South Carolina Department of Transportation Structural Efficiencies Study

December 7, 2017

Submitted by:
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December 7, 2017

The Honorable Christy Hall
Secretary of Transportation
South Carolina Department of Transportation
955 Park Street
Columbia, SC 29201

The Honorable Brian D. Lamkin
Inspector General
South Carolina Office of the Inspector General
111 Executive Center Drive, Suite 204
Columbia, SC 29210

Re: SCDOT Structural Efficiencies Study

Secretary Hall and Inspector General Lamkin,

On behalf of The Conti Group LLC (Conti Group) and our sub-contractors KPMG LLP (KPMG) and the Kercher Group – together the Project Team – we are pleased to submit this report covering the organizational assessment conducted in close coordination with the South Carolina Department of Transportation (SCDOT or the Agency).

The assignment was undertaken pursuant to Purchase Order # 4600562700, Structural Efficiencies Study (the Study), dated May 2, 2017. The objective of the Study was to evaluate SCDOT's internal structure related to the delivery of services as part of its responsibilities, with the goal of increasing efficiencies and cost-effectiveness within the Agency, focused on project prioritization and selection; project delivery; relationships with other South Carolina transportation entities; and technology and information management systems supporting the core functions of the Agency.

In support of this important Study, the Project Team conducted a series of meetings, workshops, and interviews with SCDOT leadership, senior management, key stakeholders (i.e., MPOs, COGs and local governments) and SCDOT personnel to review and evaluate current workings and processes within SCDOT, as well as to perform the corresponding analysis of the Agency's current policies, procedures and processes. The Project Team also reviewed material, information, and data provided by SCDOT, and conducted interviews, meetings and a benchmarking exercise with a peer group of comparable transportation entities.

The Project Team would like to acknowledge and express our appreciation for the high level of support and cooperation received from the SCDOT leadership team throughout this Study. Implementation of the recommendations included in the report will allow SCDOT to enhance the Agency's inclusive and supportive work culture with an added focus on efficient and cost-effective delivery of planned projects and core services, fostering an environment of continuous improvement and stakeholder-oriented service delivery. Improving operational efficiencies will allow the Agency to invest its limited resources in the most efficient and effective manner to serve the citizens and businesses of South Carolina.

Please contact me at (919) 821-0290 or gene@thecontigroupllc.com or Raj Shelat at (703) 286-6706 or rajshelat@kpmg.com with any questions.

Sincerely,

Gene Conti, *President – The Conti Group*

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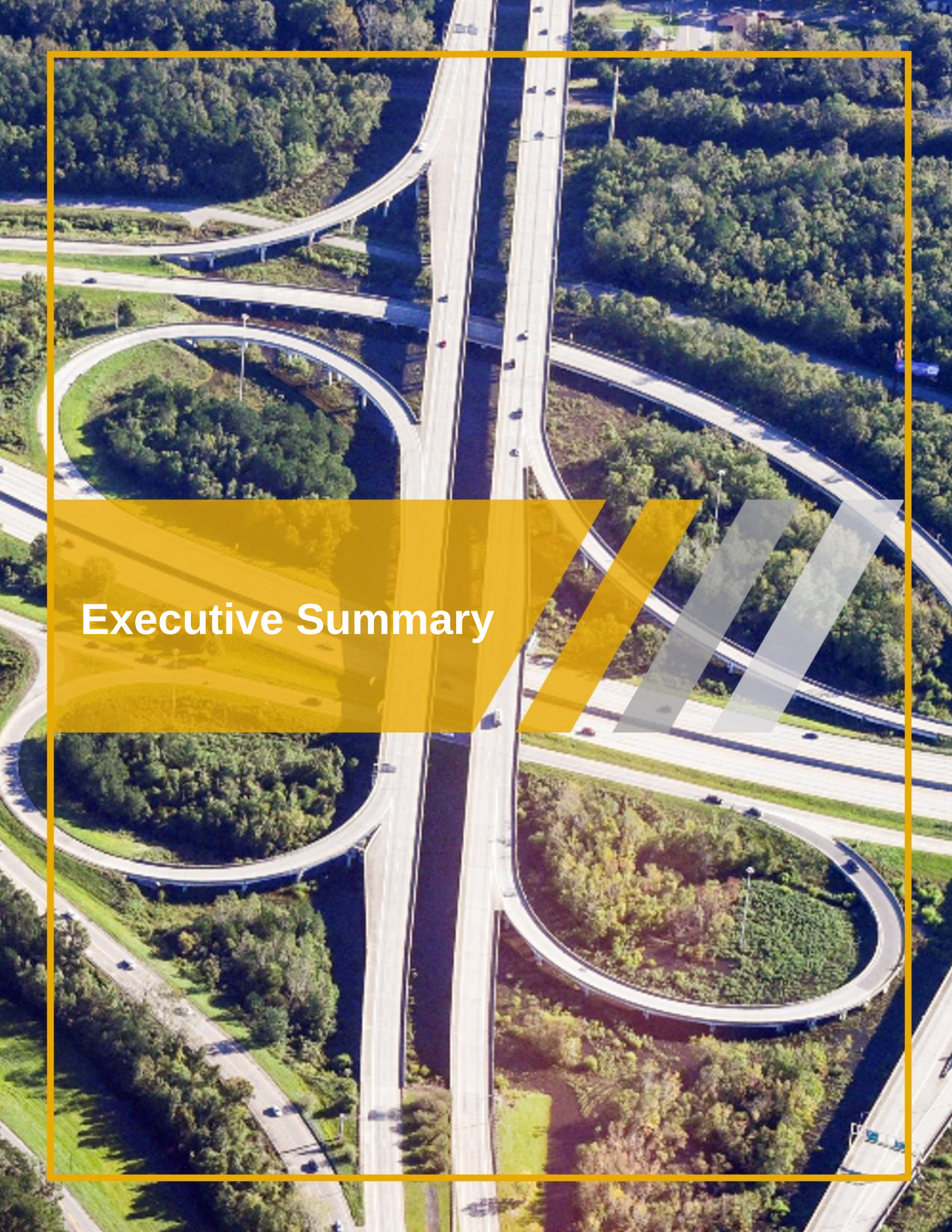


Executive Summary

Executive Summary

Introduction

The South Carolina Department of Transportation (SCDOT or the Agency) is one of the five largest state agencies in South Carolina, with approximately 4,600 employees and a total annual budget of approximately $2.36 billion for Fiscal Year 2017-18. SCDOT has a presence in each of the State's 46 counties with the central office located in Columbia.

Among state Departments of Transportation (DOTs) in the US, South Carolina is ranked 40th in the number of square miles (32,020 sq. miles). However, according to the Federal Highway Administration (FHWA), SCDOT has responsibility for maintaining the fourth-largest state-maintained highway system in the nation with approximately 41,000 miles of roads (90,000+ lane miles) and more than 8,400 bridges. SCDOT is organized into seven highway engineering districts headed by a District Engineering Administrator (DEA). The Agency's purposes include planning, construction, maintenance and operation of the state highway system, and development of a statewide intermodal and freight program.

A State Transportation Commission (the Commission) composed of nine members – one member from each Congressional District and two at-large members – is the governing authority of SCDOT, while the Secretary of Transportation (the Secretary) is the Chief Administrative Officer of SCDOT. All members of the Commission are appointed by the Governor, subject to approval of the General Assembly. The district Commissioners must be approved by the legislative delegations in the respective Congressional Districts in accordance with S. C. Code Section 57-1-325. The at-large Commissioners must be approved by the House of Representatives and the Senate by a separate confirmation vote in each body. The statutory duties and responsibilities of the Commission are set forth in Title 57 of the Code of Laws.

The Secretary is appointed by the Commission, with the advice and consent of the Senate. The Secretary is charged with the affirmative duty to carry out the policies of the Commission and to administer the day to day affairs of SCDOT. The Secretary carries out the policies of the Commission, and represents the Agency in coordination with other State agencies, local governments, special districts, other states, and the federal government.

Like many other government agencies and state DOTs across the country, SCDOT is operating in a resource-constrained environment and must constantly strive to utilize funding and staff resources more efficiently and effectively. In 2015 and 2016, at the request of members of the General Assembly, including the Legislative Oversight Committee, the Legislative Audit Council (the LAC) undertook an audit of SCDOT's operations beginning with Fiscal Year 2005-06 through Fiscal Year 2014-15. The audit culminated in the publication of a report in April 2016 that included more than 140 agency-specific recommendations.

The South Carolina General Assembly in the Fiscal Year 2016-17 budget provision directed the Agency to conduct an assessment of its internal structure and key functions related to project identification, selection and prioritization and make recommendations on improvements that would cause SCDOT to operate more effectively and more cost-efficiently.

