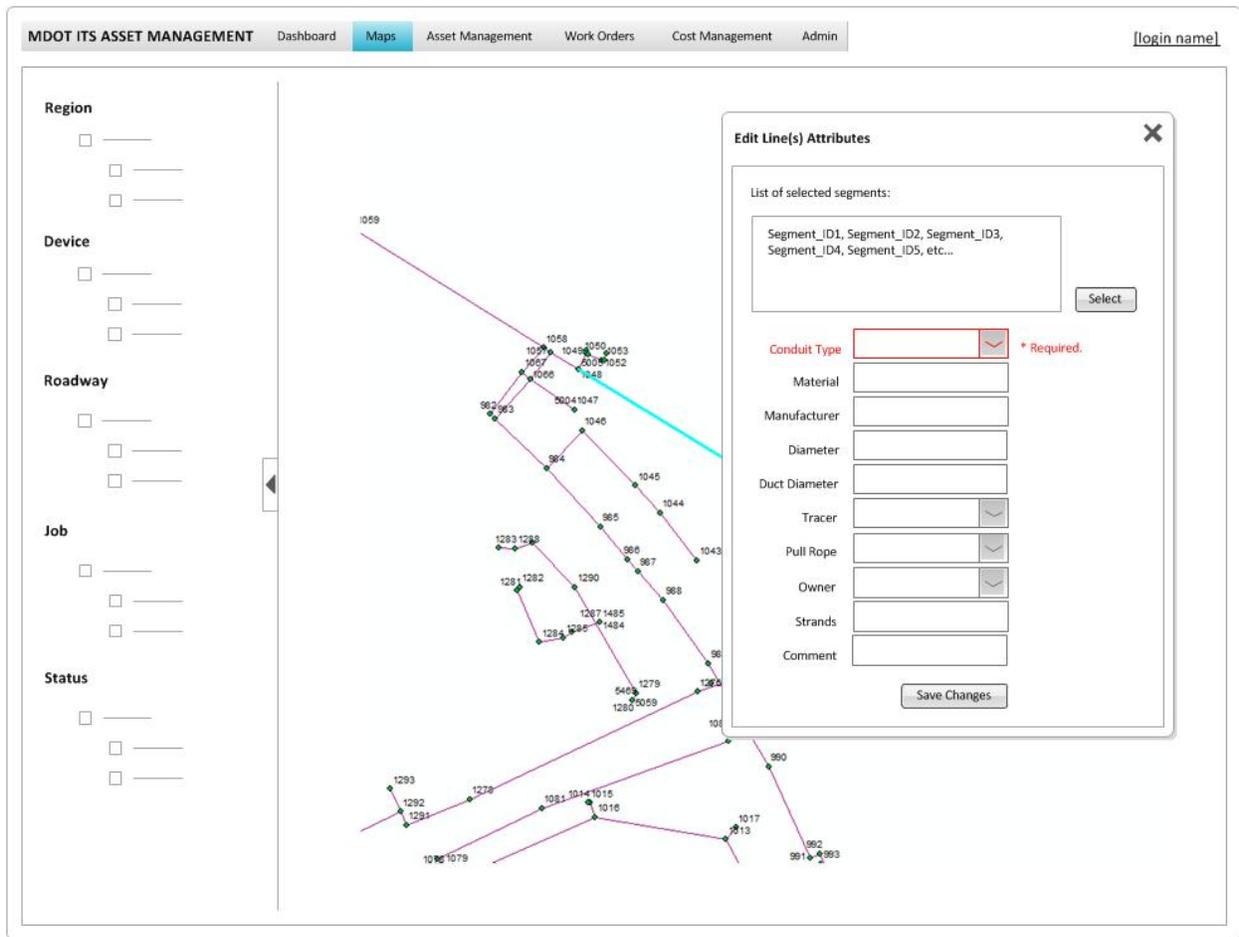


Figure 8 – Edit Line Attribute(s)

- 1) User selects line(s) on map. Textbox populates with comma-separated list of line IDs from map selection
- 2) User populates form fields. Selection will be applied to all selected line segments
- 3) User selects Save Changes
- 4) System executes stored procedure and updates map

5.2.7 Delete Line(s)

Refer to the following diagram and use case:

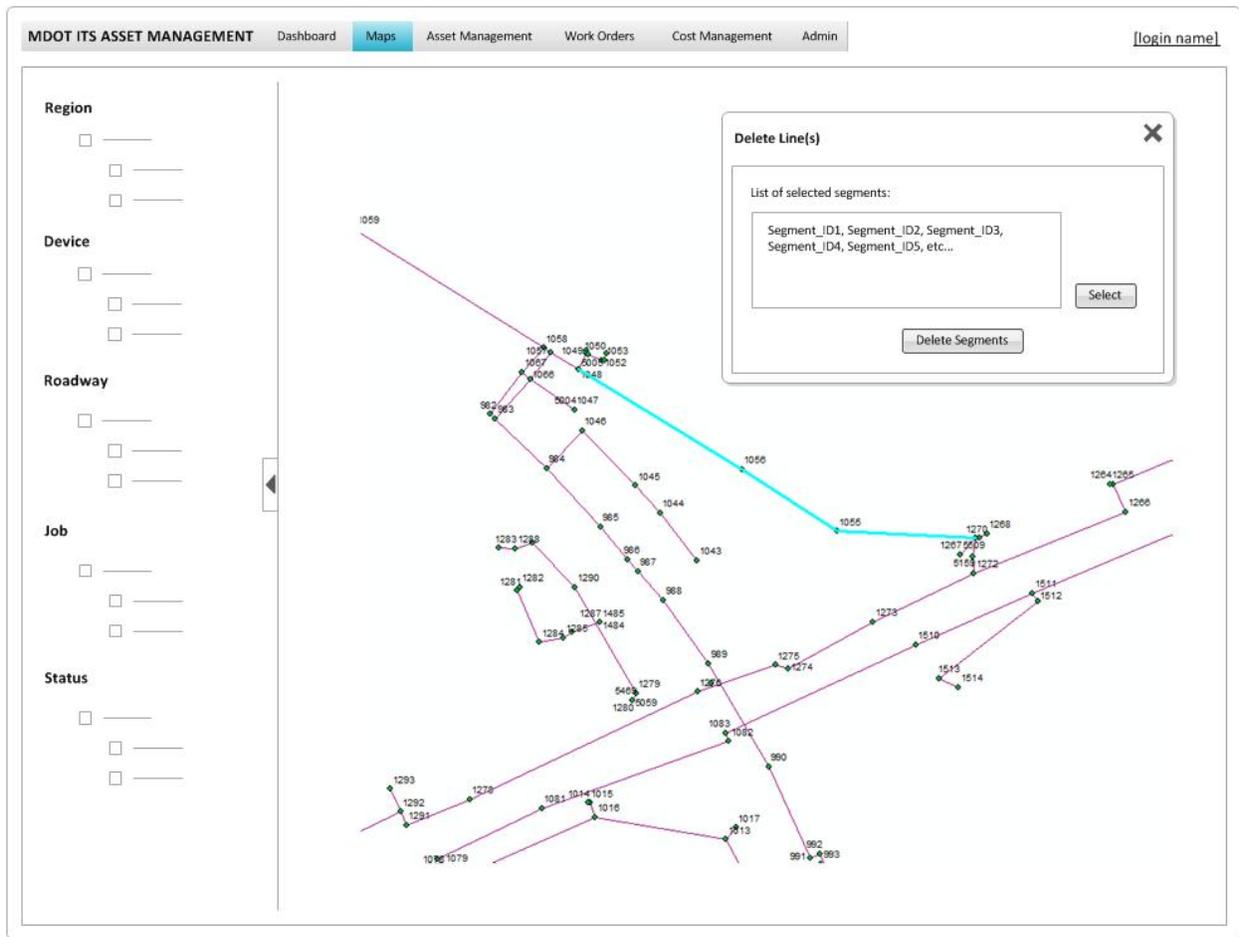


Figure 9 – Delete Line(s)

- 1) User selects line(s) on map. Textbox populates with comma-separated list of line IDs from map selection
- 2) User selects Delete Segments
- 3) System executes stored procedure and updates map

5.2.8 Add Device

Refer to the following diagram and use case:

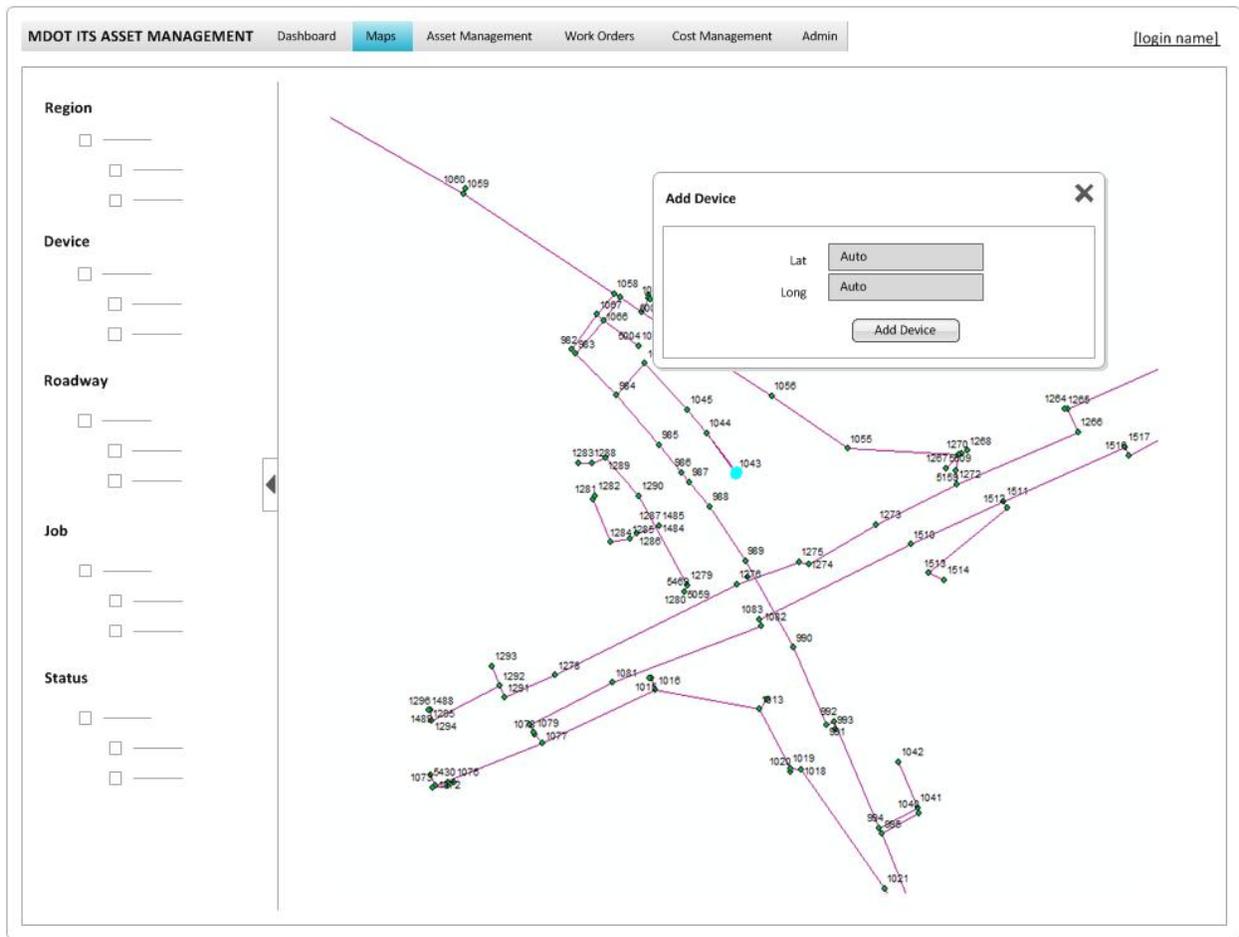


Figure 10 – Add Device

- 1) User adds a point to the map and is prompted to Add Device
- 2) Clicking on Add Device takes user to the device edit form (refer to Section 5.3.6 Edit Functionality); latitude and longitude are passed to the device edit form

5.3 Asset Management Module

The Asset Management module consists of web-based forms and reports for tracking specific characteristics of MDOT field ITS assets, and their attributes, throughout the state. Functionality handled within this module includes view/editing ITS devices, view/editing parts in inventory, and reporting on field device assets. This provides the base level of information that is necessary for functionality in all other modules.

5.3.1 High-Level Functionality

The following describes the high-level business rules that apply to objects managed within this module. These business rules are integrated within the database design. Additional data integrity and uniqueness rules can be found in Appendix C – Data Indexes.

- A Site is a generalized location where ITS assets can be found

- Field Site (has Lat/Long location)
- Warehouse (has Lat/Long location)
- Truck (no Lat/Long location)
- A Device is a stand-alone ITS asset
 - Has location if found at a Field Site
 - Can be moved between a Field Site, Warehouse and Truck
 - Can have a Work Order
 - Can have preventative maintenance
 - Can have cost management profiles
 - A Device can be associated with a cabinet at the same Site as the Device
 - Not all Device Types have a cabinet association
- A Part is a component of a device.
 - Can be moved between a Warehouse and Truck only
 - Can be referenced as part of a Device work order
 - Do not have a Work Order

5.3.2 Navigation

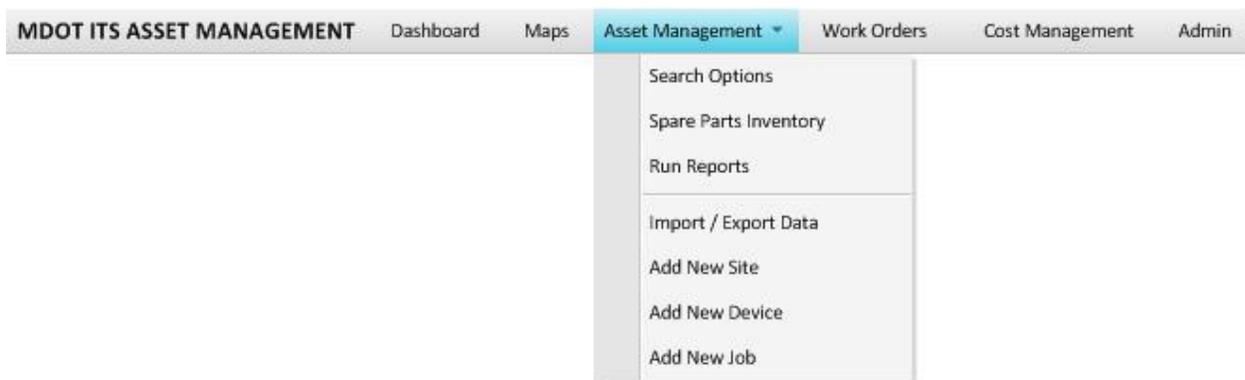


Figure 11 – Asset Management Navigation

5.3.3 MDOT Calculated Formulas

Values for columns with an auto-calculated format can change if any of the underlying data components are changed.

- **Site ATMS ID** (auto-calculated format):
 - = Primary Route Name + Direction Abbreviation + "-MM" + 4-digit mile marker + "-" + Cross Street Name
 - Example: I696E-MM0286-I94
- **Site Common Name** (auto-calculated format):
 - = Primary Route + Direction + " @ " + Cross Street + "- MM" + Site Mile Marker (one decimal place)
 - Example: I696E @ I94 - MM 28.6

- **Device Common Name** (auto-calculated format):
 - = Site Common Name + " - " + Device Type Abbreviation + iterative number per site/Device
 - Device ATMS Name is only applicable if “Has ATMS Name” is true for Device Type
 - Example: I696W @ I94 - MM 28.5 - MVDS1

- **Device ATMS Name** (auto-calculated format):
 - = one-letter abbreviation + Site Primary Route + Direction Serving + "-MM" + 4-digit mile marker + Cross-Street + iterative counter
 - Device ATMS Name is only applicable if “Has ATMS Name” is true for Device Type
 - Example: D-I696W-MM0285-I94-1

5.3.4 Search Options

Search by Device

- Device Properties shows all attributes from Access DB (edit)
- WO History shows all work orders (open or closed) for selected device. User can click on WO to load the WO template (read-only)
- Job Numbers shows Project Number(s) and formatted links to ProjectWise directory (edit)
- Power Meter only show tab for Power Meter device type (edit)
- Site shows all site attributes about the device site (read-only)

Search by Site

- Site properties are editable based on role permissions (edit)
- Device list is read-only
- A Site is any location that has devices (e.g. Field_Site, Warehouse, Truck)
- TBD: all field from Access DB > Site Properties

Search by Roadway

- Search Sites based on Site Primary Roadway Name
- Returns list of matching Sites and related Devices
- TBD: all field from Access DB > Site Properties

Search by Cross Street

- Search Sites based on Site Secondary Roadway Name
- Returns list of matching Sites and related Devices
- TBD: all field from Access DB > Site Properties

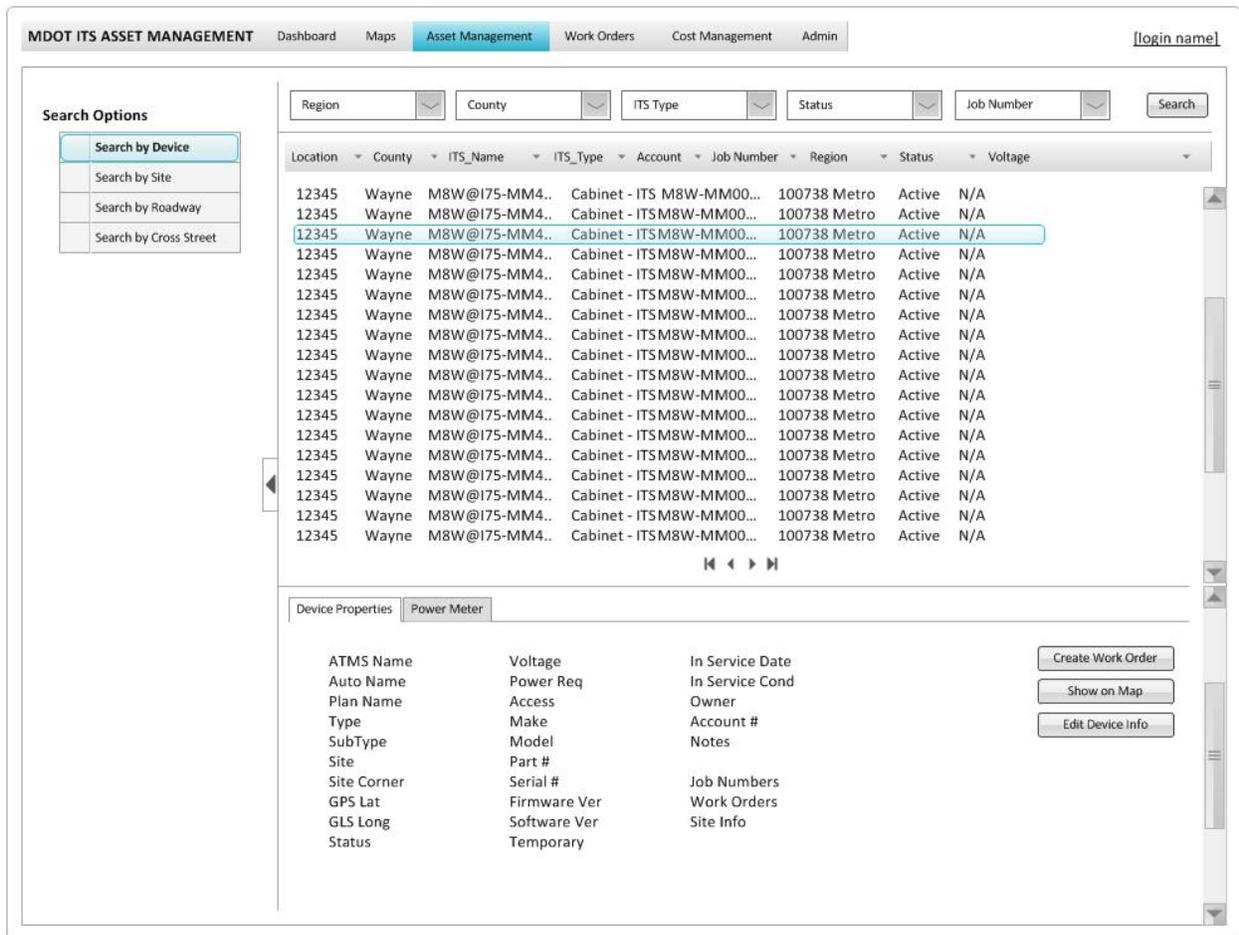


Figure 12 – Search by Device

- 1) Search for Device by selected attribute
- 2) Select device from result set
- 3) Device details for selected device displayed in Device Properties tab
- 4) Select action
 - a. Create Work Order: starts a new work order
 - b. Show on Map: opens map window
 - c. Edit Device Info: opens device attribute edit form

5.3.5 Attributes Panel

Attribute data for each selected record are viewable in attributes panel.

- Meter #
- Account #
- Service Address (Street, City, State, Zip)
- Wire Size
- Power Type
- Circuit Size
- Meter Size
- Load Sheet
- Voltage Drop

Figure 13 – Power Meter Properties

- 1) Power Meter information for Power Meter device types only
- 2) Other device types can be associated with a Power Meter at same Field Site location

5.3.6 Edit Functionality

Refer to the following diagram and use case:

The screenshot shows the 'Edit Device Properties' form in the MDOT ITS Asset Management system. The breadcrumb trail includes Dashboard, Maps, Asset Management, Work Orders, Cost Management, and Admin. A search sidebar on the left offers options: Search by Device (selected), Search by Site, Search by Roadway, and Search by Cross Street. The main form area is divided into several sections:

- Device Properties:** Includes fields for ATMS name (set to 'Auto'), Common Name, Plan Name, Type (dropdown, marked * Required), SubType (dropdown), Site (dropdown), Site Corner, GPS Lat (dropdown, marked * Required), GPS Long (dropdown, marked * Required), Status (dropdown), Voltage, AC/DC (dropdown), and Power Req. (Watts).
- Identification:** Includes Temporary (checkbox, checked), Part Number, Serial Number, Firmware Version, Software Version, Access (dropdown), Make (dropdown), and Model (dropdown).
- Edit Job Number:** Includes a Job Number field with 'Delete' and 'Add Job Number' links.
- Edit Power Meter:** A section header for power meter-related settings.
- Edit Photos:** A section header for photo management.

At the bottom of the form, there are three buttons: 'Back to list', 'Save Changes', and 'Cancel'.

Figure 14 – Edit Device Properties

- 1) Edit Device Properties
- 2) Required fields identified as required

5.3.7 Spare Parts

Spare Parts describes parts or devices, in a warehouse or a truck, that are not yet being utilized at a field site.

Rules (Part):

- Part always gets assigned to a Warehouse site first.
- Part Number is required. Combination of Part Number and Warehouse is unique in order to track quantity in database.
- Unique constraint above enforced in database
- Last Updated and Last Updated Date records who last updated the record

Rules (Device)

- When adding a device to inventory user can only add to site designated as warehouse
- Serialized devices are unique
- Last Updated and Last Updated Date records who last updated the record

API (Part)

- Update: part_guid, shelf, quantity, part no, description
- Move: part_guid, location, quantity
- Delete: part_guid
- Read: part_guid
- Insert: location, shelf, quantity, part no, description

API (Device)

- Update: device_guid, shelf, part no, serial no, model, device type
- Move: device_guid, location
- Delete: device_guid
- Read: device_guid
- Insert: location, shelf, part no, serial no, model, device type

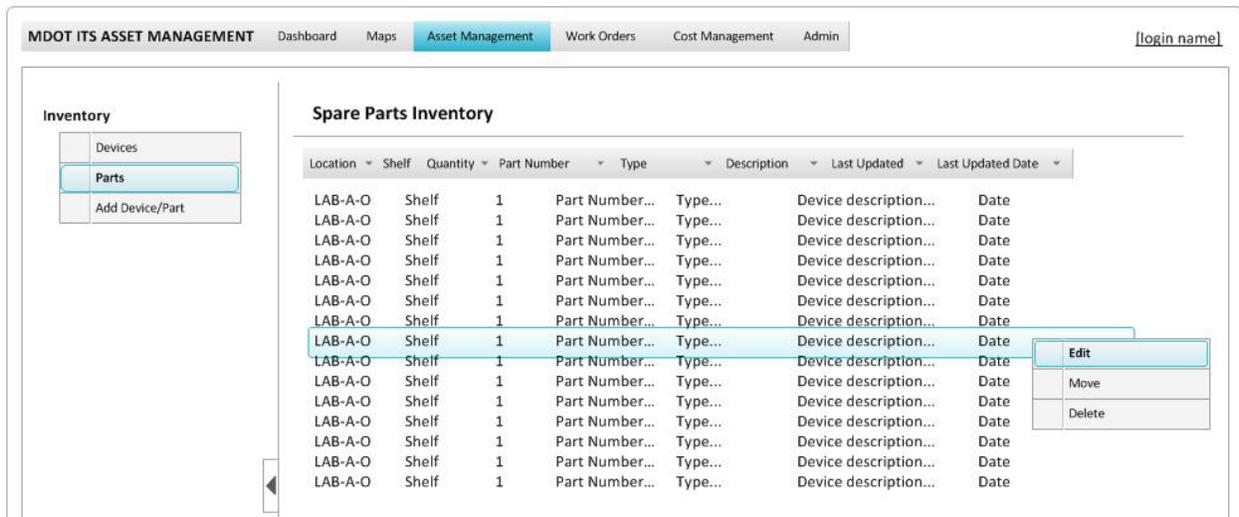


Figure 15 – Spare Parts Inventory

- 1) Filter table by location
- 2) Review parts at Site by Part No, Shelf, Quantity, name
- 3) Options include Edit, Move, and Delete

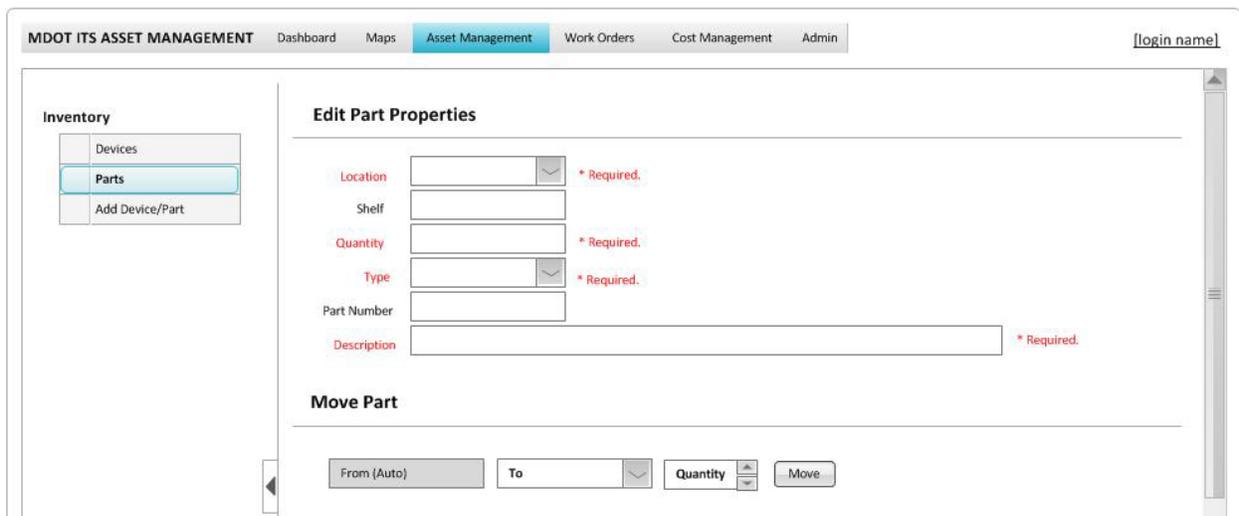


Figure 16 – Spare Parts Edit

- 1) Select To location and specify quantity of parts to move (quantity available is determined from the Spare Parts Inventory)
- 2) Select Move to complete the transfer
- 3) From location is not editable when moving parts (user must edit the Location property of the part itself)

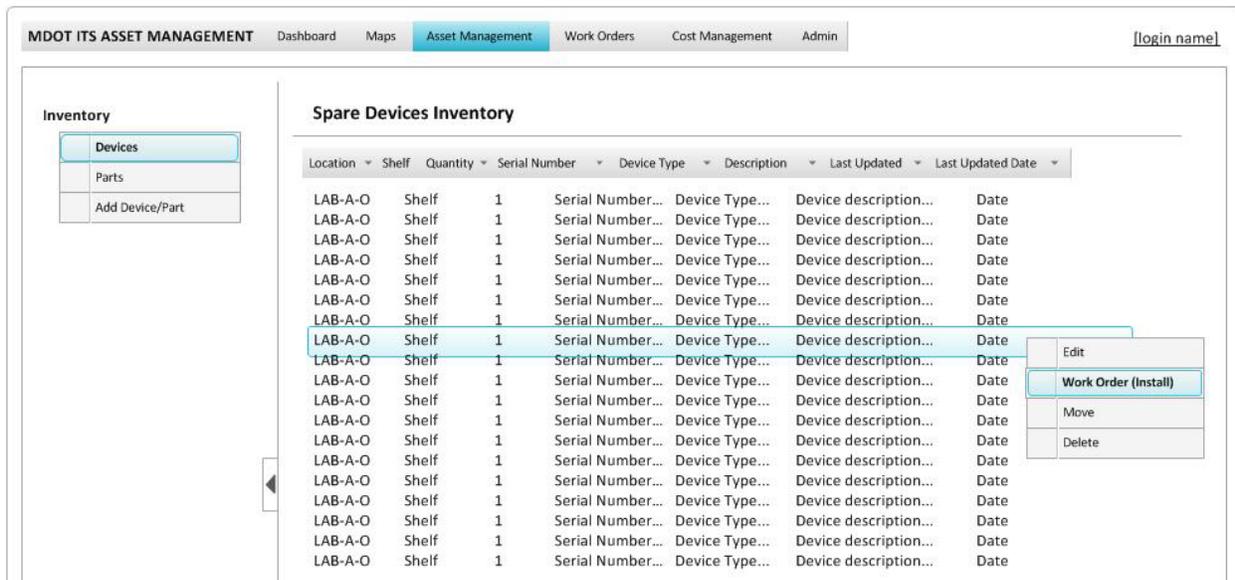


Figure 17 – Spare Devices Inventory

- 1) Filter table by location
- 2) Review parts at Site by Part No, Shelf, Quantity, name
- 3) Options include Edit, Install (Work Order), Move, and Delete – an Install Work Order can only be created on a device

5.3.8 Reports

Refer to Section 5.7 Reporting for a description of reporting functionality. The following system reports will be available in the Asset Management module:

- Equipment History
- Monthly Device Status
- Device Availability
 - County
 - Region
 - Device Type
 - Total # of Devices by Type
 - Device Availability %
 - $[(\text{Total \# of devices by type}) * (\text{Total \# of Calendar Days that Month}) - (\text{Total \# of consecutive 24hr inactive periods})] / [(\text{Total \# of devices by type}) * (\text{Total \# of Calendar Days that Month})]$

5.3.9 Import/Export Functionality

Allows for bulk upload of Device attribute information into the database. Refer to Appendix D – CONTRACTOR DATASHEET for a list of fields and properties that can be bulk-uploaded through Import/Export.

