STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

REQUEST FOR INFORMATION
FOR
MAINTENANCE MANAGEMENT SYSTEM

RFI # 40100-24100

1/11/2021

1. STATEMENT OF PURPOSE:

The State of Tennessee, Department of Transportation (TDOT) issues this Request for Information ("RFI") for the purpose of obtaining information that could assist the State in the development of a future solicitation for a next generation Maintenance Management System (MMS). We appreciate your input and participation in this process.

2. BACKGROUND:

The Tennessee Department of Transportation (TDOT) is the state agency responsible for the planning, delivery and management of the State of Tennessee's multi-modal transportation program. TDOT delivers its services through a headquarters function in Nashville and four regions located across the state, each of which are further comprised of three (3) districts with maintenance and construction offices.

A key activity for TDOT is to maintain the state-owned highway and interstate system of over 14,000 lane miles, 8,420 bridges and various citizen-facing and administrative facilities including 19 rest areas and 17 welcome centers.

TDOT utilizes a Maintenance Management System (MMS) based on software developed by Booz-Allen Hamilton, which was implemented in 2005 to help it manage and deliver its highway maintenance program. The MMS integrates with the statewide Edison Enterprise Resource Planning (ERP) system, based on Oracle PeopleSoft and other TDOT applications such as an internally developed Maintenance Quality Assurance (MQA) application, the ETRIMS roadway inventory application and TDOT's Program and Project Resource Management (PPRM) application, among others.

The existing MMS application is approaching end-of-life technically. It also has a number of functional limitations including lack of mobile technology and a lack of integration for materials management between the current MMS and the statewide Edison ERP system. To address the challenges with its current MMS, TDOT has initiated a project to plan for implementation of a next generation MMS. Appendix A provides a list of definitions and abbreviations to assist vendors' understanding of the RFI. Appendix B provides a high-level overview of the functionality and capabilities expected in TDOT's next generation MMS. Appendix C provides a list of the pain points TDOT identified during their as-is process analysis which are mapped to their business process and steps within each process. Appendix D is the full set of as-is business process documentation. It is the intention of TDOT that vendors review the as-is process and identified pain points to fully address TDOT's RFI requests for response.

As part of planning for the new MMS, TDOT has issued this RFI to obtain information from potential MMS software vendors and systems integrators about the functionality and capabilities available in their MMS applications. The information obtained through this RFI process will be utilized by TDOT to assist in the development of system requirements and the preparation of a potential Request for Proposal (RFP) for software and systems integration services.

3. COMMUNICATIONS:

3.1. Please submit your response to this RFI via email to:

Mark Patterson, IT Business Services Manager
Tennessee Department of Transportation, Information Technology Division
Phone: 615-532-3010
Email: Mark.D.Patterson@tn.gov

Jessica Jain, Sr. Business Analyst
Tennessee Department of Transportation, Information Technology Division
Phone: 615-313-5437
Email: Jessica.Jain@tn.gov

3.2. Please email all questions regarding this RFI to the main point of contact listed below.

Mark Patterson, IT Business Services Manager
Tennessee Department of Transportation, Information Technology Division
Phone: 615-532-3010
Email: Mark.D.Patterson@tn.gov

Jessica Jain, Sr. Business Analyst
Tennessee Department of Transportation, Information Technology Division
Phone: 615-313-5437
Email: Jessica.Jain@tn.gov

3.3. Please reference RFI # 40100-24100 with all communications to this RFI.

4. RFI SCHEDULE OF EVENTS:

EVENT		TIME (Central Time Zone)	DATE (all dates are State business days)
1.	RFI Issued		1/11/2021
2.	RFI Questions Deadline	4:00 p.m.	1/25/2021
3.	RFI Questions/Answers Posted	4:00 p.m.	2/4/2021
4.	RFI Response Deadline	4:00 p.m.	2/22/2021
5.	Demonstrations Scheduled		3/15/2021
6.	Demonstrations Presented		3/29/2021 – 4/1/2021

5. RFI SCHEDULE OF EVENTS:

Please note that responding to this RFI is not a prerequisite for responding to any future solicitations related to this project and a response to this RFI will not create any contract rights. Responses to this

RFI will become property of the State.

5.1. Based on the State's review of the RFI Responses, the State may elect to invite a short-list of Respondents to this RFI to provide a presentation/demonstration of its MMS capabilities. In the event presentations/demonstrations are required, the State will provide Respondents with a minimum of ten (10) business days' notice. The purpose of the presentations/demonstrations will be to allow the State to obtain any required information so as to confirm and validate information provided in the RFI response. Respondents will also have the opportunity to introduce additional information based on questions posed by TDOT.

5.2. The information gathered during this RFI is part of an ongoing procurement. In order to prevent an unfair advantage among potential respondents, the RFI responses will not be available until after the completion of evaluation of any responses, proposals or bids resulting from a Request for Qualifications, Request for Proposals, Invitation to Bid or other procurement method. In the event that the State chooses not to go further in the procurement process and responses are never evaluated, the responses to the procurement including the responses to the RFI, will be considered confidential by the State.

5.3. The State will not pay for any costs associated with responding to this RFI.

6. INFORMATIONAL PACKAGE:

The State is requesting the following information from all interested parties. Please fill out the form below. TDOT is providing their current As-Is process documentation as Appendix D that references the identified pain points (Appendix C) TDOT experiences with their current processes and systems. These should be incorporated to the greatest extent feasible in your responses. Please limit your response to a maximum of 45 pages.

RFI # 40100-24100 TECHNICAL INFORMATIONAL FORM	**Pain Point Process Step Reference**
1. RESPONDENT LEGAL ENTITY NAME:	-
2. RESPONDENT CONTACT PERSON: Name, Title: Address: Phone Number: Email:	-
3. Please provide a brief overview of Respondent's corporate history and its experience providing MMS related solutions for a Department of Transportation or similar organization. If Respondent is NOT the Software Vendor, please explain your relationship with the Software Vendor.	-
4. Please provide a brief overview of the capabilities of the Respondent's proposed MMS solution.	-
5. Please describe your prior experience implementing your proposed MMS solution for state departments of transportation. If your solution has not been implemented as an MMS for a state department of transportation, please describe where it has been implemented to support similar types of business processes. Please provide three client references with a client contact name, telephone and email address for clients most similar to TDOT where your proposed solution has been implemented.	-

RFI # 40100-24100 TECHNICAL INFORMATIONAL FORM	Pain Point Process Step Reference
6. Please describe the planning capability of the proposed MMS solution including longer-term budget planning and short-term scheduling of work (i.e., support for development of maintenance budget, annual work program and monthly/weekly work plans, etc.). Describe how the MMS tracks actual vs planned work and accomplishments, the ability to create work requests/work orders from the plan. Describe how the MMS provides for planning and budgeting for both in-house and contracted work.	7.11
7. Please describe how the proposed MMS solution supports the implementation and integration of a Maintenance Quality Assurance program (MQA) for planning, budgeting and performance management. How does work completed on an asset change the condition for the asset? Describe how performance measures and performance targets for various assets are used in the planning and budgeting process in the proposed MMS and how they are tied back to the reporting of work to measure actual performance.	2.5a
8. Please describe the asset inventory capabilities available with the proposed MMS to support assets not already managed within another TDOT management system (e.g., guardrail, locations, county field offices, rest areas/welcome centers, attenuators, delineators, culverts, ditches, mowing areas, geotechnical hazards, barriers, pavement markings, retaining walls/noise walls, roadway pavements, roadway segments, shoulders. sidewalks, vegetation, etc.). Discuss how a tiered approach - Tier 1 Assets (predictive), Tier 2 Assets (proactive), Tier 3 Assets (reactive) - to managing various assets could be used in the proposed MMS. Describe how your proposed MMS supports the asset inventory needs for facility assets and the extent those capabilities are available out of the box for your proposed MMS. How are Full Time Equivalents (FTE) calculated and tracked based on performance standards/guidelines? Can performance standards be inherited from their parent (County inherits District or Region) with the ability to modify the standard? Describe the typical workflow for creating an annual budget and how budgets are distributed across organizational units. What is the process for modifying and redistributing a budget if the request is not approved as submitted? Describe how planned work is balanced across the months of the fiscal year and across the maintenance activities to ensure that the utilization of available resources is optimized.	1.3a, 1.3d
9. Please describe your experience integrating the proposed MMS with an asset inventory system, pavement management system, bridge management system and accounting system. Describe how trade-off analysis can be performed within the proposed MMS.	1.3a, 1.3d, 1.6
10. Describe the data flow from Work Requests to Work Orders leading to recording of Work Accomplishment records. As an example, how would the proposed MMS support a typical pothole maintenance work order? Describe how MMS users, supervisors and requestors are notified when work orders or work requests have been completed?	4.2
11. Does the proposed MMS support work orders with multiple activities? Locations? Both at the same time?	-
12. How does the proposed MMS associate assets with a work order? Can it support multiple assets per work order? For single and multiple asset work orders, how are costs associated with an asset?	4.10
13. Please describe the configurability of work orders.	4.10