The Project Team, consisting of The Conti Group LLC (Conti Group), KPMG LLP (KPMG) and the Kercher Group, was selected to conduct the Structural Efficiencies Study (the Study or Project). As part of the Study, the Project Team conducted a high-level review of SCDOT's internal

structure within the context of improving the delivery of transportation services as part of its responsibilities with the goal of increasing the efficiency and cost-effectiveness of the Agency and identifying areas of improvements and leading practices from other states with comparable transportation systems to address South Carolina's transportation needs.

Project Objective

The objective of the Study is to evaluate SCDOT's internal structure as it relates to the delivery of services for which it is responsible, with the goal of increasing the efficiencies and cost-effectiveness of the Agency, particularly in the areas of project prioritization and selection; project delivery; relationships with other South Carolina transportation entities, and technology and information management systems supporting the core functions of the Agency.

Through the analysis presented in this report, the Project Team identified industry leading practices and areas of improvements to effectively utilize statewide transportation funding to address South Carolina's transportation needs that are summarized in the Key Recommendations section below.

Project Scope

The Study included seven key areas of focus as described below in order to achieve SCDOT's overarching goal of increasing the efficiency and cost-effectiveness of the Agency:

1 Strategic Plan

— This section of the report compares SCDOT's strategic plan and associated performance measures with its peer group to identify potential improvements to SCDOT's strategic plan and performance measures.

2 Organizational Structure

— This section of the report compares SCDOT's internal structure against its peer to improve delivery of transportation services, identify industry leading practices, and assess potential enhancements that can be incorporated by SCDOT to improve its organizational structure.

3 Project Prioritization and Selection

— This section of the report compares SCDOT's project prioritization and selection process with its peer group to identify potential improvements, including external stakeholder communications.

4 Project Delivery

— This section of the report evaluates the roles, responsibilities, decision making steps, outsourcing strategy, and accountability for project delivery at SCDOT, including assessing the suitability of any project management tools in use, and evaluating SCDOT's performance standards for project delivery in comparison to leading practices in use by the peer group.

5 Relationships with Other South Carolina Transportation Entities

— This section of the report evaluates SCDOT's role and relationships with local transportation entities, including Metropolitan Planning Organizations (MPOs), Councils of Government (COGs), and County Transportation Committees (CTCs) in terms of project prioritization and selection, project delivery, and SCDOT's project design and management fee structure. In addition, this section identifies leading practices from the peer group that may improve the efficiency and cost-effectiveness of SCDOT in utilizing statewide transportation funding to address the State's transportation needs.

6 Technology and Information Management Systems

— This section of the report evaluates SCDOT's existing technology and information management systems for suitability and effectiveness as they relate to the delivery of services, such as project management and maintenance management, and the systems supporting overall Agency performance management addressing its strategic objective.

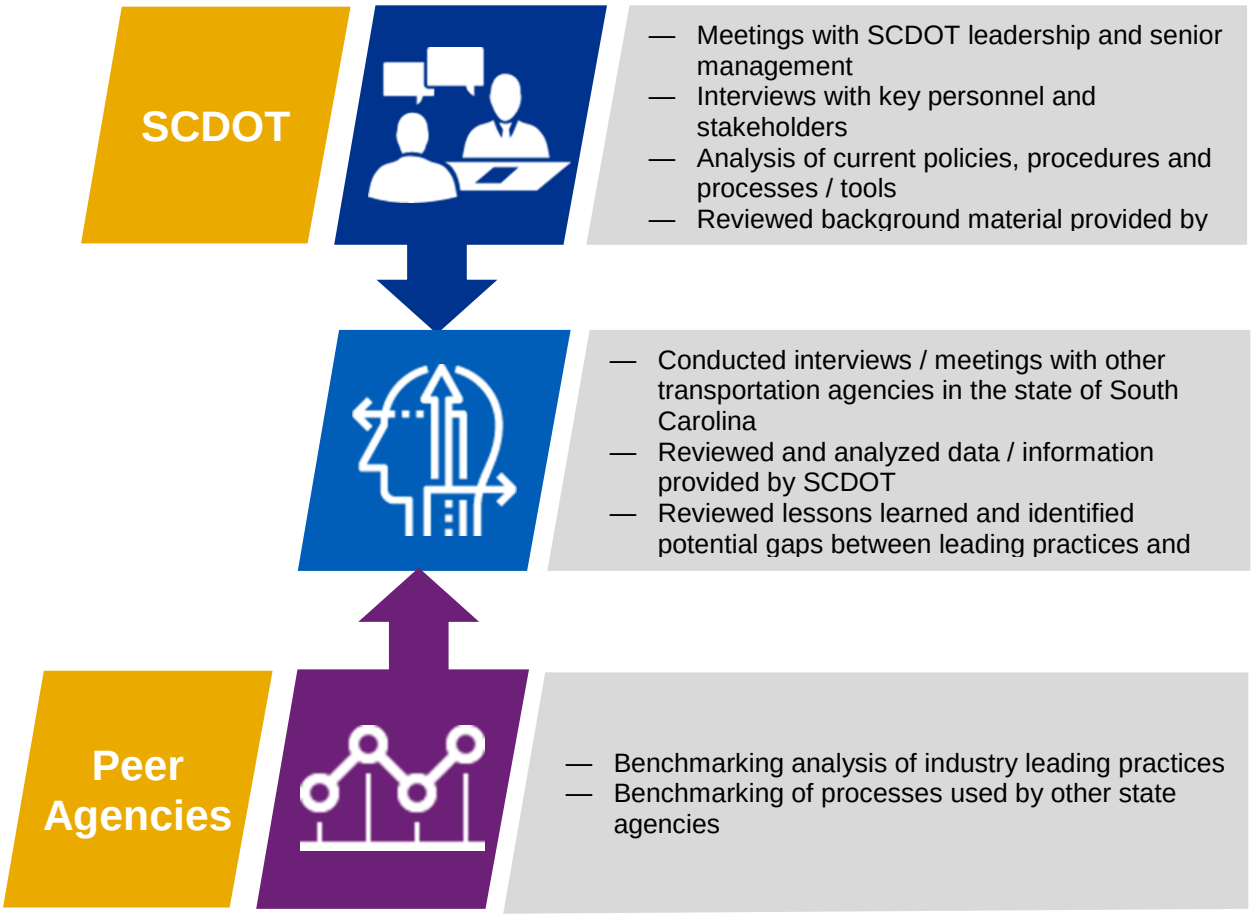
7 Transportation Funding

— This section of the report compares the State's transportation funding with its peer group to identify opportunities for cost savings and recommend alternatives based on leading practices that would increase the effectiveness of statewide transportation spending.

Project Approach

Exhibit ES 1 presents the Project Team's approach to the Study.

Exhibit ES 1: Project Approach to the Study



Source: The Project Team

In support of the Study, the Project Team conducted a series of meetings, workshops, and interviews with SCDOT leadership, senior management, key stakeholders (i.e., MPOs, COGs and local governments) and SCDOT personnel to review and evaluate current workings and processes within SCDOT, as well as to perform the corresponding analysis of the Agency's current policies, procedures and processes as they relate to SCDOT's strategic plan, internal organizational structure, project prioritization and selection, project delivery, relationships with other transportation entities, technology and information management systems, and transportation funding. In addition to the aforementioned meetings, workshops, and interviews conducted, the Project Team also reviewed material, information and data provided by SCDOT, including South Carolina Directives and Legislation, and the LAC report dated April 2016 to provide contextual understanding of the relevant legislations, as well as background and data points related to the primary focus areas for this Study.

Next, the Project Team conducted interviews, meetings and a benchmarking exercise with a peer group of comparable transportation entities to identify potential gaps between leading practices

and SCDOT's current practices in order to develop recommendations and a roadmap towards improving existing processes and achieving efficiencies and cost-effectiveness of the Agency.

Key Recommendations

The assessment of SCDOT's strategic plan, organizational structure, project prioritization and selection, project delivery, relationships with other transportation entities, technology and information management systems, and project funding identified a number of improvement opportunities to further enhance SCDOT's organizational efficiencies and enable the Agency to operate more effectively and cost efficiently.

A summary of key recommendations as set forth in each of the chapters from the report are summarized below. Detailed descriptions of each recommendation can be found within each chapter of the report.

