2019

EFFICIENCY ASSESSMENT

SCDOT Equipment Acquisition Activity

Photo Courtesy of SCDOT Facebook Page

SOUTH CAROLINA OFFICE OF THE STATE AUDITOR

INTERNAL AUDIT SERVICES

April 8, 2019

1 EXECUTIVE SUMMARY

EFFICIENCY ASSESSMENT – SCDOT EQUIPMENT ACQUISITION ACTIVITY

OBJECTIVES:

- The Agency's objective for this activity is to select, plan for, acquire, prepare and deliver appropriate and quality equipment at a cost-effective price point, while complying with applicable laws, regulations, and internal policies to ensure timely accomplishment of its strategic goals.
- Our objective was to assess the Equipment Acquisition Activity to identify inefficiencies, if any, that hinder the Agency in achieving its objectives.

BACKGROUND:

- There are significant process design inefficiencies that are likely resulting in delayed equipment delivery. Assessment of actual processing time inefficiencies is not possible because the Agency does not effectively track and monitor key steps and timeframes within the Activity's processes.

- Some inefficiencies are inherent because of unavoidable constraints such as procurement laws, limited funding, and vendor capacity to manufacture and deliver equipment.

- Where inefficiencies are within the Agency's control, Managers of the individual processes have been making efforts to improve efficiency. Our assessment is designed to evaluate and complement those efforts with a holistic assessment across the entire Equipment Acquisition Activity.

- Assessment of the equipment fleet condition indicates that numerous items are kept past their anticipated useful lives resulting in more expensive and time-consuming maintenance and repairs as equipment ages.

- SCDOT is developing an acquisition planning process in accordance with proposed State regulations that is expected to reduce acquisition time.

EXECUTIVE SUMMARY continued

OBSERVATIONS:

1. The Agency has not promulgated a formal methodology for prioritizing equipment replacement across districts that considers strategic goals and objectives of the Agency. (detailed in Observation 1 on page 17)

2. SCDOT does not effectively monitor performance metrics for its Equipment Acquisition Activity. (detailed in Observation 2 on page 19)

3. SCEIS functionality allows SCDOT to run a procurement report on all goods and services contracts but does not provide a report specific to equipment orders. As a result, SCDOT is unable to use SCEIS procurement data to glean insight into the status or performance of the equipment procurement process. (detailed in Observation 3 on page 22)

Management Action Plans are included in the report following each detailed Observation as referenced above.

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2 FOREWORD

AUTHORIZATION

The South Carolina Office of the State Auditor established the Internal Audit Services division (IAS) pursuant to SC Code Section 57-1-360 as revised by Act 275 of the 2016 legislative session. IAS is an independent, objective assurance and consulting function designed to add value and improve the operations of the South Carolina Department of Transportation (SCDOT). IAS helps SCDOT to achieve its objectives by bringing a systematic, disciplined approach to evaluating the effectiveness of risk management, internal control, and governance processes and by advising on best practices.

STATEMENT OF INDEPENDENCE

To ensure independence, IAS reports administratively and functionally to the State Auditor while working collaboratively with SCDOT leadership in developing an audit plan that appropriately aligns with SCDOT's mission and business objectives and reflects business risks and other priorities.

REPORT DISTRIBUTION

This report is intended for the information and use of the SCDOT Commission, SCDOT leadership, the Chairman of the Senate Transportation Committee, the Chairman of the Senate Finance Committee, the Chairman of the House of Representatives Education and Public Works Committee, and the Chairman of the House of Representatives Ways and Means Committee. However, this report is a matter of public record and its distribution is not limited.

FOLLOW-UP ON MANAGEMENT ACTION PLANS

We have collaborated with Management on the development of actions to address observations noted in this report. Our follow up with Management on the implementation of the actions on an ongoing basis will aid effective and timely implementation. We will provide SCDOT leadership with periodic reports on the status of Management Action Plans.

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ACKNOWLEDGEMENT

We wish to thank the Director of Maintenance as well as management and staff of the Supply and Equipment Office; the Equipment Depot; district and county offices; Procurement Division; and Human Resources Division for their insight and contributions to this assessment.

3 INTERNAL AUDITOR' S REPORT

April 8, 2019

Ms. Christy A. Hall, Secretary of Transportation
and
Members of the Commission
South Carolina Department of Transportation
Columbia, South Carolina

We have completed an efficiency assessment of the South Carolina Department of Transportation's (SCDOT's) Equipment Acquisition Activity. The objective of this assessment was to analyze processes for potential inefficiency which may impact the availability of equipment necessary to achieve the Agency's strategic goals and performance targets.

We planned and performed the engagement with due professional care in order to obtain sufficient, appropriate evidence to provide a reasonable basis for our observations and conclusions. Our observations as a result of our assessment are described in the *Observations, Recommendations, and Management Action Plans* section beginning on page 17 of this report.

George L. Kennedy, III, CPA
State Auditor

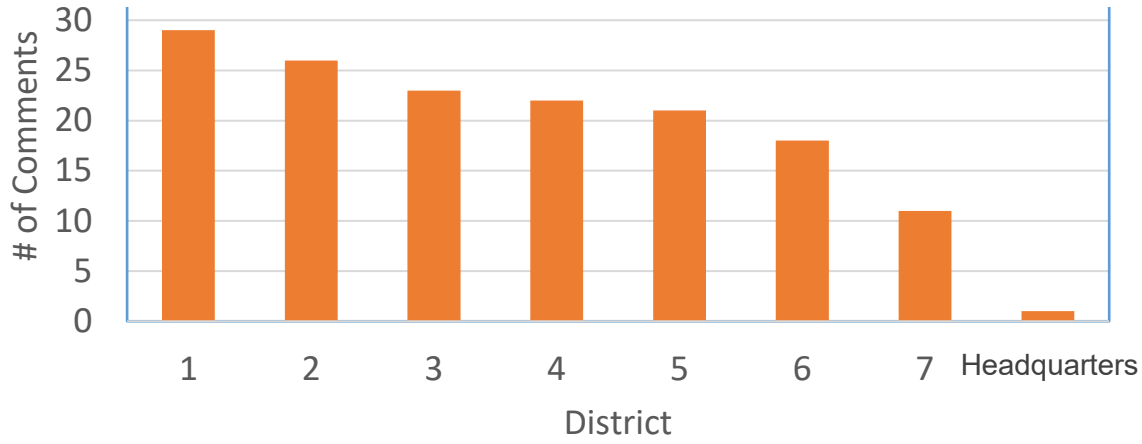
4 ENGAGEMENT OVERVIEW

4.1 BACKGROUND

According to the South Carolina Revenue and Fiscal Affairs Office, the population of South Carolina (SC) has grown by 25% since 1990. Booming population in SC city centers has rendered the interstates operating past capacity in those areas causing congestion and gridlock during peak travel times. With the 2017 passage of the SC gas tax bill, it is estimated that, by the year 2022, an additional $600 million will be generated annually. These funds will be used for upgrades to the existing transportation system. This significant increase in roadwork requires acquiring equipment in a timely manner to meet strategic goals. In order to effectively align resources with the additional work, SCDOT rolled out a three-year strategic plan in 2017. The plan was presented to SCDOT employees across the State. During the presentations, employees were provided the opportunity to voice concerns that could affect the Agency's ability to achieve its strategic objectives. Of 1,248 comments made by employees during the strategic plan presentations, 151, or 12%, were related to challenges that the districts and counties are facing in regard to the availability of appropriate equipment. Comments were distributed across districts as follows:

Photo Courtesy of SCDOT Facebook Page

Figure 1



Commenters noted that the process for obtaining requested equipment is unreasonably long and oftentimes delivers equipment different than requested which does not always meet the intended need. This leads to employees using old, broken, or inappropriate equipment which not only results in greater inefficiency, but may also pose a safety hazard. The Agency's ability to preserve the State's roadways is stymied when the field does not have the appropriate equipment in a timely manner needed to complete work. In light of these concerns, the Agency has already taken several actions to improve these processes. SCDOT Management requested that we conduct an efficiency assessment to evaluate the effectiveness of those actions and to determine if additional improvements can be made.

4.2 OBJECTIVES

The Agency's objective is to select, plan for, acquire, prepare and deliver appropriate and quality equipment at a cost-effective price point, while complying with applicable laws, regulations, and internal policies to ensure timely accomplishment of its strategic goals. Our objective was to assess the Equipment Acquisition Activity to identify inefficiencies, if any, that hinder the Agency in achieving its objectives.

4.3 SCOPE

This assessment includes evaluation of the following Equipment Acquisition Activity processes:

- County and district equipment priority and request
- Supply and Equipment Office equipment priority and request
- Director of Maintenance priority and request
- Procurement
- Post budget approval - ordering equipment
- Equipment Depot – turn-in and pickup

The timeframe of this assessment covers processes in place for the period July 2017 to September 2018.

5 ANALYSIS

5.1 CONSTRAINTS

In planning for this engagement, we identified the following constraints within the Equipment Acquisition Activity which are likely causes of inefficiency:

- Differing County, District, and Agency equipment priorities
- Funding
- Budget approvals
- State procurement laws and regulations
- Procurement processing timelines
- Equipment Depot processing timelines
- Availability of contracts (Agency or State)
- Vendor Capacity

Some of these constraints are beyond SCDOT's control because they are impacted by industry partners and State and federal governmental entities or are required by State and federal laws and regulations. In light of these constraints, we planned our engagement to identify inefficiencies within the areas under the Agency's control.

In conducting our analysis, we determined that the Agency does not effectively track and monitor key steps and timeframes within the Activity's processes; therefore, we were not able to evaluate processing time trends. Multiple data sources and tracking spreadsheets require data entry to multiple records by many different users and may result in entry errors. Data inaccuracies likely stem from batching, irregular manual entry, or human error. We attempted to analyze relevant processing time data and found numerous discrepancies. This led us to the conclusion that the processing time data is not reliable enough for complete and meaningful data analysis. For this reason, our analysis focused on process design and demographic data.

5.2 TIMWOOD SCORES

In collaboration with employees in the field, we created business process model (BPM) diagrams (Appendix A) for each of the Equipment Acquisition Activity processes noted in our scope. The BPMs document the required tasks and decision points, as well as identify the staff role responsible for each part of the process. We measured the BPMs for each location using TIMWOOD, an acronym that stands for the common types of inefficiency that can be found in processes:

T	Transportation	Unnecessary movement of materials
I	Inventory	Excess inventory not directly required for current orders
M	Motion	Extra steps taken because of an inefficient layout
W	Waiting	Periods of inactivity
O	Over-Processing	Unnecessary steps that do not add value to the outcome
O	Over-Production	Occurs when production should have stopped
D	Defects	Work not done to specifications or expectations

A TIMWOOD analysis identifies where and when inefficiencies could occur in processes, and gives insight into the possible cause, or causes, for the inefficiency. TIMWOOD provides a quantifiable baseline which can be used to measure the success of the Agency's current and future implemented process improvements. The TIMWOOD scores were incorporated into a Pareto chart[1] to focus analysis on process steps and practices that have the highest potential for inefficiency. The chart in Figure 2 shows ranked inefficiencies from most significant to least significant for the entire Equipment Acquisition Activity.