RFI # 40100-24100 TECHNICAL INFORMATIONAL FORM	Pain Point Process Step Reference
14. How does the proposed MMS support tracking of warranty work?	-
15. How does the proposed MMS manage triggering and scheduling of preventive maintenance work orders? How are work requests tracked and tied to work orders to show current status? Are unassigned work requests able to be managed as a list with reminders and viewed on maps with priorities to aid in managing these work items?	-
16. How does the proposed MMS handle citizens' requests/problem reports?	4.2
17. How does the proposed MMS support campaigns (e.g., scheduling replacement of sign assets that are defective or have poor reflective sign sheeting) and describe scenarios that are currently used by another agency/client with your proposed MMS?	-
18. Please briefly describe how the proposed MMS captures all costs on a work order (labor, equipment, materials, incidental or direct costs, etc.). Does it support tracking of contract costs on a work order? Describe how the proposed MMS tracks and reports the maintenance work and costs per asset.	-
19. Please describe how your proposed MMS captures equipment assignment and usage (on-site, idle, active). Describe how Global Positioning System (GPS) and Automatic Vehicle Location (AVL) data can be used to track location, usage, etc. for individual equipment assets.	1.6
20. Please describe how the proposed MMS supports emergency recovery work (i.e., Federal Emergency Management Agency (FEMA) and Federal Highway Administration (FHWA) Emergency Repair). How is damage to the highway network documented within the MMS (damage assessments, photos, estimated repair costs, project status)? How are reimbursable costs identified and summarized for easy reporting to federal agencies? Does the proposed MMS support the identification of repeatedly damaged facilities (locations) by "damage type"?	5.0a, 5.3, 5.9
21. Please describe how the proposed MMS supports various types of reimbursable work orders (such as third-party damage repair claims, off-system work such as for State Park Roads, etc.)	-
22. Please describe your experience integrating the proposed MMS with Oracle PeopleSoft. If you have not previously integrated with Oracle PeopleSoft, please discuss your experience integrating with other ERP solutions. From your experience, please discuss specific challenges related to implementing integrations with Oracle PeopleSoft and/or other ERP solutions regarding labor (employee timesheets), equipment, material (requisitions) resources. Describe how the proposed MMS would ensure that the information for these resources on work orders are kept in sync with PeopleSoft or other ERP solutions.	-
23. Please describe the materials management functionality available within the MMS solution itself.	6.3c, 6.3d, 6.4
24. Please describe your experience integrating the materials management functionality in the MMS solution with an inventory or materials management function within Oracle PeopleSoft and/or other ERP solutions.	6.3d
25. Please describe how monitoring is performed within the system (planned versus actual accomplishment, budget versus actual expenses for an activity, by geographical location (asset, route, county, district, region), by organization unit, by program (in-house, contract), etc.)	-

RFI # 40100-24100 TECHNICAL INFORMATIONAL FORM	Pain Point Process Step Reference
26. Please describe the reporting capabilities within your solution including standard reports and ad-hoc queries.	-
27. Please describe the dashboarding capabilities available within the system.	-
28. Please describe the mobile capabilities of your proposed MMS solution. Please provide at least one client reference where the mobile capabilities have been fully deployed including client name, contact name, contact telephone and email address.	-
29. Please describe the various approaches in which your proposed MMS can be deployed (e.g., on-premise, Software as a Service/Cloud, vendor-hosted, other approach, etc.).	-
30. Please describe the technical architecture of the proposed MMS solution. Please indicate where the proposed MMS solution has been implemented to support at least 350 concurrent users and provide a client name, contact name, contact telephone and email address.	-
31. Please describe the integration capabilities and integration architecture of the MMS solution. What published Application Program Interfaces (APIs) are available?	1.3a, 1.3d
32. Please provide an overview of your implementation methodology/approach. From your experience, what is a typical timeline for implementing your proposed solution for a client the size and complexity of TDOT?	-
33. From your prior experience, please provide a planning level cost estimate (range) for the software licenses (initial cost and on-going annual cost) and for implementation services to install the proposed MMS? For purposes of preparing the estimate, the Respondent can assume approximately 500 users of the MMS. Please provide assumptions underlying the cost estimate provided.	-
34. What potential problems or risks do you see with a solution being implemented?	-
35. Would your company be interested in responding to a future solicitation? Why do you believe, based on the information provided, that your proposed MMS solution would be a good fit for TDOT's needs?	-
36. Please feel free to provide other additional information you believe is important to share with TDOT (please limit response to two pages).	-
37. Describe how your proposed MMS solution supports Traffic Management Center (TMC) functionality and data needs. Compare similarities and differences between the TMC assets and other MMS assets such as locations, guardrail, county field offices, attenuators, delineators, culverts, ditches, mowing areas, geotechnical hazards, barriers, pavement markers, retaining walls/noise walls, rest areas/welcome centers, roadway pavements, roadway segments, shoulders, sidewalks and vegetation.	-
38. Describe how your proposed MMS solution supports ITS (Intelligent Traffic Systems) point and linear assets. Identify the biggest maintenance challenge for ITS assets and how your proposed solution addresses it. ITS assets include but are not limited to: a. Fiber optic cable	-

RFI # 40100-24100 TECHNICAL INFORMATIONAL FORM	Pain Point Process Step Reference
b. Cabinets/Intersections and the relationships they have with signals, cameras, etc. c. Dynamic Message signs and traditional traffic signs with reflectivity information d. Sensors for speed and traffic information e. Remote Traffic Microwave Sensor (RTMS) detectors f. Roadway Weather Information Systems (RWIS).	

Appendix A
Definitions and Abbreviations

TERM	DEFINITION
API	An Application Programming Interface ("API") is a set of subroutine definitions, protocols and tools for building software. In general terms, it is a set of clearly defined methods of communication between various components.
ArcGIS	Esri's mapping and analytics platform.
ER Program	Federal Highway Administration's Emergency Relief Program is a federally-funded program which provides funding to restore damaged eligible federal aid highways to pre-disaster condition.
ERP	Enterprise Resource Planning is a software system used to integrate, automate and manage important parts of a business.
ETRIMS	The Electronic Tennessee Roadway Information Management Systems is a read only web application providing access to TDOT's roadway inventory data of the Internet with a secure log-in.
FEMA	Federal Emergency Management Agency is an agency of the United States Department of Homeland Security responsible for coordinating the response to a disaster that has occurred in the United States and that overwhelms the resources of local and state authorities.
FHWA	Federal Highway Administration is a division of the United States Department of Transportation that specializes in highway transportation.
FTE	Full Time Equivalent is a unit that indicates the workload of an employed person in a way that makes workloads comparable across various contexts. FTE is often used to measure a worker's involvement in a project, or to track cost reductions in an organization. An FTE of 1.0 is equivalent to a full-time worker, while an FTE of 0.5 signals half of a full workload.
GIS	A Geographic Information System ("GIS") captures, stores, manipulates, analyzes, manages and presents all types of geographical data.
ITS	Intelligent Traffic Systems is an advanced application that provides services used to assist users with important information relating to safer, coordinated and smarter use of different modes of transport and traffic management.
LOE	Level of Effort
LOS	Level of Service

TERM	DEFINITION
LRS	Linear Referencing System
MMS	Maintenance Management System
MQA	Maintenance Quality Assurance
RTMS	Remote Traffic Microwave Sensor
RWIS	Roadway Weather Information Systems
TMC	Traffic Management Center

Appendix B
TDOT Next Generation MMS
High-Level Inventory of Desired System Capabilities

General Requirements

1. Provide an MMS solution that will support the management and tracking of maintenance activities performed by TDOT.
2. Provide an MMS solution that will support the management and tracking of maintenance activities performed on linear assets or point assets.
3. Support tracking and costing of work performed to a specific asset or segment of an asset.
4. Provide the ability to perform MMS functions on a mobile device.
5. Integrate as required with other transportation asset management functions including but not limited to transportation asset inventory, roadway inventory, bridge management, pavement management and safety management:
    a. To obtain asset inventory information and condition assessment history; and
    b. To provide work history on an ongoing basis.
6. Provide ability to maintain an asset inventory for asset classes not already managed within a TDOT asset management system.
7. Integrate as required with the statewide Edison ERP system including but not limited to accounts payable, accounts receivable and billing, cost accounting and cost allocation, time and leave, personnel administration, learning management, fleet management, procurement and inventory/materials management.
8. Integrate with TDOT's program and project management system to obtain information on upcoming projects planned by location.
9. Integrate with the TDOT Esri ArcGIS environment.
10. Integrate with the TDOT Linear Referencing System (LRS) to manage and maintain LRS locations generated within the MMS.
11. Provide a GIS viewer within the MMS application itself.
12. Provide support for the use of GPS / AVL data for equipment.

Maintenance Quality Assurance (MQA)

Two functionalities are sought as identified below: 1) Field Data Collection and 2) Annual Planning and Budgeting.

Field Data Collection

1. Integrate with TDOT's existing MQA field data collection application to obtain current condition assessment information and support development of maintenance budgets and work programs using this information.
2. Allow for the import of pre-defined route segments from an existing database to establish the population of roadway segments for random selection.
3. Provide for the generation of a set of statistically representative, stratified, randomly selected roadway segments from the population of roadway segments. Allow the user to define the parameters of the desired time frame, roadway system, confidence interval, stratification, sample size and quality control sample size.