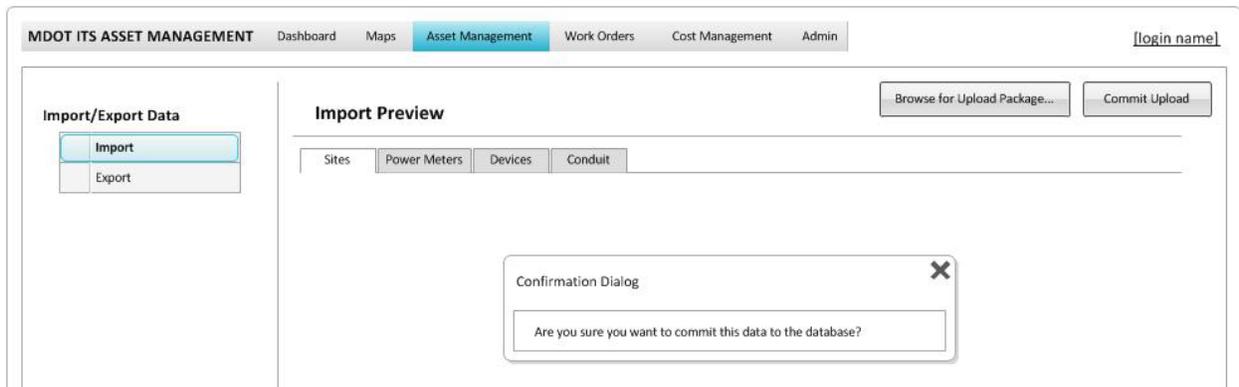


Figure 18 – Data Import

- 1) Browse for completed Contractor Datasheet data package
 - a. Selected data package will populate Sites, Power Meters, Devices and Conduit tabs.
- 2) Once data has been reviewed for accuracy then click “Commit Upload” to commit data to the database.



Figure 19 – Data Export

- 1) Filter Sites based on need criteria.
 - a. Filtering Sites will auto-filter related objects in Power Meters, Devices and Conduit tabs.
- 2) Export selected data
- 3) Save exported package to local file.

5.4 Break Fix Module (Work Orders)

The Break Fix Maintenance Module provides for creation and management of work orders and work order reports. If a device fails, a user will need to enter a work order into the system. Most often this will be a TOC Operator working directly with a device, but it could be any qualified user.

5.4.1 High-Level Functionality

The following describes the high-level business rules that apply to objects managed within this module. These business rules are integrated within the database design.

Additional data integrity and uniqueness rules can be found in Appendix C – Data Indexes.

- A Work Order consists of one Device
- A Device can have one or more Work Order
- A Work Order may be completed with multiple Parts, or a Device, from Inventory
- Only a Part that has been assigned to a Technician’s Truck can be applied to a Work Order
- A Work Order is unique by Work Order Problem Type, per Device, for an Open work order
- Only a Maintenance Contractor or a TOC Operator can reopen a closed Work Order

5.4.2 Navigation

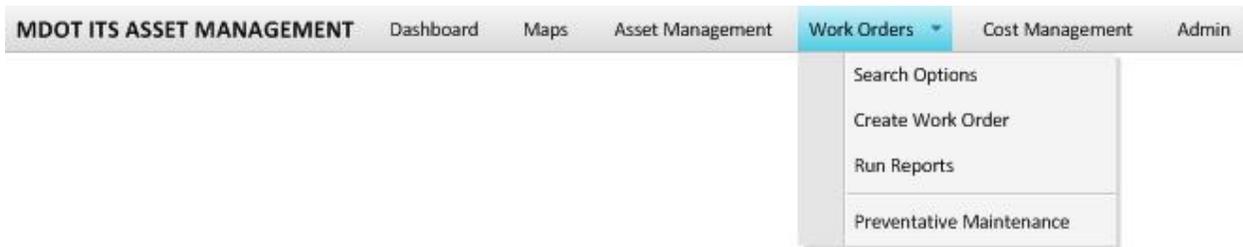


Figure 20 – Work Orders Navigation

5.4.3 Search Options

Refer to the following diagram and use case:

WO #	WO Type	System/Equipment	SubSystem	Loc./SubLoc.	Account	Status	Date
WO #	WO Type...	Equipment...	Description of the WO...	Location	Acct. No ...	Open...	01/01/0001
WO #	WO Type...	Equipment...	Description of the WO...	Location	Acct. No ...	Open...	01/01/0001
WO #	WO Type...	Equipment...	Description of the WO...	Location	Acct. No ...	Open...	01/01/0001
WO #	WO Type...	Equipment...	Description of the WO...	Location	Acct. No ...	Open...	01/01/0001
WO #	WO Type...	Equipment...	Description of the WO...	Location	Acct. No ...	Open...	01/01/0001
WO #	WO Type...	Equipment...	Description of the WO...	Location	Acct. No ...	Open...	01/01/0001
WO #	WO Type...	Equipment...	Description of the WO...	Location	Acct. No ...	Inactive	01/01/0001
WO #	WO Type...	Equipment...	Description of the WO...	Location	Acct. No ...	Inactive	01/01/0001
WO #	WO Type...	Equipment...	Description of the WO...	Location	Acct. No ...	Inactive	01/01/0001
WO #	WO Type...	Equipment...	Description of the WO...	Location	Acct. No ...	Inactive	01/01/0001
WO #	WO Type...	Equipment...	Description of the WO...	Location	Acct. No ...	Closed	01/01/0001
WO #	WO Type...	Equipment...	Description of the WO...	Location	Acct. No ...	Closed	01/01/0001

Figure 21 – Search Work Orders

- 1) Results are color-coded based on work order status (default sort order is Status = Open)
- 2) Selecting a record displays its attribute information in the Attribute Panel

5.4.4 Attributes Panel

Attribute data for each selected record are viewable in attributes panel.



Figure 22 – Work Orders Attribute Panel

- 1) Click on tabs to view sections of an existing work order
- 2) Qualified users will be able to edit

5.4.5 Work Order Search Options

Work Orders will be searchable by one or more of the following states: open-unconfirmed, open-confirmed, inactive – external factor, inactive – warranty, inactive- non-contract device, repair scheduled, and closed. Users will be able to construct a query by selecting from a predefined list of database fields.

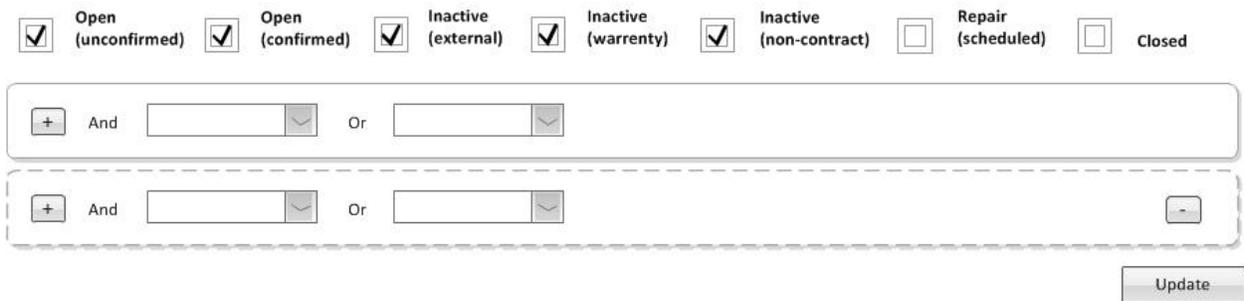


Figure 23 – Work Orders Search Options

- 1) Check/uncheck options and select Update to refresh the results
- 2) Select from a list of predefined database fields to construct a custom query
- 3) Select the Plus button to add additional custom filters to the database query

5.4.6 Sample Filter

The following diagram shows creating a custom filter.

And **Issued** From To

May 13						
M	T	W	T	F	S	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

May 13						
M	T	W	T	F	S	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

- WO Number
- WO Type
- Priority
- Approved By
- Planned By
- Requested By
- System/Equip.
- SubSystem
- Craftsmen
- Contractor
- Location
- SubLocation

Figure 24 – Sample Work Order Filter

5.4.7 Create Work Orders

Qualified users will be able to create work orders in the system.

MDOT ITS ASSET MANAGEMENT Dashboard Maps Asset Management **Work Orders** Cost Management Admin [login name]

Device ID 1234322

WO-123	<input type="button" value="v"/>
WO-234	<input type="button" value="v"/>
WO-654	<input type="button" value="v"/>

Device ID 123 (Created: YYYY-MM-DD HH:MM:SS, Closed: YYYY-MM-DD HH:MM:SS)

Customer ID	<input type="text"/>	* Required.	Severity	<input type="text"/>	<input type="button" value="v"/>
Req By	<input type="text"/>		Issued	<input type="text"/>	<input type="button" value="v"/>
Date	<input type="text"/>		Completed	<input type="text"/>	<input type="button" value="v"/>
System/Equip.	<input type="text"/>		Target	<input type="text"/>	
Location	<input type="text"/>		Type	<input type="text"/>	<input type="button" value="v"/>
Sublocation	<input type="text"/>		Problem	<input type="text"/>	<input type="button" value="v"/>
Account No.	<input type="text"/>				
Task Priority	<input type="text"/>				
W/Progress	<input type="text"/>				
Failure/Action	<input type="text"/>				

Problem Detail

Action Taken

Labor

Parts/Devices

Resolution

Figure 25 – Create Work Order

- 1) Enter Required fields
 - a. Customer ID
 - b. Severity
 - c. Problem Detail
 - d. Type (work order type)
 - e. Problem
 - f. Priority

The screenshot displays the 'Create Work Order Labor' interface within the MDOT ITS Asset Management system. The top navigation bar includes 'Dashboard', 'Maps', 'Asset Management', 'Work Orders', 'Cost Management', and 'Admin'. The user is logged in as '[login name]'. On the left, a sidebar shows 'Device ID 1234322' with a list of work orders: WO-123 (selected), WO-234, and WO-654. The main content area is titled 'Device ID 123 (Created: YYYY-MM-DD HH:MM:SS, Closed: YYYY-MM-DD HH:MM:SS)'. It features several sections: 'Problem/Detail', 'Action Taken', and 'Labor'. The 'Labor' section contains a form with the following fields and controls:

- Labor Task:** A dropdown menu.
- Labor Task Description:** A text input field.
- Labor Acct:** A dropdown menu.
- Trade:** A dropdown menu.
- Date:** A date picker.
- Craftsman ID:** A dropdown menu.
- Craftsman Name:** A text input field.
- Assigned Hour/Min:** Two numeric input fields.
- Assigned OT Hour/Min:** Two numeric input fields.
- Actual Hour/Min:** Two numeric input fields.
- Actual OT Hour/Min:** Two numeric input fields.
- Buttons:** 'Add New Craftsman', 'Add New Labor Task', 'Assigned Total', and 'Actual Total'.

At the bottom of the form, there are three buttons: 'Back to list', 'Save Changes', and 'Cancel'.

Figure 26 – Create Work Order Labor

- 1) Enter Labor Task
- 2) Enter Craftsman Name (name of person performing work)
- 3) Enter hours (optional)
- 4) Add New Labor Task for additional labor (optional)

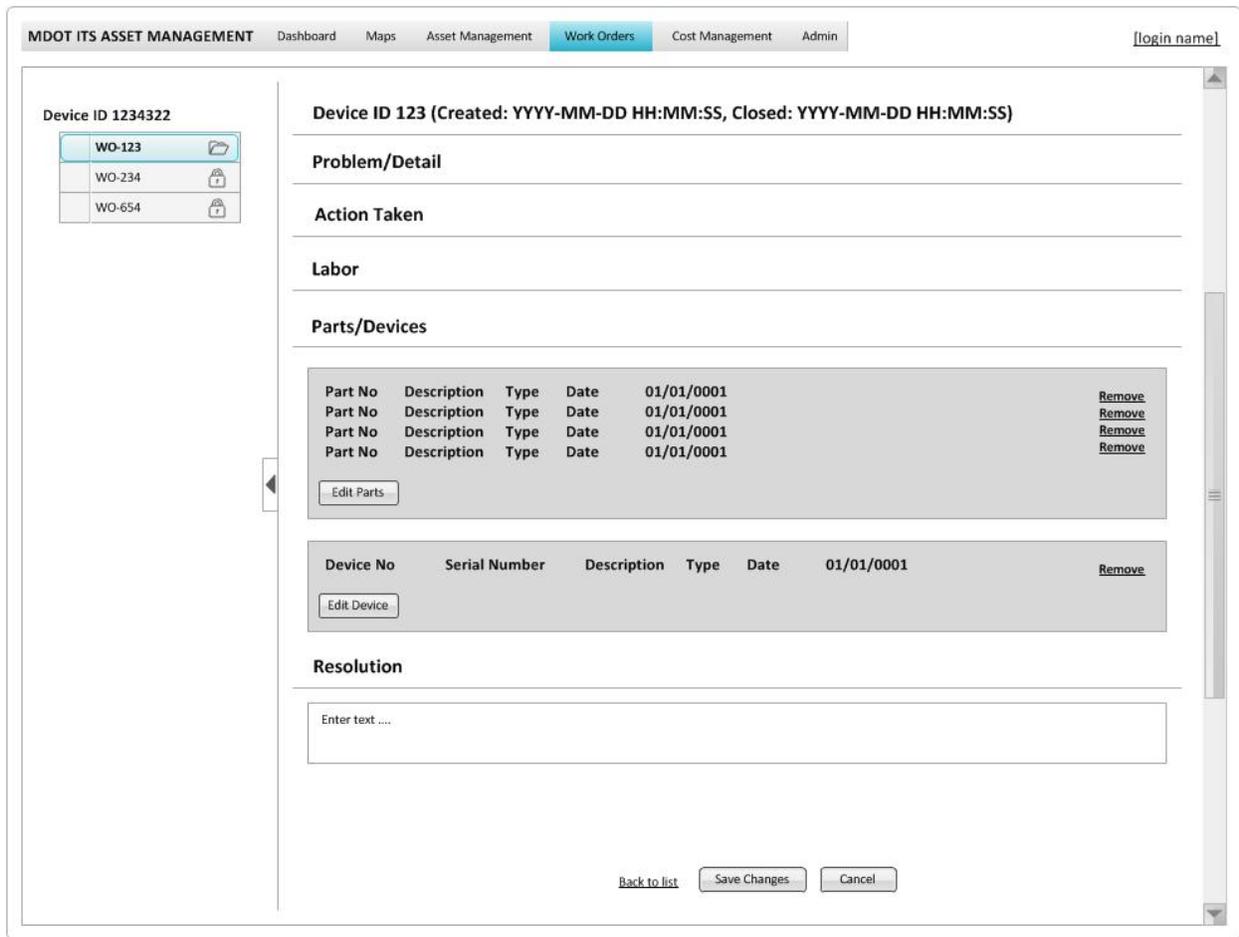


Figure 27 – Create Work Order Parts/Devices

- 1) Select Location dropdown to select location of part/device to transfer
- 2) Select part/device to transfer (from Truck)
- 3) Select Quantity (parts only)
- 4) Devices only:
 - a. If Device replacement (swap) then once Work Order is complete:
 - i. System will:
 1. Retire old device
 2. Replace device with newly selected device
 3. Update any data associations to reflect new device (by unique id)
- 5) Add new Item for additional part/device (optional)



Figure 28 – Assign Part(s) or Device(s) to Work Order

- 1) Select Edit Parts from the previous screen
- 2) Select From location from the dropdown menu
- 3) To Location will be the site of the Work Order; if To location is different, select To location using the select button
- 4) Drag part(s) from the left box to the right box to assign. Click Save Changes to complete

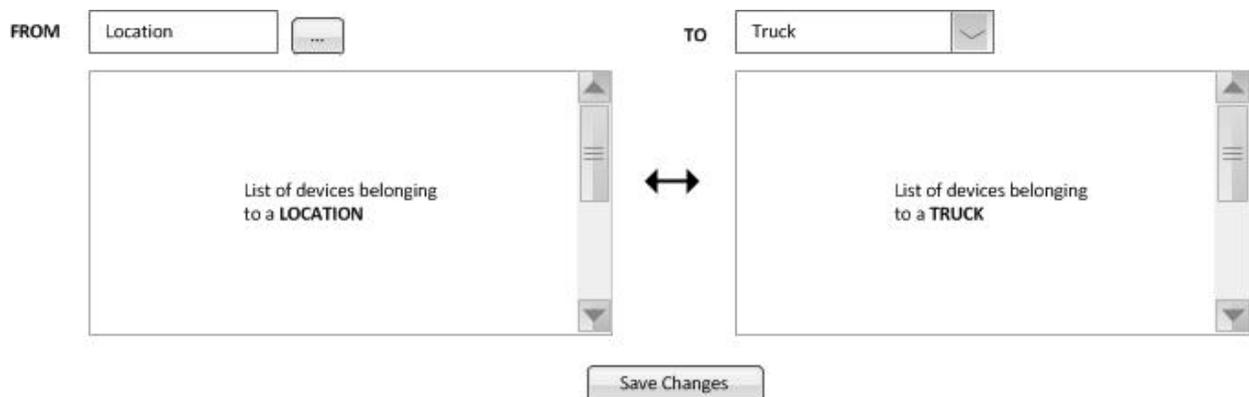


Figure 29 – Add Device to Work Order

- 1) Select Edit Device from the previous screen
- 2) From Location will be the site of the Work Order; if From location is different, select From location using the select button
- 3) Select From location from the dropdown menu
- 4) Drag device from the left box to the right box to assign. Click Save Changes to complete

5.4.8 Reports

Refer to Section 5.7 Reporting for a description of reporting functionality. The following system reports will be available in the Asset Management module:

- Preventative Maintenance Status
- [MISSING] – need list of reports from MDOT

5.4.9 Preventative Maintenance

Refer to Preventative Maintenance module.

5.5 Preventative Maintenance Module

The Preventative Maintenance Module consists of web-based forms and reports to assist with preventative maintenance tasks that should occur on a regularly scheduled interval based on guidelines established for each device type.

5.5.1 High-Level Functionality

The following describes the high-level business rules that apply to objects managed within this module. These business rules are integrated within the database design. Additional data integrity and uniqueness rules can be found in Appendix C – Data Indexes.

- Preventative Maintenance is defined by Device Type
- Scheduled Preventative Maintenance is defined as Date maintenance completed plus allocated period of time

5.5.2 PM Checklists

The following describes the high-level business rules that apply to objects managed within this module. These business rules are integrated within the database design. Additional data integrity and uniqueness rules can be found in Appendix C – DATA INDEXES.

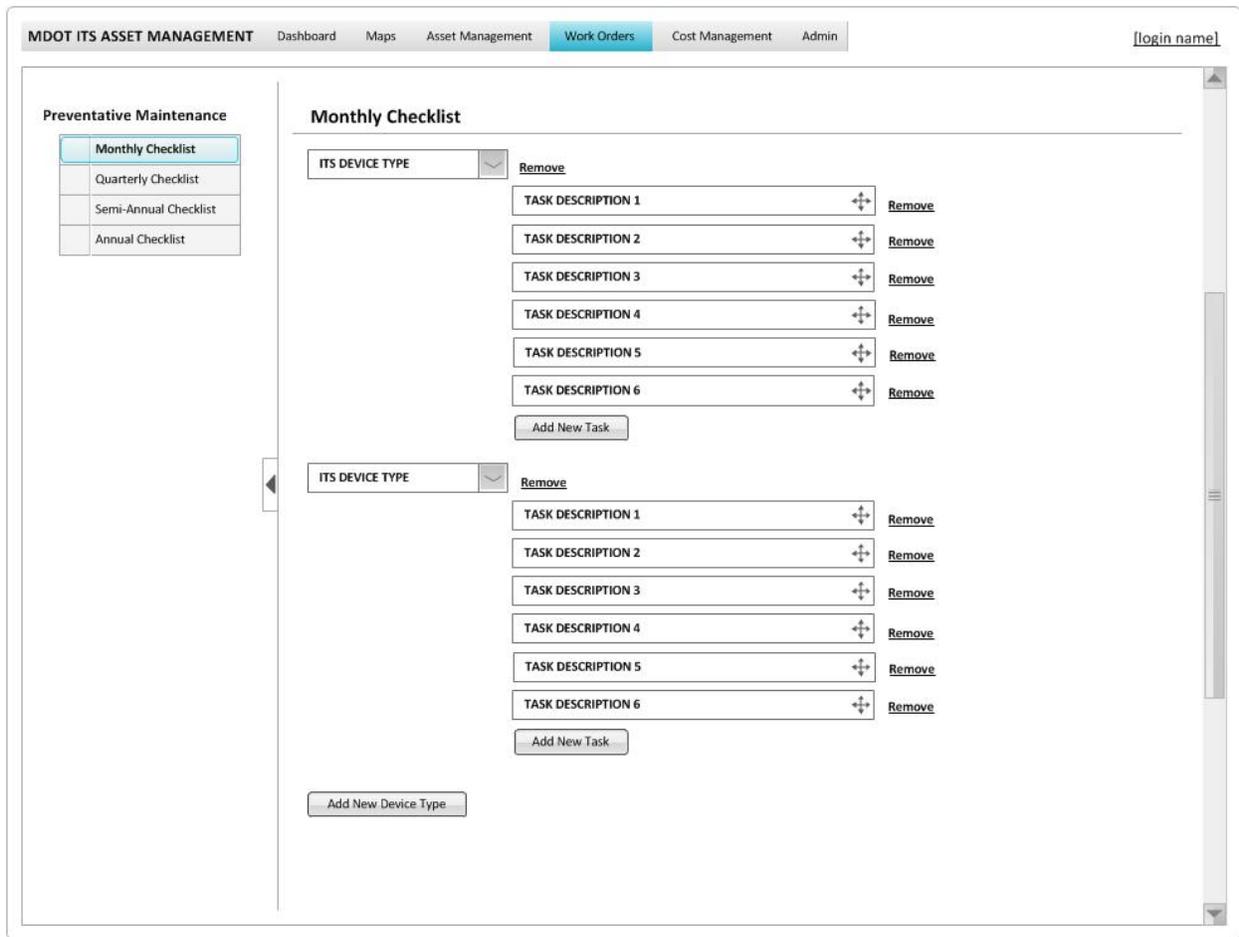


Figure 30 – Preventative Maintenance Checklist

- 1) Select Time Period (monthly, quarterly, semi-annual, annual)Explanation of item 2
- 2) Select Device Type
- 3) Enter description of preventative maintenance task
- 4) Arrange tasks in order of how tasks are to be completed (optional)

Device ID 1234322 Work Order

Customer ID	<input type="text"/>	* Required.	Severity	<input type="text"/>
Req By	SYSTEM		Issued	DATE <input type="text"/> <input type="text"/>
Date	<input type="text"/>		Completed	<input type="text"/>
System/Equip.	DEVICE NAME <input type="text"/>		Target	PM
Location	SITE <input type="text"/>		Type	<input type="text"/>
Sublocation	XSTREET <input type="text"/>		Problem	<input type="text"/>
Account No.	PWR METER <input type="text"/>			
Task Priority	LOW <input type="text"/>			
W/Progress	<input type="text"/>			
Failure/Action	<input type="text"/>			

Problem Detail

- PM Checklist Item

Figure 31 – Auto-Populated Work Order Based on Preventative Maintenance Checklist

- 1) System runs check for preventative maintenance vs. last completed preventative maintenance date
- 2) When preventative maintenance must occur within 30 days, then a new work order is auto-created.
- 3) System populates default values for auto-created work order
 - a. Req By = “System”
 - b. Issued = today’s date
 - c. System/Equip = Device Name (Device GUID)
 - d. Location = Site Name (Site GUID)
 - e. Task Priority = “Low”
 - f. Work Order Type = "PM"
 - g. Work Order State (Status) = “Open”

5.6 Cost Management Module

The Cost Management module consists of web-based forms and reports to assist with understanding future cost commitments and planned ITS deployments by estimating year-by-year future costs for each device type. Cost items are assigned for a Device Type. Project cost forecasting allowing users to define a project to use for cost forecasting.

5.6.1 High-Level Functionality

The following describes the high-level business rules that apply to objects managed within this module. These business rules are integrated within the database design.

Additional data integrity and uniqueness rules can be found in Appendix C – Data Indexes.

- Cost Management is defined by Device Type
- Projects are assigned by Job Number
- Selected Job Number populates associated devices by device type and quantity
- Project capital costs & future reoccurring costs are summed up with existing device's reoccurring costs to estimate Program costs

5.6.2 Navigation

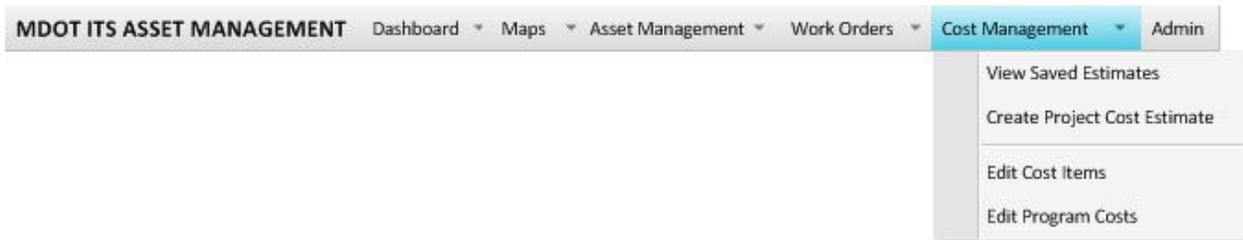


Figure 32 – Cost Management Navigation

5.6.3 Create Project Cost Estimate

The Cost Management module allows for the creation of planned Projects for cost estimating purposes. Users enter a planned project number and information about the planned project. Device Types are then selected for the project and costs are calculated based on the type and quantity of devices selected.