2) Organizational Structure

- Recommendation #1: Implement a Target Operating Model for the Agency
- Recommendation #2: Revise the current organizational structure
- Recommendation #3: Enhance SCDOT's existing Key Performance Indicators (KPIs) and Management Reports
- Recommendation #4: Formalize a Talent Management Plan for the Agency

3) Project Prioritization and Selection

- Recommendation #1: Align program funding and the prioritization and selection process with SCDOT's strategic goals
- Recommendation #2: Develop a standardized and integrated project prioritization process/system
- Recommendation #3: Improve transparency of the project prioritization and selection process
- Recommendation #4: Incentivize the MPOs/COGs to promote projects that align with SCDOT's strategic goals

4) Project Delivery

- Recommendation #1: Increase the role, authority and structure of the Project Delivery Office
- Recommendation #2: Evaluate trade-offs between project delivery methods
- Recommendation #3: Develop an outsourcing strategy to deliver the growing volume of capital programs
- Recommendation #4: Expand the use of an Alternative Project Delivery program for appropriate projects to address SCDOT's growing capital program
- Recommendation #5: Work in partnership with industry participants to augment market capacity

5) **Relationships with Other South Carolina Transportation Entities**
   - Recommendation #1: Work collaboratively with local agencies to develop a shared vision for a transportation program that addresses statewide regional and local needs
   - Recommendation #2: Enhance engagement of Districts with local government agencies
   - Recommendation #3: Improve the process for review and approval of plans submitted by local governments to accelerate delivery of projects on the SCDOT network
   - Recommendation #4: Consider a pilot project that leverages the capabilities of local governments to perform or supplement maintenance work on SCDOT's secondary roads
   - Recommendation #5: Expand the benefits of asset management beyond the boundaries of SCDOT
6) **Technology and Information Management Systems**
   - Recommendation #1: Develop an Asset Management Systems Strategic Plan
   - Recommendation #2: Develop an integrated Project Delivery Management System
   - Recommendation #3: Reengineer current cash flow processes and tools to increase automation
   - Recommendation #4: Reassess current strategic dashboards in light of the new strategic goals
   - Recommendation #5: Develop a strategic plan for increasing mobile data collection
7) **Transportation Funding**
   - Recommendation #1: Evaluate maintenance requirements in the context of planned improvements under the 10 Year Plan
   - Recommendation #2: Right-size fleet services to optimize SCDOT's fleet portfolio
   - Recommendation #3: Implement a strategic sourcing initiative to aggregate spending under competitively procured contract categories

Implementation Considerations

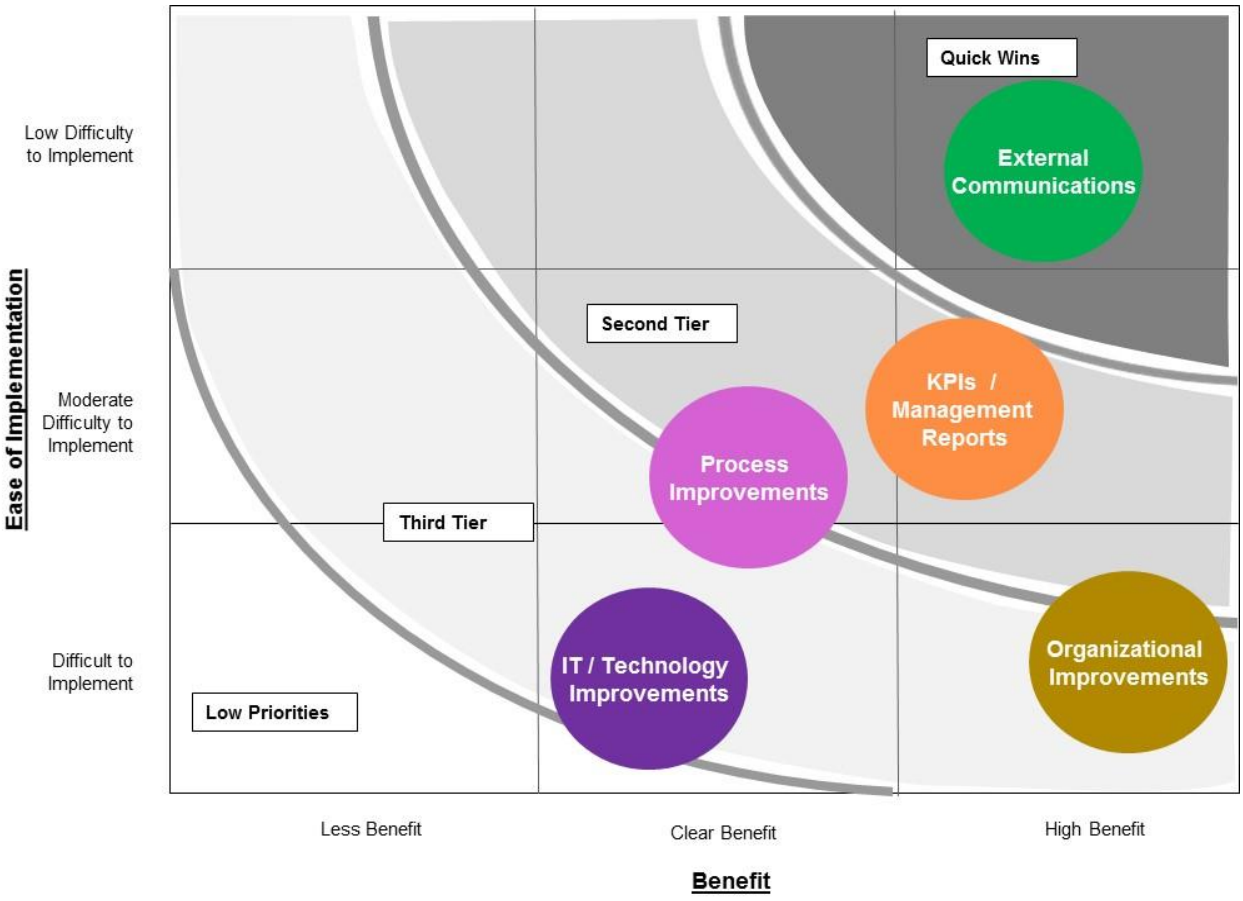
While the Study's focus areas were diverse – and the recommendations have been tailored to the specific needs and opportunities identified in each of the Study focus areas – each of the recommendations made throughout this report fall into five broad classifications. These classifications are:

- **External communications**: Recommendations that are focused on improving SCDOT's communications with other transportation entities and external stakeholders.
- **IT/technology improvements**: Recommendations that are focused on improving the way SCDOT manages its business from a technology and management systems, and data management perspective.
- **KPIs and management reports**: Recommendations that are focused on helping SCDOT to improve how the Agency tracks KPIs and links KPIs to management and execution of its core responsibility of providing a safe and reliable transportation network.
- **Organizational improvements**: Recommendations that are intended to help SCDOT to optimize the organizational structure and delivery of transportation services.

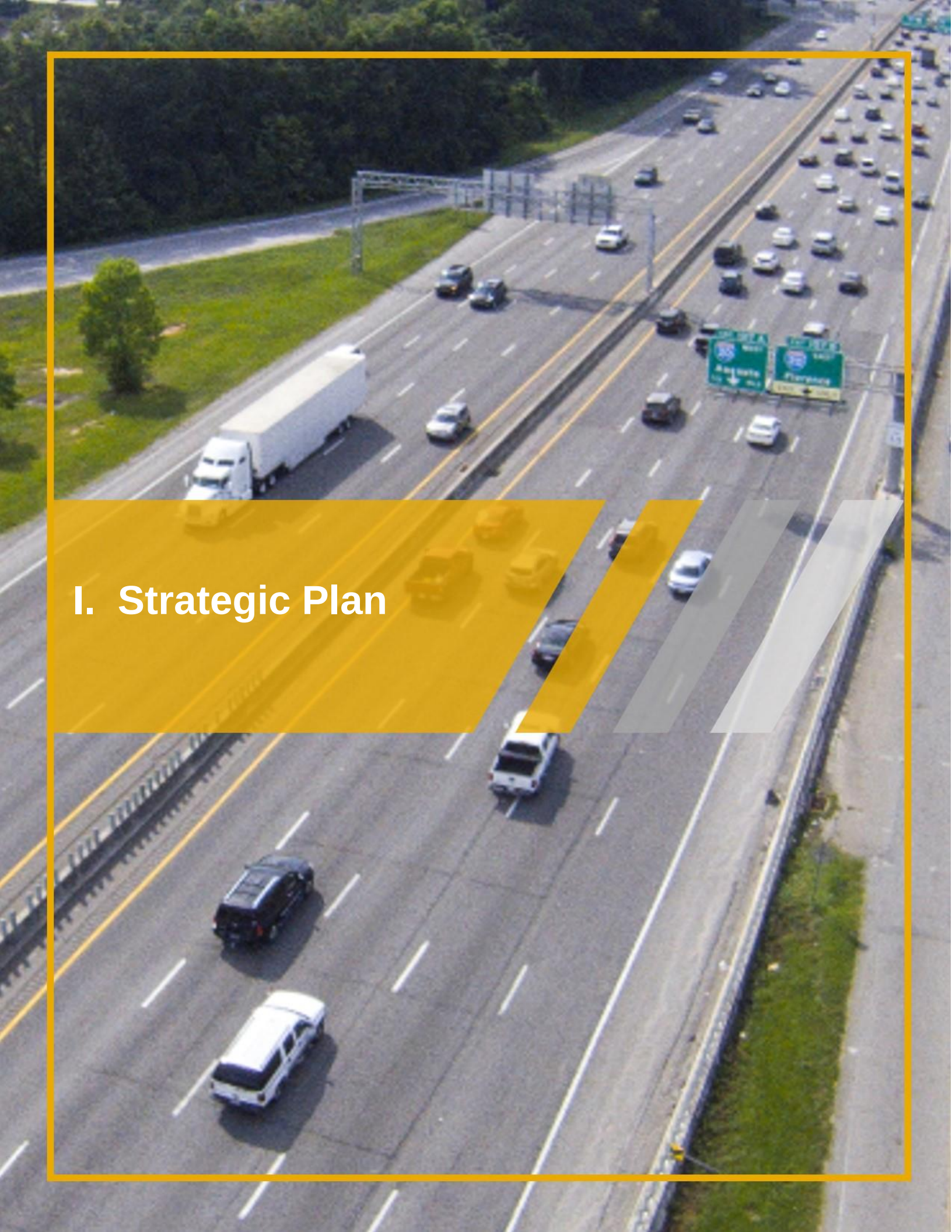
— **Business process improvements**: Recommendations that are designed to help SCDOT enhance key business processes, review and approval workstreams, and program functions to ensure that the Agency achieves its strategic objectives.