4. Provide for the exclusion of specific segments of the population for various reasons during a specified time frame.
5. Allow for the selection of alternate segments, by the inspector, in situations where the selected roadway segment cannot be inspected. If the selected roadway segment was also selected as a quality control sample, change the location of the quality control sample to match the new alternate segment's location along the roadway.
6. Allow for recording of condition assessments online or through an offline mobile device.
7. Allow for the capture of photos during an inspection and the assignment of those photos to the proper inspection segment ID, asset type and asset feature.
8. Display most recent condition assessment as part of descriptive information about the asset.
9. Provide capability to define one or more unique maintenance condition indicators for each asset type or maintenance feature per fiscal year or time period (effective dates) for which they are applicable and retain this information indefinitely for subsequent historical analysis.
10. Provide for each asset type or maintenance feature condition rating indicators with the ability to establish thresholds for letter grades for numeric scales for purposes of creating management scorecards.
11. Store the results of condition assessments for each asset based on one or more condition indicators for that asset type or maintenance characteristic.
12. For each condition assessment, capture the following information: Condition assessment rating, date of assessment, person performing assessment, type of assessment (sample, full, spot assessment) and a unique sample identifier.
13. Capture additional condition assessment data specific to each asset type or maintenance feature as required to calculate scaled ratings for each asset within an asset type (inventory amount and deficiency amount).
14. Capture the condition assessment ratings in the form of the actual score (potholes counted per lane mile, number of pieces of litter counted). The system must be able to convert this to a letter grade for display, reporting and analysis using the threshold ranges established for each rating
15. Provide for a subset of inspections for quality assurance, to be performed by a third party for comparison against the inspections performed by in-house inspectors
16. Provide for the location of sample inspections by both Linear Referencing System (LRS) and Global Position System (GPS) coordinates.
17. Provide a display of the location of selected segments on both a tabular display and a Geographic Information System (GIS) map. Allow for filtering or symbology on the table and map for various parameters such as geographic location, organization unit, roadway system, quality control identification, completion status.
18. Provide for interactive dashboards to view the status and results of the condition inspection data and to perform quality assurance checks on the data.

Annual Planning and Budgeting

19. Generate management scorecards showing condition of each asset class/maintenance feature at the roadway system, county, district, region or statewide level in comparison to the established target level-of-service for that asset class/maintenance feature.
20. Provide heat maps showing locations where MQA inspections have identified a pattern of deficiency for a specific asset type or asset feature.
21. Provide tools for planning and budgeting for highway maintenance based upon the results of the MQA field inspections along with other specified parameters defined under the "Budget

Development" section below.

Performance Guidelines

1. Create and maintain performance guidelines based on user defined values for all maintenance activities.
2. Allow performance guidelines to be defined, then allow the guidelines to be copied to lower/other organizational levels and modified as needed.
3. Identify performance guidelines by fiscal year or time-period (effective dates) for which they are applicable and retain this information indefinitely for subsequent historical analysis.
4. Allow for description of different work methods (e.g., mowing, hand mowing, machine mowing, slope mowing, etc.) for activities.

Budget Development

1. Provide budget tool supporting development of proposed budget at different agency-defined levels with a roll-up capability to higher organizational levels (e.g., county, district, region, statewide crews, etc.).
2. Provide capability to roll-down total budget to a region, district, sub-district and county level and allow the units to develop or adjust their proposed budget within the context of their total overall budget (e.g., each region, district, sub-district and county is given a total budget number based on management direction and then allowed to develop their budget within these overall parameters).
3. Provide capability to define proposed budgets for various roadway systems (interstate, NHS-state route, non-NHS state route, state park, other, etc.).
4. Provide capability to define proposed budgets for various program areas (in-house routine – interstate, in-house routine – state route, in-house routine – state park, contract mowing, contract guardrail repair, city maintenance contracts, consultant agreements, rest area maintenance, etc.).
5. Provide budget tool supporting the automated/semi-automated/manual distribution of funding by utilizing asset inventory, performance guidelines, unit cost, asset condition data (Maintenance Quality Assurance, Pavement Management System, Bridge Management System or other data sources), roadway system, organization level, available resources and program area.
6. Provide an analysis tool to compare the unit cost to perform a specific maintenance activity by various methods (in-house, let contract, city contract, other agreements, etc.) and utilize this analysis to optimize the proposed budget.
7. Provide budget tool supporting modeling of unlimited "what-if" scenarios before selecting a specific proposed budget scenario for submission to the next level of review.
8. Provide capability to develop proposed budget by modeling the impact of achieving different target levels of service for asset types and maintenance features based on the user defined letter grade scale for that asset or maintenance feature and the associated level of effort (LOE) factors.
9. Provide capability to specify a target LOS and allow system to calculate the required level of effort (LOE) (e.g., tons of asphalt patching per lane-mile, linear feet of crack sealing per lane-mile, labor-hours of repair per impact attenuator, etc.) to attain this target within one or multiple fiscal years.
10. Provide capability to distribute the proposed budget across the months of the fiscal year to balance the workload based on available (or anticipated) resources.

Work Program and Work Schedule

1. Provide the ability to produce an annual work calendar showing for each maintenance organizational unit the number of crew-days of work planned for each activity by month of the year using the monthly percent distribution for each activity from the activity performance guidelines.

2. Provide planned annual and monthly labor hours by class, equipment hours by class and planned annual and monthly material quantities by material class.
3. Provide a user-friendly scheduling tool which can be used to develop a weekly or bi-weekly work schedule of maintenance activities.
4. Provide system functionality that determines appropriate equipment and materials for scheduling and warns the user in cases where sufficient resources do not exist.
5. Provide ability to display all work scheduled by all locations and by all resource types in tabular format and on a GIS map.

Work Requests and Problem Reports

1. Provide a work request function which allows internal staff to request maintenance work to be performed which can then be reviewed by appropriate TDOT maintenance staff and advanced to a work order if appropriate.
2. Provide means to identify emergency work or accident-related work by work order or scheduled activity.
3. Integrate with the TDOT citizen problem reporting application to allow for initiation of work requests.
4. Provide automated user notifications and status reports for newly assigned work requests, completion of assessments or completion of repairs to address an assigned work request.
5. Provide automated citizen notifications when a request has been completed in the system or when an assessment is completed which may either delay the requested work or if the requested work is determined not to be the responsibility of the agency.
6. Congregate multiple work requests for the same asset or route location and requested work activity to minimize duplication of work orders for the same requested work by multiple requestors.

Work Orders

1. Provide templates for the creation of work orders.
2. Support creation of standing work orders to track routine activities (e.g., pothole patching or litter pick-up in a given county or area).
3. Support creation of work orders for specific maintenance work in response to a work request, problem report or other situation.
4. Link work requests or problem reports to a work order and pre-populate information in the work order from the work requests and/or problem reports to the extent possible.
5. Provide a method for accumulating cost and calculating unit cost per activity, asset, location, organization unit, geographic county, project number, program budget, roadway system (interstate, state route, etc.), FHWA or FEMA disaster event or special event.
6. Generate list of equipment and materials needed based on maintenance activities to be performed and associated performance standards.
7. Capture and record all costs associated with the work order including but not limited to labor hours, labor cost, equipment usage and cost, material usage and cost, contract cost and other incidental or direct costs.
8. Record work accomplished by a crew on a single activity to multiple locations using the production at each location to proportionately allocate the labor, equipment and material (or contract) costs to the locations while reporting resources utilized (labor, equipment, materials and contract) only once for the activity.
9. Provide capability to define a work order as relating to a Federal Emergency Management Agency (FEMA) event or a Federal Highway Administration (FHWA) emergency relief (ER) event.

10. Provide capability to define a work order as relating to a storm or other defined event.
11. Provide capability to indicate that a work order is for off system work. The third party must be able to then be billed for the work.
12. Provide a mechanism to red flag repairs caused by the negligence of others (i.e., traffic accidents, vandalism, etc.) The party determined at fault must be able to then be billed for these repairs.
13. Provide ability to attach various file types to the work order.
14. Provide capability to identify a project number to which a work order is to be charged.
15. Provide capability to define the program area and budget to which a project number is related.
16. Provide the ability to define equipment rental agreements or local purchase rentals and report the usage of rental equipment on work orders.

Materials Management

1. Provide a full featured materials management function/module with the capability to integrate with the Oracle PeopleSoft inventory module within Edison.
2. Provide the ability to define, catalog and classify maintenance parts, components and related materials. Maintain reference data for inventory management, such as specifications, item type and class, commodity codes, etc.
3. Identify item storage locations and maintain balances of each item at each location.
4. Provide the ability to accurately track the movement of material in and out of storage through inventory transactions for issues, returns, receipts, corrections and transfers between storage locations.
5. Provide the ability to track the usage of material to individual assets and locations.
6. Support storing material safety data sheet information for hazardous materials inventory items.
7. Support material sales and scrapping of material.
8. Utilize inventory information to compare materials needed for scheduling materials on-hand, cost work orders and daily work accomplishments and reorder materials when stock levels reach reorder points.
9. Track information on annual inventory usage, the type of usage and the work activities the material or other item is normally issued for.
10. Support warranty tracking for materials/parts including agency specific warranty types, cycle (hours, days, years or miles) and length of cycle in time and/or miles.
11. Provide the ability to report the usage of materials which are not stored by the agency and are procured directly from a vendor for direct application to the roadway.
12. Provide the ability to automate the import of pre-defined contract materials from the ERP application to the MMS application for use on work orders and other reports.
13. Provide the ability to distinguish between proactive and reactive maintenance on each work order.