MDOT ITS ASSET MANAGEMENT Dashboard Maps Asset Management Work Orders **Cost Management** Admin [login name]

Cost Management

- Project Cost Estimate
- Saved Project Estimates
- Cost Item Inputs
- Program Inputs

Project Cost Estimating

Job Number

Start Date

End Date

Job Desc

Region

Job Type

Funding Type

Funding Source

Construction Items

Device Type	Quantity	Planned/Existing	Item Capital Cost	Total Cost
<input type="text"/>	<input type="text"/>	<input type="text"/>	\$ Capital Cost (Auto)	\$ Total Cost (Auto)

Sub-Total:

Manual Adjustments:

MOT:

Integration:

Contingency:

Other:

Engineering Items

Systems Engineering	Cost	Cost Year	% of Construction (auto)
Design	Cost	Cost Year	% of Construction (auto)
System Manager	Cost	Cost Year	% of Construction (auto)
Construction Engineer	Cost	Cost Year	% of Construction (auto)

Project Grand Total

Figure 33 – Create Project Cost Estimate

- 1) Select Job Number
 - a. Job Details are auto-populated
 - b. Device Types and Quantities will be auto-populated based on the devices assigned to that Job Number in the database.
 - i. Costs summarized based on defined cost for each selected Device Type
- 2) Enter Manual Adjustment (optional) with optional Comments/Notes
 - a. Systems Engineering
 - b. Design
 - c. System Manager
 - d. Construction Manager
 - e. Contingency
 - f. MOT
 - g. Integration
 - h. Other
- 3) Enter Engineering Costs and Year.

5.6.4 Create Program Cost Estimate

MDOT ITS ASSET MANAGEMENT Dashboard Maps Asset Management Work Orders **Cost Management** Admin [login name]

Cost Management

- Project Cost Estimate
- Saved Project Estimates
- Cost Item Inputs
- Program Inputs

Program Cost Estimates

FY2013 Budget Remove

	FUNDING SOURCE		
	CMAQ	ITS TEMPLATE	
Superior	\$ <input style="width: 80%;" type="text"/>	\$ <input style="width: 80%;" type="text"/>	Total: _____
North	\$ <input style="width: 80%;" type="text"/>	\$ <input style="width: 80%;" type="text"/>	Total: _____
Grand	\$ <input style="width: 80%;" type="text"/>	\$ <input style="width: 80%;" type="text"/>	Total: _____
Bay	\$ <input style="width: 80%;" type="text"/>	\$ <input style="width: 80%;" type="text"/>	Total: _____
Southwest	\$ <input style="width: 80%;" type="text"/>	\$ <input style="width: 80%;" type="text"/>	Total: _____
University	\$ <input style="width: 80%;" type="text"/>	\$ <input style="width: 80%;" type="text"/>	Total: _____
Metro	\$ <input style="width: 80%;" type="text"/>	\$ <input style="width: 80%;" type="text"/>	Total: _____
Total:	_____	_____	

Add New Fiscal Year Section

Figure 34 – Input Program Cost Estimates

- 1) Summary of all existing device operational costs (by year) as well as planned project capital & operational costs (by year)
- 2) User selects year, region, cost type
- 3) Overall budgets entered by year, region, funding source

5.6.5 View Saved Estimates

Refer to the following use case:

- User can save a Project, with Devices, for later viewing
- User can open a saved Project, with devices, for viewing and editing

5.6.6 Edit Cost Item Table

Cost profiles are assigned at the Device Type level.

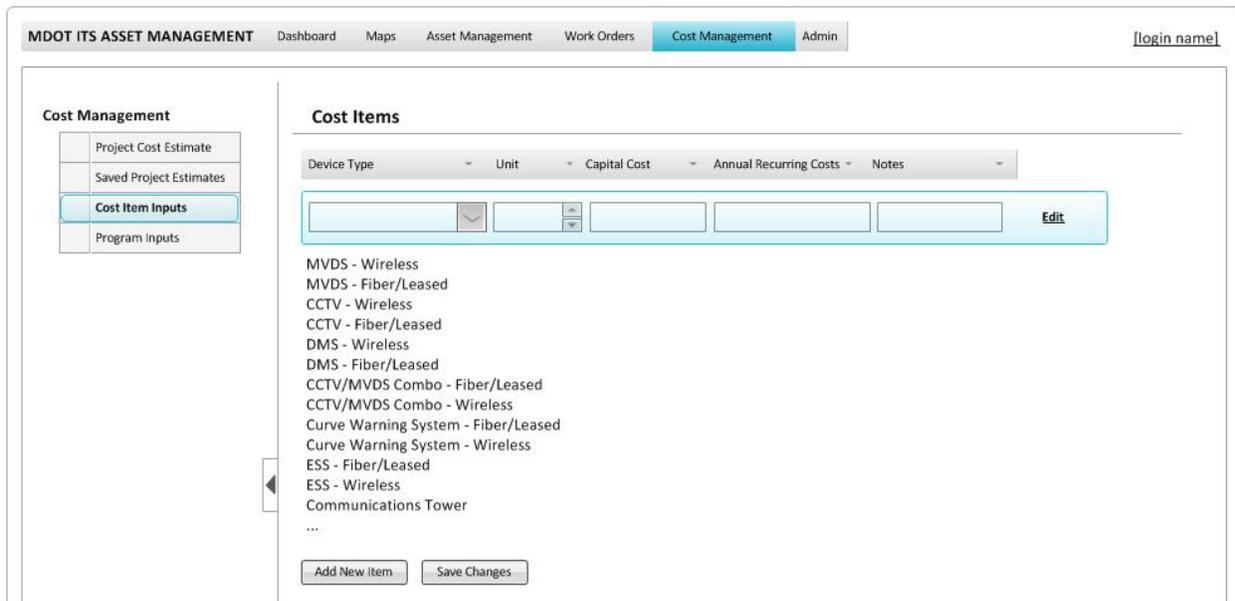


Figure 35 – Edit Cost Item Table

- 1) Select Device Type
- 2) Enter estimated Capital Cost for Device Type
- 3) Enter estimated Annual Recurring Cost for Device Type
- 4) Enter notes for Device Type (optional)

5.7 Reporting

5.7.1 High-Level Functionality

The following describes the high-level functionality that applies to reporting from the website:

- There are 2 levels of reporting as follows:
 - System reports – system reports are preconfigured and are intended to be run by qualified users on a routine basis. System reports have custom, formatted print templates assigned to them.
 - User reports – user reports are database queries that have been saved by users for future use. User reports will have a standard formatted print template.

5.7.2 Report UI

Refer to the following diagram and use case:

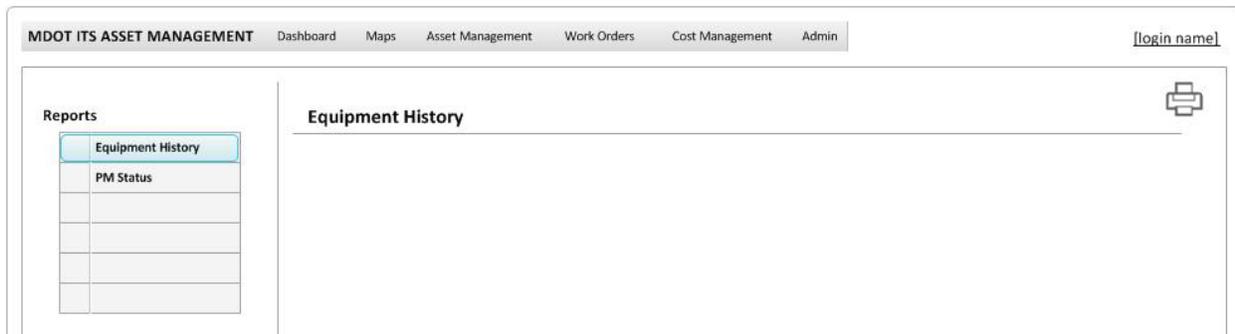


Figure 36 – Report UI

- 1) Select report to execute database query
- 2) Select print to create a PDF export (system reports will contain custom formatting; user reports will share a common formatting)

5.7.3 Sample System Report Formatting

Refer to the following diagram and use case:

System/Equip. History Report

Date: 04/26/13
Page 1 of 32

Open and Closed WOs
From: 01/01/96 To: 04/26/13

System/Equip.	SubSys	Iss/Closed	W/O Number	Ttl Hrs	Contract	Misc.	Ttl Labor	Material	Ttl WO Cost
<u>039S12A-S005-S-CHICAGO</u>	*NONE*	10/19/10	0000019716	4:0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Location: 039S12A		SubLoc		Opt 1		Num Opt 1 0			
Account No. MOTOR CITY ELECTRIC						Dn Time 0		Cost:	
Failure: R&R		REMOVE AND REPLACE COMPONENT						Meter	
Performed sign selftest found two bad driver boards. Replaced driver boards and performed sign selftest test passed. Performed lighting test and replaced one bad lamp. Contacted MITSC and verified comms and control.									
Tasks: <u>To many bad pixels, message does display</u>									
Craftsman		Labor Task			Trade	Regular	OverTime	Total Hrs	Ttl Labor
MGM - MATT MAZUREK						4:0	0:0	4:0	.00
<u>039S12A-S005-S-CHICAGO</u>	*NONE*	09/15/10	0000019415	4:0	\$0.00	\$0.00	\$0.00	\$127.61	\$127.61
Location: 039S12A		SubLoc		Opt 1		Num Opt 1 0			
Account No. MOTOR CITY ELECTRIC						Dn Time 0		Cost:	
Failure: R&R		REMOVE AND REPLACE COMPONENT						Meter	
Ran selftest, verified comms, and replaced triac mod. to restore control from MITS.									

Figure 37 – Sample Formatted Report

5.7.4 Report Data

Refer to the appendix for report data.

5.8 Admin

The Admin module consists of web-based forms to assist Administrators with managing users and select system tables that impact functionality in other modules.

5.8.1 High-Level Functionality

The Admin module includes:

- User Permission/Role management
- Lookup Table Editing

5.8.2 Lookup Tables

Refer to the following diagram and use case:

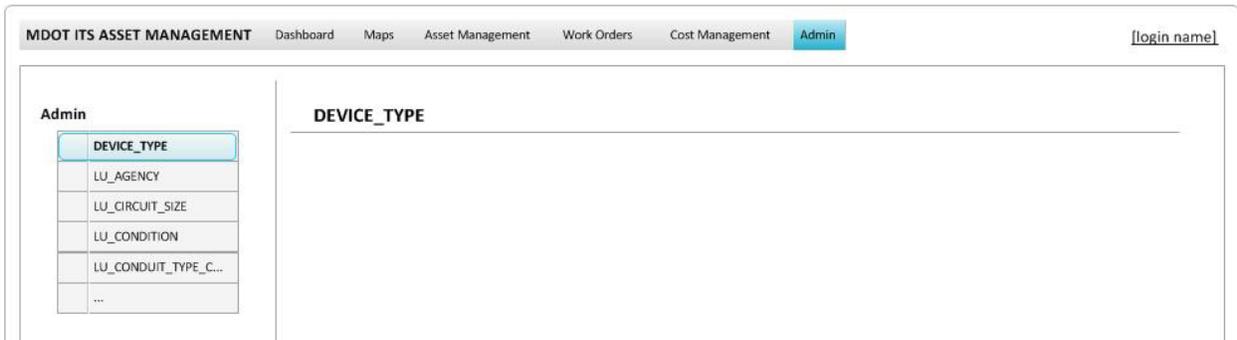


Figure 38 – Admin Lookup Table Editing

5.8.3 User Roles/Permissions

Refer to the following diagram and use case:

MDOT ITS ASSET MANAGEMENT Dashboard Maps Asset Management Work Orders Cost Management Admin [login name]

Security

- Users
- Regions

Users

User Name	First Name	Last Name	Region	Roles	Active	Approved	Last Login
User Name	First Name	Last Name	Region	System Admin, ...	Yes	Yes	4/4/2013
User Name	First Name	Last Name	Region	System Admin, ...	Yes	Yes	4/4/2013
User Name	First Name	Last Name	Region	System Admin, ...	Yes	Yes	4/4/2013
User Name	First Name	Last Name	Region	System Admin, ...	Yes	Yes	4/4/2013
User Name	First Name	Last Name	Region	System Admin, ...	Yes	Yes	4/4/2013
User Name	First Name	Last Name	Region	System Admin, ...	Yes	Yes	4/4/2013
User Name	First Name	Last Name	Region	System Admin, ...	Yes	Yes	4/4/2013
User Name	First Name	Last Name	Region	System Admin, ...	Yes	Yes	4/4/2013
User Name	First Name	Last Name	Region	System Admin, ...	Yes	Yes	4/4/2013
User Name	First Name	Last Name	Region	System Admin, ...	Yes	Yes	4/4/2013
User Name	First Name	Last Name	Region	System Admin, ...	Yes	Yes	4/4/2013

Create New User

Figure 39 – User Roles/Permissions

5.8.4 User Details

Refer to the following diagram and use case:

MDOT ITS ASSET MANAGEMENT [Dashboard](#) [Maps](#) [Asset Management](#) [Work Orders](#) [Cost Management](#) [Admin](#) [login name]

Security

- Users
- Regions

User Details

First Name * Required.

Last Name * Required.

User Name * Required.

Password Question * Required.

Password Answer * Required.

Office Phone

Mobile Phone

Email

Alt Email

Failure/Action

Active

Approved

Locked Out

Roles

- Preventative Maintenance Viewer
- Break Fix Viewer
- Cost Management Viewer
- Preventative Maintenance Viewer
- Asset Management Editor
- Cost Management Editor
- ITS Coordinator
- Maintenance Technician
- Maintenance Contractor
- MDOT Engineer
- MDOT Management
- TOC Operator
- Application Administrator
- System Administrator

Regions

- Metro
- Grand
- University
- ...

[Back to list](#)

Figure 40 – User Details

6 EXTERNAL INTERFACES

External interfaces are systems that are not within the scope of this application development, but that may be required to meet specific requirements. Communication with external systems will be through an established API (Application Programming Interface). An API allows different software to communicate directly with each other.

6.1 Solarwinds API

HNTB will continue to work with MDOT on integration with Solarwinds. The following items have been identified as next steps in the integration process.

- Confirm current architecture for connecting to Solarwinds API through external services
- Secure the Solarwinds API using SSL (Secure Sockets Layer) and HTTPS to encrypt data transferred between the web server and web browser. The current instance of Solarwinds at SEMTOC uses a self-signed certificate which is insufficient to establish a “trusted” connection to an external service. HNTB will continue to work with MDOT on creating and deploying a trusted connection.
- Create a custom polling routine to include IP address, ATMS name, and other pertinent information that can be queried through the API. This information might then be incorporated into the Asset Management Database directly to avoid duplicate information. Currently there is no polling mechanism in place for this information. HNTB will continue to work with MDOT on creating custom polling.
- HNTB to work with MDOT to identify whether data from Solarwinds would be available for the entire state through SEMTOC, or will three separate connections to Solarwinds be necessary (i.e., SEMTOC, WMTOC, and STOC).

6.1.1 Current Architecture

Refer to the following diagram:

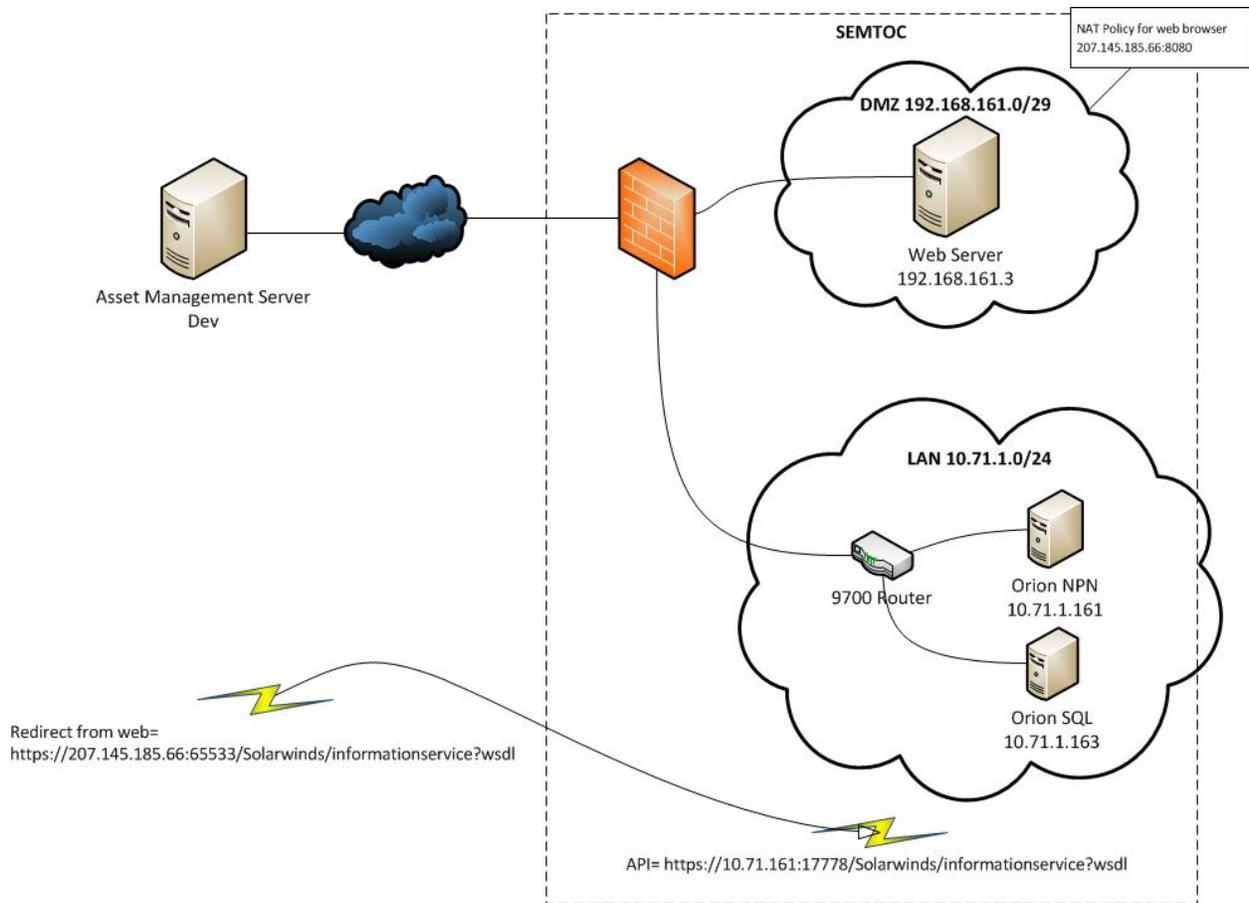


Figure 41 – Solarwinds API Current Architecture

6.2 ArcGIS Server API

- gis.mcgi.state.mi.us/arcgis/rest

6.3 ProjectWise API

[MISSING] – Documentation needed from MDOT on connecting to ProjectWise.

[MISSING] – Documentation on URL structure for connecting to project documents.

7 SOFTWARE DELIVERY

7.1 Issue Tracking

All functional and non-functional requirements, defects, bugs, feature requests, and issues pertaining to application development will be tracked using OnTime software. OnTime is a multi-user, web-based management system designed to allow teams of software developers and testers to manage and track all aspects of a software project.

MDOT will be responsible for entering test results into OnTime. Results will be categorized based on status, assignment, priority, and severity. All users will have the ability to keep track of updates through OnTime.

MDOT will be able to access HNTB's OnTime tracking portal at the following address:

<https://hntbportal.ontimenow.com/login.aspx>

7.1.1 Sample Issue Tracking Report

Refer to the following diagram:

Defects List											
ID	Project	Name	Status	Priority	Severity	Assigned To	Reported By	Build #	Est Work	Date Found	Date Fixed
41	Integration	Stored procedure not accessible by certain users	Closed	Low	Low Impact	AndyWarren	AndyWarren		2 hrs	09/22/2005	10/14/2005
40	BizTalk Automation	XML file extension is incorrect	Waiting	Low	High Impact	AndyWarren	AndyWarren		30 days	10/19/2005	
39	CRM and Accounting	The cancel button doesn't close the window	Closed	Low	Medium Impact	AndyWarren	AndyWarren		30 days	10/06/2005	10/15/2005
38	Web and CRM	Application crashes when entering 0 for the value	Closed	Medium	Medium Impact	AndyWarren	AndyWarren		1 hrs	10/10/2005	10/17/2005
37	Vendor Management	Misspelled label on add/edit vendor	Closed	High	Critical	AndyWarren	AndyWarren		30 days	10/16/2005	10/17/2005
36	Accounting	Wrong icons on the toolbar	Closed	Low	High Impact	AndyWarren	AndyWarren		30 days	10/12/2005	
35	Invoicing	Some numbers are getting cut off, field is too small	Closed	Low	Low Impact	AndyWarren	AndyWarren		30 days	09/27/2005	09/27/2005
34	General Ledger	Report was printing the wrong dates	Closed	High	High Impact	AndyWarren	AndyWarren		30 days	10/05/2005	10/05/2005
33	Vendor Management	When resizing window controls don't stretch	On Hold	High	High Impact	AndyWarren	Fred Itguy		30 days	10/20/2005	
32	Accounting	Update image on the about box	Closed	High	Critical	AndyWarren	Fred Itguy		10 days	09/29/2005	10/02/2005
31	Invoicing	When window is minimized it cannot be restored	Closed	Medium	Medium Impact	AndyWarren	Fred Itguy		30 days	09/25/2005	09/25/2005
30	General Ledger	Formatting is off when using Firefox	Closed	Low	Low Impact	AndyWarren	Fred Itguy		1 min	10/13/2005	10/17/2005
29	General Ledger	The reports are missing "printed on" date	Waiting	High	Critical	AndyWarren	Fred Itguy		30 days	10/20/2005	
28	Vendor Management	There is no confirmation when deleting a vendor	Closed	Medium	No Impact	AndyWarren	Fred Itguy		30 days	09/28/2005	10/02/2005
27	Vendor Management	When editing vendors, the location picklist is	Closed	Low	Low Impact	AndyWarren	Fred Itguy		3 hrs	10/09/2005	10/09/2005

Figure 42 – Sample Issue Tracking Report

7.1.2 Sample Issue Tracking Form

Refer to the following diagram:

Edit Defect #25

Save & Close Save Cancel

General Defect Info

Name: Map Interaction: Zoom In

Workflow Step: Defect Found Project: GeoView

Date Found: 2/11/2008 Build Number: 1.0

Test Type: System
 Regression
 Performance
 Installation

Date Fixed:

Build Number Of Fix: 1.0 Priority: High

Severity: Status: Open

Reported By: Jeff Siegel Assigned To:

Estimated Duration: 0 Actual Duration: 0

Percent Complete: 0 Publicly Viewable:

Customer Contact Name: Don Nehmer (MMSD)

Description:
Stamp >>

B I U A A Font Name 10px

InsertAttachment

SRS 3.1: Click on the map or drag a selection box on the map with a mouse zoom in.

Replication Procedures:
Stamp >>

B I U A A Font Name 10px

InsertAttachment

Resolution:
Stamp >>

B I U A A Font Name 10px

InsertAttachment

Notes:
Stamp >>

B I U A A Font Name 10px

InsertAttachment

Customer Portal

Notify customer of changes made to this defect?

Save & Close Save Save and New Save and Attach File Cancel

Figure 43 – Issue Tracking Form

7.2 Release Schedule

The following schedule shows functionality by release milestone.

Functional Requirements	Release Schedule					
	0.1	0.2	0.3	0.4	0.5	1
<i>Final Design Specification is completed prior to development</i>						
Database Creation	X					No new functionality to be delivered in this release
Development/Testing Environment	X					
Production Environment				X		
Website Framework (MVC)	X					
Entity Framework Setup	X					
Dashboard Creation			X	X		
Search Map by Region	X	X				
Edit Linework on Map		X	X			
Edit Devices on Map		X	X			
Asset Management Search	X	X				
Spare Parts/Devices Inventory		X	X			
Asset Management Reports		X				
Import/Export Data			X	X		
Add New Site	X	X				
Add New Device	X	X				
Add New Job	X	X				
Search Work Orders		X	X			
Create Work Order		X	X			
Work Order Reports		X	X			
Preventative Maintenance Checklist		X	X			
Create Project Cost Estimate			X	X		
View Saved Project Estimates			X	X		
Cost Management Admin Tables			X	X		
Reporting Framework		X	X			
Custom Reports Templates				X		
Admin User Management			X	X		
Admin Region Management			X	X		
Admin Lookup Tables			X	X		
Solarwinds Integration				X		
ProjectWise Integration				X		
ArcGIS Server Integration	X					

Table 3 – Release Schedule

- 1) It is intended that 70% of the functionality will have been tested in full prior to the v0.4 Release.
- 2) All documented functionality must be present in the v.04 Release.
- 3) Release 0.5 is reserved for acceptance testing of the entire solution

8 WORKFLOW PROCESS DIAGRAMS

This section includes workflow process diagrams to capture the functional, technical, or business processes associated with a module or part thereof.

8.1 Overview

Descriptions of this section, broken down by module or functionality...

- Asset Management
- Preventative Maintenance
- Break Fix (Work Orders)
- Contractor Datasheet
- Cost Management

FR-AM-1.3

Users shall be able to add and modify asset data associated with a new project.

MDOT ITS Coordinators shall be able to update the asset management database to reflect changes made in the field.

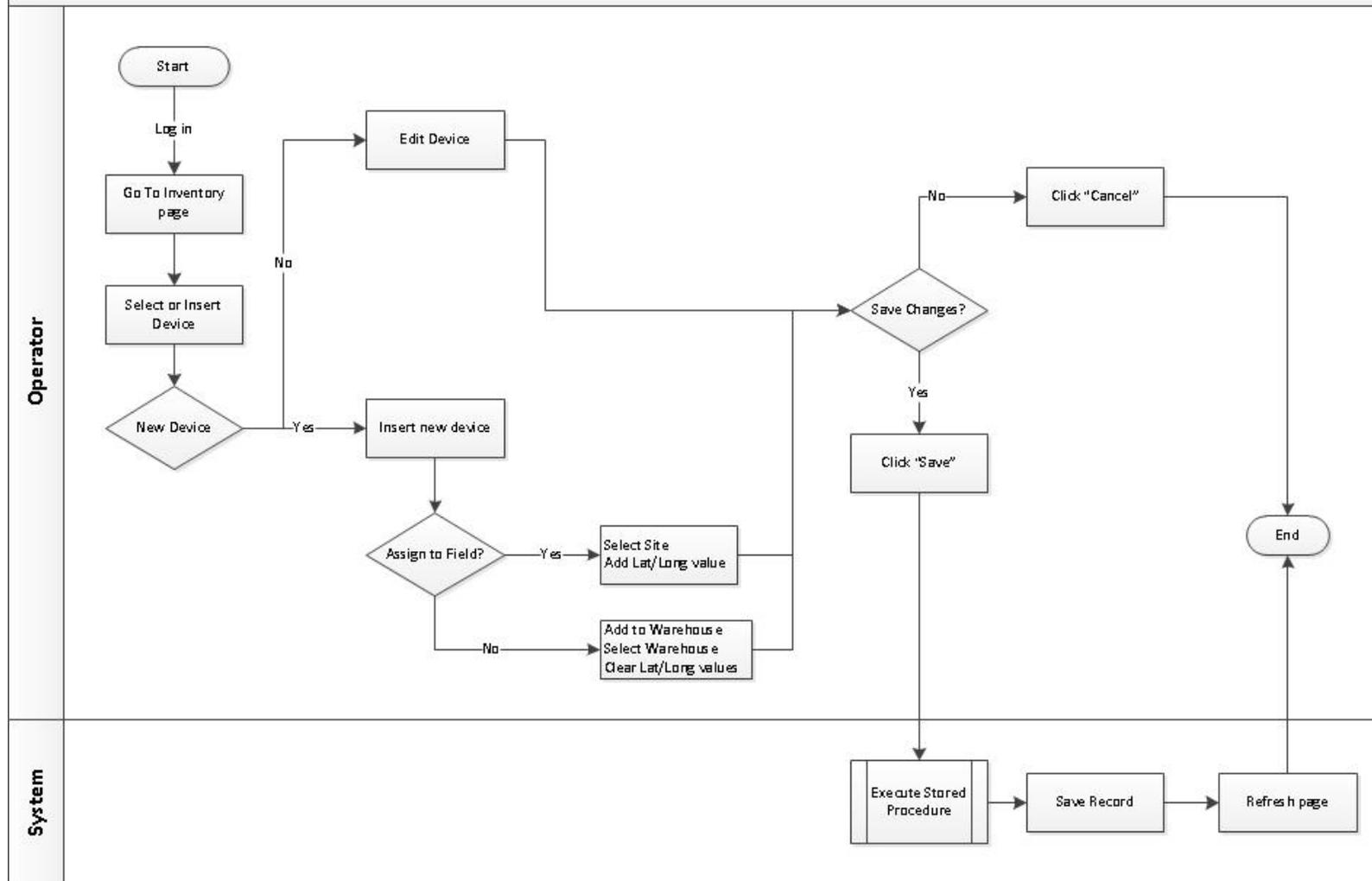


Figure 44 – FR-AM-1.3

FR-AM-1.4

identify assets with a unique ID. (e.g., serial number)

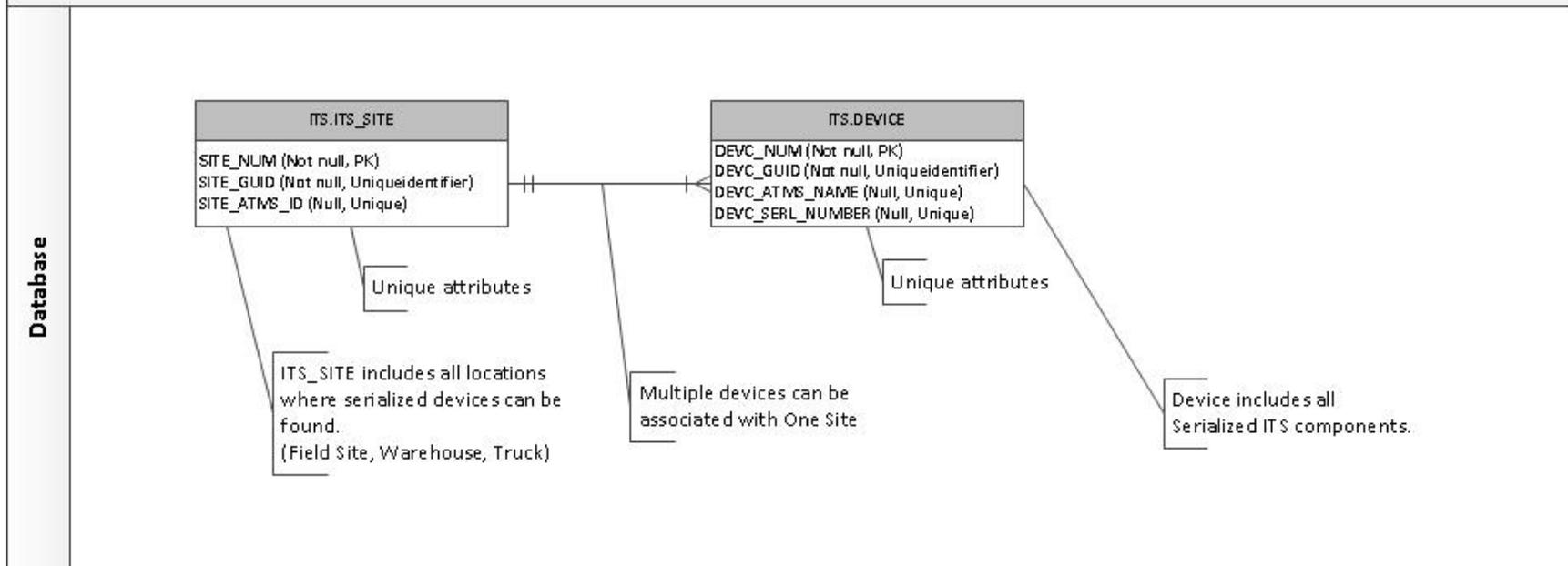


Figure 45 – FR-AM-1.4

FR-AM-1.5

enable users to identify devices with an ID by location (e.g., CCTV175MM2490) that is understood by TOC Operators.