Exhibit ES 2 presents the potential trade-offs between implementation costs and benefits of recommendations presented in the report.

Exhibit ES 2 – Implementation Complexity vs. Benefit



Whereas the specifics of each recommendation will vary, recommendations focused on external communications tend to offer the greatest benefit relative to implementation costs. KPIs/management report recommendations are similar, however, the process for tracking and reporting KPIs could increase its implementation complexity. While organizational improvements – those focused on driving improvements to SCDOT's organizational structure – have the highest benefit, they also tend to be difficult to implement, considering the number of employees, business processes, and policies involved in delivering transportation services. Technology and management systems improvements and business process improvements have clear benefits – however, technology improvements, such as procuring/developing and implementing new systems, can become very expensive, both in terms of systems acquisition as well as on-going operational/maintenance costs.



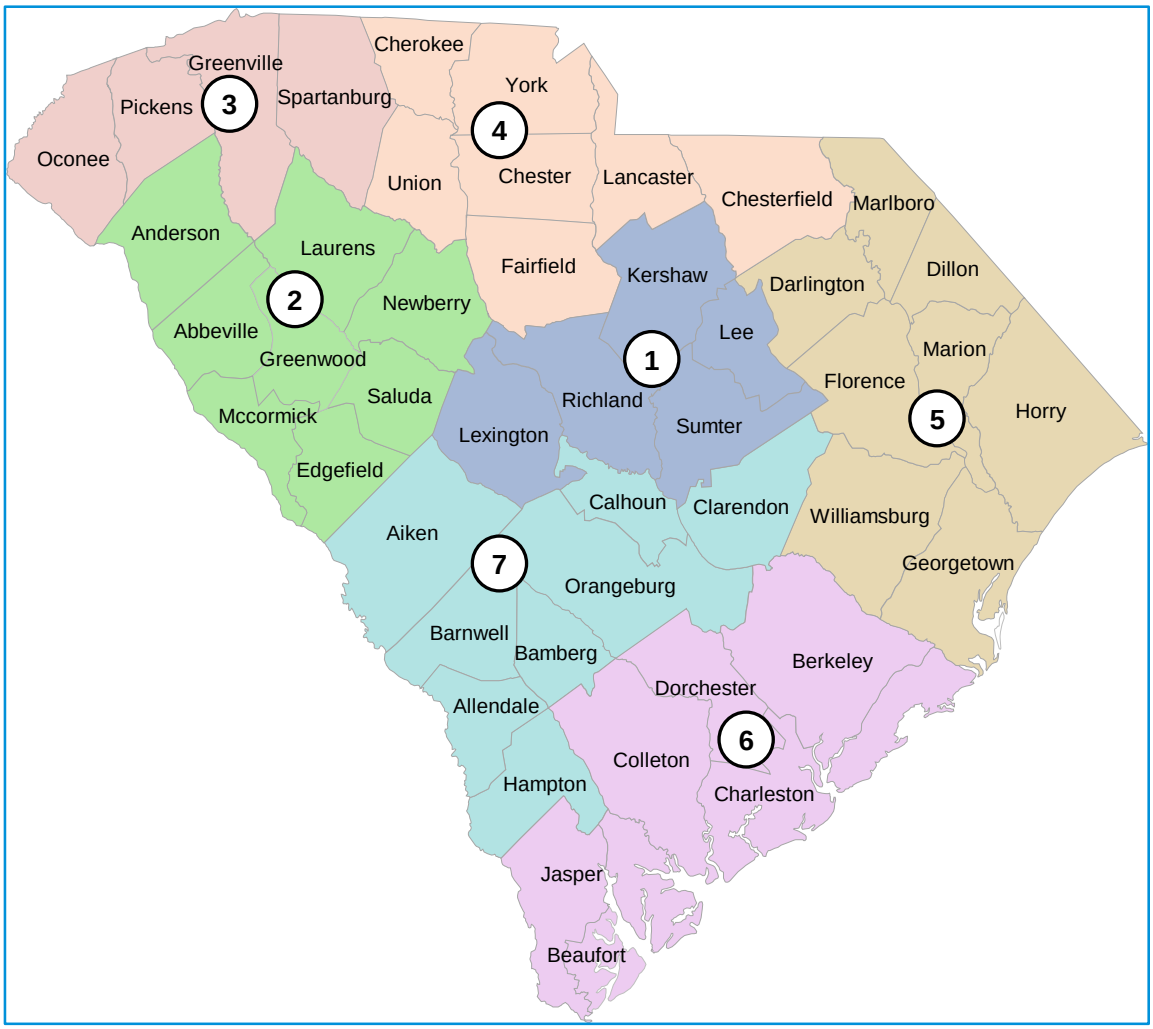
I. Strategic Plan

Strategic Plan

Introduction

The South Carolina Department of Transportation (SCDOT or the Agency) is one of the five largest state agencies in South Carolina (the State), with approximately 4,600 full-time equivalent (FTE) employees and a total annual budget of $2.36 billion for fiscal year (FY) 2017-2018. SCDOT has a presence in each of the State's 46 counties, with the Agency's central headquarters (HQ or central office) located in Columbia, the State capital. The Agency is organized into seven Engineering Districts (District) with each District headed by a District Engineering Administrator (DEA) who oversees maintenance, construction and traffic engineering activities within that District.

Exhibit 1.1 – SCDOT Engineering Districts Map



Source: SCDOT

A State Transportation Commission (the Commission) composed of nine members – one member from each Congressional District and two at-large member – is the governing authority of SCDOT, while the Secretary of Transportation (the Secretary) is Chief Administrative Officer of SCDOT. All members of the Commission are appointed by the Governor, subject to approval of the General Assembly. The district Commissioners must be approved by the legislative delegations in the respective Congressional Districts in accordance with S. C. Code Section 57-1-325. The at-large Commissioners must be approved by the House of Representatives and the Senate by a separate confirmation vote in each body. The statutory duties and responsibilities of the Commission are set forth in Title 57 of the Code of Laws.

The Secretary is appointed by the Commission, with the advice and consent of the Senate. The Secretary is charged with the affirmative duty to carry out the policies of the Commission and to administer the day to day affairs of SCDOT. Other affirmative duties of the Secretary are set forth in S. C. Code Sections 57-1-430 through 57-1-500. The Secretary carries out the policies of the Commission, and represents the Agency in coordination with other State agencies, local governments, special districts, other states, and the federal government.

Summary of Strategic Plan Review

Objectives for Review of SCDOT's Strategic Plan

The objectives for reviewing SCDOT's Strategic Plan and associated performance measures were to compare them to industry leading practices in comparable Departments of Transportation (DOTs), identify potential improvements to SCDOT's Strategic Plan and performance measures, and assist the Agency to improve its Strategic Plan. The Project Team, in consultation with the Secretary and her senior leadership team, selected six DOTs based on attributes similar to SCDOT, proximity to the State/similar geographic location, size of transportation system, scope of operations, and services provided. Together, these group of DOTs are referred to as the peer group throughout this report and include the following:

— Georgia Department of Transportation (GDOT)

— Missouri Department of Transportation (MODOT)

— North Carolina Department of Transportation (NCDOT)

— Pennsylvania Department of Transportation (PennDOT)

— Virginia Department of Transportation (VDOT)

— West Virginia Department of Transportation (WVDOT)

For a geographical illustration of the peer group, please refer to Appendix I.