Figure 1

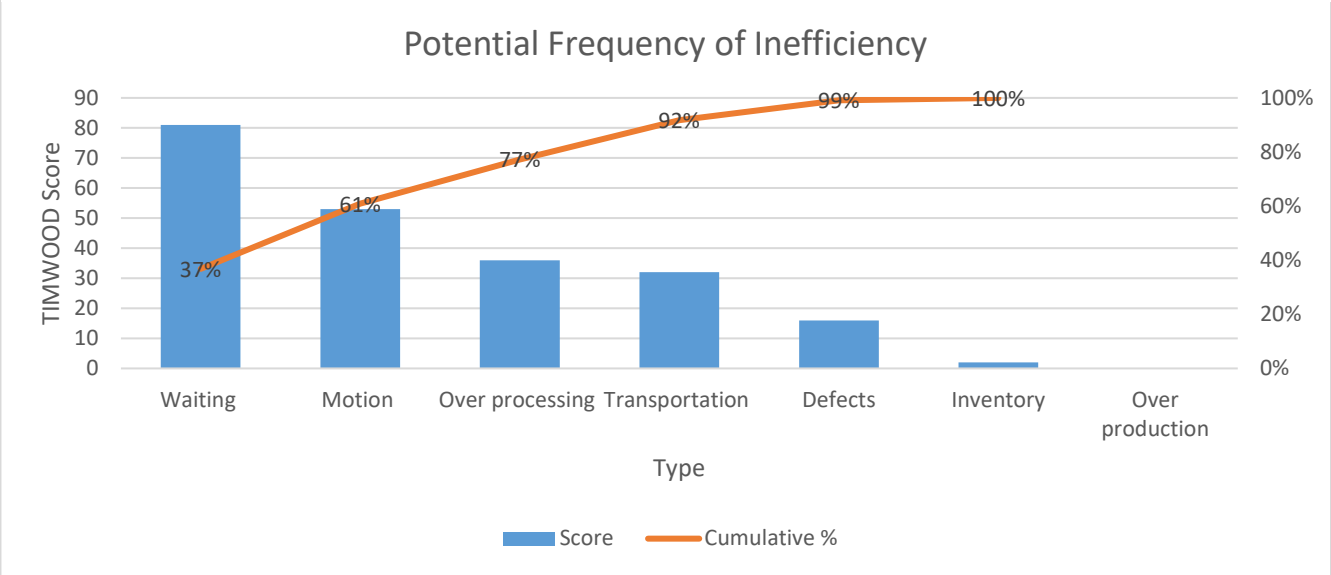
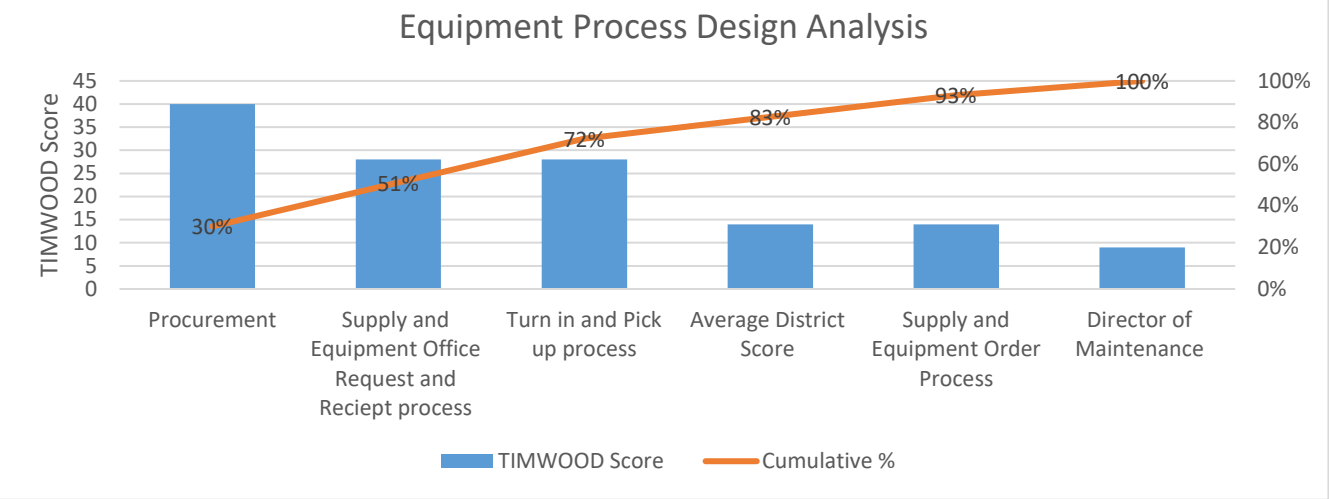


Figure 3 on the next page ranks the activity's processes from highest number of potential inefficiencies to lowest number of potential inefficiencies. The cumulative percent highlights the processes which have the least efficient process design and may be prone to bottlenecks.

[1] A Pareto chart is one of the 7 basic tools of quality. It is a graphical representation of the Pareto Principle, or the 80-20 rule, which states that 80% of effects come from 20% of the possible causes.

Figure 2



5.3 BUSINESS PROCESS MODEL (BPM) ASSESSMENT

Our Analysis of the Equipment Acquisition Activity revealed significant process design inefficiencies that are likely resulting in delayed equipment delivery. The Pareto chart in Figure 2 indicates that waiting, motion and over-processing account for 77% of the possible inefficiencies. Figure 3 indicates that the processes for Procurement, Supply and Equipment Office Request and Receipt, and Turn-In and Pickup account for 72% of the possible inefficiencies. We were unable to obtain reliable data to substantiate the commenters' reports of equipment delays with actual incidents of equipment delays.

Our assessment of each BPM in order of highest number of potential inefficiencies follows.

Procurement Process – TIMWOOD Score = 40

The Procurement process, as shown in Appendix A, includes the tasks and activities required for SCDOT to set up a contract so the Agency can order specific equipment. Procurement accounts for the highest percentage (30%) of the potential inefficiencies in the Activity. Procurement is heavily regulated by State and federal laws and regulations which provide control measures for procurement risks but can also cause inefficiencies.

Equipment purchases of a certain dollar threshold require approval by the State Materials Management Office (MMO). Since most SCDOT contracts end up being above the threshold, SCDOT's Procurement Office must request delegation authority from MMO on nearly all equipment contracts. This allows SCDOT to handle the procurement of a contract that is above the threshold amount in house thus eliminating the MMO review and approval delay. MMO often grants SCDOT delegation authority for specific equipment contract acquisitions above the threshold. However, MMO has not defined the types of contracts or conditions under which it grants delegation authority making the timing of procurement unpredictable. Additionally, MMO's response time to a delegation request or turnaround time for MMO review and approval on non-delegated procurements is also unpredictable. Any delay on the part of MMO is outside of SCDOT's control.

As indicated by the TIMWOOD analysis, waiting accounts for 55% of possible process inefficiencies in the equipment procurement process. Some inefficiencies are an inevitable part of procurement because the process design depends largely on materials, information, rules, or approvals from external parties. State and federal law requires procurements to be carried out in specific ways, which limits SCDOT's ability to reduce certain inefficiencies.

Procurement of equipment contracts often starts when the equipment request has been approved by management usually occurring close to the start of the fiscal year. When equipment contracts are not in place at the start of the fiscal year, every other process after procurement will be delayed. Procurement delays often result in vendor delays because SCDOT cannot place its order with a vendor for approved equipment requests until a contract is in place. If other State agencies are requesting equipment from the same vendors on the same delivery cycle, vendors may not have the capacity to fill late orders timely. SCDOT contracts typically require unique equipment specifications which can further delay a vendor's ability to deliver timely when its production capacity is maxed out.

We attempted to analyze procurement process time from data in the South Carolina Enterprise Information System (SCEIS). SCEIS is an enterprise information software application used by State agencies to streamline business process functions including: finance; human resources and payroll; and materials management (procurement). SCEIS collects data for all contracts but does not have a field that would allow SCDOT to search for specific goods or services that are in the contracts. The system cannot distinguish between an equipment contract and other types of goods and services contracts. The only way to gather this information for completed contracts would be to manually sort through thousands of SCDOT contracts, read each contract description to determine if it's an equipment contract and then manually enter the equipment contract information into a spreadsheet. Without easy access to the procurement processing time data, SCDOT does not have a reliable means to measure the impact that inefficiencies in the process design could have on equipment delivery to the field.

Supply and Equipment Office Process – TIMWOOD Score = 28

The Supply and Equipment Office (S&E) process, as shown in Appendix A, covers equipment acquisition from initial request to end-user delivery. Although S&E is responsible for initiating the equipment acquisition process for the next fiscal year, some districts start compiling their equipment requests well in advance of the S&E request. The S&E process is the input required for all equipment acquisition processes to start and S&E receives the outputs from nearly every Equipment Acquisition Activity process before beginning the procurement of new equipment.

Not surprisingly, the TIMWOOD analysis for the S&E process shows that waiting accounts for 46% of the potential inefficiencies. Steps in this process include collecting information from other divisions and using the information provided to prioritize, request, procure, order, receive, and deliver equipment. When other processes in the lifecycle are delayed, this process will be delayed, and other processes in the chain will be delayed as well.

While S&E collects a lot of information throughout the process, it does not have reliable tracking data from initiating the equipment request to end user delivery. There are several spreadsheets that have been developed by S&E staff to track information on the process but we noted discrepancies in the data from one spreadsheet to another. The data can't be validated and as a result there are important data points that are not effectively monitored and prevent us from completing an analysis of the total equipment acquisition processing time.

Pickup and Turn-In Process – TIMWOOD Score = 28

The Pickup and Turn-In process, as shown in Appendix A, are tasks and activities that are required for the Equipment Depot to deliver field ready equipment to the end user. The TIMWOOD analysis indicates that Motion, Waiting and Transportation account for 86% of the potential inefficiencies with Motion making up nearly half. This indicates that inefficiencies are likely due to time spent on non-value-added activities, such as repetitive tasks, or tasks that don't directly support the movement of equipment to the end user.

Districts are notified via letter from the Supply and Equipment Office when new equipment is ready for pickup at the Depot. Districts are required to identify the existing equipment that will be exchanged for new equipment at the time that it is requested. By the time the equipment is ready to be sent to the district, approximately 18 to 24 months later, priorities may have changed and/or condition of other equipment may have deteriorated more than the equipment planned for turn-in. This can result in changes to equipment previously identified for turn-in, which requires approval from management prior to pickup and turn-in. When districts arrive at the Depot without prior approval, the entire turn-in and pickup process is stalled until the appropriate approvals can be obtained.

The Depot does not have a scheduling methodology for turn-in and pickup. When district personnel arrive to exchange equipment, Depot staff must process the exchange delaying up fitting, maintenance, and repair workflow on other equipment requests. Additionally, when more than one district arrives at the same time, district personnel may wait several hours while the other district customer is being served. Equipment exchange is a time-consuming process that includes verification of turned-in item; unloading; auction preparation; new equipment issuance; and loading to transport vehicles.

The administrative process to exchange equipment is designed to ensure that no one leaves the Depot with the wrong equipment. Staff in every district reported that, without the signed authorization in hand, the Depot has refused to issue the new equipment.

As far as we can tell, the Depot has a very good record of getting the right equipment to the right place. The administrative checks and balances are overly repetitive and may increase the opportunity for errors to be made in the documentation of the equipment exchange. Equipment exchange information is written on a post-it note, and later transferred onto a carbon copy form. Subsequently, the information is keyed into the Highway Maintenance Management System (HMMS) which is a software application that SCDOT uses to document and track maintenance work. HMMS also documents and tracks equipment-related maintenance such as issuing new equipment to the field; preventative maintenance (PM); repairs; condition of equipment; daily work reports; downtime; utilization; and retirement of old equipment. The entry of information into HMMS, transcribed from a handwritten paper form after being copied from a post-it note, increases the opportunity for keying errors.

We performed a walk-through of an equipment exchange where there were no hang ups or delays and noted the exchange took more than two hours. During this time, three other districts arrived for an equipment exchange and had to wait in line until the first exchange concluded.

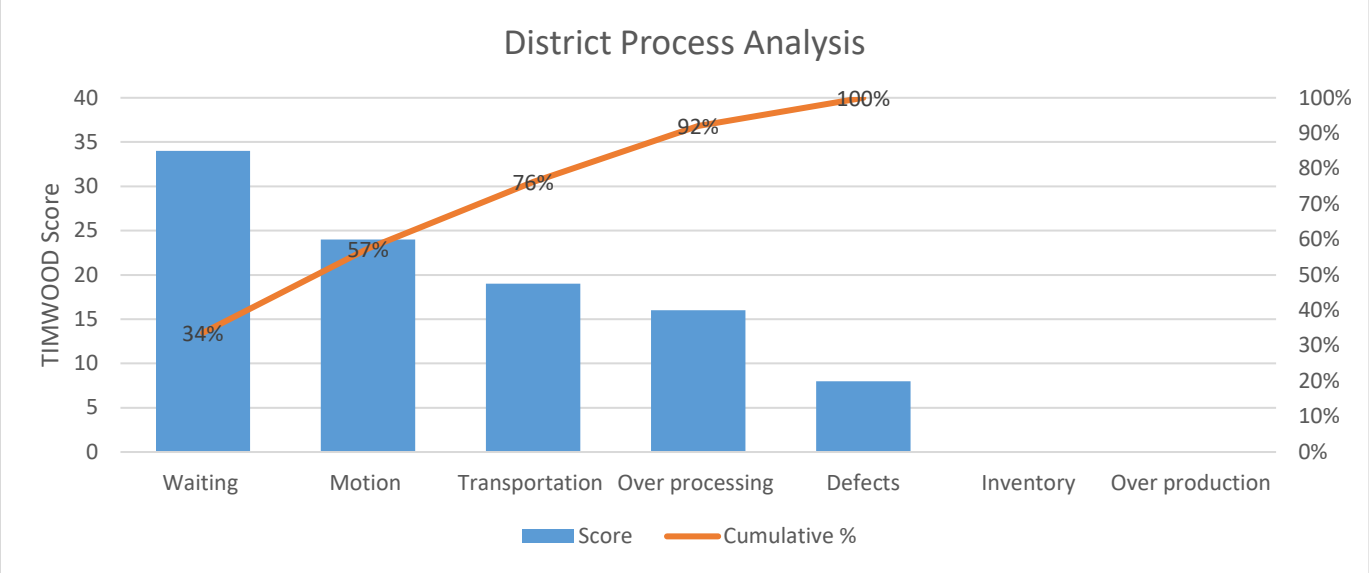
District Request Processes – Average TIMWOOD Score = 14

The District Request processes, as shown in Appendix A, are tasks and activities that are required for a district to prioritize and submit an equipment replacement request to S&E. Equipment replacement can only be requested for items that are due or past due for

replacement. SCDOT does not have enough money in the equipment budget to replace all the equipment that is due, or past due, for replacement. Each district has its own approach to prioritizing equipment requests. The approaches vary in task order, timing, and execution. By analyzing the business process models and conducting a TIMWOOD analysis we discovered that the scores across districts have little variation. The average TIMWOOD score is 14, with a low of 10 and a high of 16. The standard deviation is 2 which indicates that, in spite of variations in approach, the process design alone could not explain large variations in the overall activity.