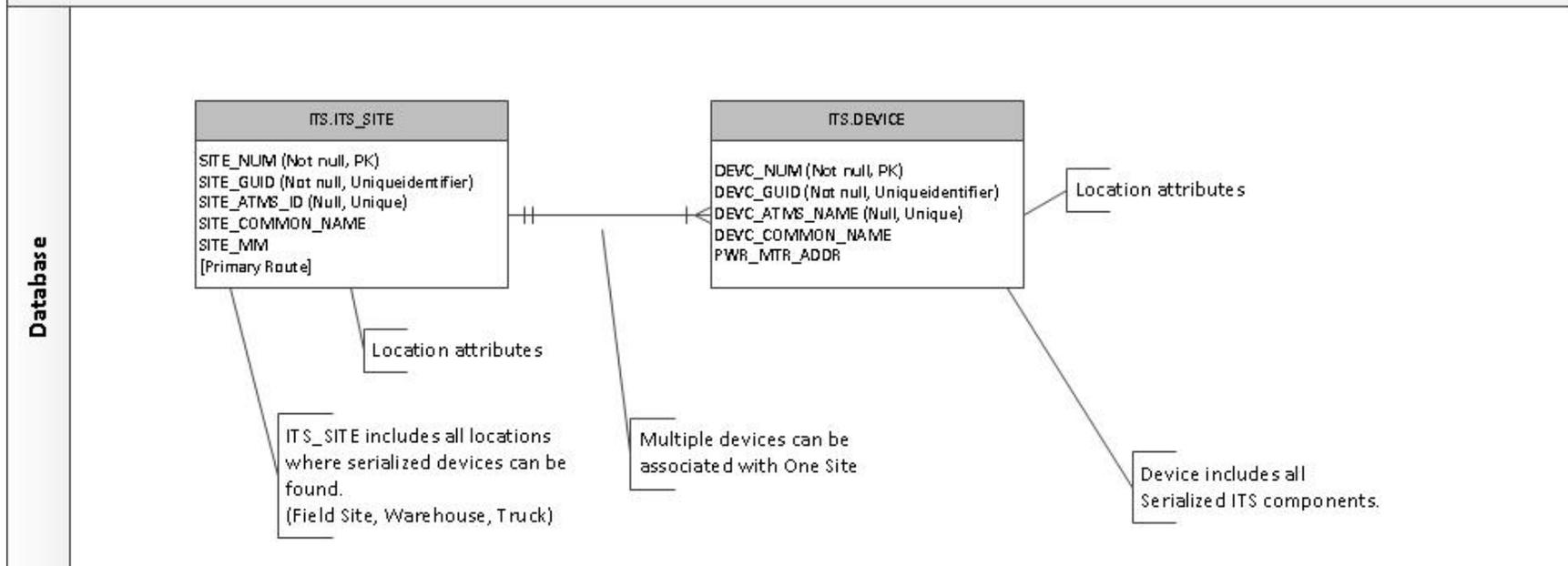


Figure 46 – FR-AM-1.5

FR-AM-1.7

batch decommissioning of devices (for replacement/ decommissioning projects) by qualified users.

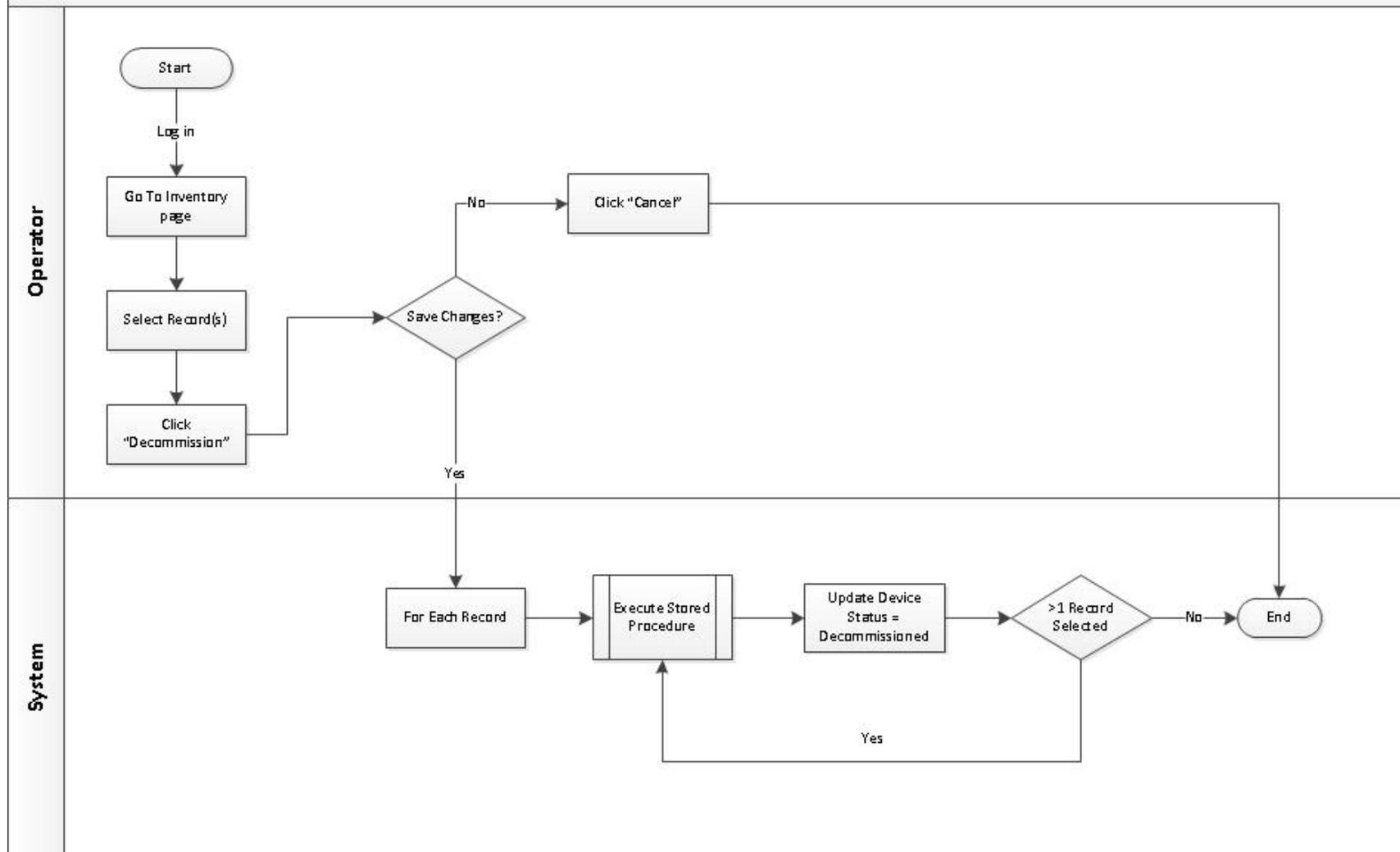


Figure 47 – FR-AM-1.7

FR-AM-1.9

associate a power meter, utility billing address, and account number with each device.

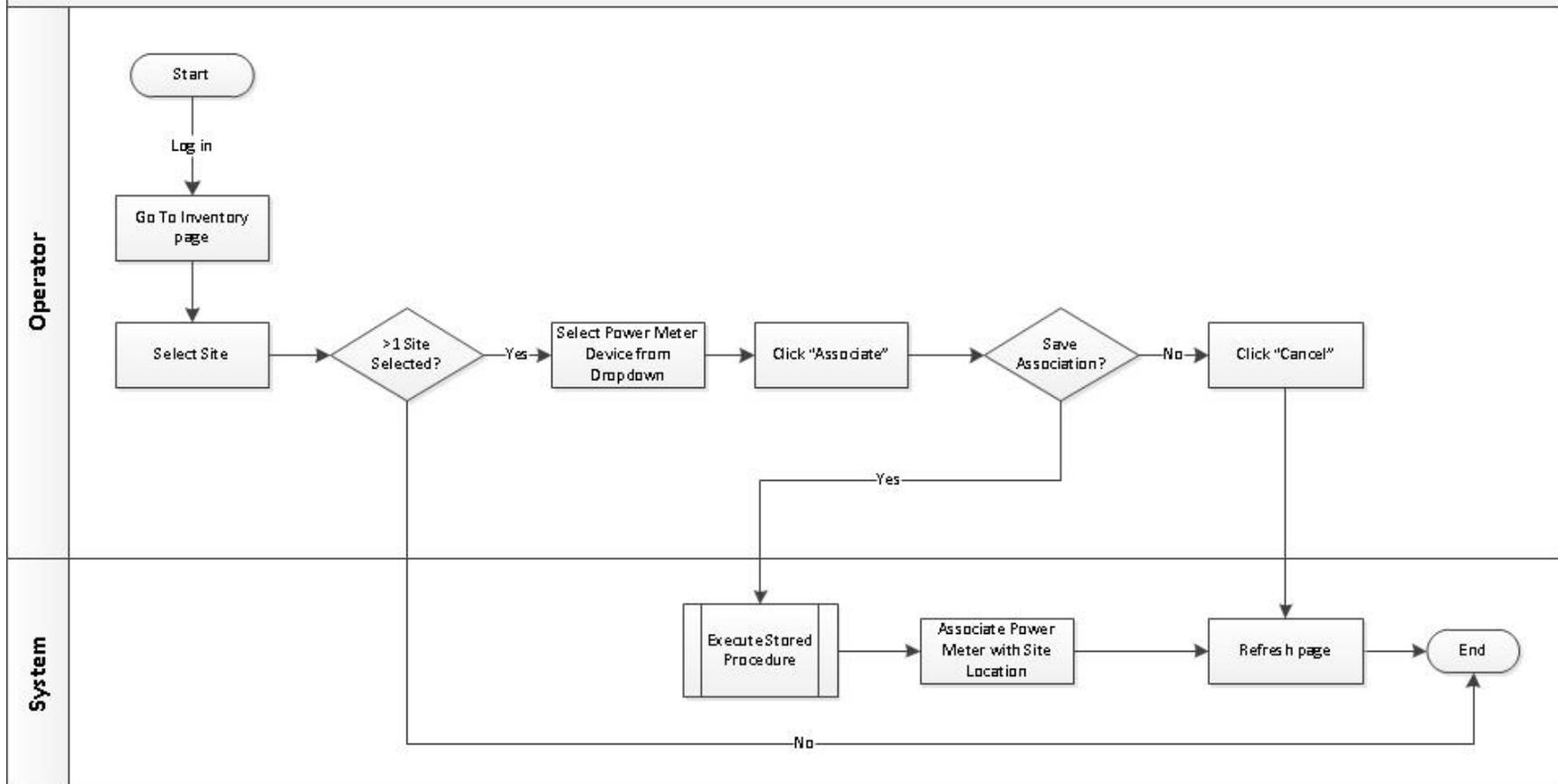


Figure 48 – FR-AM-1.9

FR-AM-1.11

enable qualified users to define new device types (e.g., connected vehicle-related devices).

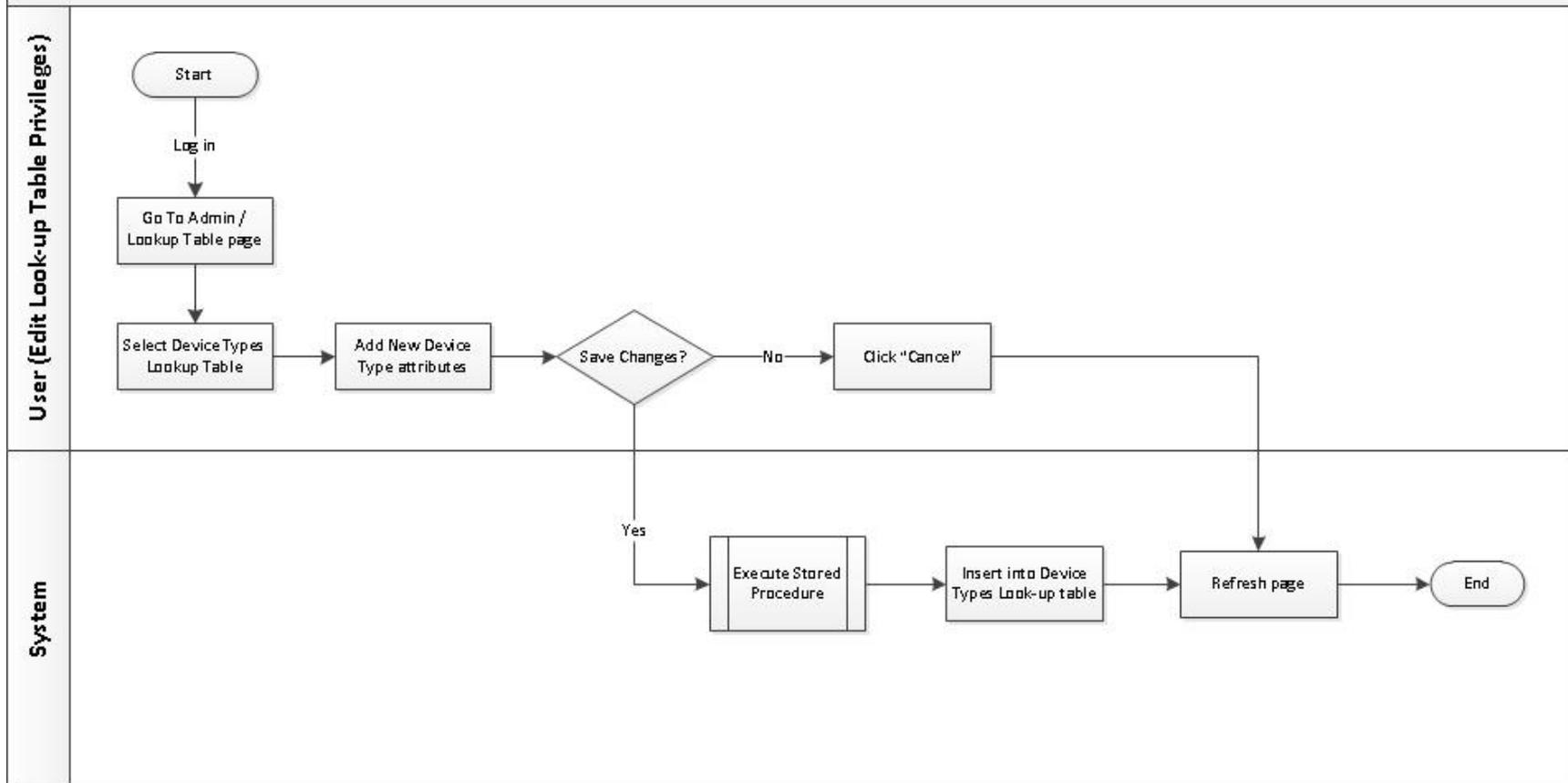


Figure 49 – FR-AM-1.11

FR-AM-1.12

enable qualified users to add new device attributes to existing device types, e.g., when technology changes.

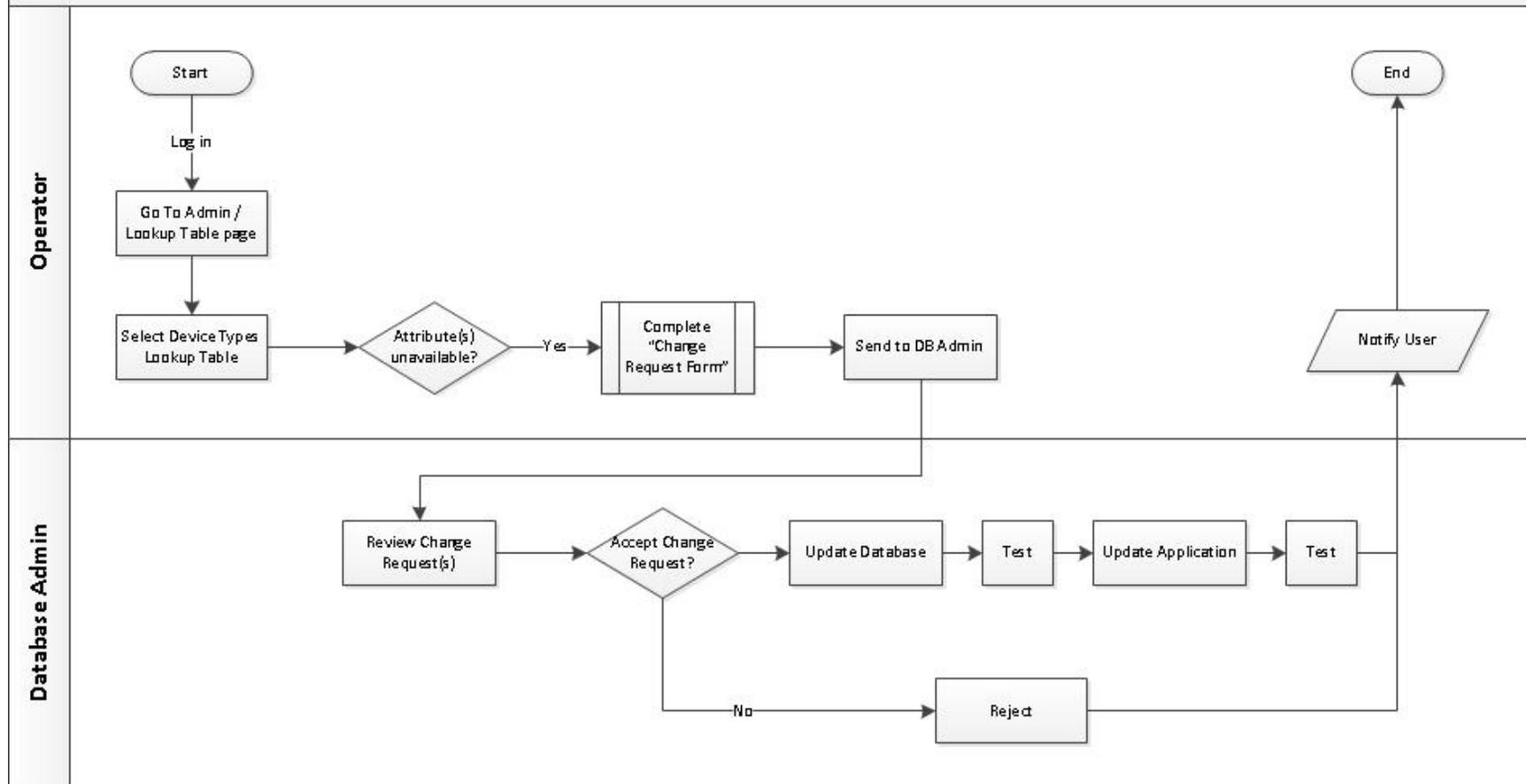


Figure 50 – FR-AM-1.12

FR-AM-2.5

allow qualified users to delete spare parts assets from the database.