Management Reports

1. Generate various management reports for the system as a whole and/or for different organizational units/levels including but not limited to:
    a. Work accomplishment reports by activity or sub-activity for any user specified period of time.
    b. Planned versus actual work accomplishment reports by activity for any user specified period of time.
    c. Unit cost by activity for all in-house or contracted activities over specified periods of time.

d. Ability to separate contracted work accomplished from in-house work totals.

e. Summary of work accomplished by activity, system, location (statewide, region, district, sub-district or county), route number, road segment and road location (e.g., offsets, reference markers, GPS) as well as special identifiers for a specified time period and/or work crew.

f. Average daily crew production by activity for any specified period of time.

g. Monthly, year-to-date and year-over-year expenditure reports, including labor, equipment, material and incidental, direct or contract costs.

h. Monthly, year-to-date and year-over-year planned versus actual productivity reports, showing average amount of work accomplished per crew-day versus the performance guideline for amount of work that should be accomplished per day.

i. Monthly, year-to-date and year-over-year planned versus actual cost per crew-day, (e.g., using planned costs by resource class and actual costs for individual resources used).

2. Prepare comparative analysis including in graphical formats, etc. against performance standards or other maintenance units by activity for the highway system, geographical location and/or various organizational units.

3. Calculate and report the actual level of effort for each activity in terms of work accomplished divided by the quantity of road inventory feature(s) associated with the activity (e.g., pothole patching, tons of asphalt used per lane-mile of inventory) for the highway system or various organizational units.

4. Provide exception reports for activities that deviate from planned performance by more than a user defined threshold for the highway system and/or various organizational units/levels.

Appendix C
TDOT As-Is Process Pain Points

The following list of process and data pain points was collected through TDOT's business process analysis activities facilitated by a third-party contractor. The vendor should incorporate these pain points in their response to the RFI with clear references to facilitate TDOT's ability to track and manage the response directly to the process step and pain point.

Process Name	Process Step	Pain Point Description
1-Asset Inventory	1.5 Equipment Requisitioned	- MMS "flag" (attribute) does not always get added to the MMS equipment list; creates a problem with trying to assign this equipment in MMS. - Onerous process to change equipment between districts and location/functions within the existing MMS. This makes it difficult to accurately track and report utilization.
1-Asset Inventory	1.3a Annual Import to ETRIMS	- Timeliness to conduct the monthly reviews. - Future item in 1.4 – in the asset report some way to record the work that is done and make it reflect on condition info for individual assets; accuracy of utilization reporting for mobile equipment within MMS as well as movement of equipment into and out of MMS for use by different entities.
1-Asset Inventory	1.3d Annual Text File Delivery and Import into ETRIMS	- Improve the timeliness of availability of the data since the text files only get imported once a year to the MMS.
1-Asset Inventory	1.6 Equipment Received	- MMS "flag" (attribute) does not always get added to the MMS equipment list; creates a problem with trying to assign this equipment in MMS. - Moving units between divisions can be a problem (e.g., mid-life reassignment - onerous process). - Takes longer for the paperwork to catch up with the actual equipment usage. - Fleet system in Edison flags equipment that is tracked in the MMS system so that it is included in the MMS reporting. However that flag in Edison does not always get accurately updated and the equipment doesn't show up in the MMS.
1-Asset Inventory	1.8 Facility Updates	- Would like more/better facility information captured in the MMS.

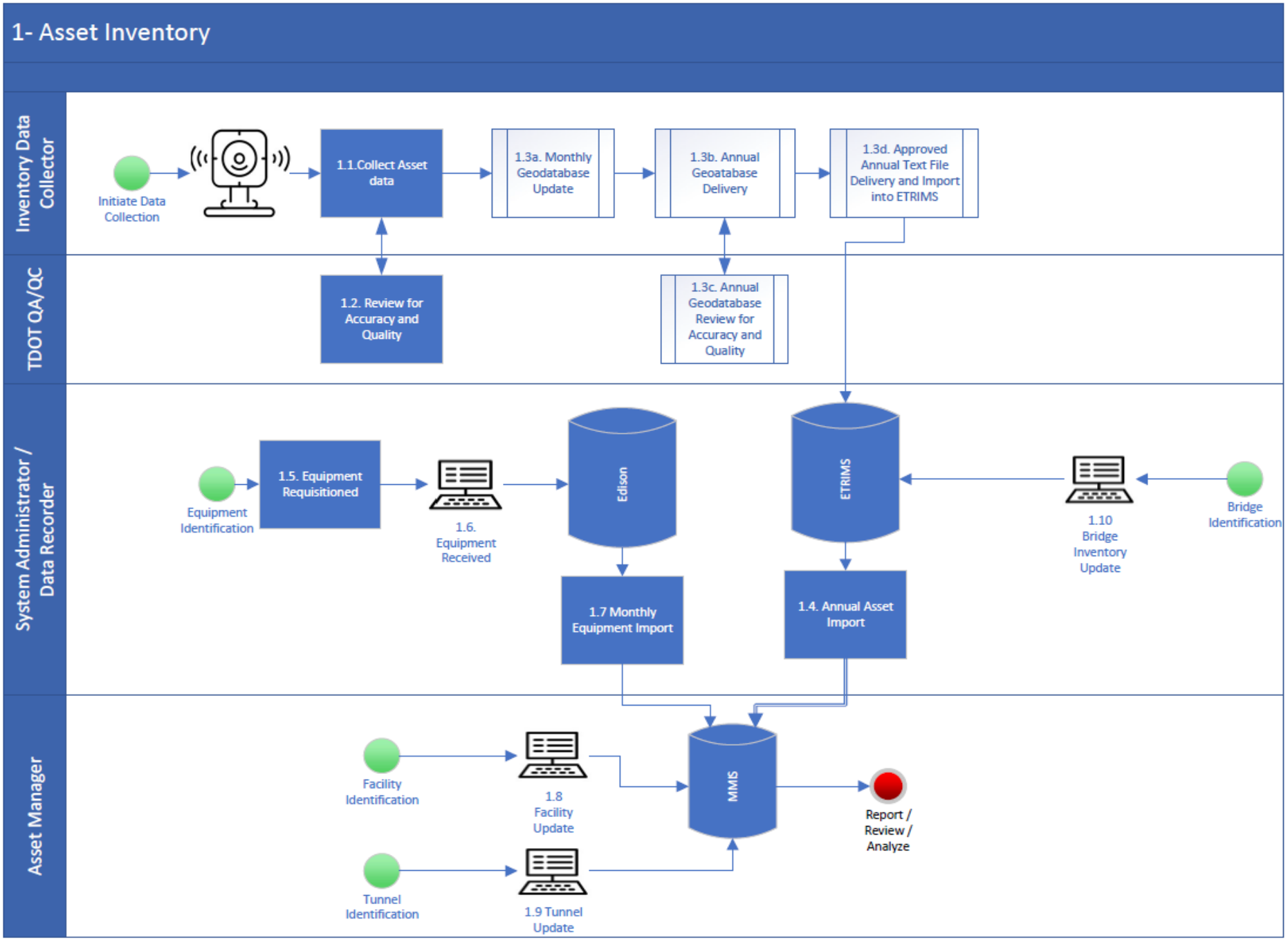
Process Name	Process Step	Pain Point Description
1-Asset Inventory	1.10 Bridge Inventory Updates	- Would like to be able to tie work and money spent to each asset.
2-Asset Condition	2.5a Data Completion and Verification	- Being able to go through process looking at field data and quality data to see where issues are. - Really a manual process and it really time consuming. - Needs more time or be an automated process. - Site locations are challenging. Mile markers could be off or GPS does not always align.
4-Asset Condition	4.2 Work Request	- Looking for a "tickler" notification (email or otherwise) to acknowledge when work has been done. - Work Request Log Daily report - list of To-Do items would be helpful. - Would like to see work Request items identified on a map. - Need forward-facing website portal that is integrated with MMS to post work requests.
4-Asset Condition	4.10 Complete DWR	- Any minor change requires deleting and reentering a new DWR. - Difficult to find equipment to enter into the DWR. - Activities entered without comments make it hard to know what the crew did. - Hard to find DWRs in general on the back end. - Very difficult to close out work order requests, especially for a non-maintenance project.
5-Disaster Recovery Decision Process	5.0a Event Notification Occurs	- Local Agencies typically default to contacting FEMA when disasters occur; still not used to considering whether disaster on locally owned roads is eligible for FHWA reimbursement. - Historically, for a non-TDOT owned road, locals have dealt with FEMA. Prior to MAP-21 there was no direct guidance on which agency to go through. There are a small number of locally owned roads that are federal aid eligible. - Now locals need to understand that not necessarily FEMA and need to go through TDOT for FHWA. So now TDOT needs to figure out whether a local road is federal aid eligible. Current working on getting word out to local agencies to come to TDOT if federal aid eligible and not veg debris.