Figure 4 indicates 76% of the potential inefficiencies in the districts are due to waiting, motion and transportation. This indicates that equipment requests from the districts may be delayed pending management decisions or approval of requests. Motion indicates that inefficiencies may occur through people work flows such as multiple rounds of management approvals for the same equipment requests. Similar to Motion, Transportation inefficiency may occur when work is transmitted or carried from one place to another so tasks can be completed.

Figure 3



Our analysis noted that a strategic approach to equipment acquisition planning may be a more efficient process design. One district developed a five-year plan that prioritizes equipment replacement requests years in advance based on the Agency's goals and objectives, anticipated budget, and planned workload.

Developing the initial five-year plan required an upfront time investment for the district staff that is paid back annually when S&E asks for the equipment request. Other districts spend time determining which equipment, past due for replacement, should be prioritized for replacement. With a strategic plan, a district only has to confirm that there aren't changes needed to the plan due to unforeseen equipment loss or deterioration. Since the condition of equipment is regularly monitored, and the plan is regularly updated, determining changes to the plan requires minimal time.

There is a general agreement among staff in the districts that procurement takes about 18 to 24 months from the time of the request to delivery of equipment if nothing major goes wrong. We were unable to obtain data that could validate this timeframe. None of the districts are

formally tracking or monitoring when equipment is requested and when it is delivered. Districts reported that in the past they only received status updates on their requests if they asked. All the districts reported that S&E's processes and responsiveness have improved over the past couple of years; however, there is still ambiguity for the districts around the status of their requests.

Supply and Equipment Order Process – TIMWOOD Score = 14

The Supply and Equipment Order process, as shown in Appendix A, covers tasks and activities that are required for SCDOT to order equipment once the request is approved by management and the procurement contract is completed. This is a fairly efficient process design but is impacted by delays in the preceding processes. Equipment orders take time because equipment must be manufactured to meet the unique specifications in the SCDOT or State contract. If SCDOT places an equipment order months after the start of the fiscal year, the vendor/manufacturer may not be able to fill the order when requested.

Director of Maintenance Process – TIMWOOD Score = 9

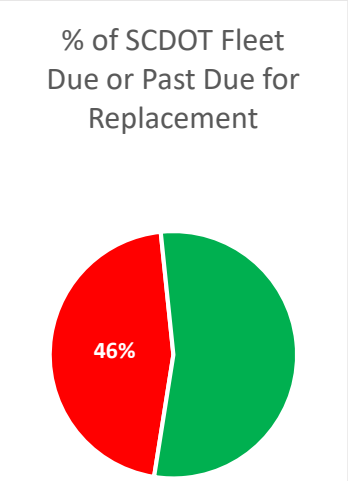
The Director of Maintenance Approval process, as shown in Appendix A, covers tasks and activities that are required for the Director of Maintenance to approve new equipment requests. The Director of Maintenance must approve all annual equipment requests to ensure that priorities line up with the objectives of the organization. The TIMWOOD analysis showed this process design is the most efficient in the Equipment Acquisition Activity.

5.4 ASSESSMENT OF FLEET

Assessment of the fleet condition indicates that large numbers of equipment in the fleet are kept past their anticipated useful lives resulting in more expensive and time-consuming maintenance and repairs as equipment ages. SCDOT is required to perform preventive maintenance (PM) on all equipment in the fleet, even if it hasn't been used since the last PM was performed. The older equipment gets, the more frequent and rigorous the PM schedule. New equipment does not require the same PM frequency or intensity as does equipment kept beyond the anticipated useful life. Purchasing or renting new equipment rather than maintaining old equipment reduces the overall cost of the equipment fleet over time.

Over the past two years, S&E and other stakeholder staff have worked diligently to move the condition of the fleet from 49% past due for replacement to 46% past due for replacement, a 6% improvement in the overall fleet since 2016.

Figure 4

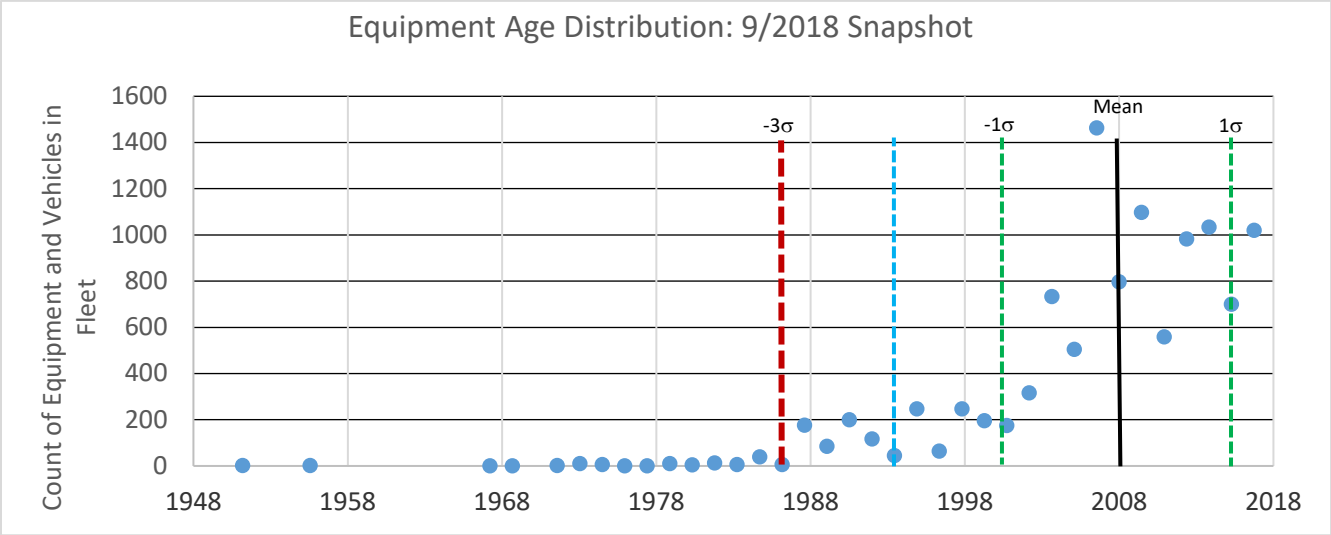


Analysis of equipment age data indicated that the SCDOT equipment fleet age spans nearly 70 years, resulting in large variabilities in equipment dependability and maintenance requirements. Figure 6 indicates that the average equipment model year in SCDOT's fleet is from 2008[2].

[2] Figure 6 shows age of SCDOT's equipment fleet. It does not compare the age of equipment with condition of equipment nor does it indicate if the equipment has met replacement criteria. The purpose of this chart is to provide scale to the overall fleet age.

Heavy equipment from the 1970s has very different features, maintenance requirements/cost, and required operator skill set than the same type of heavy equipment made in 2018. Parts for older equipment are often discontinued and replacement of broken parts becomes difficult to obtain. Equipment may be sidelined while searching for discontinued or hard-to-find replacement parts.

Figure 5



5.5 ASSESSMENT OF SCDOT IMPROVEMENT EFFORTS

Procurement and Acquisition Planning

For equipment acquisitions in which no contract is in place, SCDOT must go through the procurement process. As noted in Section 5.3, in the analysis of the procurement process, SCDOT equipment contracts regularly exceed the delegation authority threshold requiring them to be procured by MMO. When requested by the Agency, MMO may delegate authority on a specific procurement so that SCDOT can procure the equipment without MMO review and approval.

MMO recently proposed acquisition planning regulations for State agencies to help reduce the procurement time. Those regulations will require agencies to perform market research to determine if vendors have capabilities to deliver needed goods or services in advance of the procurement. Accordingly, SCDOT is developing an acquisition planning process.

S&E has been working to identify equipment needs prior to the equipment budget approval so contracts can be put in place in advance. This allows the Procurement Division the needed lead time so equipment contracts can be in place at the start of the fiscal year and orders can be submitted to vendors once they are approved by SCDOT management. This process is time-consuming because of the regulatory steps required by the State's Procurement Code and we believe these changes will help reduce the turnaround time to get equipment to the end user.

5.6 CONCLUSION

Our objective was to assess the Equipment Acquisition Activity to identify inefficiencies, if any, that hinder the Agency in achieving its objectives. Our ability to assess processing time performance is constrained because the Agency does not consistently track key data points throughout the Activity. Where the data was available, we determined that efficiency could be improved by:

- Preparing multi-year equipment request plans that consider the Agency's strategic goals
- Developing an acquisition planning process
- Seeking higher delegation authority from MMO after demonstrating improved process efficiency stemming from implementing the recommendations in this report.

Our observations and recommendations along with SCDOT management action plans are designed to complement the Agency's efforts to improve the efficient acquisition of equipment by enhancing the Agency's ability to track key data points necessary to measure performance and assess processes for inefficiencies.

6 OBSERVATIONS, RECOMMENDATIONS, AND MANAGEMENT ACTION PLANS

Observation 1 Equipment Replacement Plans

The Agency has not promulgated a formal methodology for prioritizing equipment replacement across districts that considers strategic goals and objectives of the Agency. Since SCDOT has not defined criteria for prioritizing replacement of equipment, each district approaches the prioritization of its request differently. The requests are often based on the immediate needs and the culture of each district. Without strategic planning around equipment prioritization, districts may be hindering the efficient achievement of statewide Agency objectives. We noted that one district considers the Agency's strategic plan when developing its request. Its five-year plan prioritizes equipment replacement requests years in advance based on the Agency's strategic plan, anticipated budget, and planned workload. The initial investment in time to create the plan is returned in more efficient planning and execution of work in accordance with overall Agency priorities. This district spends less time than its peer districts annually because it only needs to review its five-year plan for any updates.

Several districts are supplementing their equipment fleet with rental equipment. This may be a strategic option which would allow the Agency to reduce maintenance costs and provide the field access to needed equipment. The cost for equipment rentals currently comes out of the districts' operations budgets which may impact the ability to fund other operating needs.

Recommendation:

We recommend the Agency develop an equipment replacement plan methodology for districts to identify how equipment priorities support the objectives in the strategic plan and core functions of the Agency and districts. In developing such plans, SCDOT should consider a multi-year plan approach. To promote consistency, the methodology should include agency-wide standard criteria, instructions, and guidance to include:

- Regular assessment of the equipment fleet using standard criteria to determine if aged equipment should be replaced with a new unit or rental equipment or disposed of without replacement.
- Evaluation of rentals as an option for equipment past the anticipated useful life. This would reduce maintenance costs and avoid delays associated with procurement. To accomplish this, the Agency should consider shifting rental expense budget from operations to equipment.

(continued on next page)

- Early development of an acquisition plan with defined specifications that will provide work planners, procurement officials, Depot employees, and vendors with advanced notice to reduce acquisition time and increase productivity. The desired equipment and specifications should be posted on the publicly available website prior to procurement to solicit vendor interest and capabilities.

Implementation Consideration:

Guidelines should be developed with input from the field to assure that that standard criteria, instructions, and guidelines do not prevent districts from meeting their goals**.** Proposed changes to the procurement regulations would require all State agencies to develop acquisition plans. These regulations are expected to be finalized by September 2019.

To implement an effective long range equipment acquisition plan, SCDOT should consider setting an estimated annual equipment budget. Currently, districts estimate their equipment budget based on what they have historically received but this fluctuates year to year. The budget fluctuation can make it difficult to develop and stick to a strategic plan. By setting an estimated annual equipment budget, SCDOT would provide the districts an opportunity to develop better and more realistic equipment acquisition plans.

Management Action Plan (MAP) 1

It is the goal of the Supply and Equipment Office to manage the equipment fleet of SCDOT in an efficient manner using methodology that the Districts can support. Through the use of planning teams made up of District and Headquarter personnel, we will identify industry standard methodology for districts to identify how:

- Equipment priorities support the objectives in the strategic plan and core functions of the Agency and districts
- Explore rental options for equipment that may fit and implement a process where equipment acquisition could be streamlined through efficient processes for specification review and contract development.

The end result of this planning will produce a long range equipment replacement plan that best fits each District and processes in place that streamline the equipment acquisition process. Each District plan will be developed in its respective District.

Develop a 2-year equipment priority list and evaluate processes for equipment specifications and acquisition. **Target date 12/1/2019**.

Develop a 5-year long range equipment replacement priority list and develop/ implement processes that streamline the specification, acquisition and monitoring of equipment. **Target Date 6/1/2020**.

MAP Owner:	Jim Beach, Director of Supply and Equipment Office
Division:	Supply and Equipment Office
Scheduled Date:	Dates noted above through 6/1/2020

Observation 2 Performance Metrics

SCDOT does not effectively monitor performance metrics for its Equipment Acquisition Activity. There are no parameters, guidelines, or established expectations for process step timeframes. Equipment acquisition processing time and status data is not reliably captured. The Highway Maintenance Management System (HMMS) captures equipment information but it does not have the ability to track more detailed information of the acquisition workflow. Spreadsheets are used by the Depot and S&E to track this information but are not consistently updated or monitored and include discrepancies between them. As a result, the information is not reliable or in a format that provides the end user with visibility to the status of its equipment request throughout the workflow or allow for planning around delays. Additionally, this hinders effective work planning by decision-makers when requested equipment is substituted with an item that may not perform the work as efficiently or effectively as the item requested. For example, if a requested tractor brand is substituted with a different brand, existing attachments need to be retrofitted or replaced to fit the new equipment.