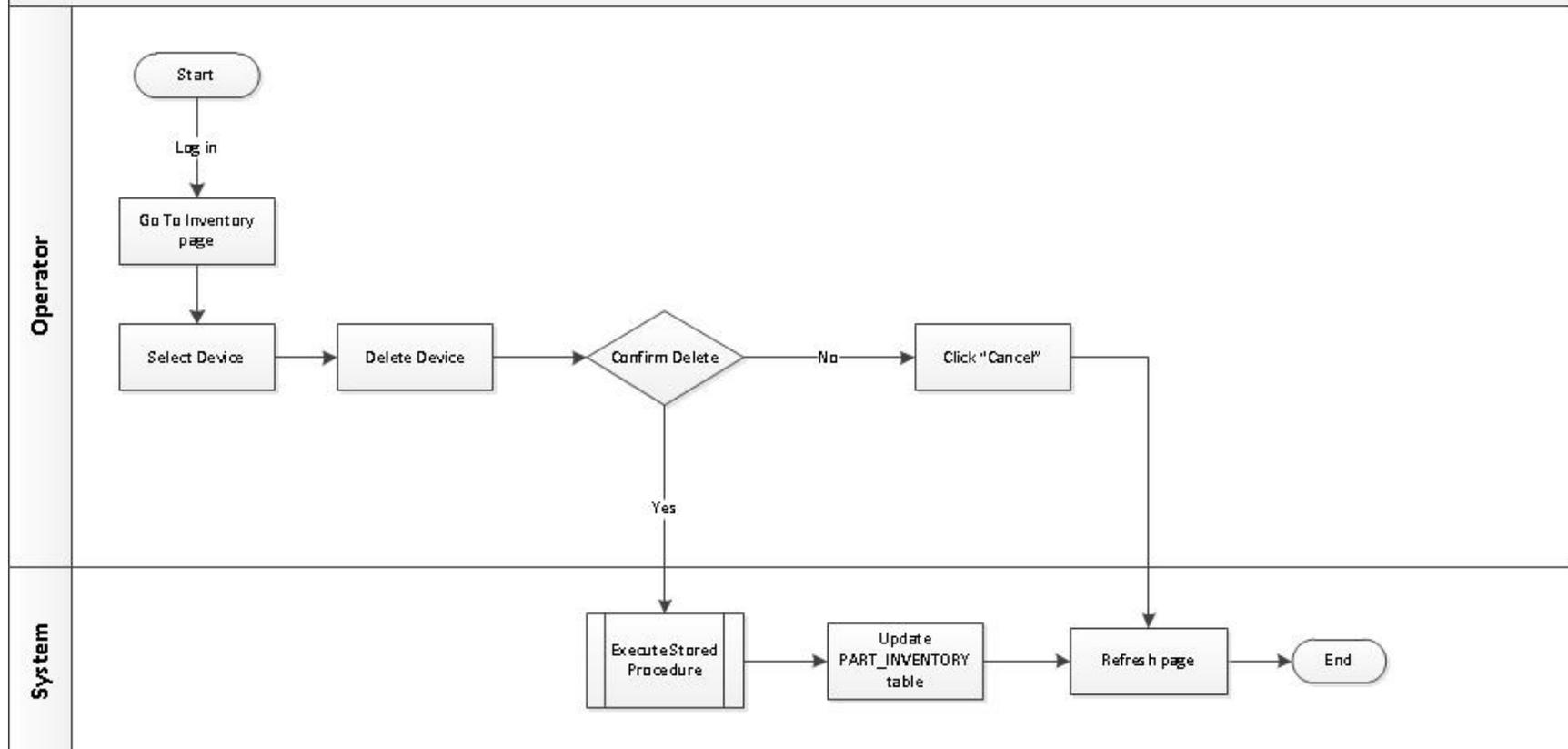


Figure 51 – FR-AM-2.5

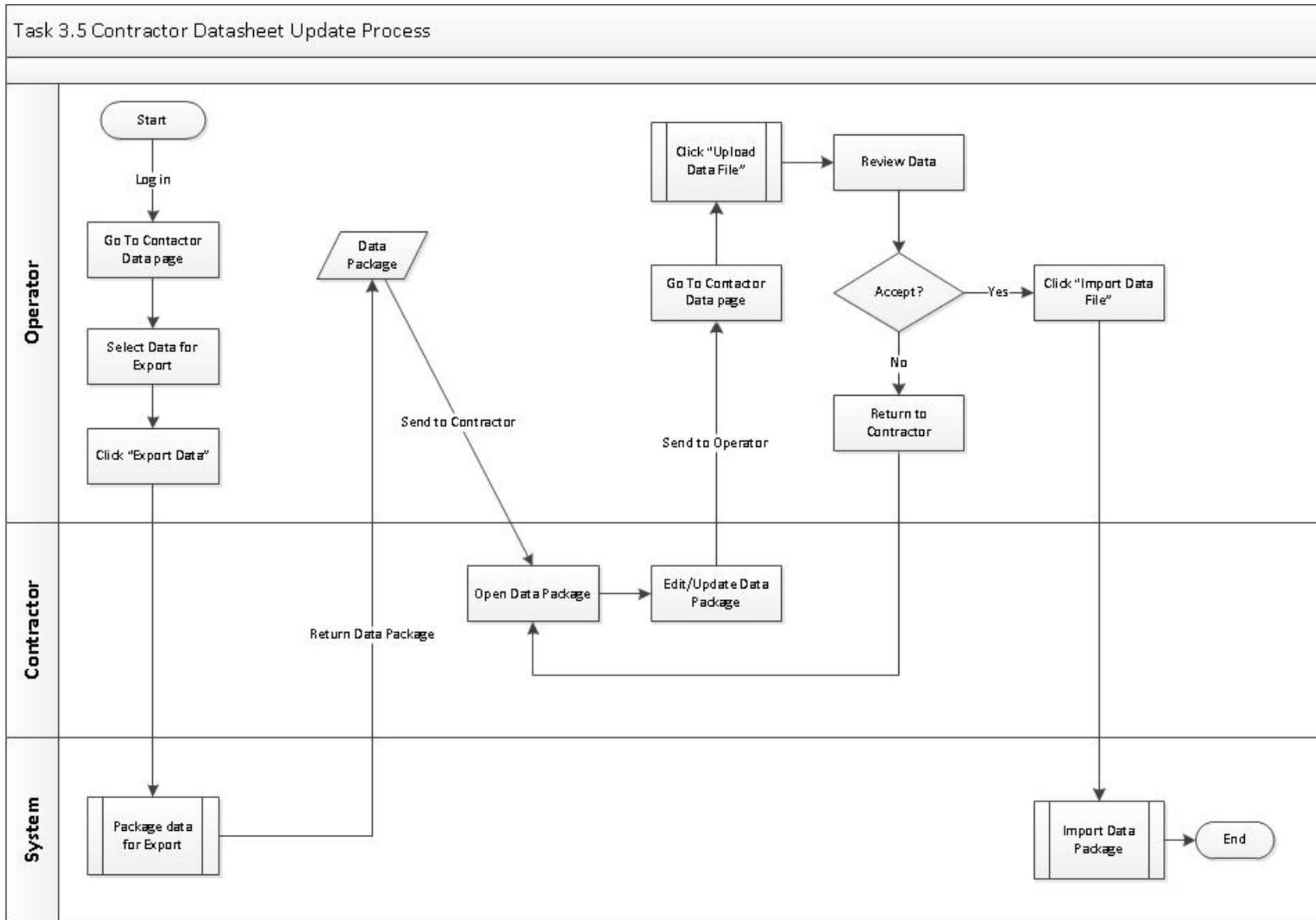


Figure 52 – Task 3.5 Contractor Datasheet Update Process

Task 4.2
Preventative Maintenance Checklist

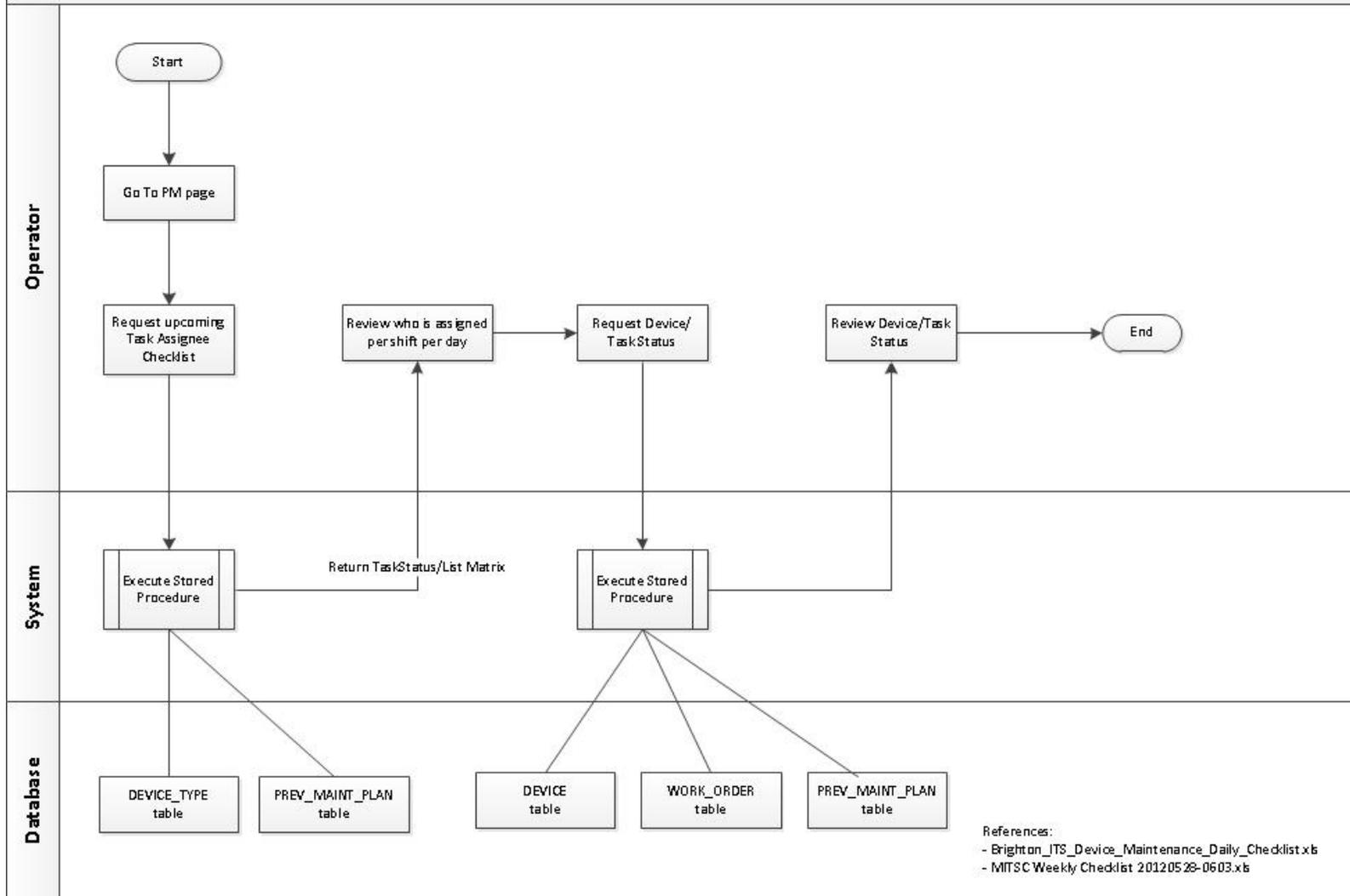


Figure 53 – Task 4.2

FR-PM-2.1
 Enable qualified users to edit the preventative maintenance checklist for a device type.

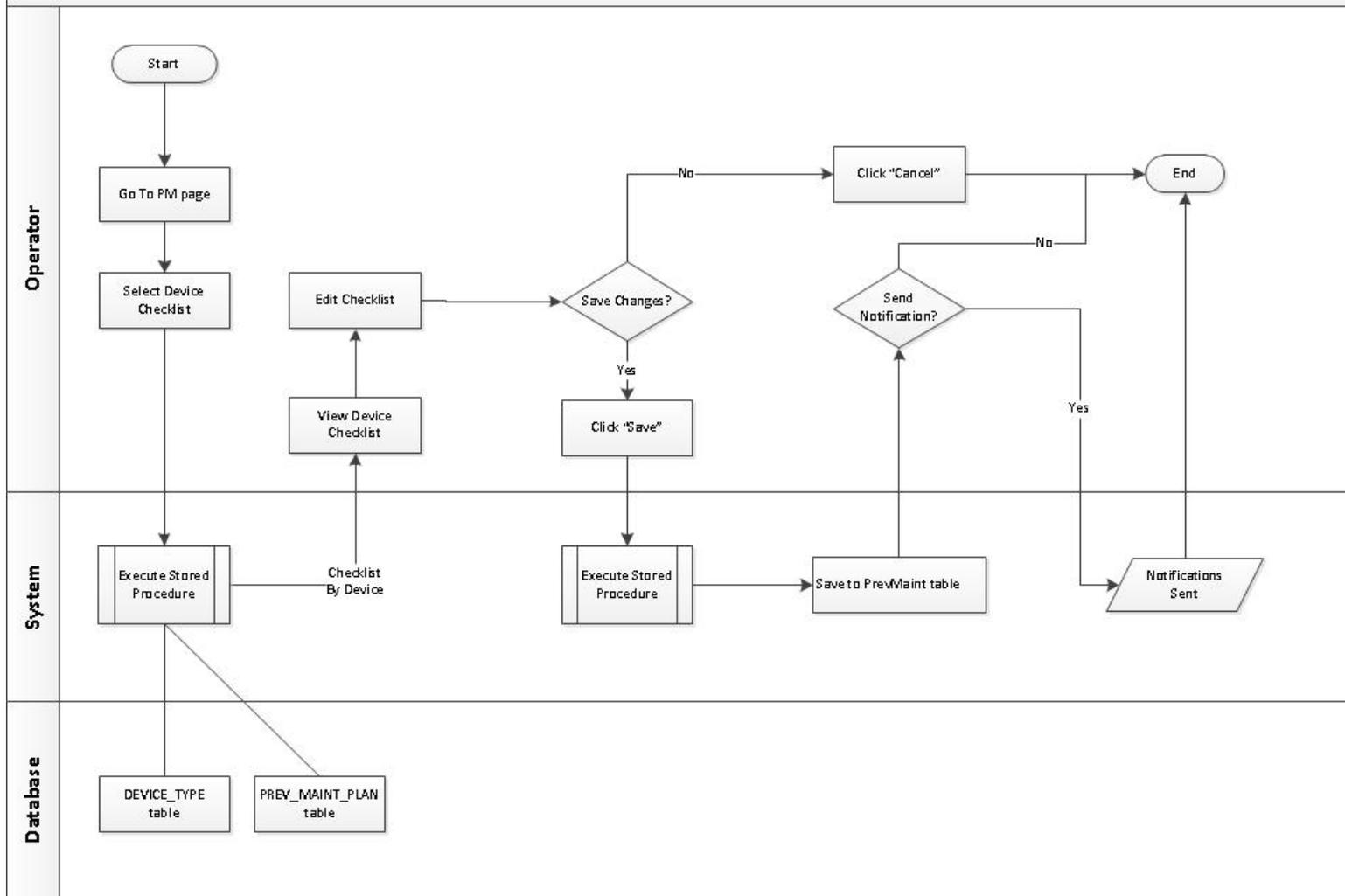


Figure 54- FR-PM-2.1

FR-PM-3.2

Enable qualified users to query the database to determine when the next preventative maintenance is due on one or all devices.

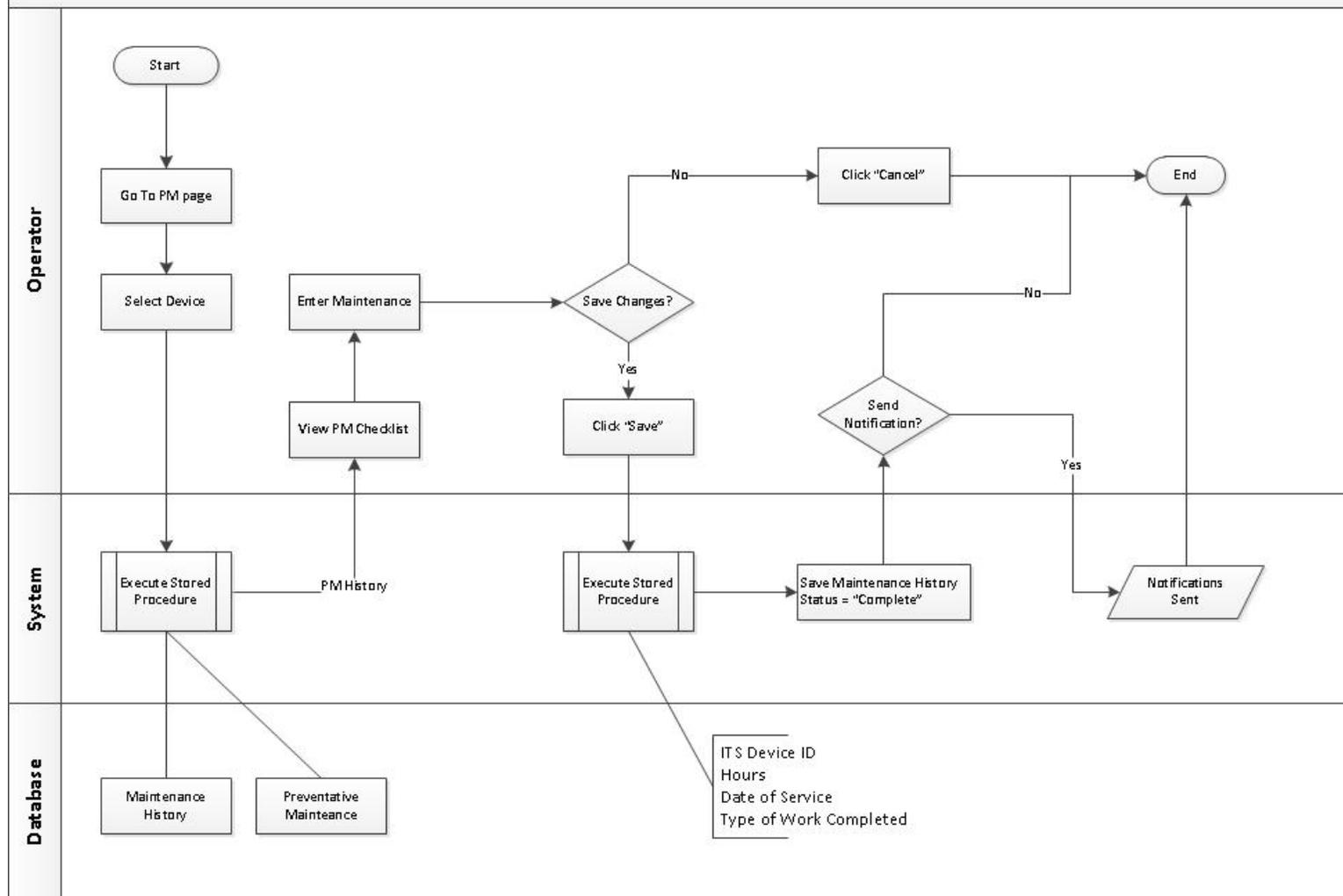


Figure 55 – FR-PM-3.2

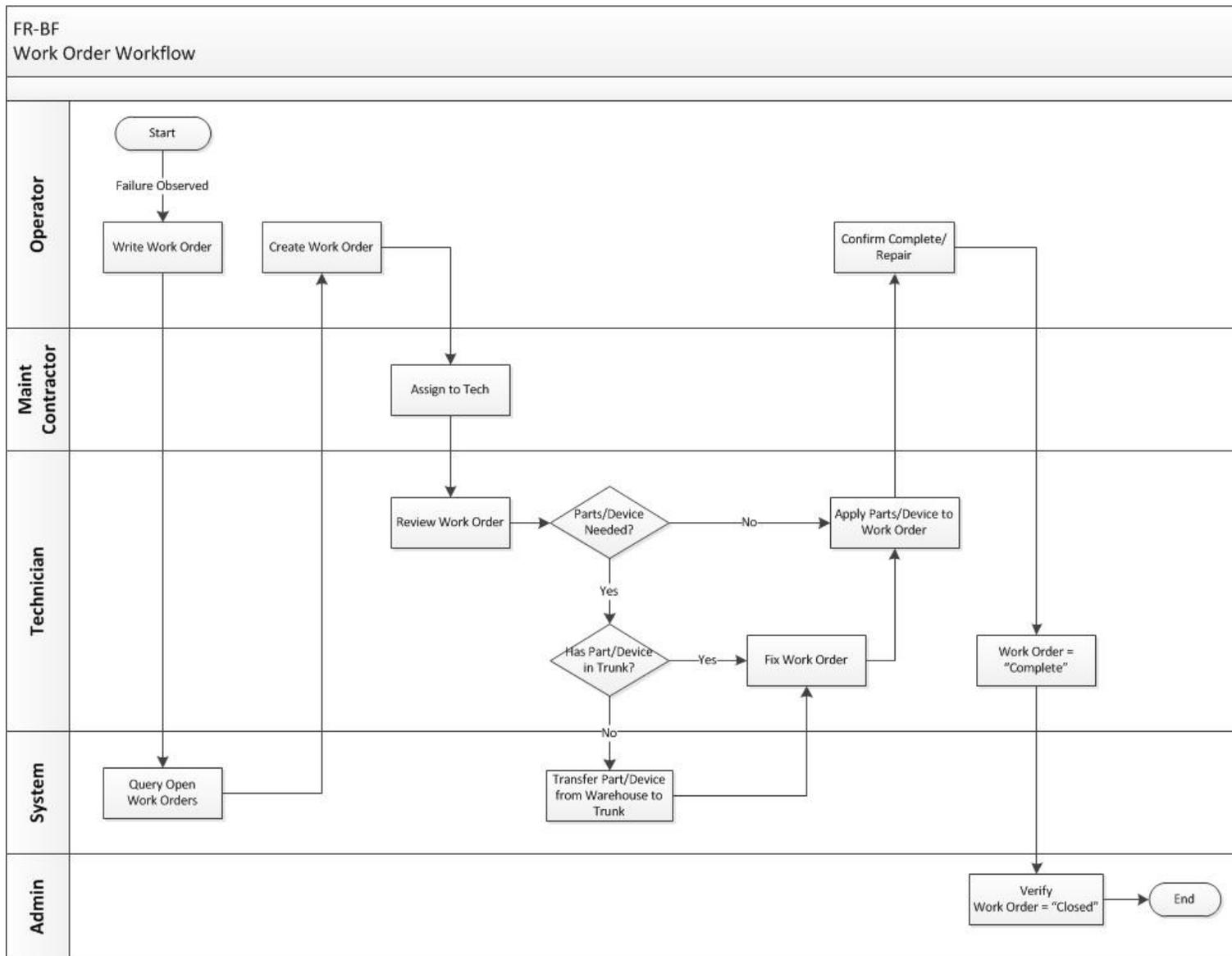


Figure 56 – FR-BR Work Order Workflow

FR-BF-1.1

The system shall allow qualified users to generate a work order once a device failure has been identified.

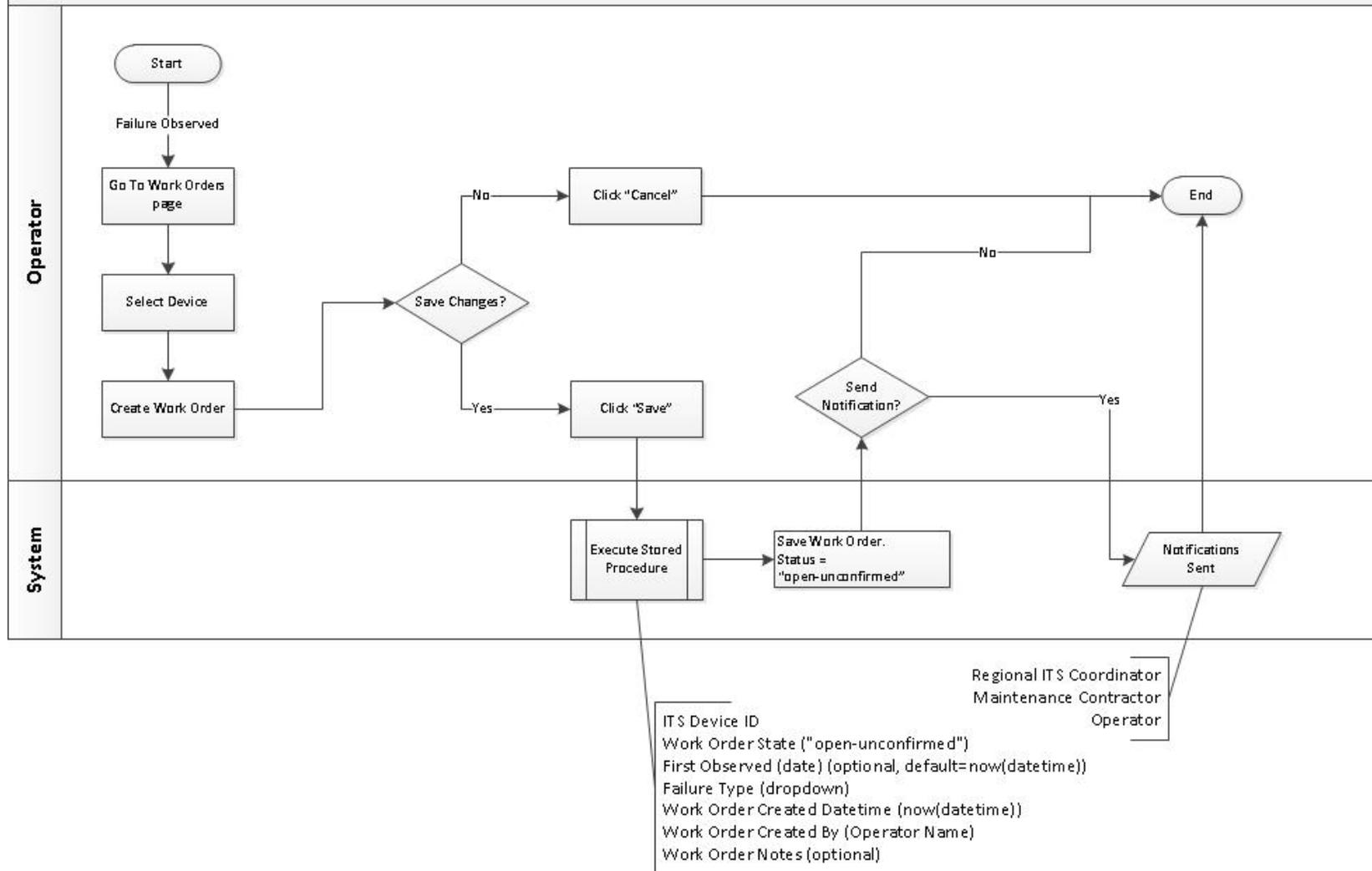


Figure 57 – FR-BF-1.1

FR-BF-1.3.2

When a new work order is initiated on a device, the system shall present to the user any open work orders on the same device.

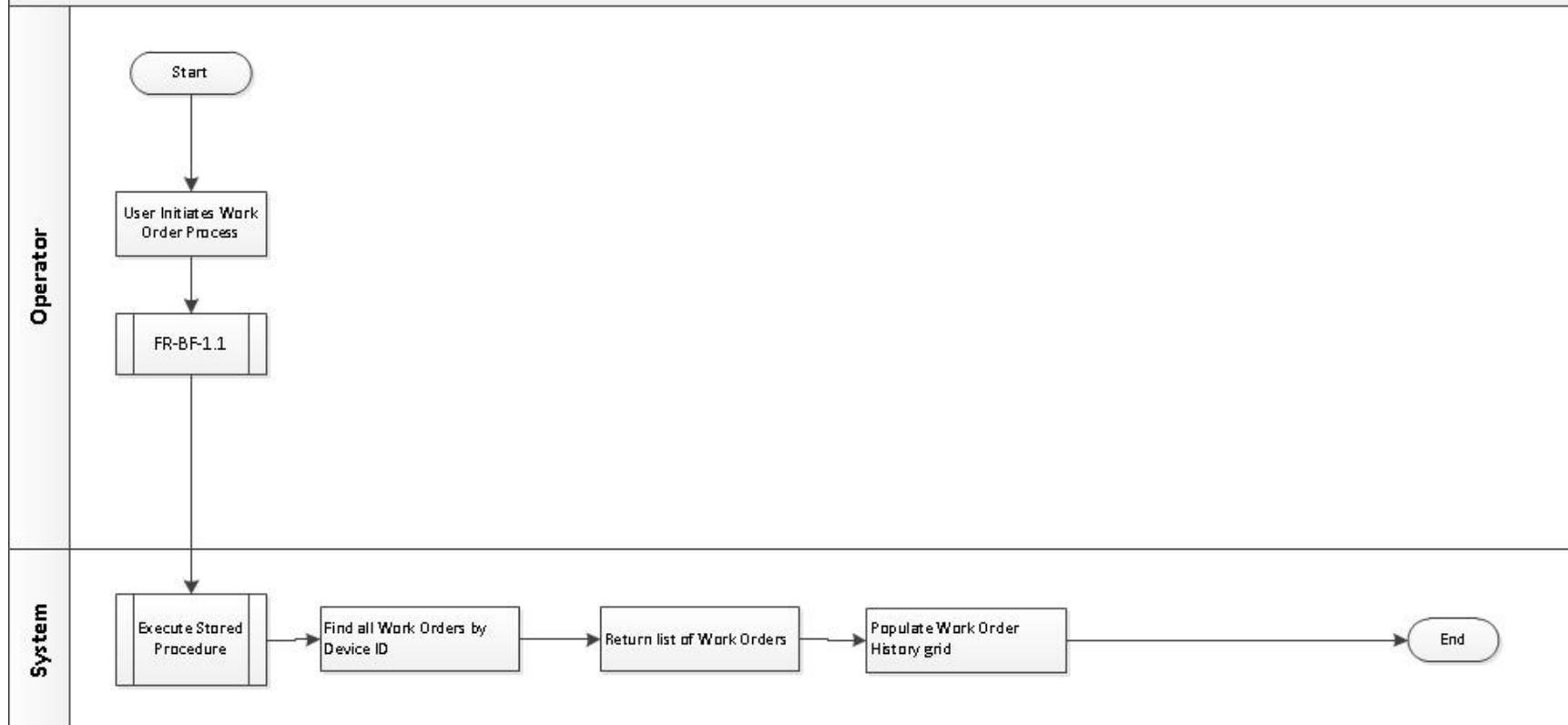


Figure 58 – FR-BF-1.3.2

FR-BF-1.3.3

The system shall enable the user to add a note to an existing work order with observations regarding the device's state if a work order already exists on a device, in lieu of creating a new work order.

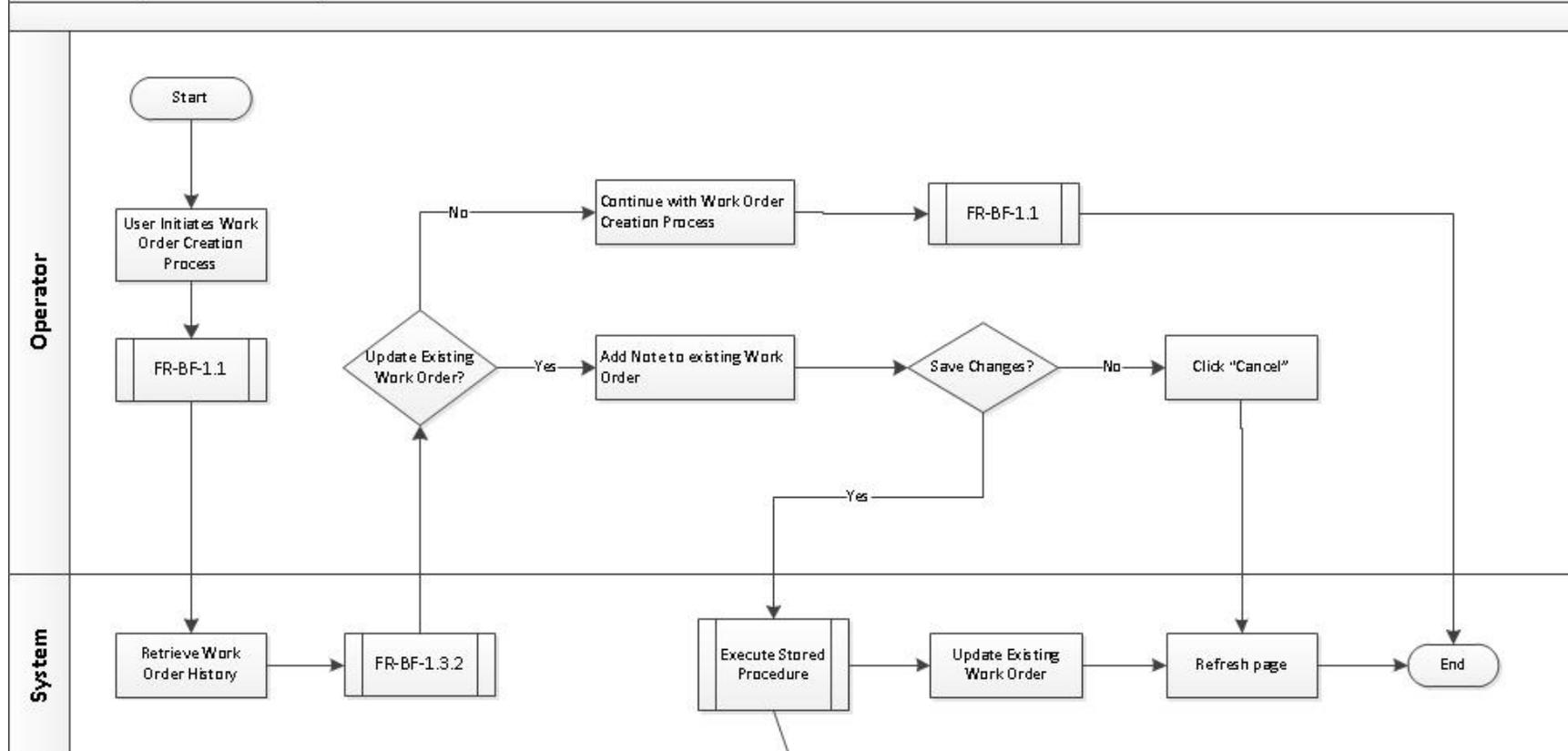


Figure 59 – FR-BF-1.3.3

FR-BF-1.5

The system shall enable Maintenance Contractors to merge duplicate work orders for devices. When each work order is queried, the system shall automatically query the complete database for other work orders with the same device ID.