The Project Team reviewed strategic plans and associated performance measures for the peer group and prepared a summary of observations to assist the process of updating the Agency's Strategic Plan, which is summarized below.

Strategic Planning Process

Historically, SCDOT has developed several versions of its strategic plan to set forth a vision and mission for the Agency. However, these plans were not fully implemented due to numerous leadership changes, a wide range of competing priorities, and a shifting funding and regulatory landscape. Additionally, the strategic planning process up until recently was viewed largely as a required exercise rather than an opportunity for the organization to identify its view of the best path forward in realizing its strategic goals and broader mission.

During the Project Team's interactions with the current SCDOT leadership, it became evident that leadership is committed to developing a Strategic Plan that is focused on addressing the transportation challenges facing the State and moving the Agency forward as an organization and steward of the State's roadway network. Most importantly, the leadership team indicated a strong commitment to implementing the revised Strategic Plan and to measuring the Agency's performance against a clear and specific set of goals.

The following objectives were established to guide the strategic planning process:

— The Strategic Plan should help set a new direction for SCDOT and transportation services in the State.

— The Strategic Plan should set clear goals and strategies to help SCDOT achieve the success envisioned.

— The Strategic Plan should provide strategic direction and guidance for SCDOT's programs, projects, and transportation services.

— The Strategic Plan should help SCDOT to develop associated performance measures that will help demonstrate progress made in achieving stated goals.

The Agency's core mission, vision and values are outlined in State law, and are summarized below:

Mission:

"SCDOT connects communities and drives our economy through the systematic planning, construction, maintenance and operation of the state highway system and the statewide intermodal transportation and freight system."

Source: SCDOT

Vision:

"The vision of SCDOT is to rebuild our transportation system over the next decade in order to provide adequate, safe and efficient transportation services for the movement of people and goods in the Palmetto state."

Source: SCDOT

Values:

The SCDOT team recognizes the importance of all SCDOT divisions, units, and offices functioning as one team—One SCDOT. The SCDOT workforce not only serves our citizens and businesses to accomplish the mission and achieve the vision, it also exemplifies the qualities and holds the following values that make SCDOT one of the top DOTs in the nation.

Source: SCDOT

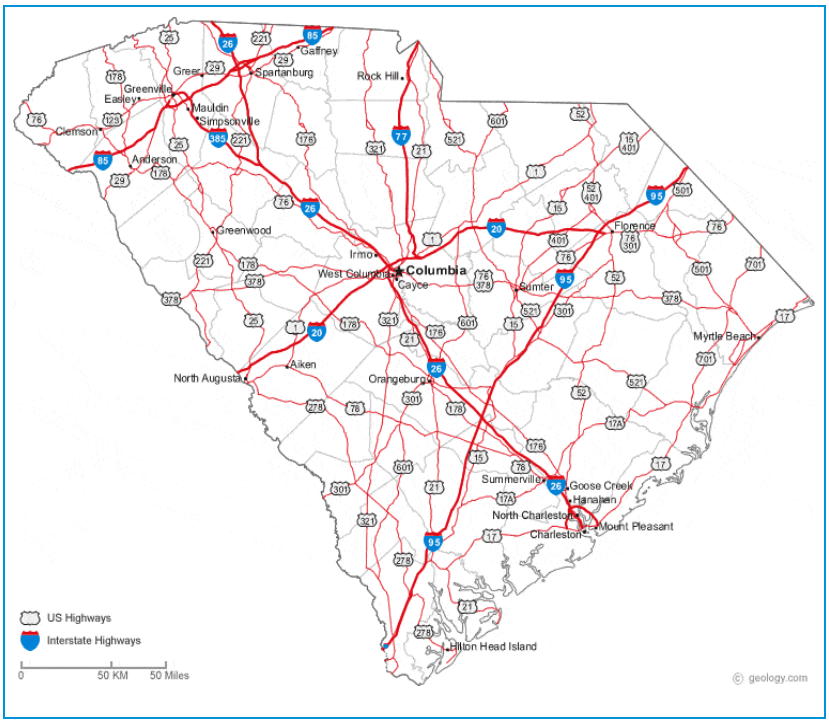
Exhibit 1.2 – SCDOT Values

Source: SCDOT

Strategic Planning Workshop # 1

With a goal to develop and finalize an actionable Strategic Plan by the beginning of the State fiscal year in July 2017, the Project Team facilitated a workshop with the leadership team to review the peer group strategic plans and goals, and to begin the process of developing specific and measurable goals for the State.

Exhibit 1.3 – South Carolina Transportation System



All participants were requested to identify the most significant transportation needs in the State in the context of the State's transportation system.

Participants were requested to log into *Poll Everywhere* (an online meeting participation tool) and place up to three dots on the State map where they felt there was a specific transportation need or geographical issue.

The potential issues and challenges facing the State's transportation system, as well as opportunities for improvement discussed at the workshop are summarized below:

Source: SCDOT Strategic Planning Workshop

— The State's road system needs major reconstruction.

— SCDOT's focus should be on "Back to the Basics."

— SCDOT needs to plan for the future and effectively utilize available resources.

— The 10-Year Plan will help return the transportation network to an acceptable condition.

— Focus should be on addressing "structurally deficient" bridges and not on "functionally obsolete" bridges.

— Due to lack of adequate funding, SCDOT is decades behind in delivering capacity projects (i.e., the non-interstate network represents a big gap for the State that is not being addressed).

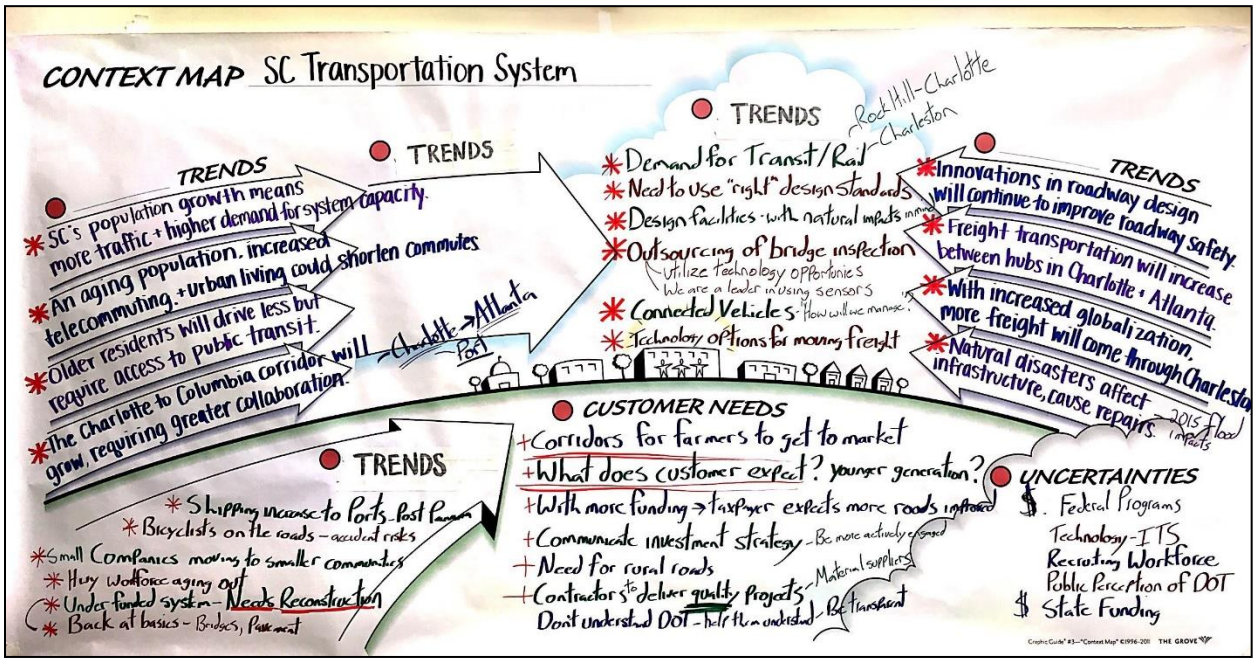
— SCDOT is facing an ongoing challenge with successfully describing how projects are selected and prioritized.

— Customer/Citizen-centric focus: Effective communication with internal and external stakeholders, and customers is important (SCDOT should utilize media through carefully crafted messages to inform and educate the progress being made to address challenges facing the Agency).

— High-performing organization: Partnering with design and construction industry participants is required to deliver the volume of planned projects.