Monitoring Key Performance Indicators[3] (KPIs) could give SCDOT better insight into the problem areas in the Activity. Development of parameters and structure to monitor performance would give SCDOT the ability to identify actual problem areas and provide a starting place for implementing meaningful process improvements. Such improvements would not only decrease timeframes in internal processes, but could reduce the state-level review and approval delays as well. MMO officials told us that they will consider raising the Agency's delegation authority threshold once SCDOT addresses this report's recommendations for measuring and remediating inefficient process steps. This would result in fewer procurements required to go through the MMO approval process.

Recommendations:

Long Term: SCDOT is currently researching asset management software to replace aging systems. We recommend that the Agency consider including an equipment management and tracking component to automate tracking of key dates. This will significantly reduce manual collection and measure of data which often lead to human error and create delays.

Short Term: We recommend that SCDOT implement a short-term solution to address these issues ahead of the implementation of EAMS. SCDOT should implement standard processes and procedures for accurately capturing, maintaining, and reporting data on process time and status. To accomplish this, the Agency should include the following actions:

- Identify KPIs for tracking dates and other information within process steps that will allow for assessment of process efficiency.

(continued on next page)

[3] Key Performance Indicators (KPIs) are financial and non-financial metrics that help an organization understand how it is performing relative to achieving objectives efficiently and effectively.

- Assess the data systems and records used for capturing and reporting this information to ensure the data is accurate, reliable, and timely.

- Develop an agency-wide dashboard/workflow that:
  - provides visibility to all stakeholders on the status of equipment requests
  - identifies each step's responsible party and required tasks
  - communicates order status and specification changes
  - reports key performance data for the purpose of trend evaluation, monitoring, and data-driven decision making.

- Conduct analysis on KPIs to identify areas that may benefit from process improvement.

Finally, we recommend that SCDOT develop a mobile application for data collection in the field. All new equipment comes with barcodes which provide an opportunity for equipment information to be collected and auto populated into a system or spreadsheet by scanning a barcode. This enhancement will reduce risk of human error and delays from manual data entry.

Implementation Considerations:

A time commitment is required from SCDOT staff for developing, collecting, monitoring, and analyzing KPIs. Development of an agency-wide dashboard/workflow will likely require a time investment from IT staff and data owners. The Agency will also need to evaluate software capabilities for linking information from various databases and manual records.

SCDOT should conduct analyses to determine if development of certain short-term solutions is worth the investment of resources given the anticipated capabilities of a long-term software solution.

While automation can reduce the risk of error and delay, the Agency should invest in automation where the financial cost and staff time to implement do not exceed the expected benefit.

Management Action Plan (MAP) 2

It is the goal of the Supply and Equipment Office to manage the equipment fleet of SCDOT in an efficient manner using methodology that the Districts can support. Through the use of an equipment acquisition and outfit tracking system, S&E will be able to use a scanner type tool to read vehicle VIN by scanning the bar coded supplied by the manufacturer. The VIN will then be tied to the information supplied to SCDOT by the vendor in relation to an *Equipment Preventative Maintenance Questionnaire Form* (EPMQF) attached to the contract. This basic data could verify specifications matching

(continued on the next page)

or not matching contract, auto-fill work order information and begin tracking of asset through our process. The VIN bar code could be used throughout the process since it would be specific to the asset. Develop a process map for the two main processes while identifying Key Indicator Points. **Target Date 12/1/2019** The S&E office is in the process of hiring someone to develop KPIs and manage performance. Identification of KPIs. **Target date 5/30/2020** S&E Office will develop a scope of service for small applications and seek IT resources. **Target date 6/1/2020** Robust application to track processes. **Target date 6/1/2022**	
MAP Owner:	Jim Beach, Director of Supply and Equipment Office
Division:	Supply and Equipment Office
Scheduled Date:	Dates noted above through 6/1/2022

Observation 3 SCEIS Procurement Reports

SCEIS functionality allows SCDOT to run a procurement report on all goods and services contracts but does not provide a report specific to equipment orders. As a result, SCDOT is unable to use SCEIS procurement data to glean insight into the status or performance of the equipment procurement process.

Recommendation:

We recommend that SCDOT continue to collaborate with SCEIS to develop reporting of data specific to equipment procurements. Access to the acquisition manager system in SCEIS would allow for better tracking of procurement information.

Implementation Consideration:

Staff time will be needed to continue to collaborate with SCEIS personnel.

Management Action Plan (MAP) 3

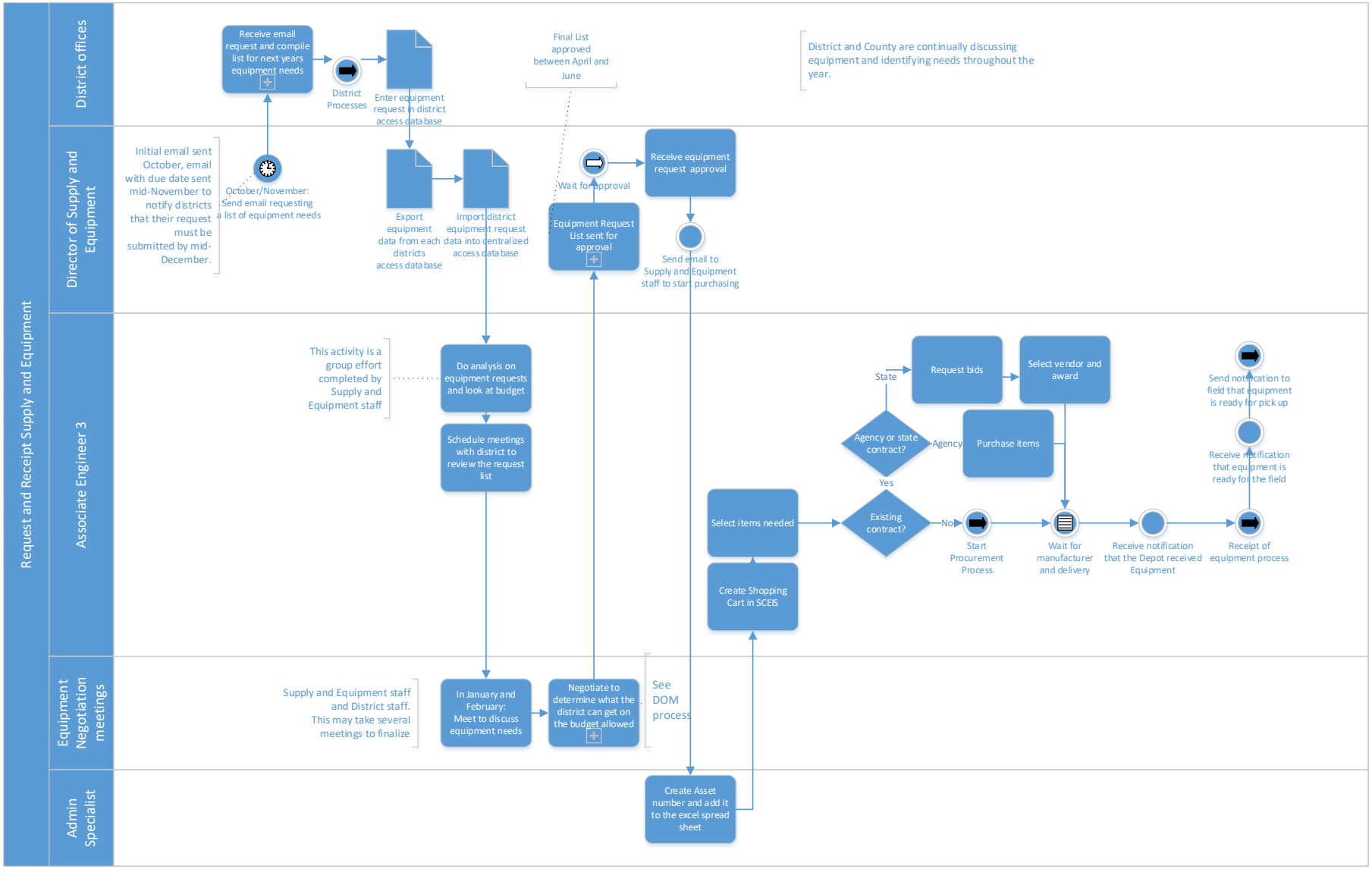
SCDOT Procurement will work with other agencies and SCEIS to develop reports which will allow for data to be exported for specific purposes. To achieve this goal, the Procurement Director will contact procurement directors from other State agencies to develop common requirements as SCEIS will not develop reports unless they are needed by all agencies or can be justified by more than one.

SCDOT procurement will also work with SCEIS to identify those items which need to be removed/deleted from SCEIS in order to assist in data reporting accuracy. As of 5/9/2019 a request for reporting to be enhanced has been sent to SCEIS.

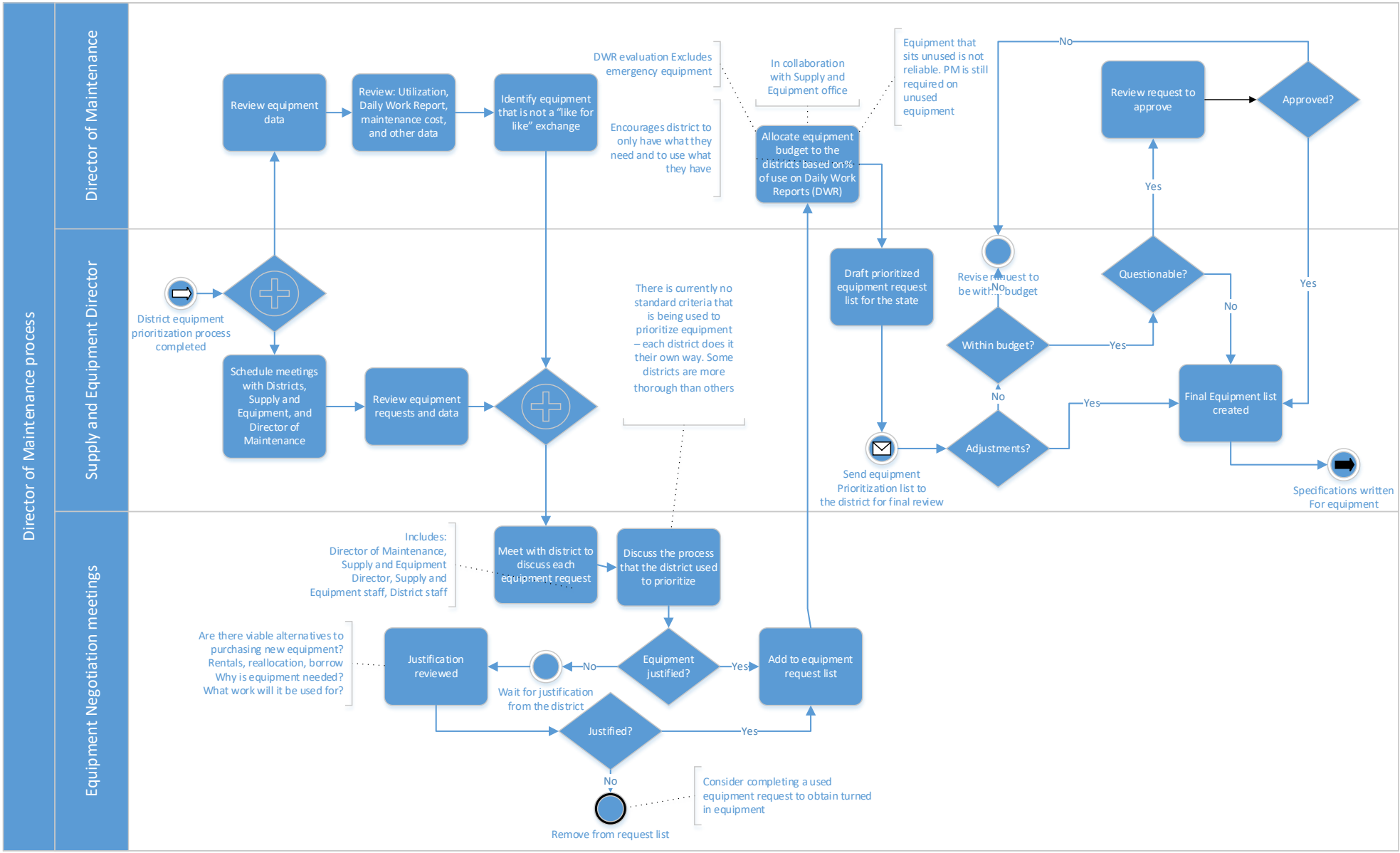
MAP Owner:	Emmett Kirwan
Division:	Procurement
Scheduled Date:	11/15/2019