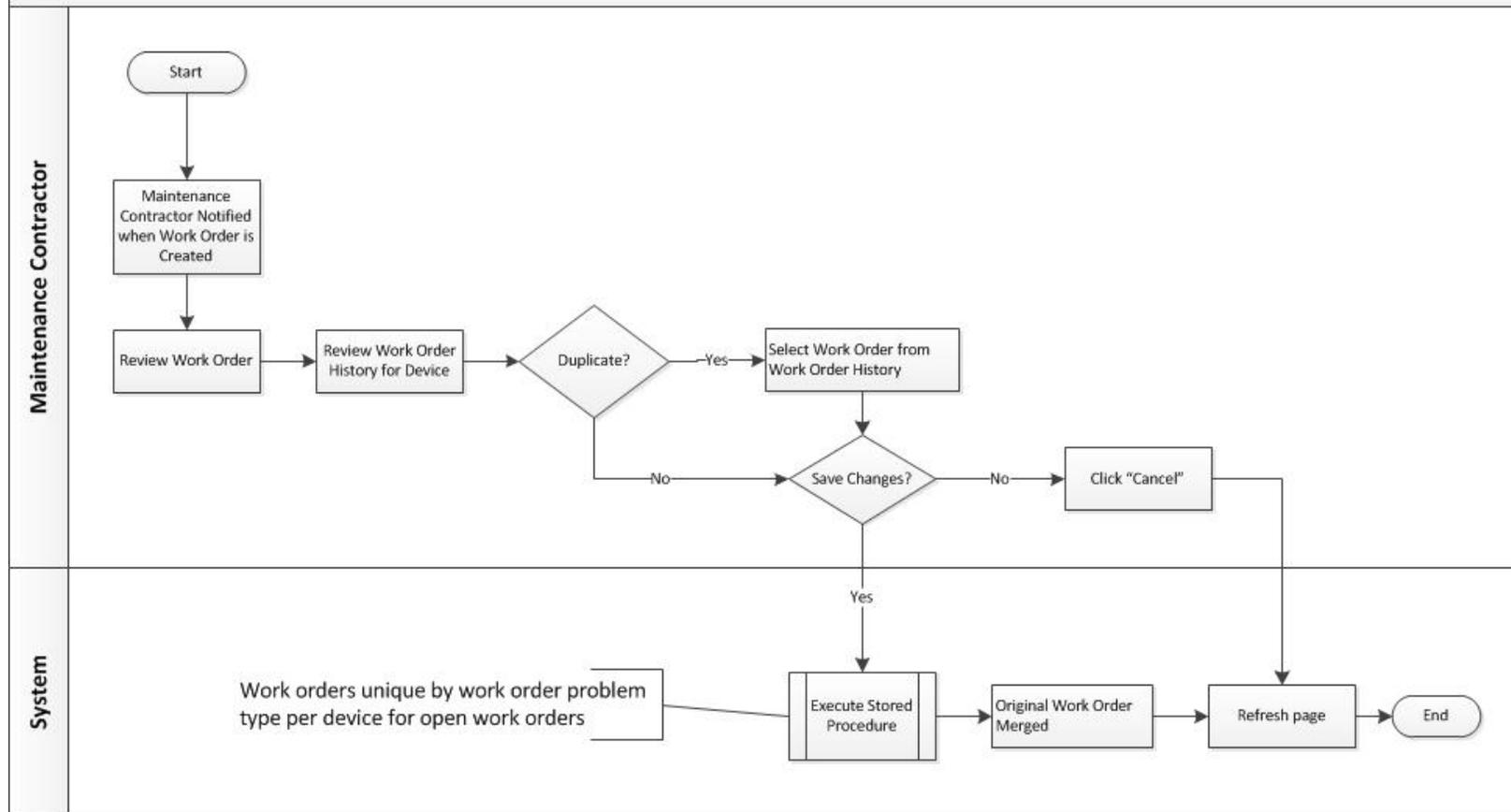


Figure 60 – FR-BF-1.5

FR-BF-1.6

The system shall enable qualified users to attribute work orders to external factors. Device failures are sometimes caused by construction or other factors outside the control of the Maintenance Contractor.

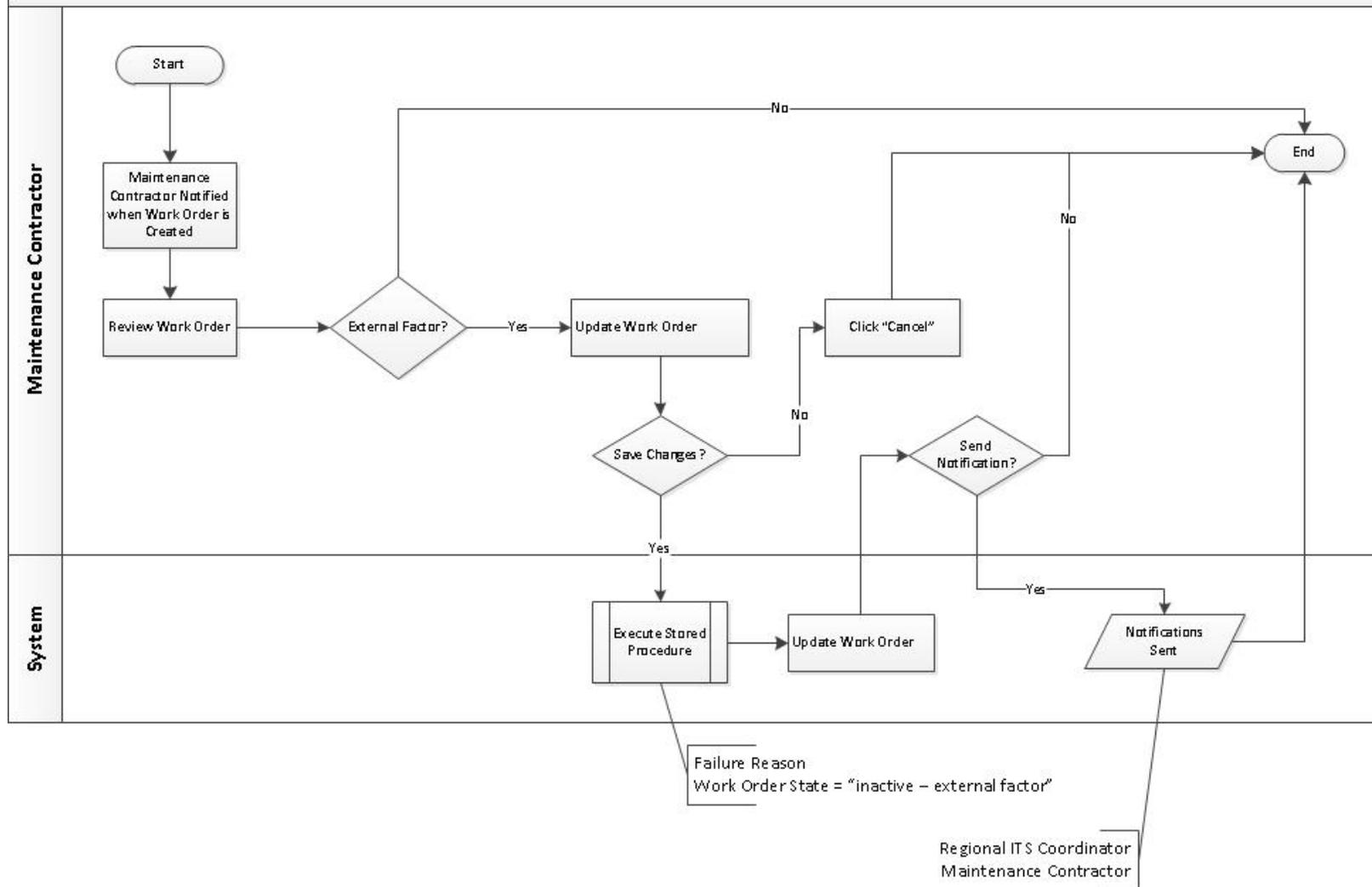


Figure 61 – FR-BF-1.6

FR-BF-1.6.4

The system shall enable the Regional ITS Coordinator to change the state of a work order back to open if the external factor no longer applies (e.g., the construction project is completed).

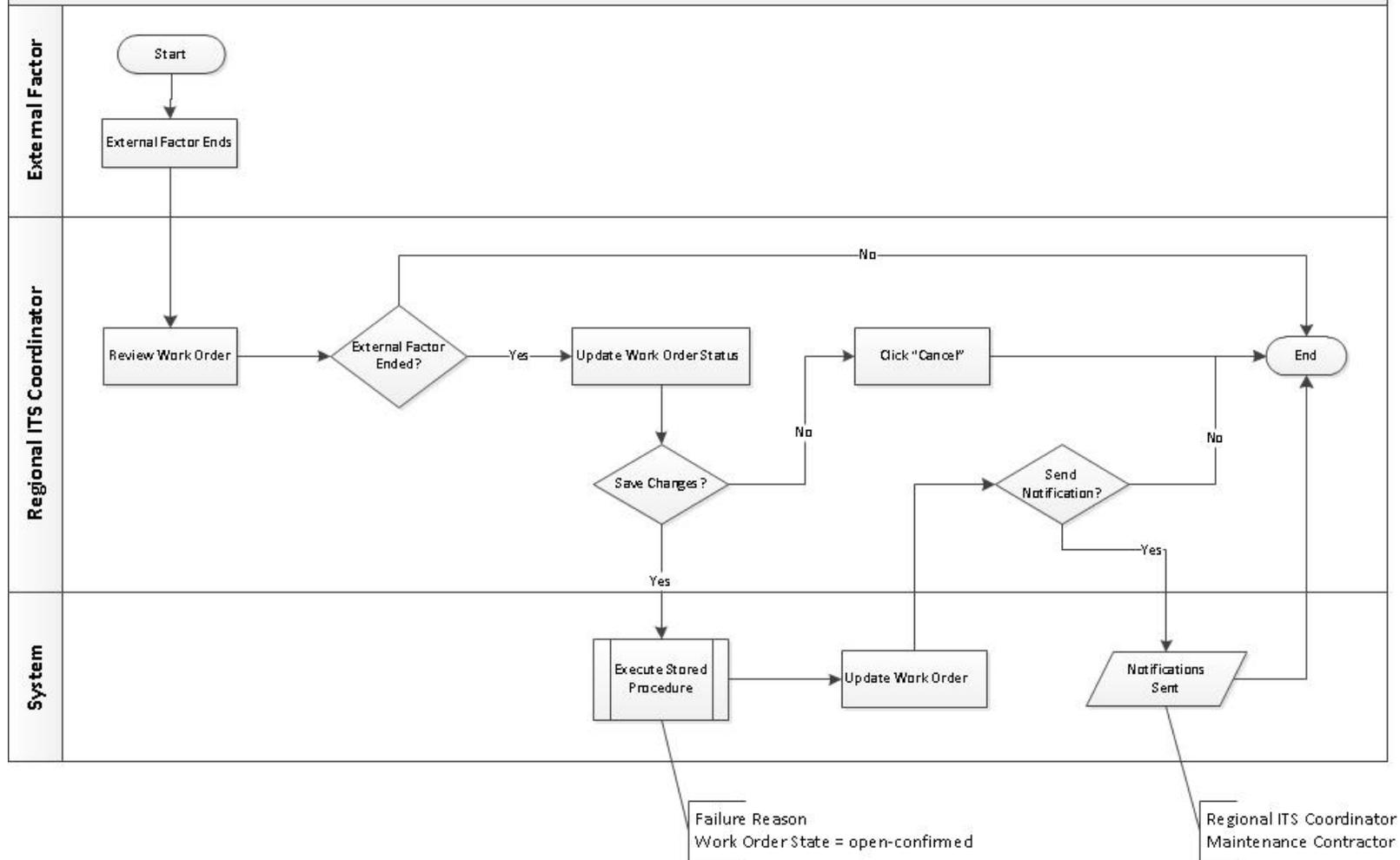


Figure 62 – FR-BF-1.6.4

FR-BF-1.8

The system shall enable the Maintenance Contractor to close out a work order when the work is completed.

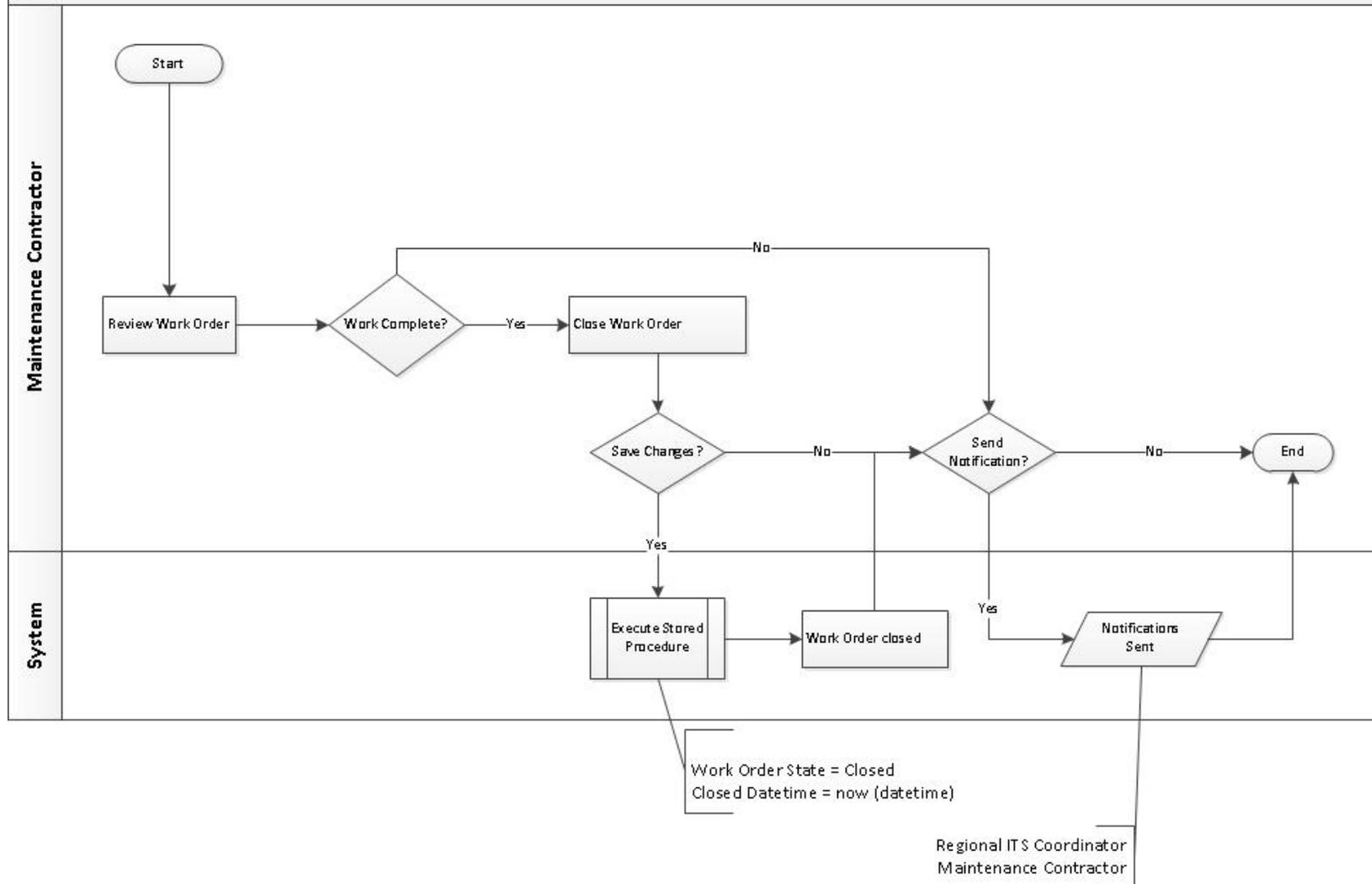


Figure 63 – FR-BF-1.8

FR-BF-1.8.2

The system shall enable the Maintenance Contractor, Region ITS Coordinator or MDOT Engineer to record maintenance hours by maintenance contractor completing the work, date and devices serviced.

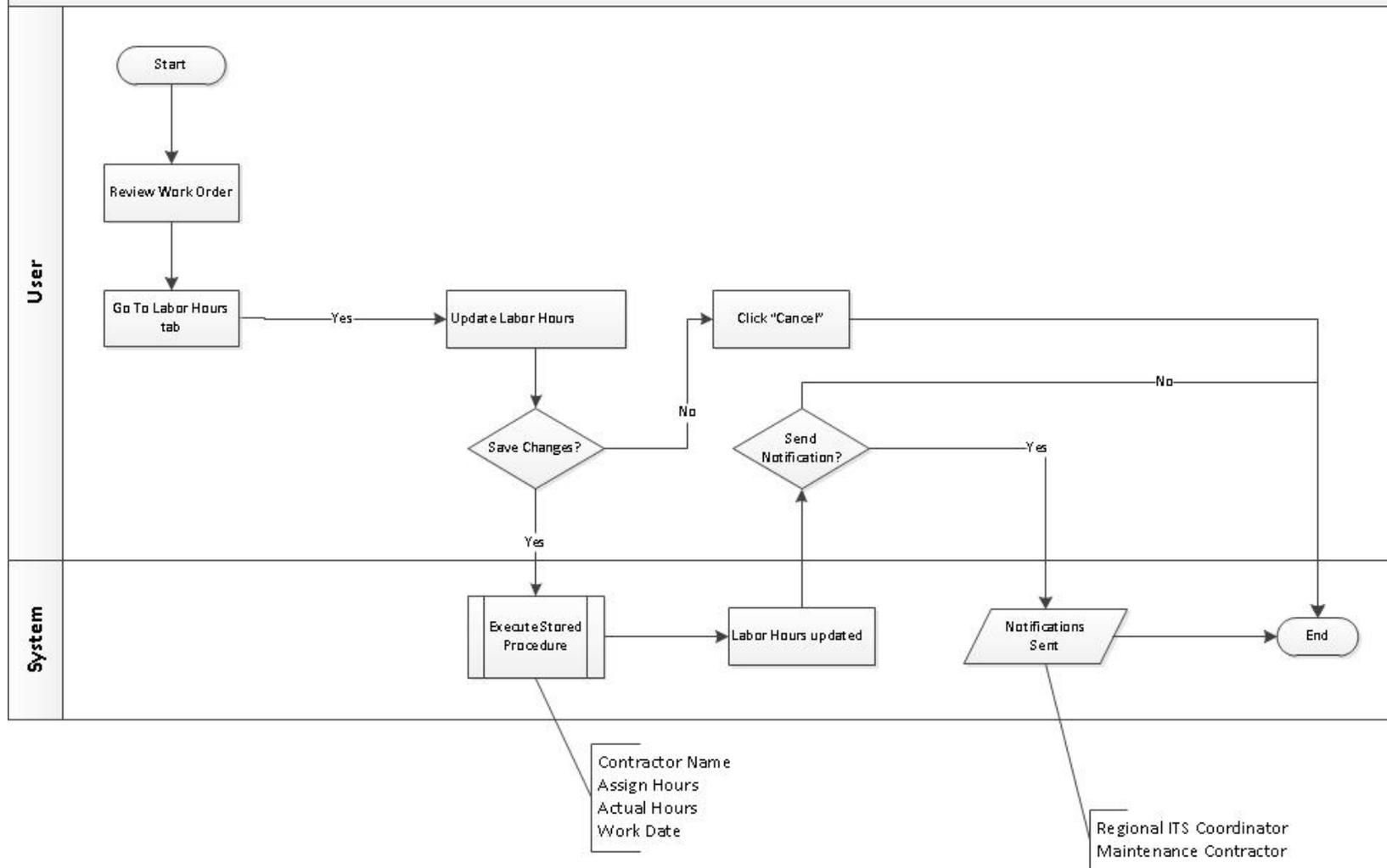


Figure 64 – FR-BF-1.8.2

FR-BF-1.8.3

The system shall enable the Maintenance Contractor to move spare parts into service and move field assets to spare parts inventory.

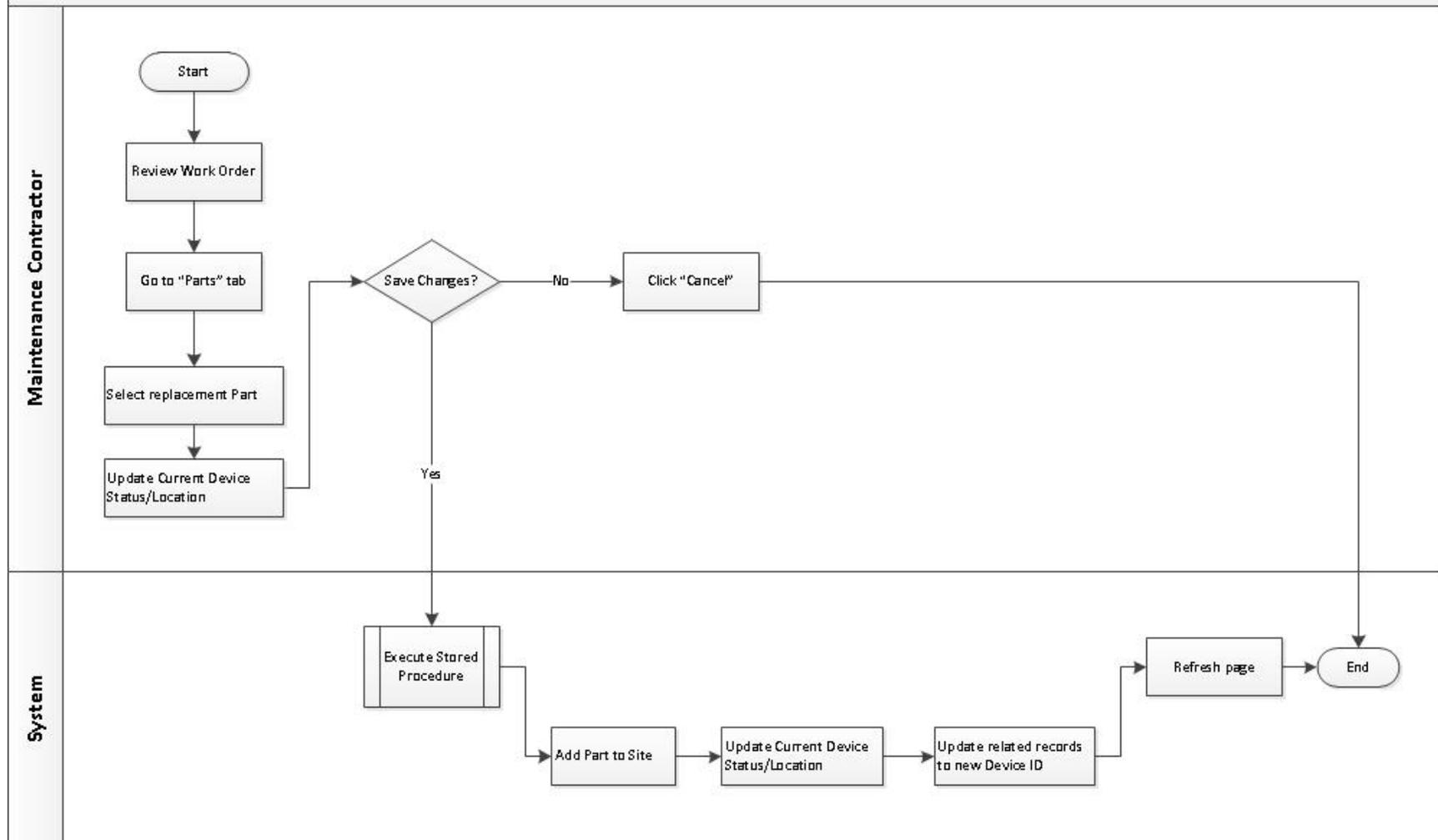


Figure 65 – FR-BF-1.8.3

FR-BF-1.8.5

The system shall enable the Region ITS Coordinator to confirm the break fix notification has been successfully completed.

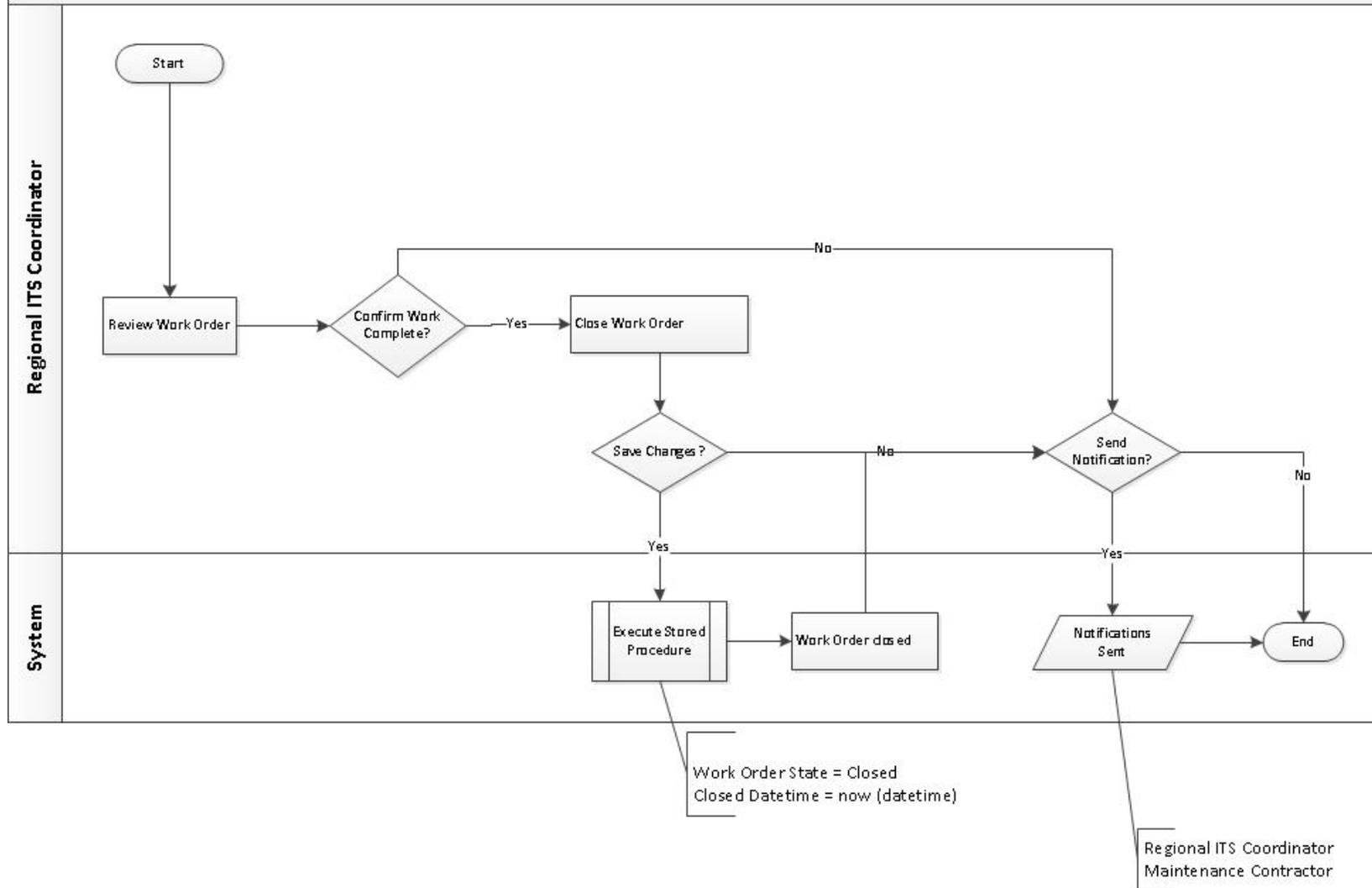


Figure 66 – FR-BF-1.8.5

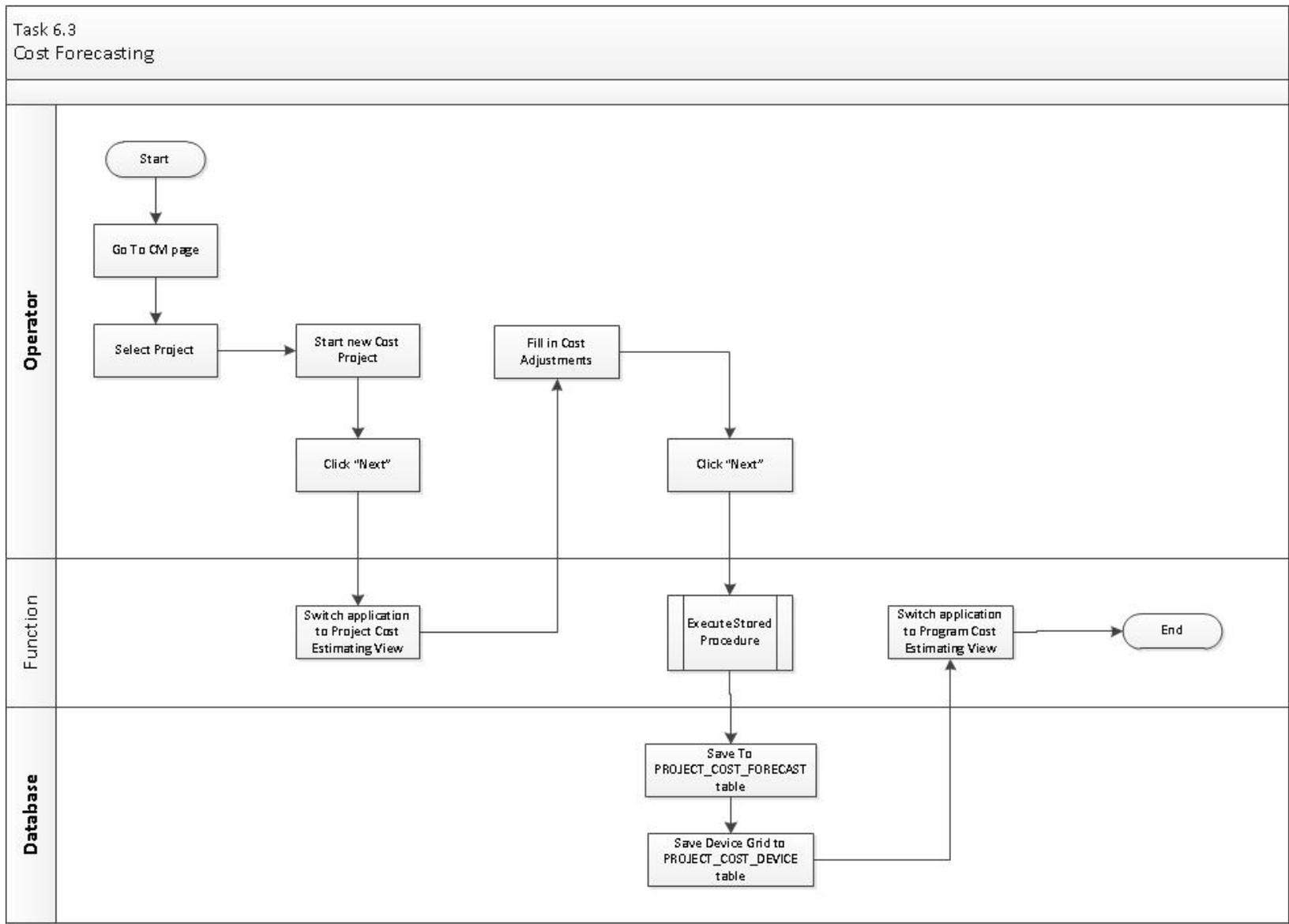


Figure 67 – Task 6.3 Cost Forecasting

APPENDIX B – DATA DICTIONARY

TABLE_NAME	COLUMN_NAME	LOGICAL_NAME	FORMAT	NULL?	PK?
CONDUIT	CONDUIT_GUID	Conduit GUID	uniqueidentifier	No	No
CONDUIT	LINE_GUID	Line GUID	uniqueidentifier	No	No
CONDUIT	CONDUIT_NUMBER	Conduit Number	int	No	No
CONDUIT	CONDUIT_TYPE_CD	Conduit Type Code	varchar(2)	No	No
CONDUIT	CONDUIT_MATL	Material	varchar(255)	Yes	No
CONDUIT	CONDUIT_MNFR	Manufacturer	varchar(255)	Yes	No
CONDUIT	CONDUIT_DIAMETER	Diameter	int	Yes	No
CONDUIT	DUCT_DIAMETER	Duct Diameter	int	Yes	No
CONDUIT	TRACER_IND	Tracer	bit	No	No
CONDUIT	PULL_ROPE_IND	Pull Rope	bit	No	No
CONDUIT	OWNER_NUM	Owner	int	Yes	No
CONDUIT	CONDUIT_COMM	Comment	varchar(255)	Yes	No
CONTRACTOR	CONTR_NUM	Contractor PK	int	No	Yes
CONTRACTOR	CONTR_NAME_ABBRV	Contractor Abbreviation	varchar(3)	No	No
CONTRACTOR	CONTR_NAME	Contractor Name	varchar(100)	No	No
CONTRACTOR	CONTR_PHNE	Contractor Phone No	varchar(50)	Yes	No
CONTRACTOR	CONTR_EMAIL	Contractor Email Address	varchar(50)	No	No
CONTRACTOR	CONTR_STD_HRS	Standard Hours	int	No	No
CONTRACTOR	CONTR_TYPE_NUM	Contractor Type FK	int	No	No
COUNTY	COUNTY_NUM	County PK	int	No	Yes
COUNTY	COUNTY_NAME	County Name	varchar(50)	No	No
COUNTY	REGN_NUM	Region FK	int	Yes	No
CUSTOMER	CUST_NUM	Customer PK	int	No	Yes
CUSTOMER	CUST_ID	Customer ID	varchar(50)	No	No
CUSTOMER	CUST_NAME	Customer Name	varchar(100)	No	No
CUSTOMER	CUST_ADDR	Customer Address	varchar(100)	Yes	No
CUSTOMER	CUST_CITY	Customer City	varchar(100)	Yes	No