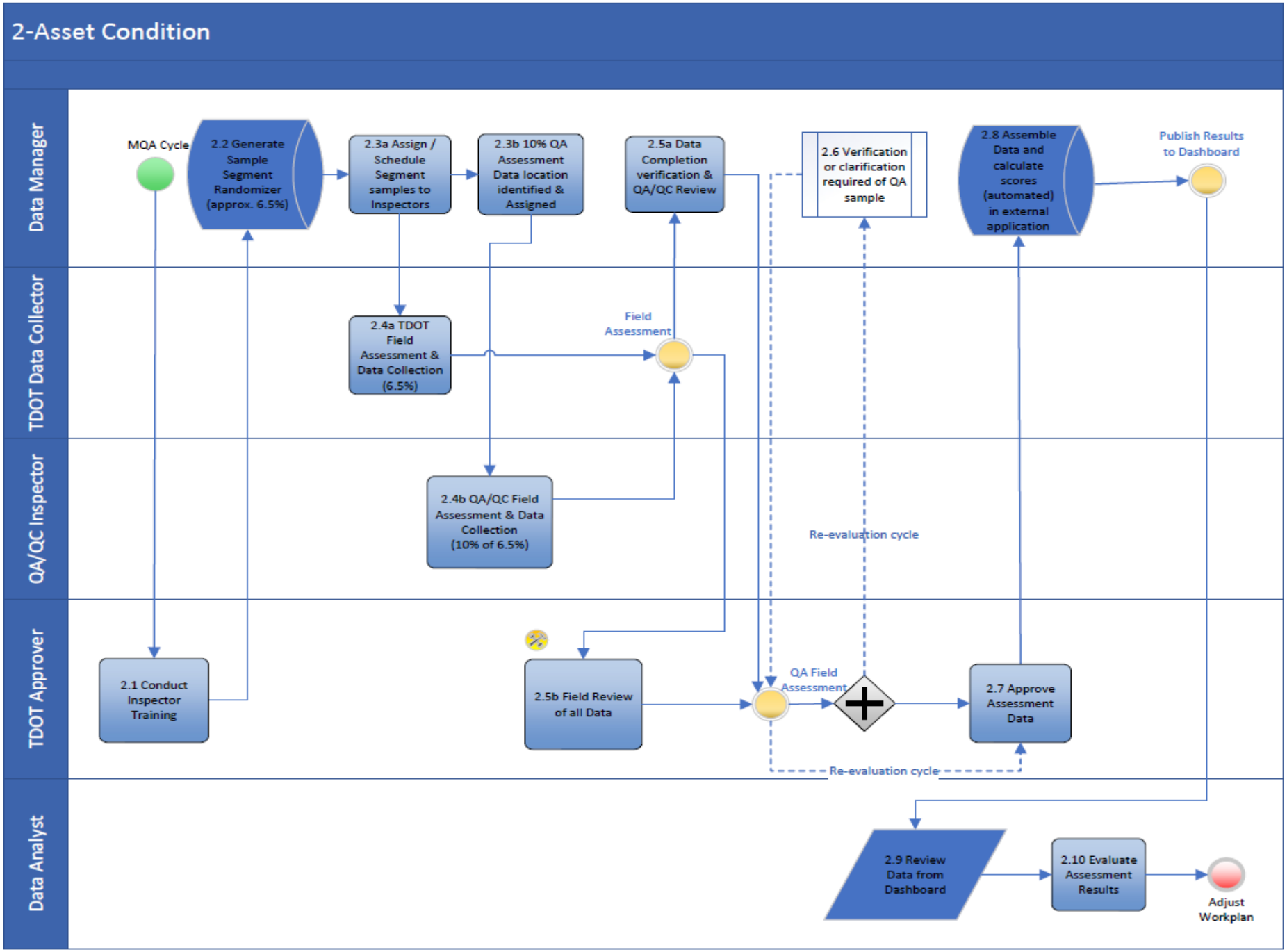
Process Name	Process Step	Pain Point Description
5-Disaster Recovery Decision Process	5.2 Assess Conditions	- Currently TDOT uses a spreadsheet to try to support this process; are looking to embed more of this process into the new MMS system.
5-Disaster Recovery Decision Process	5.3 Emergency Repairs	- Field staff struggle with trying to keep up with locations and different project numbers on spreadsheets - knowing who has latest information, etc. - Proposed system should have this information in the system.
5-Disaster Recovery FHWA Process	5.9 Complete Detailed Assessment Form (DAF)	- So many docs need to be filled in and not a lot of continuity between docs (double entry required). - Would be nice to streamline and create better templates. - Knowing when you can go ahead and self-perform the work is sometimes a problem. - For any individual site, need the ability for the system to be able to flag items that can be self-performed versus need to wait on approval. Also need to be flagged as emergency repairs versus permanent work. - May need a checklist of fields (e.g., separate tab on work request or work order) but ultimately need good, detailed standard operating procedure.
5-Disaster Recovery FHWA Process	5.14 Enter DWR in MMS	- Need to have a requirement to be able to designate vehicle operator for FEMA event work. - Kind of a pain; if new process was user friendly, may be able to capture information better/more often. - Information could be useful outside of just FEMA documentation. E.g., claims, making sure routine maintenance is done, good to have record of operator for tracking repeated problems. - Ideally need to have an “event” flag in the system, that when set, allows/requires filling out of additional fields (may be slightly different).

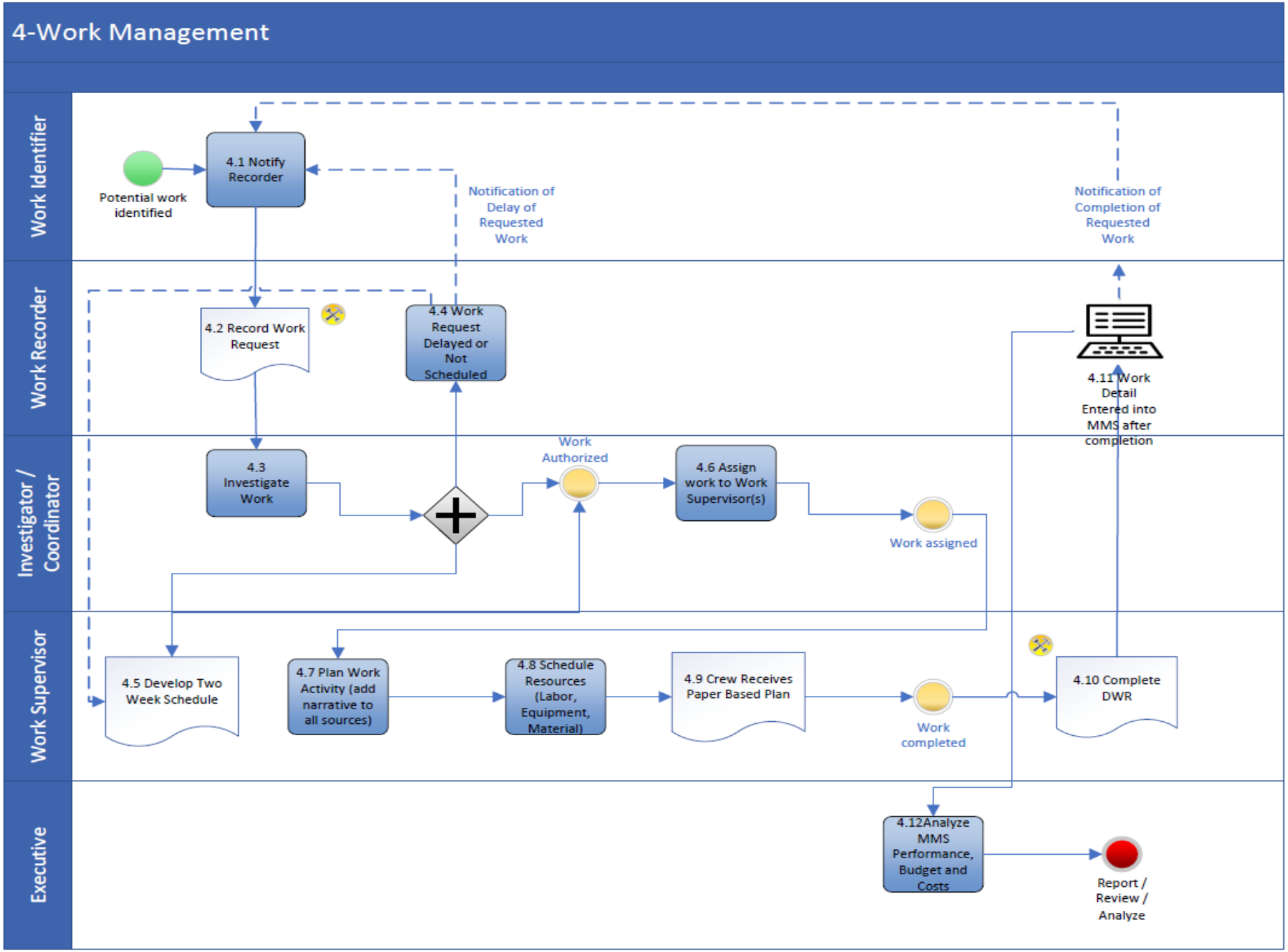
Process Name	Process Step	Pain Point Description
6-Material Management	6.3c Purchase materials and received into Stockroom (Edison) / Stockpiles (MMS)	- Manual process for entering information into MMS; problem is trying to get a correct unit price. - No "check and balance" between Edison and MMS to make sure information is updated and accurate. - Stockpile issues can come from various sources – wrong counties, typo (e.g., 4000 versus 400), usage estimates. - Procurement issues out a week of material (herbicide) from Edison stockroom, then it gets received into stockpile (in MMS) - two transactions. Then is issued onto DWR via a third transaction. - If stockpile not up to date, then need to be able to fully delete out any materials that are actually no longer stocked. Out of stock materials still show up in DWR picklist. - No standard stockpile naming conventions. Can have multiple stockpiles names that actually refer to the same location. - Each material must be typed into MMS manually.
6-Material Management	6.3d Record issue of materials from Stockpile	- Making sure materials are available in MMS. - Must be listed in stockpile table to show up in picklist. - Transfers between Regions is a problem. Need to be able to just specify unit. - Finding the right material/stockpile items a bit of a problem for putting on a DWR. Ideally would like to be able to query or reduce size of picklist.
6-Material Management	6.4 Report usage with source on DWR against project	- Ideally, would like to be able to query or reduce size of picklist.
7-Planning and Budgeting	7.11 Reconcile work plan with spending	- Direct purchases (e.g., stockpile material) are charged out and hit budget immediately even though it has not necessarily all been used on jobs. - MMS is typically ahead of Edison in spending (because Edison only gets spending up to date at end of pay period).