APPENDIX A BUSINESS PROCESS MODELS

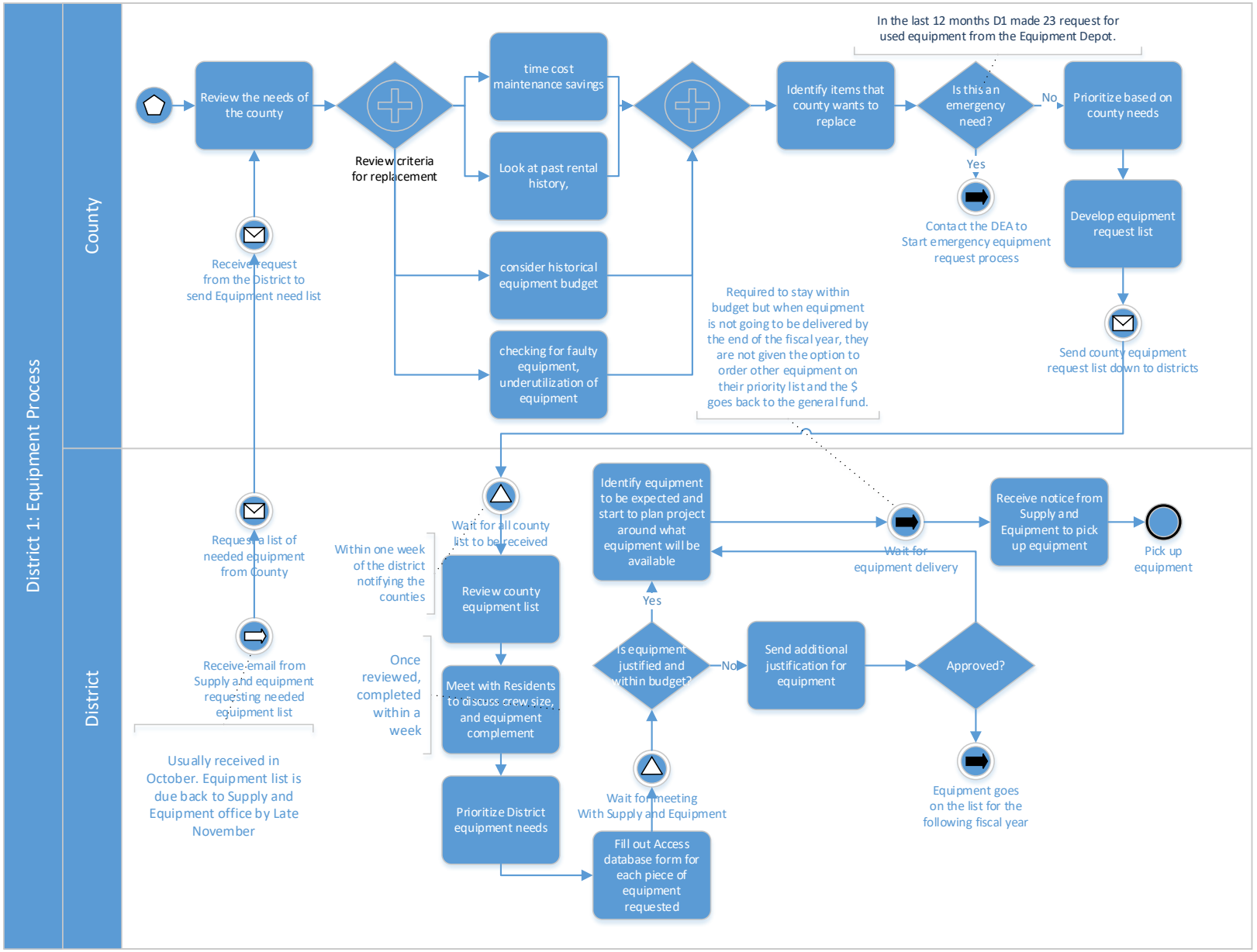
Supply and Equipment Office Process



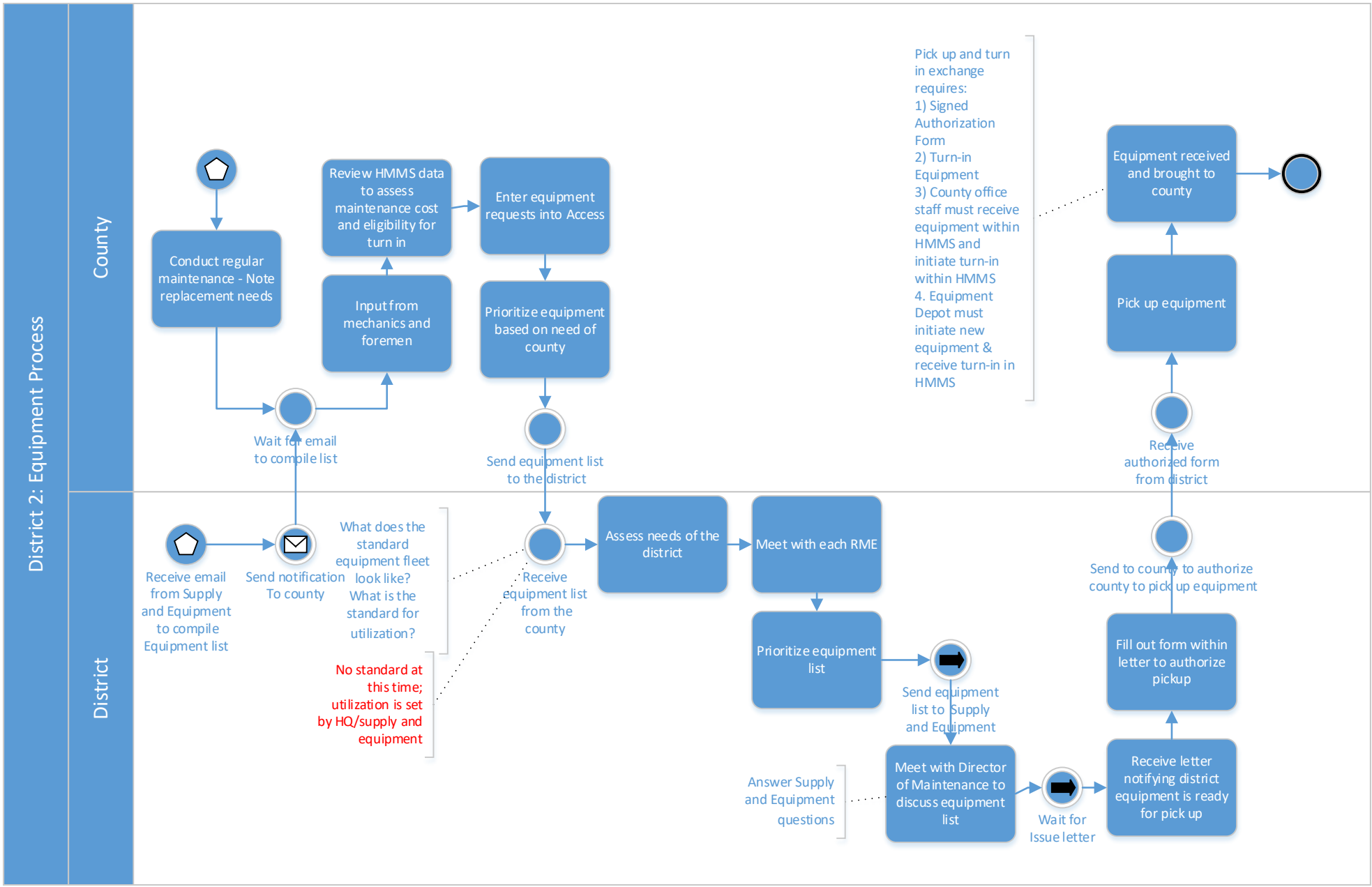
Director of Maintenance



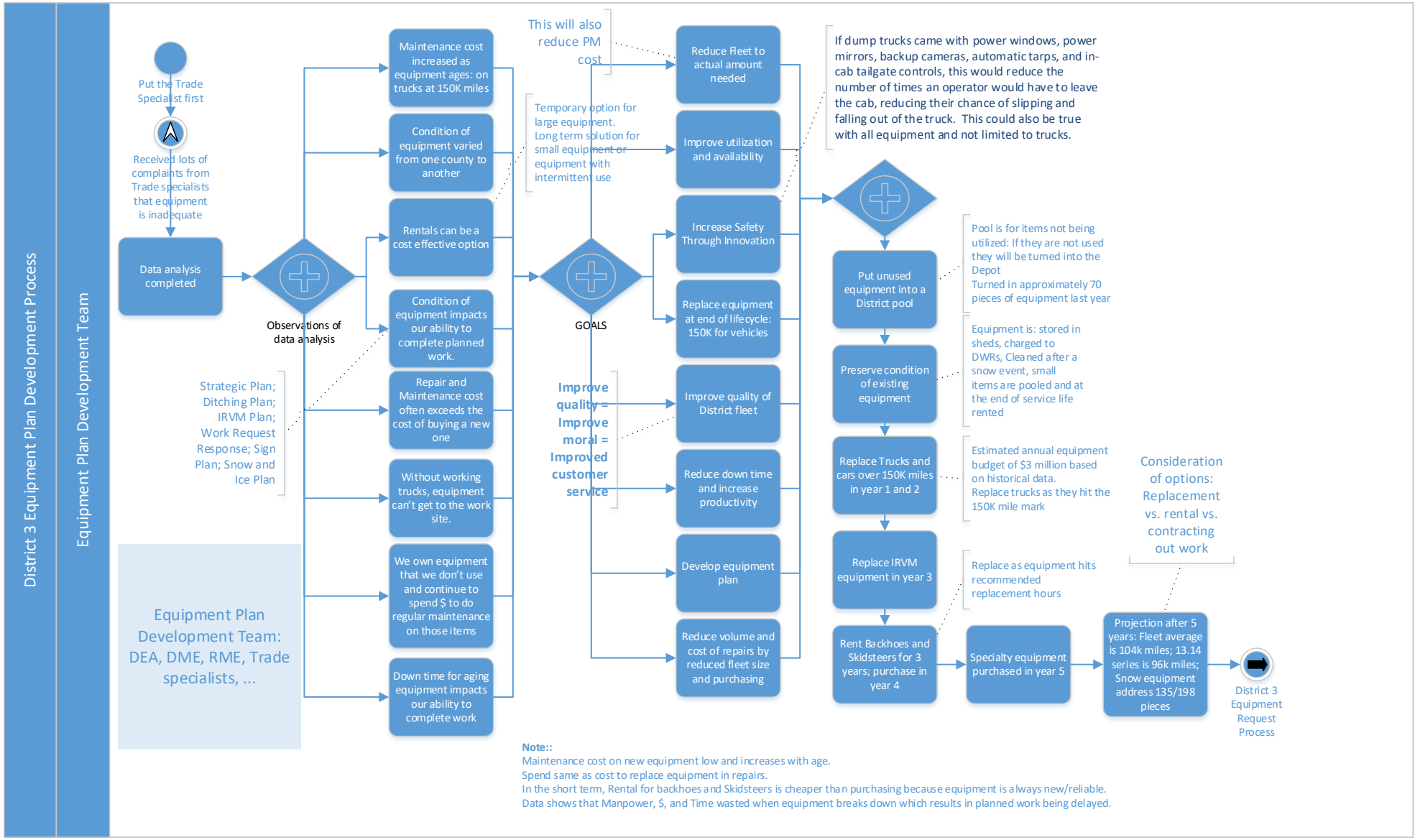
District 1


District 1: Equipment Process
County
District
Review the needs of the county
Review criteria for replacement
time cost maintenance savings
Look at past rental history,
consider historical equipment budget
checking for faulty equipment, underutilization of equipment
Identify items that county wants to replace
In the last 12 months D1 made 23 request for used equipment from the Equipment Depot.
Is this an emergency need?
No
Yes
Contact the DEA to Start emergency equipment request process
Prioritize based on county needs
Develop equipment request list
Send county equipment request list down to districts
Required to stay within budget but when equipment is not going to be delivered by the end of the fiscal year, they are not given the option to order other equipment on their priority list and the $ goes back to the general fund.
Receive request from the District to send Equipment need list
Request a list of needed equipment from County
Receive email from Supply and equipment requesting needed equipment list
Usually received in October. Equipment list is due back to Supply and Equipment office by Late November
Wait for all county list to be received
Within one week of the district notifying the counties
Review county equipment list
Once reviewed, completed within a week
Meet with Residents to discuss crew size, and equipment complement
Prioritize District equipment needs
Fill out Access database form for each piece of equipment requested
Wait for meeting With Supply and Equipment
Is equipment justified and within budget?
Yes
No
Send additional justification for equipment
Approved?
Equipment goes on the list for the following fiscal year
Identify equipment to be expected and start to plan project around what equipment will be available
Wait for equipment delivery
Receive notice from Supply and Equipment to pick up equipment
Pick up equipment