TABLE_NAME	COLUMN_NAME	LOGICAL_NAME	FORMAT	NULL?	PK?
CUSTOMER	CUST_ST_CD	Customer State Code	varchar(2)	Yes	No
CUSTOMER	CUST_ZIP	Customer Zip	int	Yes	No
CUSTOMER	CUST_PHONE	Customer Phone	varchar(20)	Yes	No
CUSTOMER	CUST_FAX	Customer Fax	varchar(20)	Yes	No
CUSTOMER	CUST_CONTACT	Customer Contact Name	varchar(50)	Yes	No
DEVICE	DEVC_NUM	Device PK	int	No	Yes
DEVICE	DEVC_GUID	Device GUID	uniqueidentifier	No	No
DEVICE	SITE_GUID	Site GUID	uniqueidentifier	No	No
DEVICE	DEVC_ATMS_NAME	ATMS Name	varchar(60)	Yes	No
DEVICE	DEVC_COMMON_NAME	Auto Name	varchar(60)	Yes	No
DEVICE	DEVC_PLAN_NAME	Plan Name	varchar(60)	Yes	No
DEVICE	DEVC_TYPE_NUM	Device Type	int	No	No
DEVICE	DEVC_STAT_NUM	Status	int	Yes	No
DEVICE	IS_TEMP_IND	Is Temporary	bit	No	No
DEVICE	DEVC_SITE_CRNR	Site Corner	varchar(50)	Yes	No
DEVICE	DEVC_GPS_LAT	GPS Lat	float	No	No
DEVICE	DEVC_GPS_LON	GPS Long	float	No	No
DEVICE	OWN_AGN_NUM	Owner	int	Yes	No
DEVICE	DEVC_VOLTAGE	Voltage	int	Yes	No
DEVICE	VOLTAGE_TYPE_NUM	Voltage Type FK	int	Yes	No
DEVICE	SPCL_ACS_NUM	Special Access FK	int	Yes	No
DEVICE	MAKE_MODL_NUM	Model	int	Yes	No
DEVICE	DEVC_SERL_NUMBER	Serial #	varchar(50)	Yes	No
DEVICE	DEVC_PART_NUMBER	Part #	varchar(50)	Yes	No
DEVICE	DEVC_FIRMWARE_VERS	Firmware Ver	varchar(50)	Yes	No
DEVICE	DEVC_SOFTWARE_VERS	Software Ver	varchar(50)	Yes	No
DEVICE	DEVC_IN_SERV_DATE	In Service Date	datetime	Yes	No
DEVICE	COND_NUM	In Service Cond	int	Yes	No
DEVICE	SERV_AGN_NUM	Service Agency	int	Yes	No

TABLE_NAME	COLUMN_NAME	LOGICAL_NAME	FORMAT	NULL?	PK?
DEVICE	WARRANTY_AGN_NUM	Warranty Agency	int	Yes	No
DEVICE	DEVC_WARRANTY_TERMS	Warranty Terms	varchar(50)	Yes	No
DEVICE	DEVC_WARRANTY_STRT_DATE	Warranty Start	date	Yes	No
DEVICE	DEVC_WARRANTY_END_DATE	Warranty End	date	Yes	No
DEVICE	PWR_MTR_ID	Meter #	varchar(50)	Yes	No
DEVICE	PWR_MTR_ACCT_ID	Account #	varchar(50)	Yes	No
DEVICE	PWR_MTR_ADDR	Street Address	varchar(80)	Yes	No
DEVICE	PWR_MTR_CITY	City	varchar(50)	Yes	No
DEVICE	PWR_MTR_ST_CD	State Code	varchar(2)	Yes	No
DEVICE	PWR_MTR_ZIP	Zip	varchar(50)	Yes	No
DEVICE	WIRE_SIZE_NUM	Wire Size	int	Yes	No
DEVICE	PWR_TYPE_NUM	Power Type	int	Yes	No
DEVICE	CRCT_SIZE_NUM	Circuit Size	int	Yes	No
DEVICE	MTR_SIZE_NUM	Meter Size	int	Yes	No
DEVICE	DEVC_COMM	Notes	nvarchar(-1)	Yes	No
DEVICE	DEVC_GEOM_PT	SHAPE	geography	Yes	No
DEVICE	DEVC_UPDT_BY_UID	Last Updated By	varchar(50)	Yes	No
DEVICE	DEVC_UPDT_TMSP	Last Updated	timestamp	Yes	No
DEVICE	DEVC_HYPERLINK	Hyperlink	varchar(-1)	Yes	No
DEVICE	IS_LANE_CLOS_REQD_IND	Lane Closure Required	bit	Yes	No
DEVICE	DEVC_SHELF	Shelf	int	Yes	No
DEVICE_DEPENDENCY_XREF	DEPENDING_DEVC_NUM	Depending Device PK	int	No	Yes
DEVICE_DEPENDENCY_XREF	DEPENDING_UPON_DEVC_NUM	Dependent Upon Device PK	int	No	No
DEVICE_DEPENDENCY_XREF	DEPENDENCY_PATH_NUM	Dependency Path PK	int	No	No
DEVICE_ITS_JOBS_XREF	DEVC_NUM	Device ID	int	No	No
DEVICE_ITS_JOBS_XREF	JOB_ID	Job ID	int	No	No
DEVICE_STATUS	DEVC_STAT_NUM	Status ID	int	No	Yes
DEVICE_STATUS	DEVC_STAT	Status	varchar(50)	No	No
DEVICE_STATUS	DEVC_STAT_DESC	Status Description	varchar(255)	Yes	No

TABLE_NAME	COLUMN_NAME	LOGICAL_NAME	FORMAT	NULL?	PK?
DEVICE_TYPE	DEVC_TYPE_NUM	Device Type PK	int	No	Yes
DEVICE_TYPE	DEVC_TYPE	Device Type	varchar(50)	No	No
DEVICE_TYPE	DEVC_SUBTYPE	Device SubType	varchar(50)	Yes	No
DEVICE_TYPE	DEVC_TYPE_ABBRV	Device Type Abbrev	varchar(50)	No	No
DEVICE_TYPE	DEVC_TYPE_PWR_WATTS_AVG	Power Watts Avg	int	Yes	No
DEVICE_TYPE	IS_TIER1_IND	Is Tier 1	bit	No	No
DEVICE_TYPE	IS_STD_IND	Has Standard Name	bit	No	No
DEVICE_TYPE	IS_COMMON_NAME_IND	Has Common Name	bit	No	No
DEVICE_TYPE	IS_PLAN_NAME_IND	Has Plan Name	bit	No	No
DEVICE_TYPE	IS_AUTO_COMMON_NAME_IND	Has Auto Common Name	bit	No	No
DEVICE_TYPE	ATMS_DESIGNATION	ATMS Designation	varchar(1)	Yes	No
DEVICE_TYPE	IS_MOUNT_ENCLOSURE_IND	Has Mount Enclosure	bit	No	No
DEVICE_TYPE	IS_COMMN_IND	Has Communication	bit	No	No
DEVICE_TYPE	IS_PWR_IND	Has Power	bit	No	No
DEVICE_TYPE	IS_PREV_MAINT_IND	Gets Prev Maintenance	bit	No	No
DEVICE_TYPE	IS_ACCT_IND	Has Account	bit	No	No
DEVICE_TYPE	IS_SERV_ADDR_IND	Has Service Address	bit	No	No
DEVICE_TYPE	IS_CONDUIT_IND	Has Conduit	bit	No	No
DEVICE_TYPE	IS_IN_CABINET_IND	Is In Cabinet	bit	No	No
DEVICE_TYPE	DEVC_TYPE_CPTL_AMT	Capital Cost	decimal	No	No
DEVICE_TYPE	DEVC_TYPE_ANNL_REOCCUR_AMT	Annual Reoccurring Cost	decimal	No	No
DEVICE_TYPE	DEVC_TYPE_COST_COMM	Cost Comments	varchar(-1)	Yes	No
DEVICE_TYPE	DEVC_TYPE_COST_TYPE_CD	Cost Type Code	varchar(1)	No	No
DEVICE_TYPE	DEVC_TYPE_COST_UNIT_NUM	Device Type Cost Unit FK	int	No	No
DEVICE_TYPE	IS_COST_PROFILE_ONLY_IND	Is Cost Profile Device Only	bit	No	No
DEVICE_WORK_ORDER_XREF	DEVC_NUM	Device FK	int	No	No
DEVICE_WORK_ORDER_XREF	WKDR_NUM	Work Order FK	int	No	No
DEVICE_WORK_ORDER_XREF	IS_PRIMARY_DEVC_IND	Is Primary Device	bit	No	No
FIBER	FIBER_GUID	Fiber GUID	uniqueidentifier	No	No

TABLE_NAME	COLUMN_NAME	LOGICAL_NAME	FORMAT	NULL?	PK?
FIBER	CONDUIT_GUID	Conduit GUID	uniqueidentifier	Yes	No
FIBER	FIBER_NUMBER	Fiber Number	int	Yes	No
FIBER	STRANDS	Strands	int	Yes	No
ITS_JOBS	JOB_ID	Job ID	int	No	Yes
ITS_JOBS	JOB_NUMBER	Job #	nvarchar(15)	No	No
ITS_JOBS	JOB_DESC	Job Description	nvarchar(255)	Yes	No
ITS_JOBS	JOB_START_DATE	Job Start Date	date	Yes	No
ITS_JOBS	JOB_END_DATE	Job End Date	date	Yes	No
ITS_JOBS	JOB_TYPE_NUM	Job Type FK	int	No	No
ITS_JOBS	JOB_FUND_TYPE_NUM	Job Funding Type FK	int	No	No
ITS_JOBS	JOB_FUND_SOURCE_NUM	Job Funding Source FK	int	No	No
ITS_JOBS	REGN_NUM	Region FK	int	No	No
ITS_LINE	LINE_GUID	Line GUID	uniqueidentifier	No	No
ITS_LINE	LINE_TYPE_CD	Line Type Code	varchar(2)	No	No
ITS_LINE	FROM_DEVC_GUID	From Device GUID	uniqueidentifier	No	No
ITS_LINE	TO_DEVC_GUID	To Device GUID	uniqueidentifier	No	No
ITS_LINE	LINE_GEOM_LINE	LINE_SHAPE	geography	Yes	No
ITS_SITE	SITE_NUM	Site ID	int	No	Yes
ITS_SITE	SITE_GUID	Site GUID	uniqueidentifier	No	No
ITS_SITE	SITE_ATMS_ID	ATMS Site ID	varchar(60)	Yes	No
ITS_SITE	SITE_COMMON_NAME	Site Common Name	varchar(60)	Yes	No
ITS_SITE	SITE_PLAN_NAME	Site Plan Name	varchar(60)	Yes	No
ITS_SITE	DRTN_CD	Site Direction	varchar(2)	No	No
ITS_SITE	SITE_MM	Mile Marker	real	Yes	No
ITS_SITE	SITE_PR	PR	varchar(50)	Yes	No
ITS_SITE	SITE_PR_MP	PR MP	varchar(50)	Yes	No
ITS_SITE	SITE_PR_VERS	PR Version	varchar(50)	Yes	No
ITS_SITE	SITE_CS	Control Section	varchar(50)	Yes	No
ITS_SITE	SITE_CS_MP	Control Section Milepost	varchar(50)	Yes	No

TABLE_NAME	COLUMN_NAME	LOGICAL_NAME	FORMAT	NULL?	PK?
ITS_SITE	SITE_GPS_LAT	Site GPS Latitude	float	Yes	No
ITS_SITE	SITE_GPS_LON	Site GPS Longitude	float	Yes	No
ITS_SITE	SITE_COMM	Site Comments	varchar(255)	Yes	No
ITS_SITE	SITE_GEOM_PT	SHAPE	geography	No	No
ITS_SITE	SITE_UPDT_BY_UID	Last Updated By	varchar(50)	Yes	No
ITS_SITE	SITE_UPDT_TMSP	Last Updated	timestamp	Yes	No
ITS_SITE	SITE_TYPE_NUM	Site Type FK	int	No	No
ITS_SITE	COUNTY_NUM	County FK	int	Yes	No
ITS_SITE_ROUTES_XREF	SITE_NUM	Site PK	int	No	No
ITS_SITE_ROUTES_XREF	ROUTE_NUM	Route PK	int	No	No
ITS_SITE_ROUTES_XREF	IS_PRIMARY_IND	Is Route Primary	bit	No	No
LU_AGENCY	AGN_NUM	Agency PK	int	No	Yes
LU_AGENCY	AGN_NAME	Agency Name	varchar(50)	No	No
LU_AGENCY	IS_AGN_OWNP_IND	Is AgencyOfOwnership	bit	No	No
LU_AGENCY	IS_AGN_SERV_IND	Is AgencyOfService	bit	No	No
LU_AGENCY	IS_AGN_WARRANTY_IND	Is AgencyOfWarranty	bit	No	No
LU_AGENCY	IS_AGN_PWR_IND	Is AgencyOfPower	bit	No	No
LU_CIRCUIT_SIZE	CRCT_SIZE_NUM	Circuit Size PK	int	No	Yes
LU_CIRCUIT_SIZE	CRCT_SIZE	Circuit Size	varchar(255)	No	No
LU_CONDITION	COND_NUM	Condition PK	int	No	Yes
LU_CONDITION	COND	Condition	varchar(50)	No	No
LU_CONDUIT_TYPE_CDTB	CONDUIT_TYPE_CD	Conduit Type Code	varchar(2)	No	No
LU_CONDUIT_TYPE_CDTB	CONDUIT_TYPE	Conduit Type	varchar(255)	No	No
LU_CONTRACTOR_TYPE	CONTR_TYPE_NUM	Contractor Type PK	int	No	Yes
LU_CONTRACTOR_TYPE	CONTR_TYPE	Contractor Type Desc	varchar(50)	No	No
LU_DEPENDENCY_PATH	DEPENDENCY_PATH_NUM	Dependency Path PK	int	No	Yes
LU_DEPENDENCY_PATH	DEPENDENCY_PATH_DESC	Dependency Path Description	varchar(50)	No	No
LU_DEVICE_COST_TYPE_CDTB	DEVC_TYPE_COST_TYPE_CD	Cost Type Code	varchar(1)	No	No
LU_DEVICE_COST_TYPE_CDTB	DEVC_TYPE_COST_TYPE	Cost Type	varchar(10)	No	No

TABLE_NAME	COLUMN_NAME	LOGICAL_NAME	FORMAT	NULL?	PK?
LU_DEVICE_COST_TYPE_CDTB	DEVC_TYPE_COST_TYPE_DESC	Cost Type Description	varchar(50)	No	No
LU_DEVICE_TYPE_COST_UNIT	DEVC_TYPE_COST_UNIT_NUM	Device Type Cost Unit PK	int	No	Yes
LU_DEVICE_TYPE_COST_UNIT	DEVC_TYPE_COST_UNIT	Device Type Cost Unit	varchar(50)	No	No
LU_DIRECTION_CDTB	DRTN_CD	Direction Code	varchar(2)	No	No
LU_DIRECTION_CDTB	DRTN_DESC	Direction Description	varchar(10)	No	No
LU_FAILURE_REASON	FAILURE_RESN_NUM	Failure Reason PK	int	No	Yes
LU_FAILURE_REASON	FAILURE_RESN_DESC	Failure Reason Desc	varchar(100)	No	No
LU_FAILURE_TYPE_CDTB	FAILURE_TYPE_CD	Failure Type Code	varchar(10)	No	No
LU_FAILURE_TYPE_CDTB	FAILURE_TYPE_DESC	Failure/Action	varchar(100)	No	No
LU_ITS_LINE_TYPE_CDTB	LINE_TYPE_CD	Line Type Code	varchar(2)	No	No
LU_ITS_LINE_TYPE_CDTB	LINE_TYPE	Line Type	varchar(50)	No	No
LU_JOB_FUNDING_SOURCE	JOB_FUND_SOURCE_NUM	Job Funding Source PK	int	No	Yes
LU_JOB_FUNDING_SOURCE	JOB_FUND_SOURCE	Funding Source	varchar(50)	No	No
LU_JOB_FUNDING_TYPE	JOB_FUND_TYPE_NUM	Job Funding Type PK	int	No	Yes
LU_JOB_FUNDING_TYPE	JOB_FUND_TYPE	Funding Type	varchar(50)	No	No
LU_JOB_TYPE	JOB_TYPE_NUM	Job Type FK	int	No	Yes
LU_JOB_TYPE	JOB_TYPE	Job Type	varchar(50)	No	No
LU_LABOR_ACCOUNT	LBR_ACCT_NUM	Labor Account PK	int	No	Yes
LU_LABOR_ACCOUNT	LBR_ACCT	Labor Account	varchar(50)	No	No
LU_LABOR_TASK	LBR_TASK_NUM	Labor Task PK	int	No	Yes
LU_LABOR_TASK	LBR_TASK	Labor Task	varchar(50)	No	No
LU_LABOR_TASK	LBR_TASK_DESC		varchar(50)	Yes	No
LU_MAKE_MODEL	MAKE_MODL_NUM	Make/Model PK	int	No	Yes
LU_MAKE_MODEL	MAKE	Make	varchar(50)	No	No
LU_MAKE_MODEL	MODEL	Model	varchar(50)	No	No
LU_METER_SIZE	MTR_SIZE_NUM	Meter Size PK	int	No	Yes
LU_METER_SIZE	MTR_SIZE	Meter Size	varchar(255)	No	No
LU_POWER_TYPE	PWR_TYPE_NUM	Power Type PK	int	No	Yes
LU_POWER_TYPE	PWR_TYPE	Power Type	varchar(255)	No	No

TABLE_NAME	COLUMN_NAME	LOGICAL_NAME	FORMAT	NULL?	PK?
LU_PREV_MAINT_PLAN_FREQ	PM_PLAN_FREQ_NUM	PMP Frequency PK	int	No	Yes
LU_PREV_MAINT_PLAN_FREQ	PM_PLAN_FREQ_DESC	Frequency	varchar(50)	No	No
LU_PREV_MAINT_PLAN_FREQ	PM_PLAN_FREQ_MOS	Frequency Months	int	No	No
LU_SITE_TYPE	SITE_TYPE_NUM	Site Type PK	int	No	Yes
LU_SITE_TYPE	SITE_TYPE	Site Type	varchar(50)	No	No
LU_SPECIAL_ACCESS	SPCL_ACS_NUM	Special Access PK	int	No	Yes
LU_SPECIAL_ACCESS	SPCL_ACS	Special Access Required	varchar(50)	No	No
LU_STATE_CDTB	ST_CD	State Code	varchar(2)	No	No
LU_STATE_CDTB	ST_NAME	State Name	varchar(50)	No	No
LU_STRAND_TYPE	STRANDS	Strands	int	No	No
LU_VOLTAGE_TYPE	VOLTAGE_TYPE_NUM	Voltage Type PK	int	No	Yes
LU_VOLTAGE_TYPE	VOLTAGE	Voltage	varchar(50)	No	No
LU_WIRE_SIZE	WIRE_SIZE_NUM	Wire Size PK	int	No	Yes
LU_WIRE_SIZE	WIRE_SIZE	Wire Size	varchar(50)	No	No
LU_WORK_NONCOMPLETE	WK_NCMPT_NUM	NonCompletion Reason PK	int	No	Yes
LU_WORK_NONCOMPLETE	WK_NCMPT	NonCompletion Reason Desc	varchar(50)	No	No
LU_WORK_ORDER_DEPARTMENT	WKDR_DEPT_NUM		int	No	Yes
LU_WORK_ORDER_DEPARTMENT	WKDR_DEPT		varchar(50)	No	No
LU_WORK_PRIORITY	WKDR_PRTY_NUM	Work Order Task Priority PK	int	No	Yes
LU_WORK_PRIORITY	WKDR_PRTY_DESC	Work Order Task Priority Desc	varchar(10)	No	No
LU_WORK_PROBLEM_TYPE_CDTB	WKDR_PROB_TYPE_CD	Work Order Problem Type Code	varchar(10)	No	No
LU_WORK_PROBLEM_TYPE_CDTB	WKDR_PROB_TYPE_DESC	Work Order Problem Type Desc	varchar(50)	No	No
LU_WORK_PROGRESS	WKDR_PROGRESS_NUM	Work Order Progress PK	int	No	Yes
LU_WORK_PROGRESS	WKDR_PROGRESS_CD	Work Order Progress Code	varchar(10)	No	No
LU_WORK_PROGRESS	WKDR_PROGRESS_DESC	Work Order Progress Description	varchar(50)	No	No
LU_WORK_SEVERITY_CDTB	WKDR_SVTY_CD	Severity Code	varchar(5)	No	No
LU_WORK_SEVERITY_CDTB	WKDR_SVTY_DESC	Severity Desc	varchar(100)	No	No
LU_WORK_STATE	WKDR_ST_NUM	Work Order State	int	No	Yes
LU_WORK_STATE	WKDR_ST	Work Order State Desc	varchar(100)	No	No

TABLE_NAME	COLUMN_NAME	LOGICAL_NAME	FORMAT	NULL?	PK?
LU_WORK_TYPE_CDTB	WKDR_TYPE_CD	Work Order Type Code	varchar(10)	No	No
LU_WORK_TYPE_CDTB	WKDR_TYPE_DESC	Work Order Type Desc	varchar(50)	No	No
PART_INVENTORY	PART_INVT_NUM	Part Inventory PK	int	No	Yes
PART_INVENTORY	SITE_GUID	Site GUID	uniqueidentifier	No	No
PART_INVENTORY	PART_INVT_SHELF	Shelf	int	Yes	No
PART_INVENTORY	PART_INVT_QTY	Quantity	int	No	No
PART_INVENTORY	PART_NUMBER	Part No	varchar(100)	Yes	No
PART_INVENTORY	PART_DESC	Part Description	varchar(200)	No	No
PART_INVENTORY	PART_INVT_UPDT_BY_UID	Last Updated By	varchar(50)	Yes	No
PART_INVENTORY	PART_INVT_UPDT_TMSP	Last Updated	timestamp	Yes	No
PREV_MAINT_PLAN	PM_PLAN_NUM	PMP ID	int	No	Yes
PREV_MAINT_PLAN	DEVC_TYPE_NUM	Device Type	int	No	No
PREV_MAINT_PLAN	PM_PLAN_ACT	PMP Activity	varchar(200)	No	No
PREV_MAINT_PLAN	PM_PLAN_FREQ_NUM	PMP Frequency FK	int	No	No
PREV_MAINT_PLAN	PM_PLAN_ACT_ORDER	PMP Activity Order	int	No	No
PROGRAM_COST	PGM_COST_NUM	Program Cost PK	int	No	Yes
PROGRAM_COST	PGM_BDGT_YR	Budget Year	int	No	No
PROGRAM_COST	REGN_NUM	Region FK	int	No	No
PROGRAM_COST	FUND_TYPE_NUM	Funding Type	int	No	No
PROGRAM_COST	PGM_COST_AMT	Program Cost	int	No	No
PROJECT_COST_FORECAST	PROJECT_COST_FCST_NUM	Project Cost Forecast PK	int	No	Yes
PROJECT_COST_FORECAST	JOB_ID	Job ID	int	No	No
PROJECT_COST_FORECAST	PROJECT_COST_FCST_NAME	Project Cost Forecast Name	varchar(50)	No	No
PROJECT_COST_FORECAST	PROJ_COST_MNUL_ADJUST_AMT	Manual Adjustment	decimal	No	No
PROJECT_COST_FORECAST	PROJ_COST_SYS_ENGR_AMT	Systems Engineering Cost	nchar	Yes	No
PROJECT_COST_FORECAST	PROJ_COST_SYS_ENGR_AMT_YR	Systems Engineering Cost Year	decimal	No	No
PROJECT_COST_FORECAST	PROJ_COST_DSGN_AMT	Design Cost	nchar	Yes	No
PROJECT_COST_FORECAST	PROJ_COST_DSGN_AMT_YR	Design Cost Year	decimal	No	No
PROJECT_COST_FORECAST	PROJ_COST_SYS_MGR_AMT	Systems Manufacturer Cost	nchar	Yes	No