These comments were instrumental in developing the goals and strategies that are at the heart of the new Strategic Plan. Additionally, to better understand the trends in the State's transportation system, the participants were asked, "What are the most important issues and trends SCDOT should be paying attention to over the next five years as it carries out its mission?"

Exhibit 1.4 – Strategic Planning Context Map



Source: SCDOT Strategic Planning Workshop

A summary of trends, customer needs and uncertainties identified during the workshop is presented below:

— Key Trends:

  - The State's population growth means more traffic and higher demand for system capacity is likely in the future.

- An aging population, increased telecommuting, and denser urban living patterns may lead to shortened commutes and higher demand for public transit.
- Augmenting bridge inspection: Leverage sensors and technology to reduce manual processes.
- Autonomous/Connected vehicles: “What impact might they have on SCDOT’s network, and how will SCDOT manage these impacts?”
- Innovations in roadway design will continue to improve roadway safety.
- Freight transportation will increase between hubs in Charlotte and Atlanta, as well as from coastal and inland ports.
- Highway workforce aging – How to manage workforce planning?

— Customer Needs:

- Corridors for moving goods and services to market.
- With additional funding, taxpayers expect more roads to be improved.
- Communicate investment strategy: Be more actively engaged.
- Need for rural road expansion and improvement.
- Contractors to deliver quality projects: Material suppliers need to plan in advance.

— Uncertainties

- Federal Programs Status and Funding/Technology/Intelligent Transportation System (ITS).
- Recruiting and retention of workforce.
- Public perception of SCDOT.
- State funding to address transportation infrastructure needs.

Envisioning Success

Finally, the participants were requested to define what success looks like for SCDOT (i.e., where SCDOT wants to be in the next decade). Below are the themes, as illustrated in Exhibit 1.5, which emerged from the discussion.

— Themes:

- SCDOT ranked the # 1 DOT in the nation.
- Road work causes small business boom!
- Carolina Crossroads nearing completion.
- A recipe for success for SCDOT: how the Agency brought a deteriorated system back to life.
- “From There to Here”: “Poor” to “Good” rating is GREAT for the State’s transportation infrastructure.
- Traffic fatalities down significantly.

Exhibit 1.5 – Themes for Defining Success

Strategic Planning Workshop # 2

The objective of the second workshop was to develop consensus among participants for the final goals and strategies to be included in the revised Strategic Plan, and to define the performance measures that will help SCDOT to determine the implementation success of the Strategic Plan.

The following five goals were selected for the Strategic Plan 2018–2020:

— Goal # 1: Improve safety programs and outcomes in our high-risk areas.

— Goal # 2: Maintain and preserve our existing transportation infrastructure.

— Goal # 3: Improve SCDOT program delivery to increase the efficiency and reliability of our road and bridge network.

— Goal # 4: Provide a safe and productive work environment for SCDOT employees.

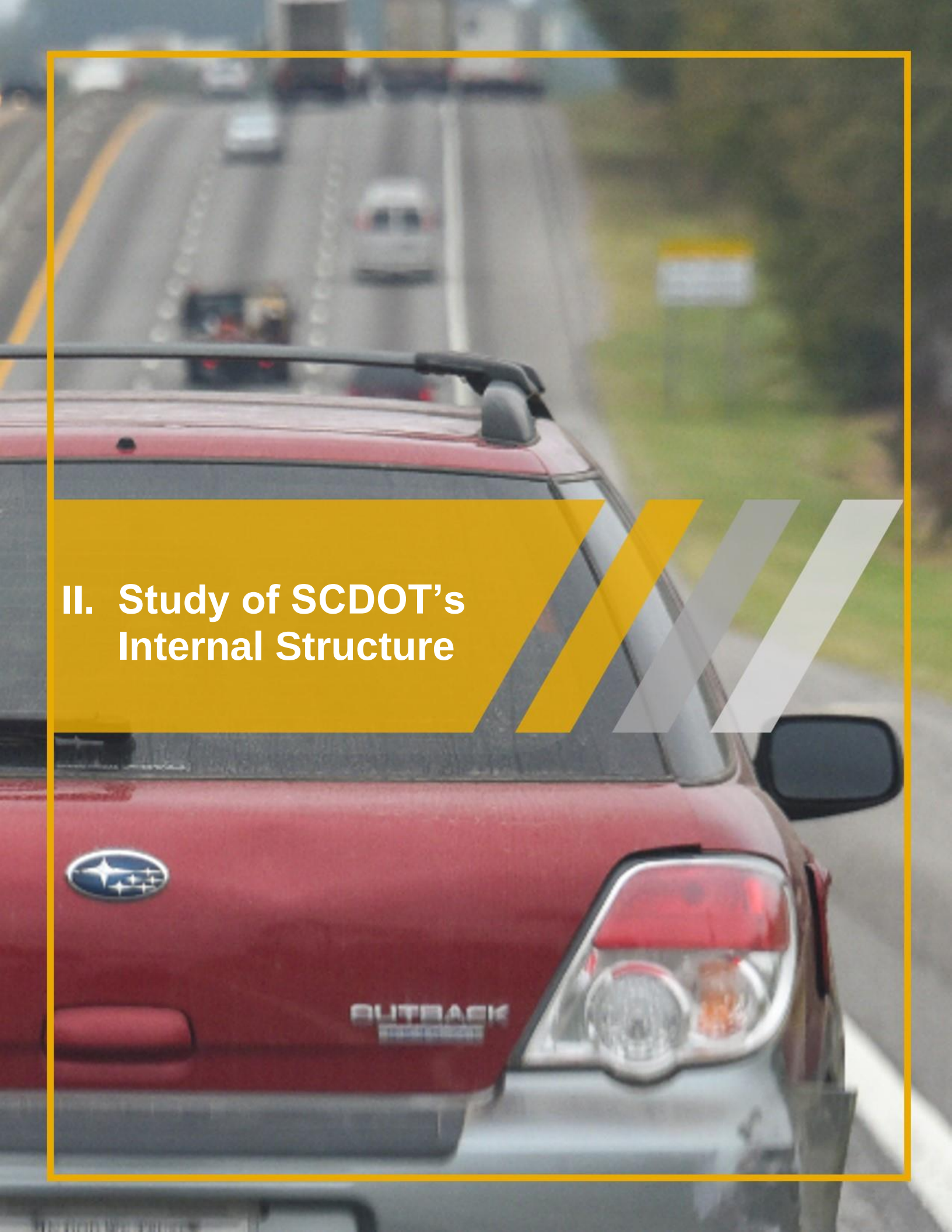
— Goal # 5: Earn public trust through transparency, improved communications, and audit compliance.

These strategic goals, along with corresponding strategies, are intended to empower SCDOT to work with, and engage, its employees and public and private partners in fulfilling SCDOT's vision of rebuilding the State's transportation system over the next decade in order to provide adequate, safe and efficient transportation services for the movement of people and goods in the Palmetto state.

Secretary Hall and her leadership team have indicated that their task over the next 10 years and beyond is to repair and rebuild the State's transportation network to ensure that the citizens and businesses of the State can travel on a safe and reliable system. The leadership team emphasized its commitment to implementing the Strategic Plan to achieve the Agency's stated goals to enhance the State's transportation infrastructure and maintain the system to ensure it continues to serve as the backbone of the State's growth for years to come.

The Project Team would like to recognize and applaud the efforts, energy, and commitments of Secretary Hall and her leadership team throughout the strategic planning process. SCDOT leadership has begun to inform the Agency's employees, its partners in the public and private sectors, and the Commission and Legislature about the new direction for SCDOT.

For a copy of SCDOT's Strategic Plan 2018–2020, please refer to Appendix I.



II. Study of SCDOT's Internal Structure

Study of SCDOT's Internal Structure

Introduction

South Carolina is ranked 40th in the number of square miles (32,020 sq. miles), however, according to the Federal Highway Administration (FHWA), SCDOT has responsibility for maintaining the fourth-largest highway system in the nation with approximately 41,000 miles of roads (90,000+ lane miles), more than 8,400 bridges, and providing mass transit services to the State's citizens and businesses.

SCDOT manages its responsibilities with a staff of approximately 4,600 men and women who work in all of the State's 46 counties. Like many other DOTs, more than 90 percent of the Agency's resources are assigned to the Highway Maintenance and the Engineering Administration/Project Management.