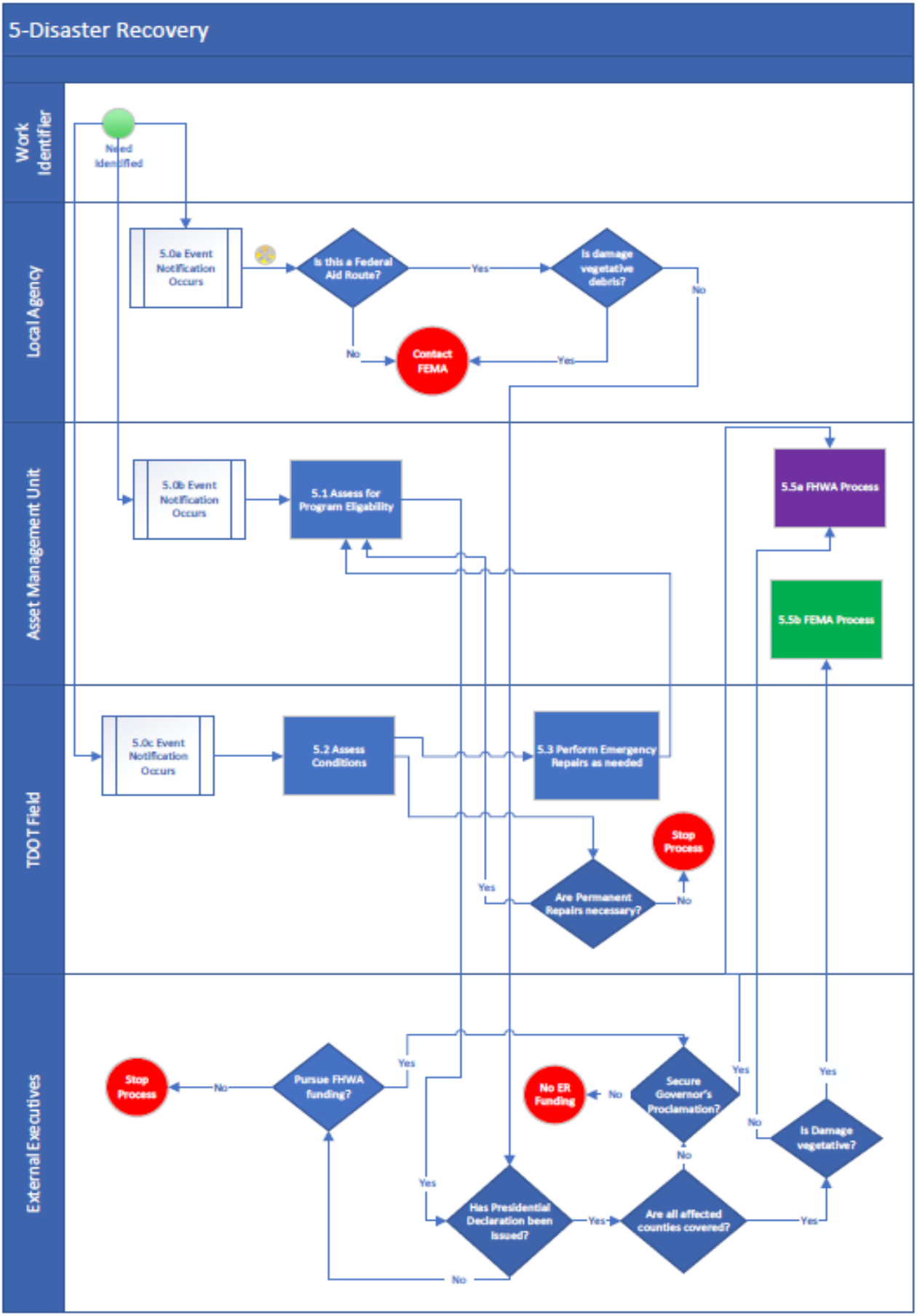
Appendix D
TDOT As-Is Business Process Maps

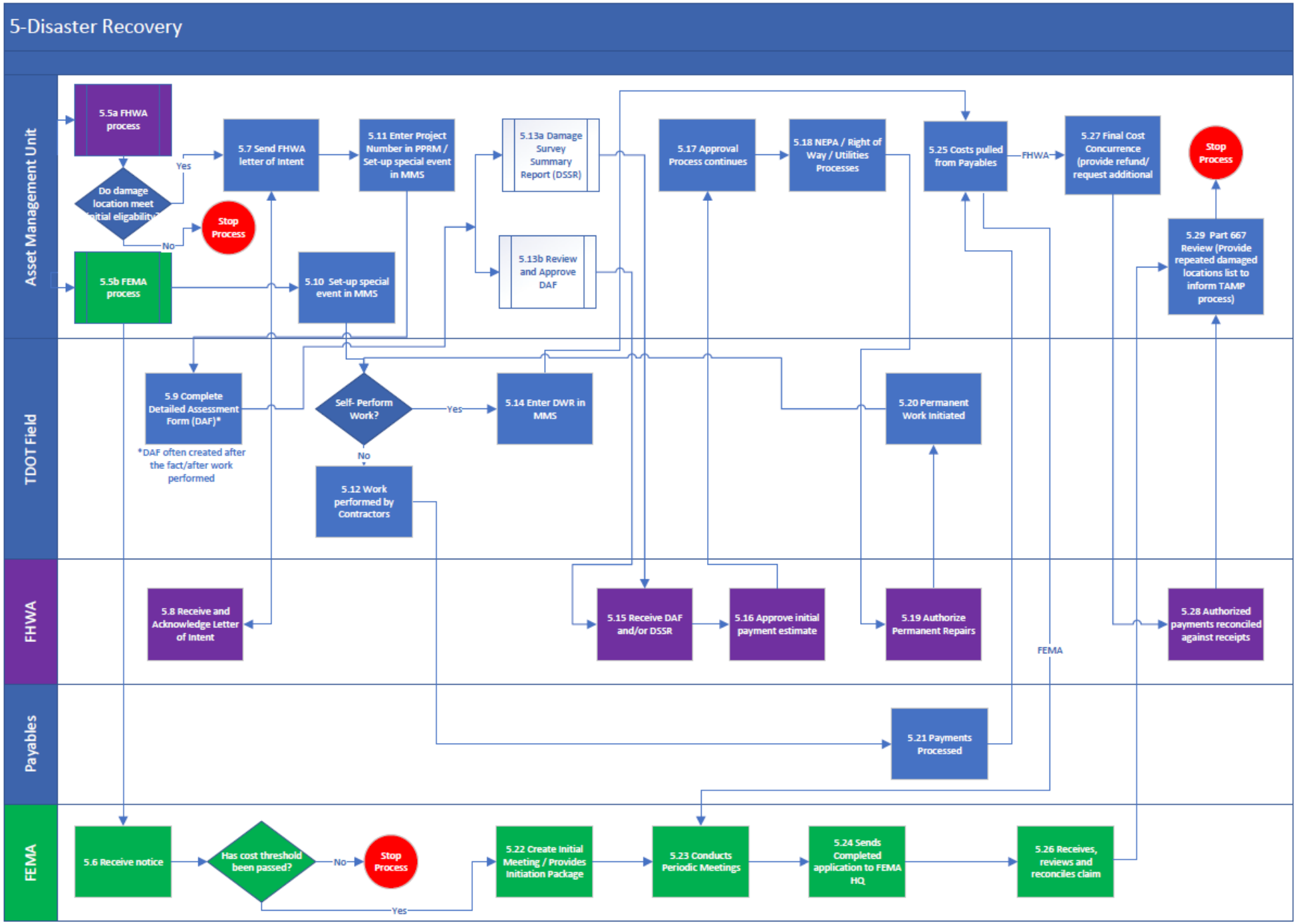
The following TDOT As-Is business process maps provide additional context to clarify the identified pain points in relation to the business process as captured in Section 6, the Technical Informational Form and listed in Appendix C - TDOT As-Is Process Pain Points.