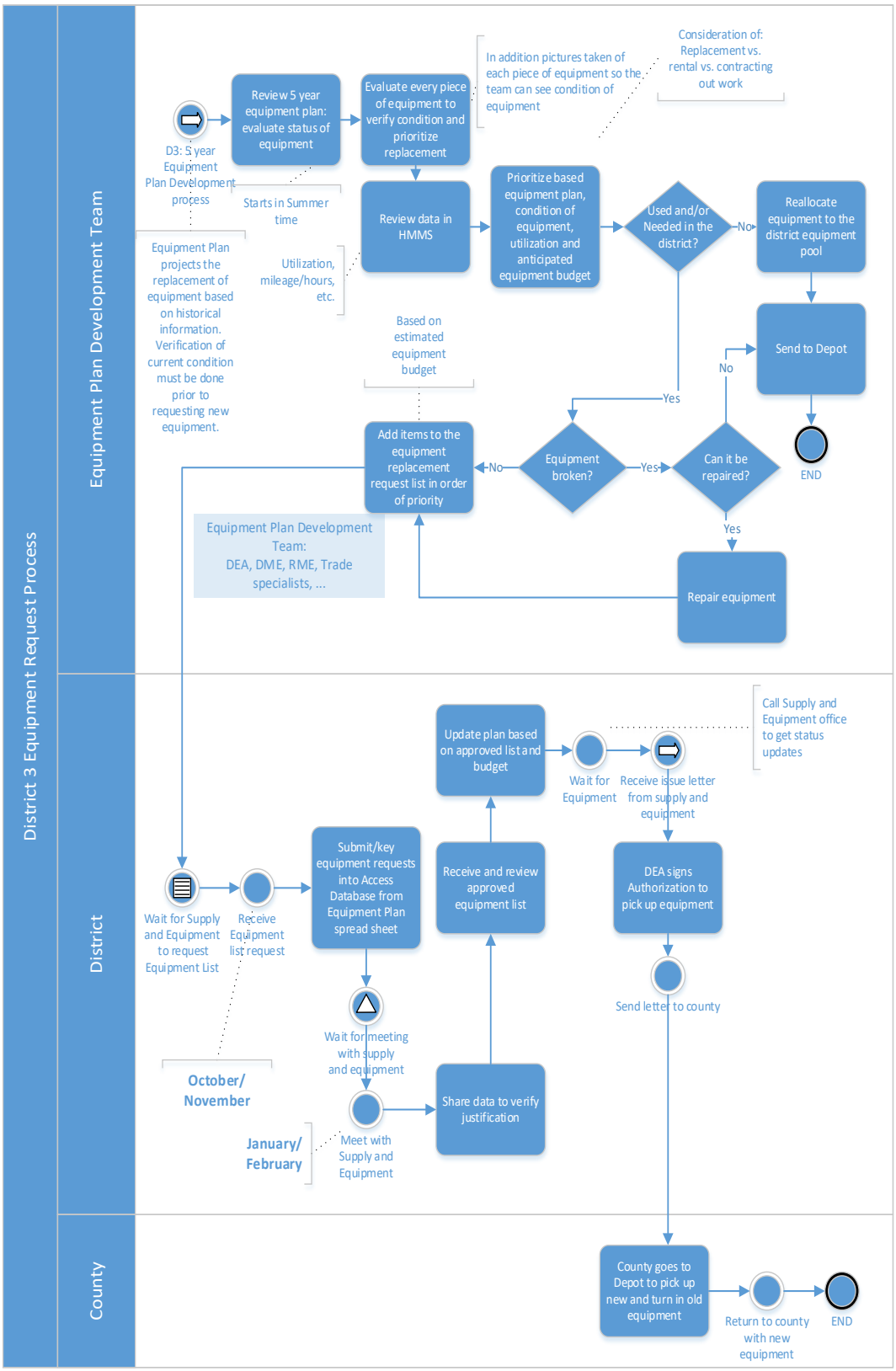
District 2


District 2: Equipment Process
County
District
Conduct regular maintenance - Note replacement needs
Review HMMS data to assess maintenance cost and eligibility for turn in
Enter equipment requests into Access
Input from mechanics and foremen
Prioritize equipment based on need of county
Wait for email to compile list
Send equipment list to the district
Pick up and turn in exchange requires:
1) Signed Authorization Form
2) Turn-in Equipment
3) County office staff must receive equipment within HMMS and initiate turn-in within HMMS
4. Equipment Depot must initiate new equipment & receive turn-in in HMMS
Equipment received and brought to county
Pick up equipment
Receive authorized form from district
Receive email from Supply and Equipment to compile Equipment list
Send notification To county
What does the standard equipment fleet look like? What is the standard for utilization?
No standard at this time; utilization is set by HQ/supply and equipment
Receive equipment list from the county
Assess needs of the district
Meet with each RME
Prioritize equipment list
Send equipment list to Supply and Equipment
Answer Supply and Equipment questions
Meet with Director of Maintenance to discuss equipment list
Wait for Issue letter
Receive letter notifying district equipment is ready for pick up
Fill out form within letter to authorize pickup
Send to county to authorize county to pick up equipment

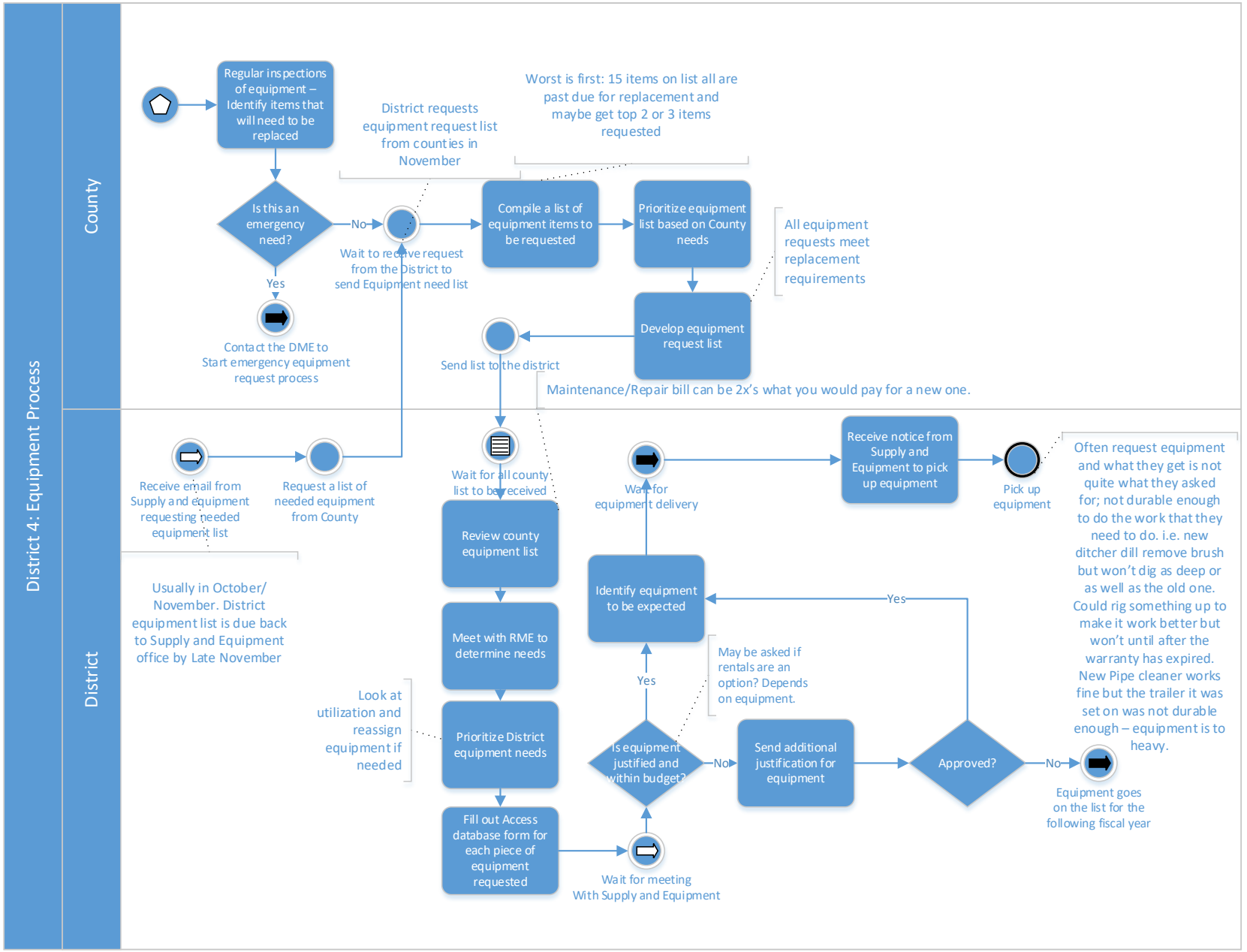
District 3 – 5-year Plan



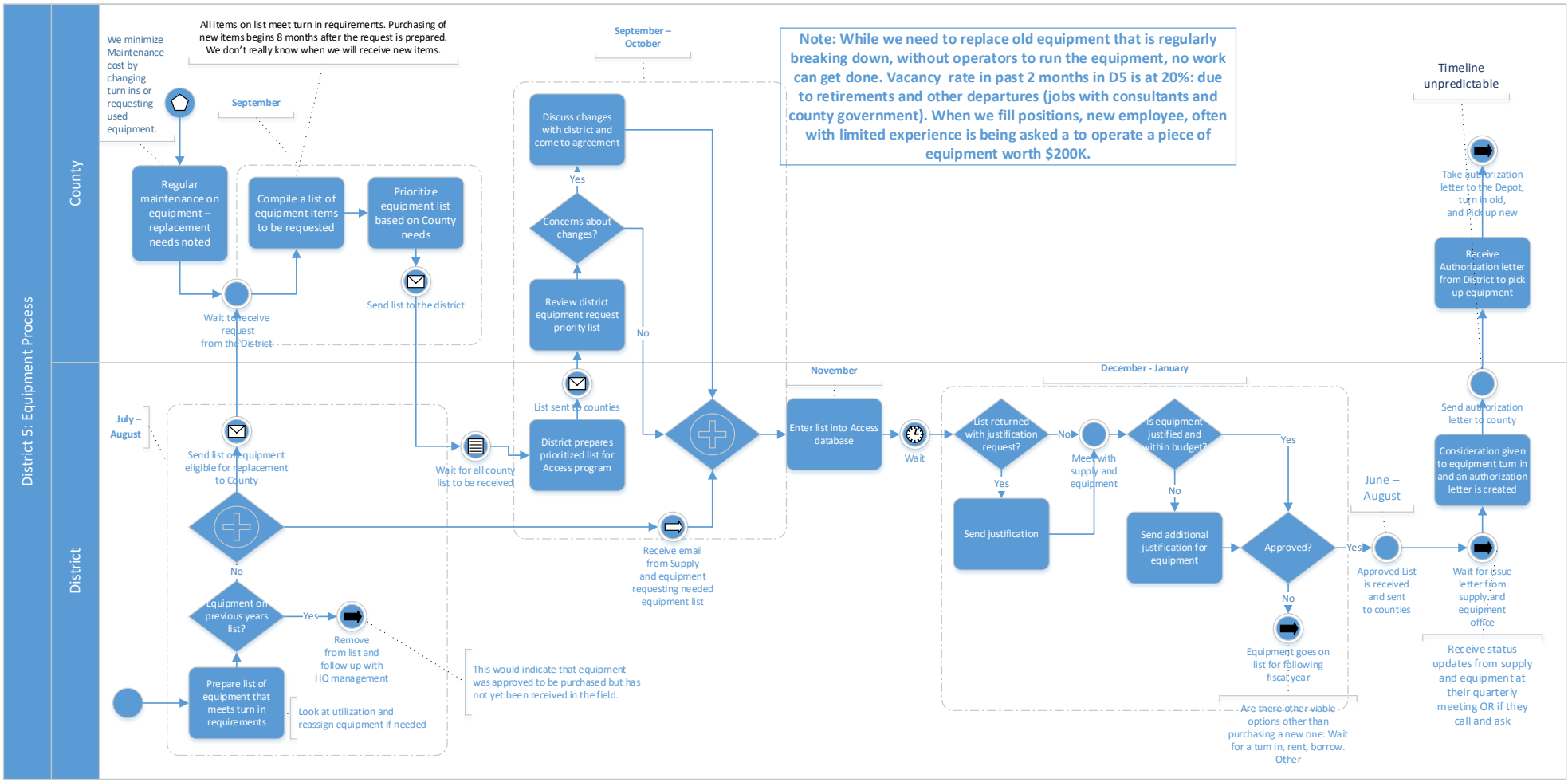
District 3


District 3 Equipment Request Process
Equipment Plan Development Team
District
County
D3: 5 year Equipment Plan Development process
Review 5 year equipment plan: evaluate status of equipment
Starts in Summer time
Evaluate every piece of equipment to verify condition and prioritize replacement
In addition pictures taken of each piece of equipment so the team can see condition of equipment
Consideration of: Replacement vs. rental vs. contracting out work
Review data in HMMS
Utilization, mileage/hours, etc.
Prioritize based equipment plan, condition of equipment, utilization and anticipated equipment budget
Used and/or Needed in the district?
No
Reallocate equipment to the district equipment pool
Send to Depot
Yes
No
Equipment Plan projects the replacement of equipment based on historical information. Verification of current condition must be done prior to requesting new equipment.
Based on estimated equipment budget
Add items to the equipment replacement request list in order of priority
No
Equipment broken?
Yes
Can it be repaired?
Yes
END
Equipment Plan Development Team: DEA, DME, RME, Trade specialists, ...
Repair equipment
Update plan based on approved list and budget
Call Supply and Equipment office to get status updates
Wait for Equipment
Receive issue letter from supply and equipment
Wait for Supply and Equipment to request Equipment List
Receive Equipment list request
Submit/key equipment requests into Access Database from Equipment Plan spread sheet
Receive and review approved equipment list
DEA signs Authorization to pick up equipment
Send letter to county
Wait for meeting with supply and equipment
October/ November
Share data to verify justification
January/ February
Meet with Supply and Equipment
County goes to Depot to pick up new and turn in old equipment
Return to county with new equipment
END