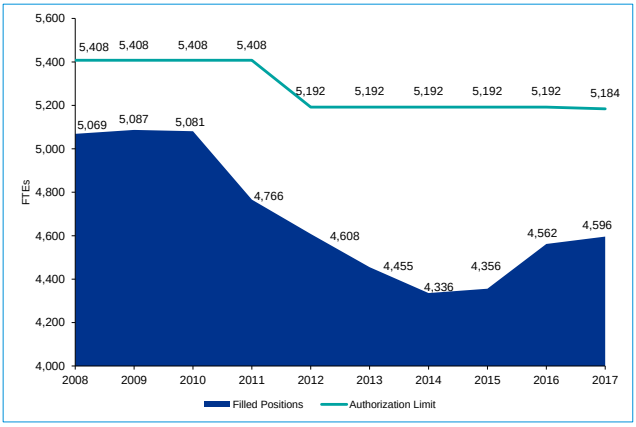
Exhibit 2.1 below, presents a breakdown of SCDOT's FTE staffing information by organizational units as of July 2017.

Exhibit 2.1: SCDOT's Staffing Information by Organization Units as of July 2017

Organizational Unit	Planned FTE Level	Filled FTEs	Division Vacancy Rate
General Administration	281	248	12%
Engineering Administration/Project Management	1,537	1,353	12%
Highway Maintenance	3,269	2,852	13%
Tolls	2	2	0%
Intermodal Planning	95	81	15%
Total	**5,184**	**4,536**	**13%**

Source: SCDOT

Exhibit 2.2: FTE Trends (as of January 2017)

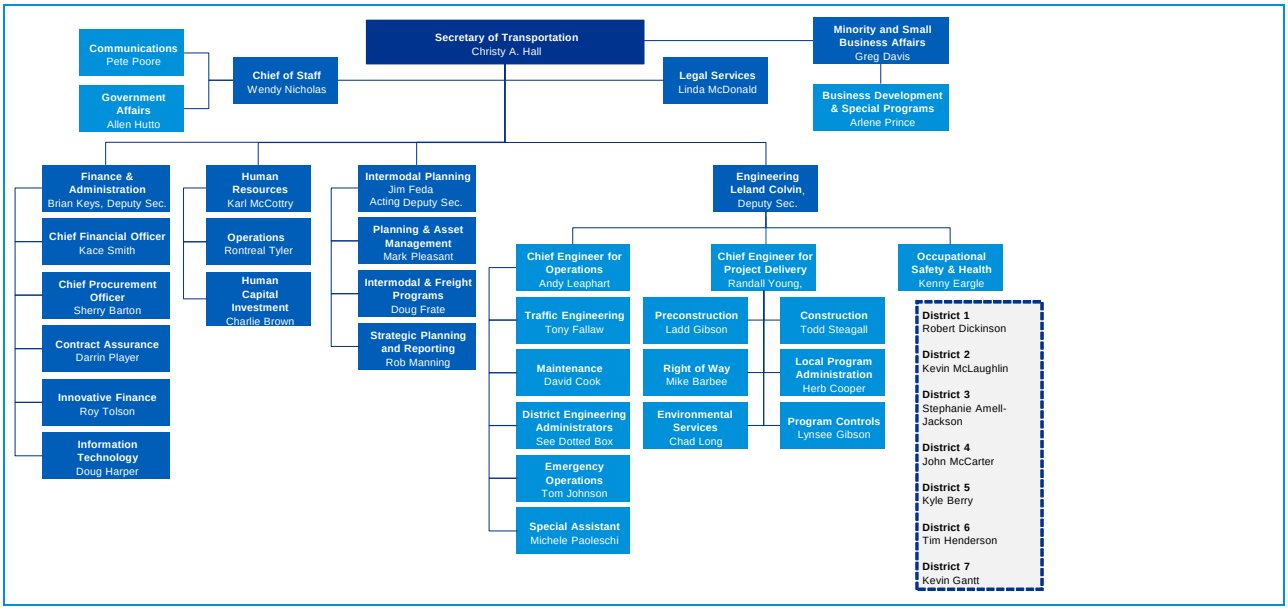


Source: SCDOT

As shown in Exhibit 2.2, the staffing strength (i.e., filled positions) significantly reduced from the 2010 level of more than 5,000 FTEs to the current level of approximately 4,600 FTEs. The Districts' staffing represents approximately 75 percent of the Agency's total FTEs and they include a variety of technical, maintenance, procurement, and administrative staff in each District. The Highway Maintenance unit has the highest number of budgeted and actual FTEs.

As shown in Exhibit 2.3, and also in Appendix II, the SCDOT organizational chart includes a secretary of transportation assisted by a chief of staff, three deputy secretaries, and functional offices headquartered in Columbia that provide administrative and technical support to SCDOT's seven districts. As described in the Strategic Plan chapter, a DEA manages each district office and oversees construction, maintenance and traffic engineering activities of its area's transportation system.

Exhibit 2.3: SCDOT's Organizational Structure



Source: SCDOT

SCDOT's organizational structure is similar to common forms of organization used by a majority of DOTs. In this form organizational structure, the state has a single state transportation agency that is organized into divisions or organizational units based on functional activities such as administration, finance, planning, engineering, operations, and construction.

Organizational charts for the peer group are presented in Appendix II.

Summary of SCDOT Internal Structure Review

Objectives

As part of the Study, the Agency requested a high-level review of SCDOT's internal structure within the context of improving the delivery of transportation services with the goal of increasing the efficiency and cost-effectiveness of the Agency, identifying areas of improvement and leading practices from other states with comparable transportation systems to address the State's transportation needs.

With the passage of the Roads Bill that initiated an annual two-cent increase on the State gas tax for the next six years, the Agency is expecting approximately $600 million in additional revenue by 2024. This additional funding is scheduled to be directed to four key priorities for investment: Resurfacing, Interstate Widening, Bridges, and Rural Road Safety programs.

The objectives for the review of SCDOT's internal structure were to:

— Assess SCDOT's project delivery functions to improve the quality of the statewide transportation services;

— Remove operational barriers and improve the efficiency and effectiveness of operations; and

— Recommend opportunities for improvement that would enable SCDOT to operate more effectively and with greater cost-efficiency.

Key Activities Performed

The Project Team focused its efforts on three key areas to align the Agency's vision and performance measures to enhance its delivery of services:

1) Evaluate SCDOT's internal structure in the delivery of services under its responsibilities with the goal of increasing the efficiency and cost-effectiveness of the Agency;

2) Review SCDOT's interrelationships with other transportation agencies in the State; and

3) Review practices from the peer group that may improve the efficiency and effectiveness of SCDOT.

The Project Team conducted a series of interviews with SCDOT leadership, senior management, District staff and select representatives from the Metropolitan Planning Organizations (MPOs) and Council of Governments (COGs), and reviewed information/data provided by SCDOT to assess the Agency's organization structure. The review of SCDOT's internal structure was supported by a benchmarking analysis of comparable transportation systems to identify leading practices and potential areas of improvement. A summary of the benchmarking analysis is presented in the section below.

Peer Group Analysis

Like many other government agencies and DOTs across the country, SCDOT is operating in a resource-constrained environment and is constantly striving to improve its organizational structure and business processes for efficient and effective use of available resources to deliver transportation services. To gain a better understanding of SCDOT's effectiveness and cost-efficiency levels and to guide further assessment of SCDOT's performance, the Project Team conducted a benchmarking analysis specific to the peer group's internal structure, as discussed below:

1) **GDOT**: GDOT is responsible for planning, constructing, maintaining, and improving the state's roads bridges, and interstate highways. GDOT provides planning and financial support for other modes of transportation including rail, transit, general aviation, and bicycle and pedestrian programs. GDOT is organized according to the functional divisions consisting of administration, information technology, operations, preconstruction, construction, legal services, and planning, data, and intermodal development. For more information regarding GDOT's organizational structure, please refer to Appendix II.

2) **MODOT**: MODOT is responsible for maintaining and improving a total of 33,856 center-line miles of roadway within the state of Missouri. MODOT works with the public, transportation partners, state and federal legislators, and other state and local agencies to provide a safe and efficient transportation system to the people of Missouri. MODOT is governed by a six-member Highways and Transportation Commission. Functional units that are responsible for implementing highway and bridge projects, such as planning, design, rights of way, and

construction, report to the Director of Program Delivery. Other highway-related business units such as traffic, highway safety, maintenance, and motor carrier regulation, report to the Director of System Management. All non-highway transportation modes (aviation, railroads, transit, and waterways) are located together in a separate Multimodal Operations Division. For more information regarding MODOT's organizational structure, please refer to Appendix II.

3) **NCDOT**: NCDOT is responsible for maintaining the nation's second-largest state-maintained road network, consisting of approximately 80,000 miles of roadways and 18,000 bridges and culverts across North Carolina, as well as regulating and implementing programs to support rail, aviation, ferry, public transit, and bicycle and pedestrian transportation. NCDOT has evolved into a multimodal agency providing a wide range of projects and services to meet North Carolina's transportation needs. The secretary of transportation, a member of the governor's cabinet, leads the Department, and a 19-member board serves as the Department's governing body and assists in making decisions and approving allocation of funds. For more information regarding NCDOT's organizational structure, please refer to Appendix II.