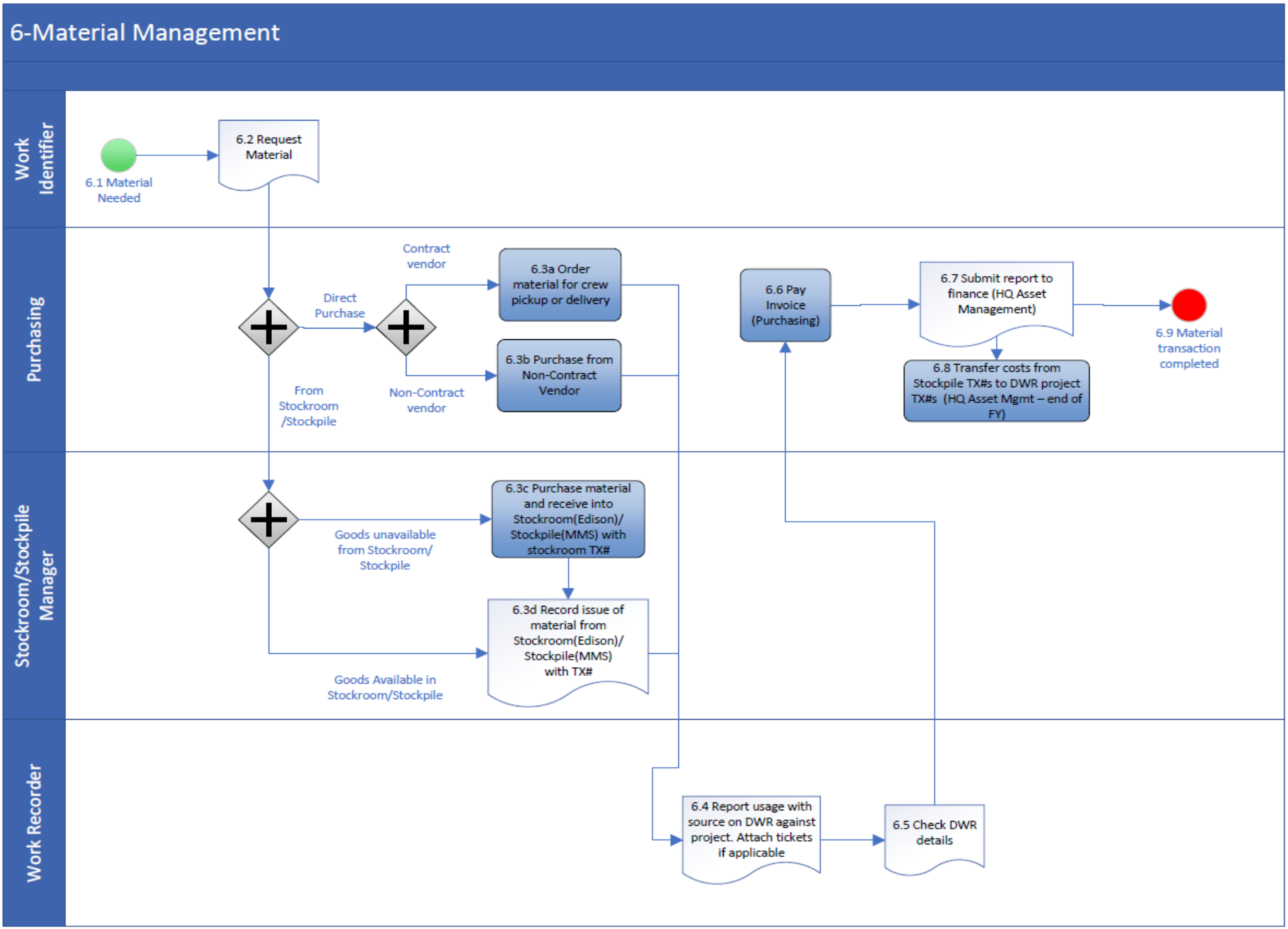

1- Asset Inventory
Inventory Data Collector
TDOT QA/QC
System Administrator / Data Recorder
Asset Manager
Initiate Data Collection
1.1.Collect Asset data
1.3a. Monthly Geodatabase Update
1.3b. Annual Geoatabase Delivery
1.3d. Approved Annual Text File Delivery and Import into ETRIMS
1.2. Review for Accuracy and Quality
1.3c. Annual Geodatabase Review for Accuracy and Quality
Equipment Identification
1.5. Equipment Requisitioned
1.6. Equipment Received
Edison
ETRIMS
1.10 Bridge Inventory Update
Bridge Identification
1.7 Monthly Equipment Import
1.4. Annual Asset Import
Facility Identification
1.8 Facility Update
MMIS
Report / Review / Analyze
Tunnel Identification
1.9 Tunnel Update

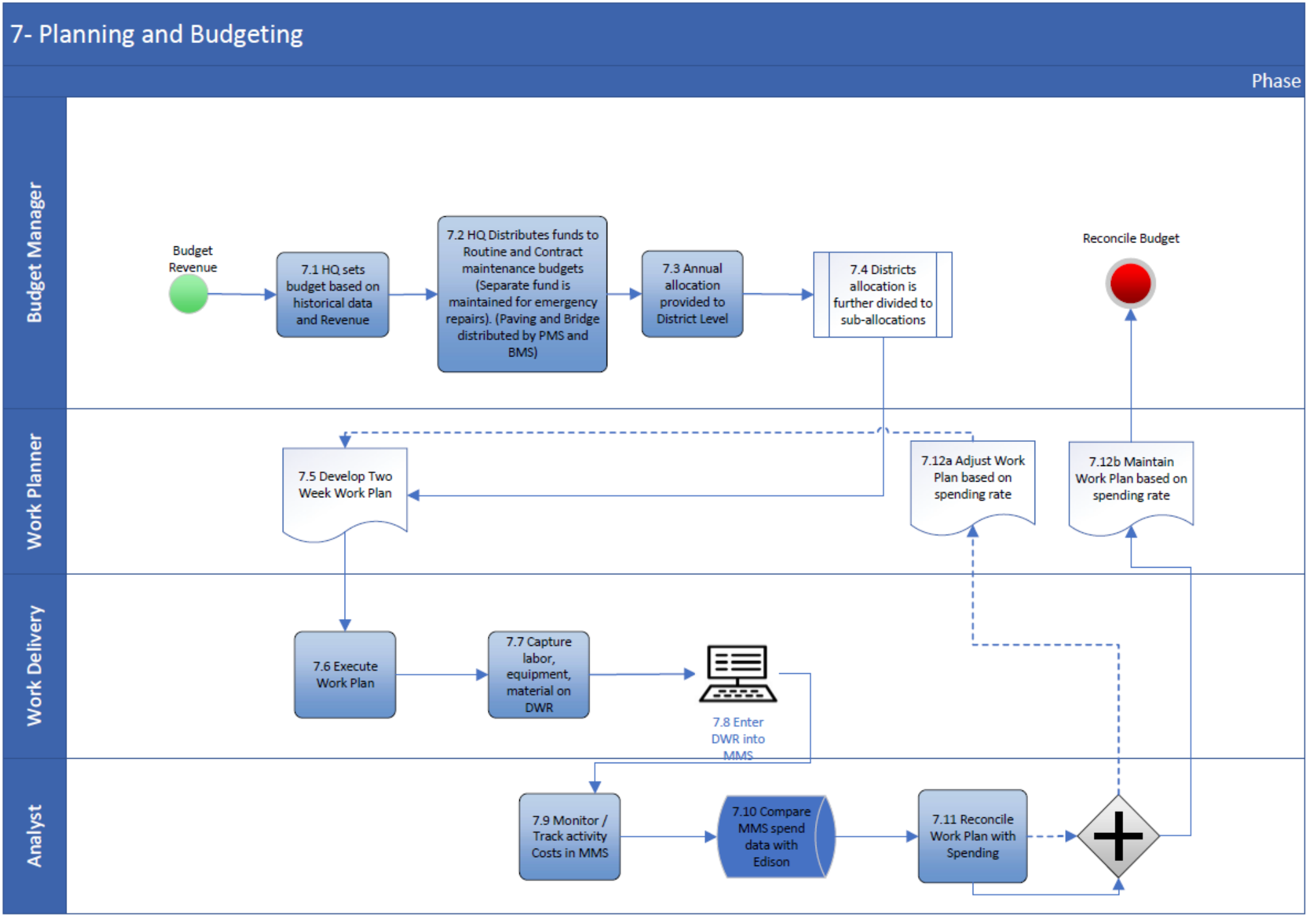

2-Asset Condition
Data Manager
TDOT Data Collector
QA/QC Inspector
TDOT Approver
Data Analyst
MQA Cycle
2.2 Generate Sample Segment Randomizer (approx. 6.5%)
2.3a Assign / Schedule Segment samples to Inspectors
2.3b 10% QA Assessment Data location identified & Assigned
2.5a Data Completion verification & QA/QC Review
2.6 Verification or clarification required of QA sample
2.8 Assemble Data and calculate scores (automated) in external application
Publish Results to Dashboard
2.4a TDOT Field Assessment & Data Collection (6.5%)
Field Assessment
2.4b QA/QC Field Assessment & Data Collection (10% of 6.5%)
Re-evaluation cycle
2.1 Conduct Inspector Training
2.5b Field Review of all Data
QA Field Assessment
2.7 Approve Assessment Data
Re-evaluation cycle
2.9 Review Data from Dashboard
2.10 Evaluate Assessment Results
Adjust Workplan


4-Work Management
Work Identifier
Work Recorder
Investigator / Coordinator
Work Supervisor
Executive
Potential work identified
4.1 Notify Recorder
Notification of Delay of Requested Work
Notification of Completion of Requested Work
4.2 Record Work Request
4.4 Work Request Delayed or Not Scheduled
4.11 Work Detail Entered into MMS after completion
4.3 Investigate Work
Work Authorized
4.6 Assign work to Work Supervisor(s)
Work assigned
4.5 Develop Two Week Schedule
4.7 Plan Work Activity (add narrative to all sources)
4.8 Schedule Resources (Labor, Equipment, Material)
4.9 Crew Receives Paper Based Plan
Work completed
4.10 Complete DWR
4.12Analyze MMS Performance, Budget and Costs
Report / Review / Analyze