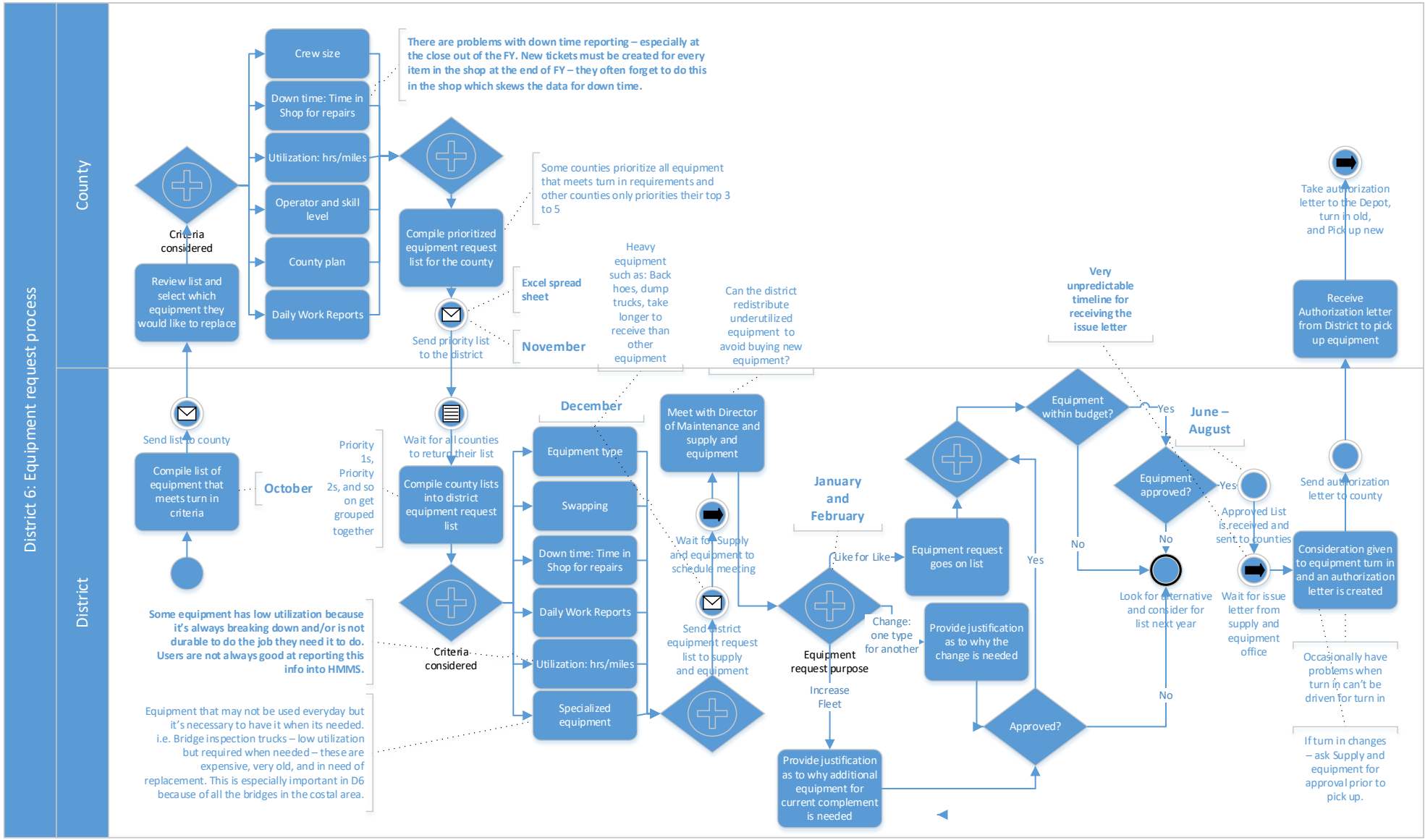
District 4


District 4: Equipment Process
County
District
Regular inspections of equipment – Identify items that will need to be replaced
Is this an emergency need?
No
Yes
Contact the DME to Start emergency equipment request process
Wait to receive request from the District to send Equipment need list
District requests equipment request list from counties in November
Worst is first: 15 items on list all are past due for replacement and maybe get top 2 or 3 items requested
Compile a list of equipment items to be requested
Prioritize equipment list based on County needs
All equipment requests meet replacement requirements
Develop equipment request list
Send list to the district
Maintenance/Repair bill can be 2x's what you would pay for a new one.
Receive email from Supply and equipment requesting needed equipment list
Request a list of needed equipment from County
Usually in October/ November. District equipment list is due back to Supply and Equipment office by Late November
Wait for all county list to be received
Review county equipment list
Meet with RME to determine needs
Look at utilization and reassign equipment if needed
Prioritize District equipment needs
Fill out Access database form for each piece of equipment requested
Wait for meeting With Supply and Equipment
Is equipment justified and within budget?
Yes
No
May be asked if rentals are an option? Depends on equipment.
Identify equipment to be expected
Send additional justification for equipment
Approved?
Yes
No
Wait for equipment delivery
Receive notice from Supply and Equipment to pick up equipment
Pick up equipment
Often request equipment and what they get is not quite what they asked for; not durable enough to do the work that they need to do. i.e. new ditcher dill remove brush but won't dig as deep or as well as the old one. Could rig something up to make it work better but won't until after the warranty has expired. New Pipe cleaner works fine but the trailer it was set on was not durable enough – equipment is to heavy.
Equipment goes on the list for the following fiscal year

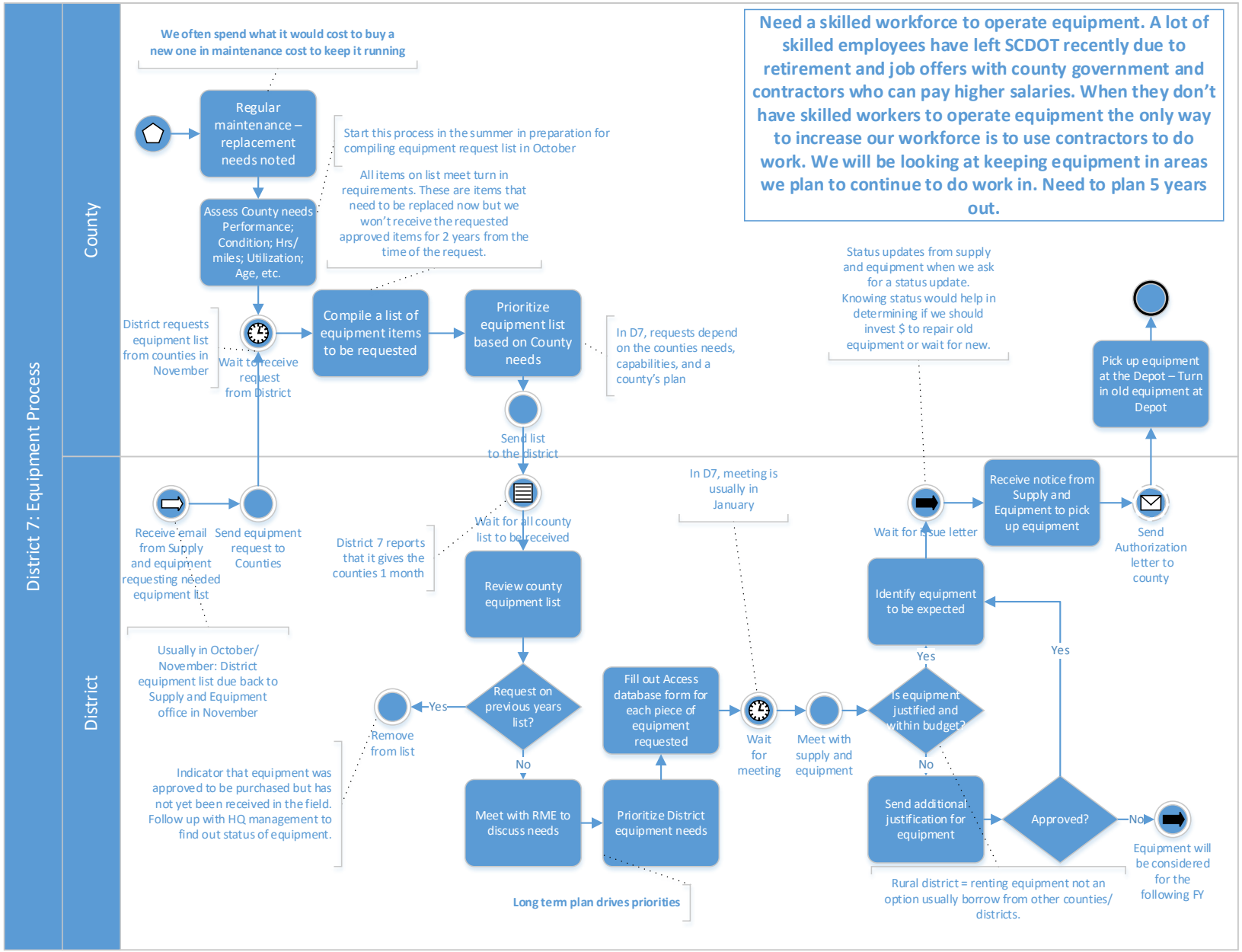
District 5


District 5: Equipment Process
County
District
We minimize Maintenance cost by changing turn ins or requesting used equipment.
All items on list meet turn in requirements. Purchasing of new items begins 8 months after the request is prepared. We don't really know when we will receive new items.
September
Regular maintenance on equipment – replacement needs noted
Compile a list of equipment items to be requested
Prioritize equipment list based on County needs
Send list to the district
Wait to receive request from the District
September – October
Discuss changes with district and come to agreement
Yes
Concerns about changes?
No
Review district equipment request priority list
List sent to counties
District prepares prioritized list for Access program
Note: While we need to replace old equipment that is regularly breaking down, without operators to run the equipment, no work can get done. Vacancy rate in past 2 months in D5 is at 20%: due to retirements and other departures (jobs with consultants and county government). When we fill positions, new employee, often with limited experience is being asked a to operate a piece of equipment worth $200K.
Timeline unpredictable
Take authorization letter to the Depot, turn in old, and Pick up new
Receive Authorization letter from District to pick up equipment
July – August
Send list of equipment eligible for replacement to County
Wait for all county list to be received
Receive email from Supply and equipment requesting needed equipment list
No
Equipment on previous years list?
Yes
Remove from list and follow up with HQ management
This would indicate that equipment was approved to be purchased but has not yet been received in the field.
Prepare list of equipment that meets turn in requirements
Look at utilization and reassign equipment if needed
November
Enter list into Access database
Wait
December - January
List returned with justification request?
No
Meet with supply and equipment
Is equipment justified and within budget?
Yes
Send justification
No
Send additional justification for equipment
Approved?
Yes
No
Equipment goes on list for following fiscal year
Are there other viable options other than purchasing a new one: Wait for a turn in, rent, borrow. Other
June – August
Approved List is received and sent to counties
Send authorization letter to county
Consideration given to equipment turn in and an authorization letter is created
Wait for issue letter from supply and equipment office
Receive status updates from supply and equipment at their quarterly meeting OR if they call and ask