TABLE_NAME	COLUMN_NAME	LOGICAL_NAME	FORMAT	NULL?	PK?
PROJECT_COST_FORECAST	PROJ_COST_SYS_MGR_AMT_YR	Systems Manufacturer Cost Year	decimal	No	No
PROJECT_COST_FORECAST	PROJ_COST_CNST_ENGR_AMT	Engineering Cost	nchar	Yes	No
PROJECT_COST_FORECAST	PROJ_COST_CNST_ENGR_AMT_YR	Engineering Cost Year	decimal	No	No
PROJECT_COST_FORECAST	PROJ_COST_MNUL_ADJUST_COMM	Manual Adjustment Notes	varchar(255)	Yes	No
REGION	REGN_NUM	Region ID	int	No	Yes
REGION	REGN_NAME	Region Name	varchar(50)	No	No
ROUTES	ROUTE_NUM	Route ID	int	No	Yes
ROUTES	ROUTE_NAME	Route	varchar(100)	No	No
ROUTES	IS_PRIMARY_IND	Is Route Primary	bit	No	No
ROUTES	IS_SECONDARY_IND	Is Route Secondary	bit	No	No
WORK_ORDER	WKDR_NUM	Work Order ID	int	No	Yes
WORK_ORDER	WKDR_GUID	Work Order GUID	uniqueidentifier	No	No
WORK_ORDER	WKDR_ST_NUM	Work Order State	int	No	No
WORK_ORDER	DEVC_GUID	ITS Device	uniqueidentifier	No	No
WORK_ORDER	WKDR_CRET_TMSP	Work Order Created Datetime	datetime	No	No
WORK_ORDER	WKDR_CRET_BY_UID	Work Order Created By	uniqueidentifier	No	No
WORK_ORDER	CUST_NUM	Customer FK	int	No	No
WORK_ORDER	WKDR_SVTY_CD	Work Order Severity Code	varchar(5)	Yes	No
WORK_ORDER	WKDR_TYPE_CD	Work Order Type Code	varchar(10)	No	No
WORK_ORDER	WKDR_PROB_TYPE_CD	Work Order Problem Type Code	varchar(10)	Yes	No
WORK_ORDER	WKDR_PROGRESS_NUM	Work Order Progress FK	int	Yes	No
WORK_ORDER	WKDR_PRTY_NUM	Work Order Task Priority FK	int	Yes	No
WORK_ORDER	WKDR_OBSVD_TMSP	First Observed	datetime	No	No
WORK_ORDER	FAILURE_TYPE_CD	Failure Type Code	varchar(10)	No	No
WORK_ORDER	FAILURE_RESN_NUM	Failure Reason FK	int	Yes	No
WORK_ORDER	WKDR_CLSD_TMSP	Work Order Closed Datetime	datetime	Yes	No
WORK_ORDER	CONTR_NUM	Contractor Assigned	int	Yes	No
WORK_ORDER	WKDR_TRGT_DATE	Target Date	date	Yes	No
WORK_ORDER	WKDR_PROB_DETAIL_COMM	Problem Detail/Update	varchar(-1)	Yes	No

TABLE_NAME	COLUMN_NAME	LOGICAL_NAME	FORMAT	NULL?	PK?
WORK_ORDER	WKDR_ACTN_TAKEN_COMM	Problem Found/Action Taken	varchar(-1)	Yes	No
WORK_ORDER	WONCR_NUM	Noncompletion Reason FK	int	Yes	No
WORK_ORDER	WKDR_DOWNTIME_COMM	Downtime Reason	varchar(100)	Yes	No
WORK_ORDER	WKDR_UPDT_BY_UID	Last Updated By	varchar(50)	Yes	No
WORK_ORDER	WKDR_UPDT_TMSP	Last Updated	timestamp	Yes	No
WORK_ORDER_LABOR	WKDR_LBR_NUM	Work Order Labor ID	int	No	Yes
WORK_ORDER_LABOR	WKDR_NUM	Work Order ID	int	No	No
WORK_ORDER_LABOR	CONTR_NAME_NUM	Contractor Name	int	No	No
WORK_ORDER_LABOR	WKDR_LBR_ASGN_HRS	Assign Hours	decimal	No	No
WORK_ORDER_LABOR	WKDR_LBR_ASGN_OVRT_HRS	Assign Overtime Hours	decimal	No	No
WORK_ORDER_LABOR	WKDR_LBR_ACTL_HRS	Actual Hours	decimal	No	No
WORK_ORDER_LABOR	WKDR_LBR_ACTL_OVRT_HRS	Actual Overtime Hours	decimal	No	No
WORK_ORDER_LABOR	WKDR_LBR_WK_DATE	Work Date	date	No	No
WORK_ORDER_LABOR	WKDR_LBR_ASGN_HRS_CALC	Total Assigned Hours	decimal	Yes	No
WORK_ORDER_LABOR	WKDR_LBR_ACTL_HRS_CALC	Total Actual Hours	decimal	Yes	No
WORK_ORDER_LABOR	LBR_TASK_NUM	Labor Task FK	int	Yes	No
WORK_ORDER_LABOR	LBR_ACCT_NUM	Labor Account FK	int	Yes	No
WORK_ORDER_LABOR	WKDR_TRADE	Trade	varchar(50)	Yes	No
WORK_ORDER_LABOR	WKDR_DEPT_NUM	Dept	int	Yes	No
WORK_ORDER_PART	WKDR_PART_NUM	Work Order Part PK	int	No	Yes
WORK_ORDER_PART	WKDR_NUM	Work Order FK	int	No	No
WORK_ORDER_PART	FROM_SITE_GUID	From Site GUID	uniqueidentifier	No	No
WORK_ORDER_PART	WKDR_PART_QTY	Quantity	int	No	No
WORK_ORDER_PART	WKDR_PART_NUMBER	Part No	varchar(100)	Yes	No
WORK_ORDER_PART	WKDR_PART_DESC	Part Description	varchar(200)	No	No
WORK_ORDER_PART	WKDR_PART_UPDT_BY_UID	Last Updated By	varchar(50)	Yes	No
WORK_ORDER_PART	WKDR_PART_UPDT_TMSP	Last Updated	timestamp	Yes	No
WORK_STATUS_HISTORY	WK_STAT_HISTORY_NUM	Work Status History PK	int	No	Yes
WORK_STATUS_HISTORY	WKDR_NUM	Work Order FK	int	No	No

TABLE_NAME	COLUMN_NAME	LOGICAL_NAME	FORMAT	NULL?	PK?
WORK_STATUS_HISTORY	WKDR_PROGRESS_NUM	Work Order Progress FK	int	No	No
WORK_STATUS_HISTORY	WK_STAT_HISTORY_UPDT_BY_UID	Last Updated By	varchar(50)	Yes	No
WORK_STATUS_HISTORY	WK_STAT_HISTORY_UPDT_TMSP	Last Updated	datetime	No	No

Table 4 – Data Dictionary

APPENDIX C – DATA INDEXES

This section defines unique indexes and constraints as required by system business requirements.

IndexName	Keys
AGN_NAME_UX1	AGN_NAME
CONDUIT_NX1	LINE_GUID
CONDUIT_UX1	CONDUIT_GUID
CONDUIT_UX2	CONDUIT_GUID CONDUIT_NUMBER
CONDUIT_UXK1	CONDUIT_GUID
CONTRACTOR_UX1	CONTR_NAME_ABBRV
COUNTY_UX1	COUNTY_NAME
CUSTOMER_UX1	CUST_ID
DEVICE_SITE_NX1	SITE_GUID
DEVICE_SITE_UX1	DEVC_GUID
DEVICE_STATUS_UX1	DEVC_STAT
DEVICE_TYPE_UX1	DEVC_TYPE DEVC_SUBTYPE
DEVICE_TYPE_UX2	DEVC_TYPE_ABBRV
DEVICE_WORK_ORDER_XREF_UX1	WKDR_NUM IS_PRIMARY_DEVC_IND
FIBER_NX1	CONDUIT_GUID
FIBER_UX1	FIBER_GUID
ITS_JOBS_UX1	JOB_NUMBER
ITS_LINE_NX1	FROM_DEVC_GUID
ITS_LINE_NX2	TO_DEVC_GUID
ITS_LINE_UX1	LINE_GUID
ITS_SITE_UK1	SITE_GUID
ITS_SITE_UX1	SITE_GUID
LU_CIRCUIT_SIZE_UX1	CRCT_SIZE
LU_CONDITION_UX1	COND
LU_CONDUIT_TYPE_CDTB_UX1	CONDUIT_TYPE

IndexName	Keys
LU_CONTRACTOR_TYPE_UX1	CONTR_TYPE
LU_DEPENDENCY_PATH_UX1	DEPENDENCY_PATH_DESC
LU_DEVICE_COST_TYPE_CDTB_UX1	DEVC_TYPE_COST_TYPE
LU_DEVICE_TYPE_COST_UNIT_UX1	DEVC_TYPE_COST_UNIT
LU_DIRECTION_CDTB_UX1	DRTN_DESC
LU_FAILURE_REASON_UX1	FAILURE_RESN_DESC
LU_FAILURE_TYPE_CDTB_UX1	FAILURE_TYPE_DESC
LU_ITS_LINE_TYPE_CDTB_UX1	LINE_TYPE
LU_JOB_FUNDING_SOURCE_UX1	JOB_FUND_SOURCE
LU_JOB_FUNDING_TYPE_UX1	JOB_FUND_TYPE
LU_JOB_TYPE_UX1	JOB_TYPE
LU_LABOR_ACCOUNT_UX1	LBR_ACCT
LU_MAKE_MODEL_UX1	MAKE MODEL
LU_METER_SIZE_UX1	MTR_SIZE
LU_POWER_TYPE_UX1	PWR_TYPE
LU_PREV_MAINT_PLAN_FREQ_UX1	PM_PLAN_FREQ_DESC
LU_SITE_TYPE_UX1	SITE_TYPE
LU_SPECIAL_ACCESS_UX1	SPCL_ACS
LU_STATE_CDTB_UX1	ST_NAME
LU_VOLTAGE_TYPE_UX1	VOLTAGE
LU_WIRE_SIZE_UX1	WIRE_SIZE
LU_WORK_NONCOMPLETE_UX1	WK_NCMPT
LU_WORK_ORDER_DEPARTMETN_UX1	WKDR_DEPT
LU_WORK_ORDER_TASK_UX1	LBR_TASK
LU_WORK_PRIORITY_UX1	WKDR_PRTY_DESC
LU_WORK_PROBLEM_TYPE_CDTB_UX1	WKDR_PROB_TYPE_DESC
LU_WORK_PROGRESS_UX1	WKDR_PROGRESS_CD
LU_WORK_SEVERITY_CDTB_UX1	WKDR_SVTY_DESC
LU_WORK_STATE_UX1	WKDR_ST

IndexName	Keys
LU_WORK_TYPE_CDTB_UX1	WKDR_TYPE_DESC
PARTS_INVENTORY_UX1	SITE_GUID PART_NUMBER PART_DESC
PREV_MAINT_PLAN_UK1	DEVC_TYPE_NUM PM_PLAN_ACT PM_PLAN_FREQ_NUM PM_PLAN_ACT_ORDER
PROGRAM_COST_UX1	PGM_BDGT_YR REGN_NUM FUND_TYPE_NUM
PROJECT_COST_FORECAST_UX1	JOB_ID PROJECT_COST_FCST_NAME
REGION_UX1	REGN_NAME
WORK_ORDER_PART_UX1	WKDR_NUM FROM_SITE_GUID WKDR_PART_NUMBER WKDR_PART_DESC
WORK_ORDER_UX1	WKDR_GUID

Table 5 – Data Indexes

APPENDIX D – CONTRACTOR DATASHEET

VIEW_NAME	COLUMN_NAME	LOGICAL_NAME	DATA_TYPE	LENGTH
qryXportContractorConduit	Comment2	Comment2	nvarchar	255
qryXportContractorConduit	Comment3	Comment3	nvarchar	255
qryXportContractorConduit	Comment4	Comment4	nvarchar	255
qryXportContractorConduit	Comment5	Comment5	nvarchar	255
qryXportContractorConduit	Comment6	Comment6	nvarchar	255
qryXportContractorConduit	Comment7	Comment7	nvarchar	255
qryXportContractorConduit	Comment8	Comment8	nvarchar	255
qryXportContractorConduit	CONDUIT_COMM	CONDUIT_COMM	nvarchar	255
qryXportContractorConduit	CONDUIT_DIAMETER	CONDUIT_DIAMETER	int	
qryXportContractorConduit	CONDUIT_TYPE	CONDUIT_TYPE	nvarchar	255
qryXportContractorConduit	Diameter2	Diameter2	int	
qryXportContractorConduit	Diameter3	Diameter3	int	
qryXportContractorConduit	Diameter4	Diameter4	int	
qryXportContractorConduit	Diameter5	Diameter5	int	
qryXportContractorConduit	Diameter6	Diameter6	int	
qryXportContractorConduit	Diameter7	Diameter7	int	
qryXportContractorConduit	Diameter8	Diameter8	int	
qryXportContractorConduit	FROM_DEVC_GUID	FROM_DEVC_GUID	uniqueidentifier	
qryXportContractorConduit	From_ITS_CommonName	From_ITS_CommonName	nvarchar	60
qryXportContractorConduit	LINE_GUID	LINE_GUID	uniqueidentifier	
qryXportContractorConduit	Other	Other	varchar	1
qryXportContractorConduit	Other2	Other2	varchar	1
qryXportContractorConduit	Other3	Other3	varchar	1
qryXportContractorConduit	Other4	Other4	varchar	1
qryXportContractorConduit	Other5	Other5	varchar	1
qryXportContractorConduit	Other6	Other6	varchar	1
qryXportContractorConduit	Other7	Other7	varchar	1
qryXportContractorConduit	Other8	Other8	varchar	1
qryXportContractorConduit	Pull_Rope	Pull_Rope	varchar	3
qryXportContractorConduit	Pull_Rope2	Pull_Rope2	varchar	3
qryXportContractorConduit	Pull_Rope3	Pull_Rope3	varchar	3

VIEW_NAME	COLUMN_NAME	LOGICAL_NAME	DATA_TYPE	LENGTH
qryXportContractorConduit	Pull_Rope4	Pull_Rope4	varchar	3
qryXportContractorConduit	Pull_Rope5	Pull_Rope5	varchar	3
qryXportContractorConduit	Pull_Rope6	Pull_Rope6	varchar	3
qryXportContractorConduit	Pull_Rope7	Pull_Rope7	varchar	3
qryXportContractorConduit	Pull_Rope8	Pull_Rope8	varchar	3
qryXportContractorConduit	STRANDS	STRANDS	int	
qryXportContractorConduit	Strands2	Strands2	int	
qryXportContractorConduit	Strands3	Strands3	int	
qryXportContractorConduit	Strands4	Strands4	int	
qryXportContractorConduit	Strands5	Strands5	int	
qryXportContractorConduit	Strands6	Strands6	int	
qryXportContractorConduit	Strands7	Strands7	int	
qryXportContractorConduit	Strands8	Strands8	int	
qryXportContractorConduit	TO_DEVC_GUID	TO_DEVC_GUID	uniqueidentifier	
qryXportContractorConduit	To_ITS_CommonName	To_ITS_CommonName	nvarchar	60
qryXportContractorConduit	Tracer_Wi2	Tracer_Wi2	varchar	3
qryXportContractorConduit	Tracer_Wi3	Tracer_Wi3	varchar	3
qryXportContractorConduit	Tracer_Wi4	Tracer_Wi4	varchar	3
qryXportContractorConduit	Tracer_Wi5	Tracer_Wi5	varchar	3
qryXportContractorConduit	Tracer_Wi6	Tracer_Wi6	varchar	3
qryXportContractorConduit	Tracer_Wi7	Tracer_Wi7	varchar	3
qryXportContractorConduit	Tracer_Wi8	Tracer_Wi8	varchar	3
qryXportContractorConduit	TRACER_Wir	TRACER_Wir	varchar	3
qryXportContractorConduit	Type2	Type2	nvarchar	255
qryXportContractorConduit	Type3	Type3	nvarchar	255
qryXportContractorConduit	Type4	Type4	nvarchar	255
qryXportContractorConduit	Type5	Type5	nvarchar	255
qryXportContractorConduit	Type6	Type6	nvarchar	255
qryXportContractorConduit	Type7	Type7	nvarchar	255
qryXportContractorConduit	Type8	Type8	nvarchar	255
qryXportContractorConduit	Work Type	Work Type	varchar	8
qryXportContractorITSDevice	COND	Condition	varchar	50
qryXportContractorITSDevice	DEVC_ATMS_NAME	ATMS Name	varchar	60
qryXportContractorITSDevice	DEVC_COMM	Notes	nvarchar	-1

VIEW_NAME	COLUMN_NAME	LOGICAL_NAME	DATA_TYPE	LENGTH
qryXportContractorITSDDevice	DEVC_COMMON_NAME	Auto Name	varchar	60
qryXportContractorITSDDevice	DEVC_FIRMWARE_VERS	Firmware Ver	varchar	50
qryXportContractorITSDDevice	DEVC_GPS_LAT	GPS Lat	float	
qryXportContractorITSDDevice	DEVC_GPS_LON	GPS Long	float	
qryXportContractorITSDDevice	DEVC_GUID	Device GUID	uniqueidentifier	
qryXportContractorITSDDevice	DEVC_IN_SERV_DATE	In Service Date	datetime	
qryXportContractorITSDDevice	DEVC_PLAN_NAME	Plan Name	varchar	60
qryXportContractorITSDDevice	DEVC_SERL_NUMBER	Serial #	varchar	50
qryXportContractorITSDDevice	DEVC_SOFTWARE_VERS	Software Ver	varchar	50
qryXportContractorITSDDevice	DEVC_STAT	Status	varchar	50
qryXportContractorITSDDevice	DEVC_TYPE_ABBRV	Device Type Abbrev	varchar	50
qryXportContractorITSDDevice	DEVC_VOLTAGE	Voltage	int	
qryXportContractorITSDDevice	DEVC_WARRANTY_END_DATE	Warranty End	date	
qryXportContractorITSDDevice	DEVC_WARRANTY_STRT_DATE	Warranty Start	date	
qryXportContractorITSDDevice	DEVC_WARRANTY_TERMS	Warranty Terms	varchar	50
qryXportContractorITSDDevice	Direction Serving	Direction Serving	varchar	1
qryXportContractorITSDDevice	MAKE	Make	varchar	50
qryXportContractorITSDDevice	MODEL	Model	varchar	50
qryXportContractorITSDDevice	Owner	Owner	varchar	50
qryXportContractorITSDDevice	PWR_TYPE	Power Type	varchar	255
qryXportContractorITSDDevice	Service Agency	Service Agency	varchar	3
qryXportContractorITSDDevice	SITE_ATMS_ID	ATMS Site ID	varchar	60
qryXportContractorITSDDevice	SITE_COMMON_NAME	Site Common Name	varchar	60
qryXportContractorITSDDevice	SITE_GUID	Site GUID	uniqueidentifier	
qryXportContractorITSDDevice	SITE_GUID	Site GUID	uniqueidentifier	
qryXportContractorITSDDevice	SPCL_ACS	Special Access Required	varchar	50
qryXportContractorITSDDevice	Work Type	Work Type	varchar	8
qryXportContractorPowerMeter	CRCT_SIZE	Circuit Size	varchar	255
qryXportContractorPowerMeter	DEVC_COMMON_NAME	Auto Name	varchar	60
qryXportContractorPowerMeter	DEVC_GPS_LAT	GPS Lat	float	
qryXportContractorPowerMeter	DEVC_GPS_LON	GPS Long	float	
qryXportContractorPowerMeter	DEVC_GUID	Device GUID	uniqueidentifier	
qryXportContractorPowerMeter	MTR_SIZE	Meter Size	varchar	255
qryXportContractorPowerMeter	Power Company	Power Company	varchar	3

VIEW_NAME	COLUMN_NAME	LOGICAL_NAME	DATA_TYPE	LENGTH
qryXportContractorPowerMeter	PWR_MTR_ACCT_ID	Account #	varchar	50
qryXportContractorPowerMeter	PWR_MTR_ADDR	Street Address	varchar	80
qryXportContractorPowerMeter	PWR_MTR_CITY	City	varchar	50
qryXportContractorPowerMeter	PWR_MTR_ID	Meter #	varchar	50
qryXportContractorPowerMeter	PWR_MTR_ST_CD	State Code	varchar	2
qryXportContractorPowerMeter	PWR_MTR_ZIP	Zip	varchar	50
qryXportContractorPowerMeter	PWR_TYPE	Power Type	varchar	255
qryXportContractorPowerMeter	SITE_ATMS_ID	ATMS Site ID	varchar	60
qryXportContractorPowerMeter	SITE_COMMON_NAME	Site Common Name	varchar	60
qryXportContractorPowerMeter	SITE_GUID	Site GUID	uniqueidentifier	
qryXportContractorPowerMeter	SITE_GUID	Site GUID	uniqueidentifier	
qryXportContractorPowerMeter	SITE_NUM	Site ID	int	
qryXportContractorPowerMeter	WIRE_SIZE	Wire Size	varchar	50
qryXportContractorPowerMeter	Work Type	Work Type	varchar	8
qryXportContractorSites	COUNTY_NAME	COUNTY_NAME	nvarchar	25
qryXportContractorSites	Cross Street	Cross Street	varchar	3
qryXportContractorSites	DRTN_DESC	DRTN_DESC	nchar	10
qryXportContractorSites	Job Number	Job Number	varchar	1
qryXportContractorSites	Primary Route	Primary Route	varchar	3
qryXportContractorSites	SITE_ATMS_ID	SITE_ATMS_ID	nvarchar	60
qryXportContractorSites	SITE_COMM	SITE_COMM	nvarchar	255
qryXportContractorSites	SITE_COMMON_NAME	SITE_COMMON_NAME	nvarchar	60
qryXportContractorSites	SITE_CS	SITE_CS	nvarchar	50
qryXportContractorSites	SITE_GPS_LAT	SITE_GPS_LAT	float	
qryXportContractorSites	SITE_GPS_LON	SITE_GPS_LON	float	
qryXportContractorSites	SITE_GUID	SITE_GUID	uniqueidentifier	
qryXportContractorSites	SITE_MM	SITE_MM	real	
qryXportContractorSites	SITE_PLAN_NAME	SITE_PLAN_NAME	nvarchar	60
qryXportContractorSites	Work Type	Work Type	varchar	8

Table 6 – Contractor Datasheet

APPENDIX F – REPORTS

The following reports have been identified

MODULE	TABLE_NAME	COLUMN_NAME	LOGICAL_NAME
Break Fix	VW_RPT_DEVICE_MAINT_HISTORY	DEVC_COMMON_NAME	Auto Name
Break Fix	VW_RPT_DEVICE_MAINT_HISTORY	WKDR_CLSD_TMSP	WKDR_CLSD_TMSP
Break Fix	VW_RPT_DEVICE_MAINT_HISTORY	WKDR_NUM	Work Order ID
Break Fix	VW_RPT_DEVICE_MAINT_HISTORY	SITE_COMMON_NAME	Site Common Name
Break Fix	VW_RPT_DEVICE_MAINT_HISTORY	PWR_MTR_ACCT_ID	Account #
Break Fix	VW_RPT_DEVICE_MAINT_HISTORY	FAILURE_TYPE_CD	Failure Type Code
Break Fix	VW_RPT_DEVICE_MAINT_HISTORY	FAILURE_TYPE_DESC	Failure/Action
Break Fix	VW_RPT_DEVICE_MAINT_HISTORY	WKDR_ACTN_TAKEN_C OMM	WKDR_ACTN_TAKEN_C OMM
Break Fix	VW_RPT_DEVICE_MAINT_HISTORY	WKDR_PROB_DETAIL_C OMM	WKDR_PROB_DETAIL_C OMM
Break Fix	VW_RPT_DEVICE_MAINT_HISTORY	CONTR_NAME_NUM	Contractor Name
Break Fix	VW_RPT_DEVICE_MAINT_HISTORY	LBR_TASK	Labor Task
Break Fix	VW_RPT_DEVICE_MAINT_HISTORY	WKDR_TRADE	Trade
Break Fix	VW_RPT_DEVICE_MAINT_HISTORY	WKDR_LBR_ASGN_HRS	Assign Hours
Break Fix	VW_RPT_DEVICE_MAINT_HISTORY	WKDR_LBR_ASGN_OVR T_HRS	Assign Overtime Hours
Break Fix	VW_RPT_DEVICE_MAINT_HISTORY	WKDR_LBR_ACTL_HRS	Actual Hours
Break Fix	VW_RPT_DEVICE_MAINT_HISTORY	WKDR_LBR_ACTL_OVR T_HRS	Actual Overtime Hours
Break Fix	VW_RPT_DEVICE_MAINT_HISTORY	WKDR_LBR_ASGN_HRS _CALC	Total Assigned Hours
Break Fix	VW_RPT_DEVICE_MAINT_HISTORY	WKDR_LBR_ACTL_HRS _CALC	Total Actual Hours
Break Fix	VW_RPT_OPEN_DEVICES	CUST_ID	Customer ID
Break Fix	VW_RPT_OPEN_DEVICES	WKDR_NUM	WKDR_NUM
Break Fix	VW_RPT_OPEN_DEVICES	WKDR_CRET_TMSP	WKDR_CRET_TMSP
Break Fix	VW_RPT_OPEN_DEVICES	SITE_COMMON_NAME	Site Common Name
Break Fix	VW_RPT_OPEN_DEVICES	DEVC_TYPE_ABBRV	Device Type Abbrev

MODULE	TABLE_NAME	COLUMN_NAME	LOGICAL_NAME
	S		
Break Fix	VW_RPT_OPEN_DEVICE S	DEVC_COMMON_NAME	Auto Name
Break Fix	VW_RPT_OPEN_DEVICE S	WKDR_PROB_TYPE_CD	WKDR_PROB_TYPE_CD
Break Fix	VW_RPT_OPEN_DEVICE S	FAILURE_TYPE_CD	FAILURE_TYPE_CD
Break Fix	VW_RPT_OPEN_DEVICE S	WKDR_PRTY_DESC	Work Order Task Priority Desc
Break Fix	VW_RPT_OPEN_DEVICE S	WKDR_PROGRESS_CD	Work Order Progress Code
Break Fix	VW_RPT_OPEN_DEVICE S	WKDR_PROB_DETAIL_C OMM	WKDR_PROB_DETAIL_C OMM
Break Fix	VW_RPT_OPEN_DEVICE S	FAILURE_RESN_DESC	Failure Reason Desc
Break Fix	VW_RPT_OPEN_DEVICE S	WKDR_TYPE_CD	WKDR_TYPE_CD
Preventative Maintenance	VW_RPT_PM_DETAIL	DEVC_TYPE_ABBRV	Device Type Abbrev
Preventative Maintenance	VW_RPT_PM_DETAIL	DEVC_TYPE	Device Type
Preventative Maintenance	VW_RPT_PM_DETAIL	DEVC_SUBTYPE	Device SubType
Preventative Maintenance	VW_RPT_PM_DETAIL	PM_PLAN_ACT	PMP Activity
Preventative Maintenance	VW_RPT_PM_DETAIL	PM_PLAN_FREQ_DESC	Frequency

Table 7 - Reports

APPENDIX E – ITEMS OUT OF SCOPE

The following were identified as items out of scope with value that should be considered as enhancements for future development.

- Add minimal threshold for when to order Part for inventory
- Requirements for tracking device uptime are addressed in Solarwinds and are considered beyond the scope of this application
- Control Room Daily Task Checklist
- MITSC Weekly Checklist
- Group and relate Work Orders from different devices
- Insert/save images as part of a work order
- Automation of device failure priority status
 - When creating a work order based on the information provided have the system automatically determine the priority of the repair. Right now we use “Bad” “Ok” “Tmp” and the Operator creating the work order determines this. I think it would be beneficial to have this auto determined. For example, when creating a work order for a device that has no video the priority would be automatically determined to be High, for a device that needs to be cleaned the priority would be automatically determined to be Low.

APPENDIX F – FINAL REVIEW COMMENTS

Searchable fields:

- Route
- Control Section
- County
- City
- Region
- Device Make
- Device Model Number
- Device Firmware
- Device in Service Date
- Service Agency
- Warranty dates
- Power Meter: Address, Account ID, Meter Number
- Power provider (CE, Holland BPL, etc.)
- ITS Job Number
- Device Status
- Device Type
- Device Name (various)
- Power Type (Solar/Elec)
- Comm Type (Ethernet, Cell, Cable, etc.)
- Agency owner
- Prev Maint Status
- PM last date

Fields to query and include in ad-hoc search:

- Device by Type, Name and/or location
- Work Order #'s
- Type/Description of trouble found
- Status of Work Order

Standard reports:

- Status Report by Device Type
- Status Report by Locations
- Work Order History Report – showing all details of the work order (who created, work done, who closed it, status of device)
- Device History Report – showing all work orders that have been created and details of work done
- Open work order report with date of creation, device issue stated, comments and current status

- Open work order report by date created (to show devices with work orders over 30, 60 or 90 day periods)
- Device Issue Report (a report that shows all devices with No Video, No PTZ, etc.)
- Preventative Maintenance Schedule by device types

Searchable fields:

- Device Type
- Device Location
- Description of device issue
- Date
- Work Order #
- Status of Device
- Comments

Work Order process:

- Put in place something to alert when duplicating a device work order
 - This device has an open work order do you wish to create another?
- Automation of device failure priority status