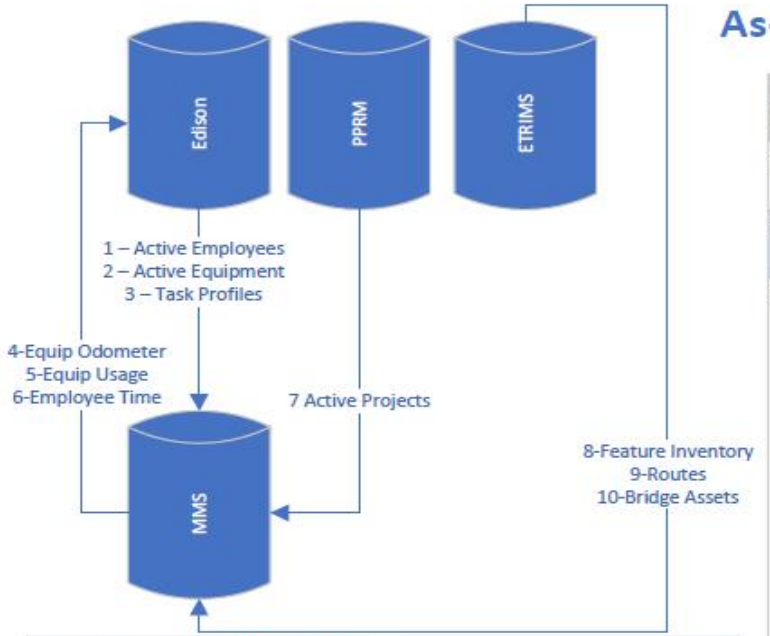

5-Disaster Recovery
Work Identifier
Local Agency
Asset Management Unit
TDOT Field
External Executives
Need Identified
5.0a Event Notification Occurs
Is this a Federal Aid Route?
Yes
Is damage vegetative debris?
No
No
Contact FEMA
Yes
5.0b Event Notification Occurs
5.1 Assess for Program Eligibility
5.5a FHWA Process
5.5b FEMA Process
5.0c Event Notification Occurs
5.2 Assess Conditions
5.3 Perform Emergency Repairs as needed
Stop Process
Yes
Are Permanent Repairs necessary?
No
Stop Process
No
Pursue FHWA funding?
Yes
No ER Funding
No
Secure Governor's Proclamation?
Yes
No
Is Damage vegetative?
Yes
Yes
Has Presidential Declaration been issued?
Yes
Are all affected counties covered?
Yes
No


5-Disaster Recovery
Asset Management Unit
TDOT Field
FHWA
Payables
FEMA
5.5a FHWA process
Do damage location meet initial eligibility?
Yes
No
Stop Process
5.7 Send FHWA letter of Intent
5.11 Enter Project Number in PPRM / Set-up special event in MMS
5.13a Damage Survey Summary Report (DSSR)
5.13b Review and Approve DAF
5.17 Approval Process continues
5.18 NEPA / Right of Way / Utilities Processes
5.25 Costs pulled from Payables
FHWA
5.27 Final Cost Concurrence (provide refund/ request additional
Stop Process
5.29 Part 667 Review (Provide repeated damaged locations list to inform TAMP process)
5.5b FEMA process
5.10 Set-up special event in MMS
5.9 Complete Detailed Assessment Form (DAF)*
*DAF often created after the fact/after work performed
Self- Perform Work?
Yes
No
5.14 Enter DWR in MMS
5.12 Work performed by Contractors
5.20 Permanent Work Initiated
5.8 Receive and Acknowledge Letter of Intent
5.15 Receive DAF and/or DSSR
5.16 Approve initial payment estimate
5.19 Authorize Permanent Repairs
5.28 Authorized payments reconciled against receipts
FEMA
5.21 Payments Processed
5.6 Receive notice
Has cost threshold been passed?
No
Stop Process
Yes
5.22 Create Initial Meeting / Provides Initiation Package
5.23 Conducts Periodic Meetings
5.24 Sends Completed application to FEMA HQ
5.26 Receives, reviews and reconciles claim


6-Material Management
Work Identifier
Purchasing
Stockroom/Stockpile Manager
Work Recorder
6.1 Material Needed
6.2 Request Material
Direct Purchase
Contract vendor
Non-Contract vendor
From Stockroom /Stockpile
6.3a Order material for crew pickup or delivery
6.3b Purchase from Non-Contract Vendor
6.3c Purchase material and receive into Stockroom(Edison)/ Stockpile(MMS) with stockroom TX#
Goods unavailable from Stockroom/ Stockpile
6.3d Record issue of material from Stockroom(Edison)/ Stockpile(MMS) with TX#
Goods Available in Stockroom/Stockpile
6.4 Report usage with source on DWR against project. Attach tickets if applicable
6.5 Check DWR details
6.6 Pay Invoice (Purchasing)
6.7 Submit report to finance (HQ Asset Management)
6.8 Transfer costs from Stockpile TX#s to DWR project TX#s (HQ Asset Mgmt – end of FY)
6.9 Material transaction completed


7- Planning and Budgeting
Phase
Budget Manager
Work Planner
Work Delivery
Analyst
Budget Revenue
7.1 HQ sets budget based on historical data and Revenue
7.2 HQ Distributes funds to Routine and Contract maintenance budgets (Separate fund is maintained for emergency repairs). (Paving and Bridge distributed by PMS and BMS)
7.3 Annual allocation provided to District Level
7.4 Districts allocation is further divided to sub-allocations
Reconcile Budget
7.5 Develop Two Week Work Plan
7.12a Adjust Work Plan based on spending rate
7.12b Maintain Work Plan based on spending rate
7.6 Execute Work Plan
7.7 Capture labor, equipment, material on DWR
7.8 Enter DWR into MMS
7.9 Monitor / Track activity Costs in MMS
7.10 Compare MMS spend data with Edison
7.11 Reconcile Work Plan with Spending

As-Is TDOT MMS Integration



Source System	Target System	Timing	Description of information provided
1. Edison	MMS	Nightly	List of Active Employees and related cost and organization structure information.
2. Edison	MMS	Monthly	List of Active Equipment and related cost and organization assignment information, run of the first of the month.
3. Edison	MMS	Hourly	Task Profiles are a unique identifier in the accounting system (smart numbering in Edison) linking specific cost centers in the TDOT accounting system. For any new combinations of the three accounting fields in Edison a corresponding cost center is needed: 1. Department id (Org unit level) (identifies each county crew/floating crew) 2. Project Number (routine maintenance project number for each county and system (Example: In Davidson County, Interstate System, State Route System, State Park System), recycled, and special projects (such as crew deployment to LA for hurricane cleanup). 3. Source Type (Edison), MMS stores in the activity type field (3 digit code, 401, manual spot patch, ranges between 400-500). The MMS to Edison (MEU) interface [interfaces #4, #5, and #6] uses a crosswalk table to look up existing task profiles (also known as speedcharts) provided in interface #3 from Edison. Task profiles are NOT used directly in MMS. Crews report Org Unit, Project Number, and Activity on DWR's in MMS, which are then cross-walked to task profiles prior to export of employee time and equipment usage records from MMS to Edison.
4. MMS	Edison	Monthly	Equipment odometer readings, typically last day of each month.
5. MMS	Edison	Monthly	Equipment usage based on DWR's
6. MMS	Edison	On Demand	Employee Time from DWR's, On Demand - run each Monday and at the end of each pay period.
7. PPRM	MMS	Daily	End of the day list of active projects.
8. ETRIMS	MMS	On Demand	Full road features inventory, typically run annually targeted for February or March. Asset inventory data that is in ETRIMS (from LiDAR) at county and system level, city inventory is deducted from this inventory which is then imported into MMS, used for planning and budgeting.
9. ETRIMS	MMS	Weekly	Routes inventory, run on Monday of each week.
10. ETRIMS	MMS	Weekly	List of active assets focused on bridge assets (bridges, overpasses and culverts (4-20 ft in length)) for inventory and location, run on Monday of each week. ETRIMS is the data warehouse for these assets, the source system of record is the Bridge Management (BrM) which is TDOT's bridge management system, an AASHTOWare product.

Acronyms and Descriptions:

Edison: Edison is the State of Tennessee's Enterprise Accounting System. PeopleSoft is the software utilized for Human Capital Management, Financial Supply Chain Management, and Fleet Management. (Oracle database - PeopleSoft)

PPRM: Program & Project Resource Management (PPRM) is used to identify program allotments and produce the Statewide Transportation Investment Plan (STIP). PPRM is interfaced with Edison and the Federal Highway Administration's (FHWA) financial system (FMIS). (Oracle database – Primavera COTS software, but currently under replacement)

MMS: Maintenance Management System (MMS) – this is the current system used to produce annual highway maintenance budgets and to track annual expenditures for highway maintenance activities. (Oracle database – Booz Allen & Hamilton COTS application)

ETRIMS: Enhanced Tennessee Roadway Information Management System (ETRIMS) is a custom-built application which is the data warehouse for Tennessee's roadway information. (Oracle database – Intergraph developed custom application).