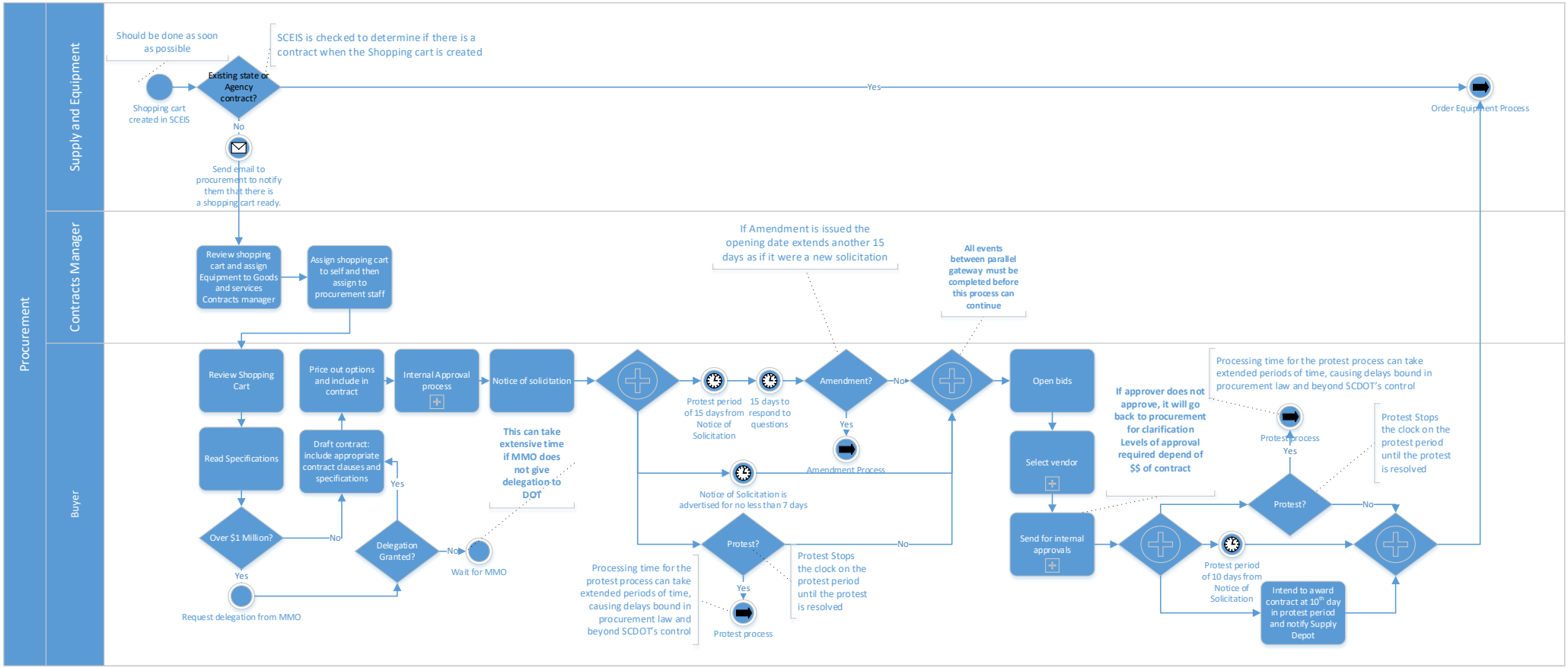
District 6


District 6: Equipment request process
County
District
Crew size
Down time: Time in Shop for repairs
Utilization: hrs/miles
Operator and skill level
County plan
Daily Work Reports
There are problems with down time reporting – especially at the close out of the FY. New tickets must be created for every item in the shop at the end of FY – they often forget to do this in the shop which skews the data for down time.
Criteria considered
Review list and select which equipment they would like to replace
Compile prioritized equipment request list for the county
Some counties prioritize all equipment that meets turn in requirements and other counties only priorities their top 3 to 5
Excel spread sheet
November
Send priority list to the district
Heavy equipment such as: Back hoes, dump trucks, take longer to receive than other equipment
Can the district redistribute underutilized equipment to avoid buying new equipment?
Very unpredictable timeline for receiving the issue letter
Take authorization letter to the Depot, turn in old, and Pick up new
Receive Authorization letter from District to pick up equipment
Send list to county
Compile list of equipment that meets turn in criteria
October
Priority 1s, Priority 2s, and so on get grouped together
Wait for all counties to return their list
Compile county lists into district equipment request list
December
Equipment type
Swapping
Down time: Time in Shop for repairs
Daily Work Reports
Utilization: hrs/miles
Specialized equipment
Meet with Director of Maintenance and supply and equipment
Wait for Supply and equipment to schedule meeting
Send district equipment request list to supply and equipment
Some equipment has low utilization because it's always breaking down and/or is not durable to do the job they need it to do. Users are not always good at reporting this info into HMMS.
Criteria considered
Equipment that may not be used everyday but it's necessary to have it when its needed. i.e. Bridge inspection trucks – low utilization but required when needed – these are expensive, very old, and in need of replacement. This is especially important in D6 because of all the bridges in the costal area.
January and February
Like for Like
Change: one type for another
Equipment request purpose
Increase Fleet
Provide justification as to why additional equipment for current complement is needed
Equipment request goes on list
Provide justification as to why the change is needed
Approved?
Yes
No
Equipment within budget?
Yes
No
June – August
Equipment approved?
Yes
No
Look for alternative and consider for list next year
Approved List is received and sent to counties
Wait for issue letter from supply and equipment office
Send authorization letter to county
Consideration given to equipment turn in and an authorization letter is created
Occasionally have problems when turn in can't be driven for turn in
If turn in changes – ask Supply and equipment for approval prior to pick up.

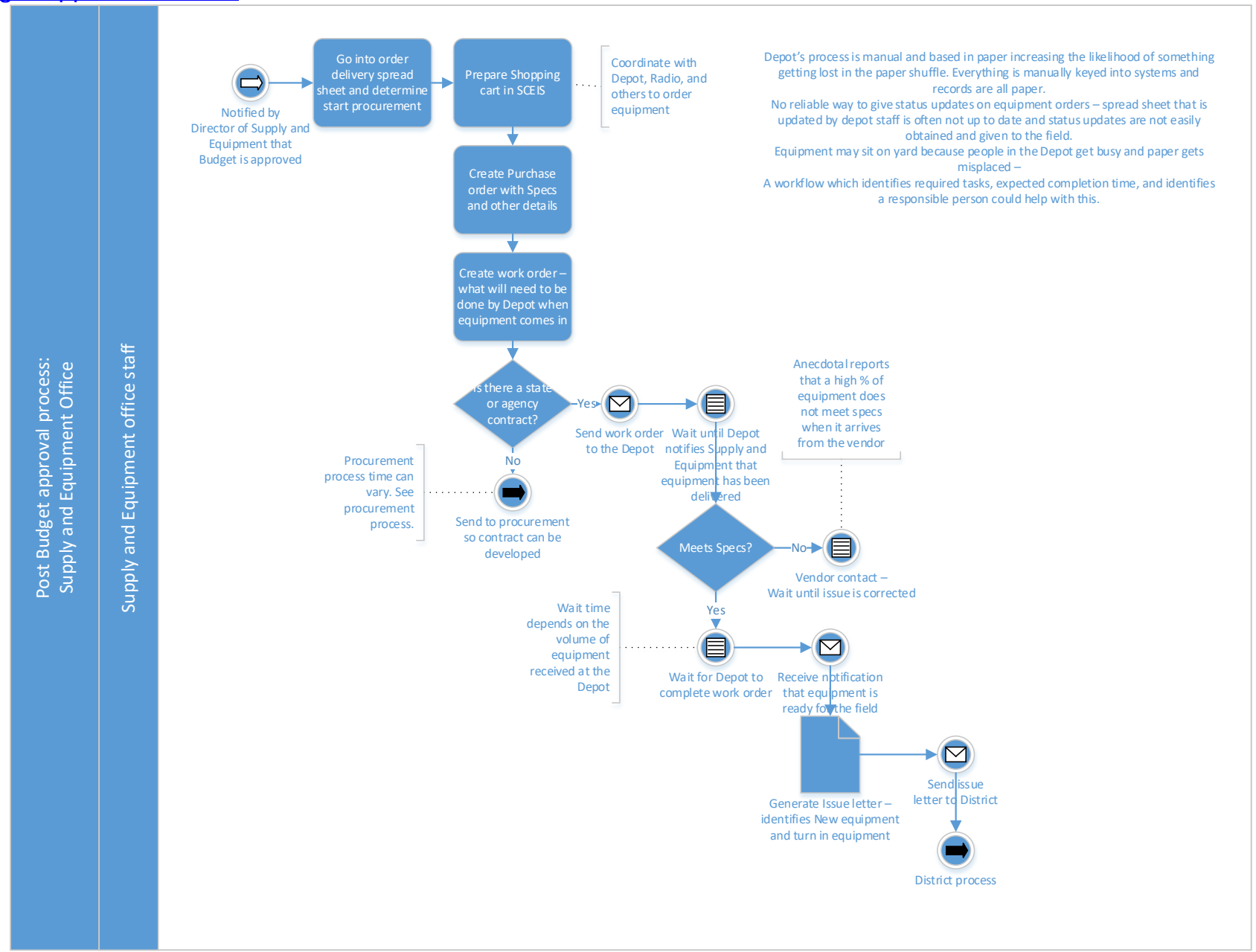
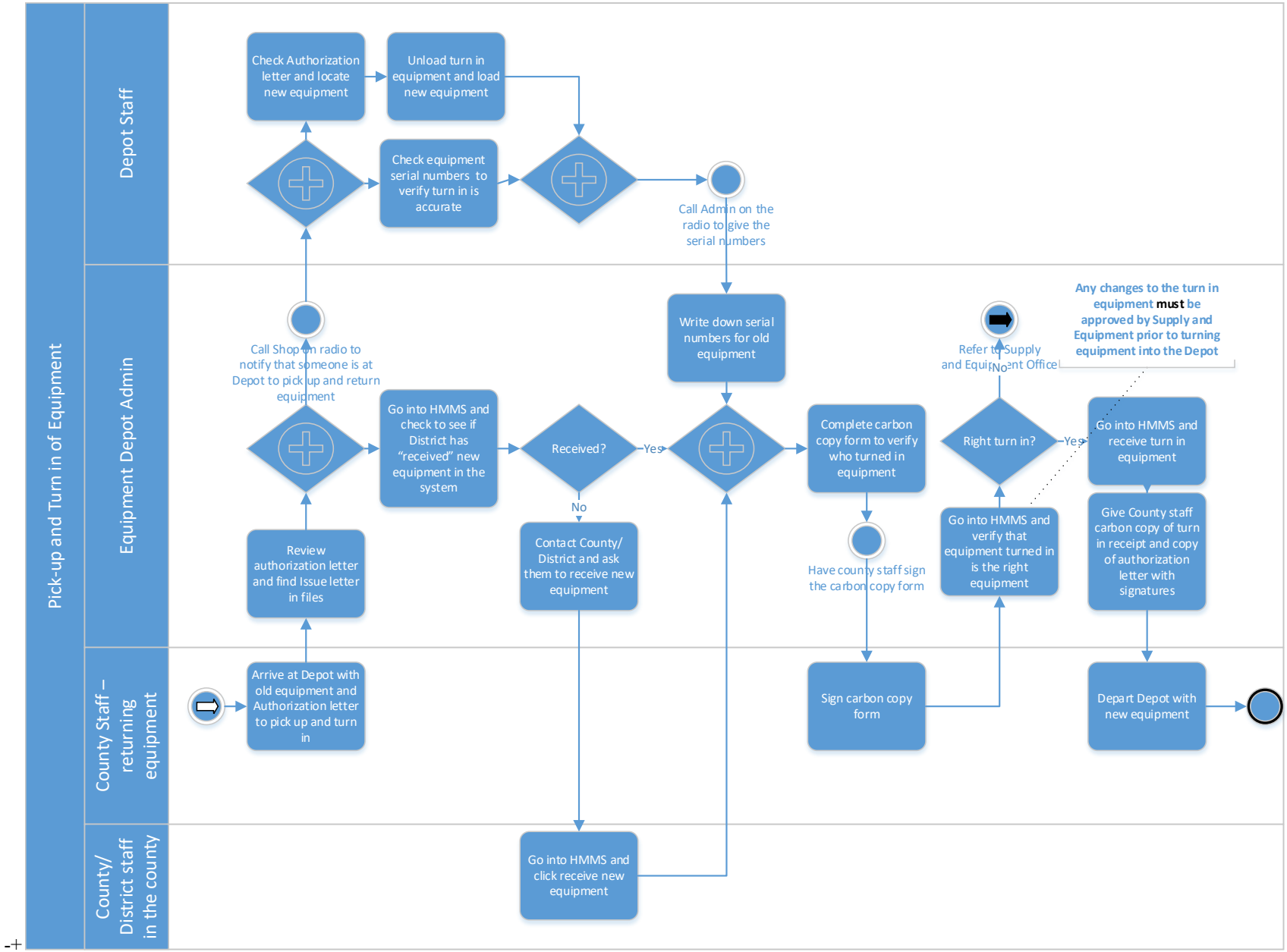
District 7


District 7: Equipment Process
County
District
We often spend what it would cost to buy a new one in maintenance cost to keep it running
Need a skilled workforce to operate equipment. A lot of skilled employees have left SCDOT recently due to retirement and job offers with county government and contractors who can pay higher salaries. When they don't have skilled workers to operate equipment the only way to increase our workforce is to use contractors to do work. We will be looking at keeping equipment in areas we plan to continue to do work in. Need to plan 5 years out.
Regular maintenance – replacement needs noted
Start this process in the summer in preparation for compiling equipment request list in October
Assess County needs Performance; Condition; Hrs/ miles; Utilization; Age, etc.
All items on list meet turn in requirements. These are items that need to be replaced now but we won't receive the requested approved items for 2 years from the time of the request.
District requests equipment list from counties in November
Wait to receive request from District
Compile a list of equipment items to be requested
Prioritize equipment list based on County needs
In D7, requests depend on the counties needs, capabilities, and a county's plan
Status updates from supply and equipment when we ask for a status update. Knowing status would help in determining if we should invest $ to repair old equipment or wait for new.
Pick up equipment at the Depot – Turn in old equipment at Depot
Send list to the district
Receive email from Supply and equipment requesting needed equipment list
Send equipment request to Counties
Wait for all county list to be received
District 7 reports that it gives the counties 1 month
In D7, meeting is usually in January
Wait for issue letter
Receive notice from Supply and Equipment to pick up equipment
Send Authorization letter to county
Review county equipment list
Identify equipment to be expected
Usually in October/ November: District equipment list due back to Supply and Equipment office in November
Request on previous years list?
Yes
No
Remove from list
Fill out Access database form for each piece of equipment requested
Wait for meeting
Meet with supply and equipment
Is equipment justified and within budget?
Yes
No
Yes
Indicator that equipment was approved to be purchased but has not yet been received in the field. Follow up with HQ management to find out status of equipment.
Meet with RME to discuss needs
Prioritize District equipment needs
Send additional justification for equipment
Approved?
No
Equipment will be considered for the following FY
Long term plan drives priorities
Rural district = renting equipment not an option usually borrow from other counties/ districts.

Procurement



Post Budget Approval Process



Equipment Depot: Pickup and Turn in Process