4) **PennDOT**: PennDOT is responsible for overseeing programs and policies affecting highways, urban and rural public transportation, airports, railroads, ports, and waterways. PennDOT is responsible for maintaining nearly 40,000 miles of highway and roughly 25,000 bridges. More than 10,600 of PennDOT's complement of nearly 12,417 employees are engaged in the maintenance, restoration, and expansion of the state highway system, and they work in central headquarters in Harrisburg and 11 engineering districts, with facilities in all 67 counties. For more information regarding PennDOT's organizational structure, please refer to Appendix II.

5) **VDOT**: Virginia has the third-largest state-maintained highway system in the country, behind Texas and North Carolina. VDOT is responsible for building, maintaining, and operating the 57,867 miles of the state's roads, over 12,000 bridges and tunnels, and through the Commonwealth Transportation Board, it provides funding for airports, seaports, rail, and public transportation. VDOT has approximately 7,500 full-time employees and nine highway districts. For more information regarding VDOT's organizational structure, please refer to Appendix II.

6) **WVDOT**: WVDOT has more than 6,000 full-time employees who work in the Division of Highways; Division of Motor Vehicles; Division of Public Transit; the Public Port Authority; the Parkways, Economic Development and Tourism Authority (W.V. Turnpike); the State Rail Authority; and the Aeronautics Commission. WVDOT provides essential services in transportation, tourism, and economic development. For more information regarding VDOT's organizational structure, please refer to Appendix II.

Summary of Peer Group Comparison

The following four measures were assessed to gain an understanding of how well SCDOT performs in comparison to its peer group:

— Lane miles

— Structurally deficient bridges

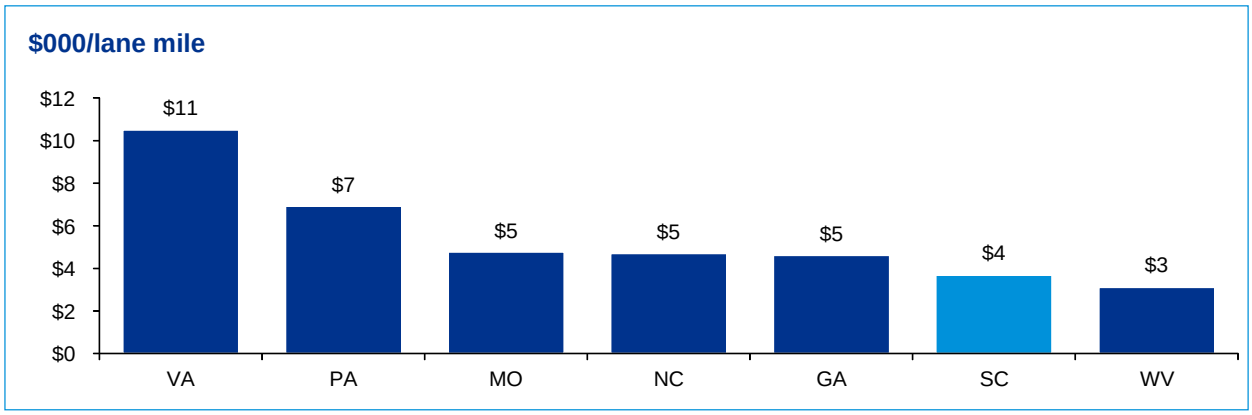
— FTE employees per lane mile

— Fatality rate per vehicle mile traveled

Maintenance per Lane mile

Exhibit 2.4 presents a comparison of total annual maintenance outlay per lane mile for SCDOT and its peer group.

Exhibit 2.4: Maintenance per Lane mile (in $000)1



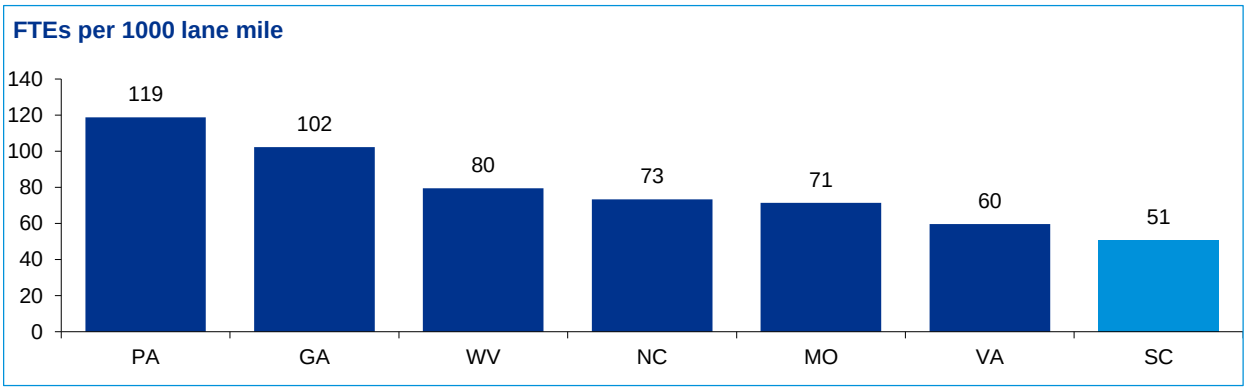
Source: Peer Group Benchmarking Analysis

The State-controlled highway mileage makes SCDOT's network the fourth largest state-maintained system in the nation. Over the past five years, SCDOT's roadway network has remained roughly the same size as the Agency has focused its efforts on preserving and maintaining the existing network. The total number of lane miles maintained by a DOT serves as a good indicator for comparing the overall responsibility of an agency.

FTE per Lane Mile

Exhibit 2.5 presents a comparison of number of FTE employees per 1,000 lane miles for SCDOT and its peer group.

Exhibit 2.5: Number FTE Employees per 1,000 Lane Miles



Source: Peer Group Benchmarking Analysis

In terms of available human resources, SCDOT has approximately 51 FTE employees available per 1,000 lane miles, which is the lowest among its peer group. Additionally, SCDOT's annual maintenance outlay per lane mile is the second-lowest among the peer group with only West

[1] Data as of 2014. For Pennsylvania, data was not received for 2014. Reused data from previous year(s).

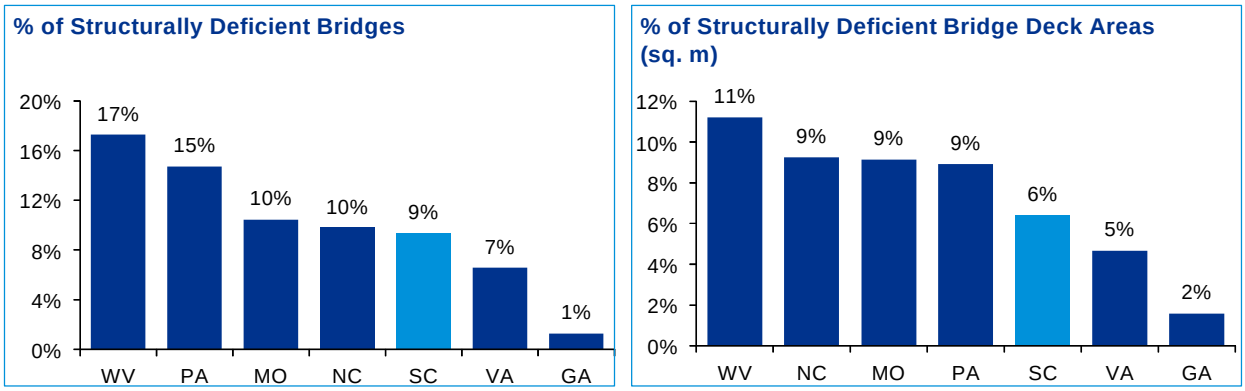
Virginia having a lower annual maintenance outlay per centerline mile. Like many DOTs, approximately 64 percent of SCDOT's employees are associated with highway maintenance function(s). As a result, the low ratios of available FTE employees per lane mile and annual maintenance outlay per centerline mile suggest that SCDOT will have to leverage other means (i.e., leverage private contractors in greater volume, innovative process improvements/technical solutions, etc.) to further boost the Agency's throughput per employee.

Structurally Deficient Bridges

Of the State's 8,400 plus bridges, approximately nine percent are structurally deficient. Over the past five years, SCDOT has made good progress in gradually reducing the percentage of structurally deficient bridges from over 10 percent to 8.9 percent. SCDOT is planning to deploy a portion of additional revenues generated as a result of the Roads Bill for replacing/reconstructing approximately 465 bridges.

Exhibit 2.6 presents a comparison of structurally deficient bridges for SCDOT and its peer group.

Exhibit 2.6: Statewide Structurally Deficient Bridges (Across All Networks)



Source: Peer Group Benchmarking Analysis

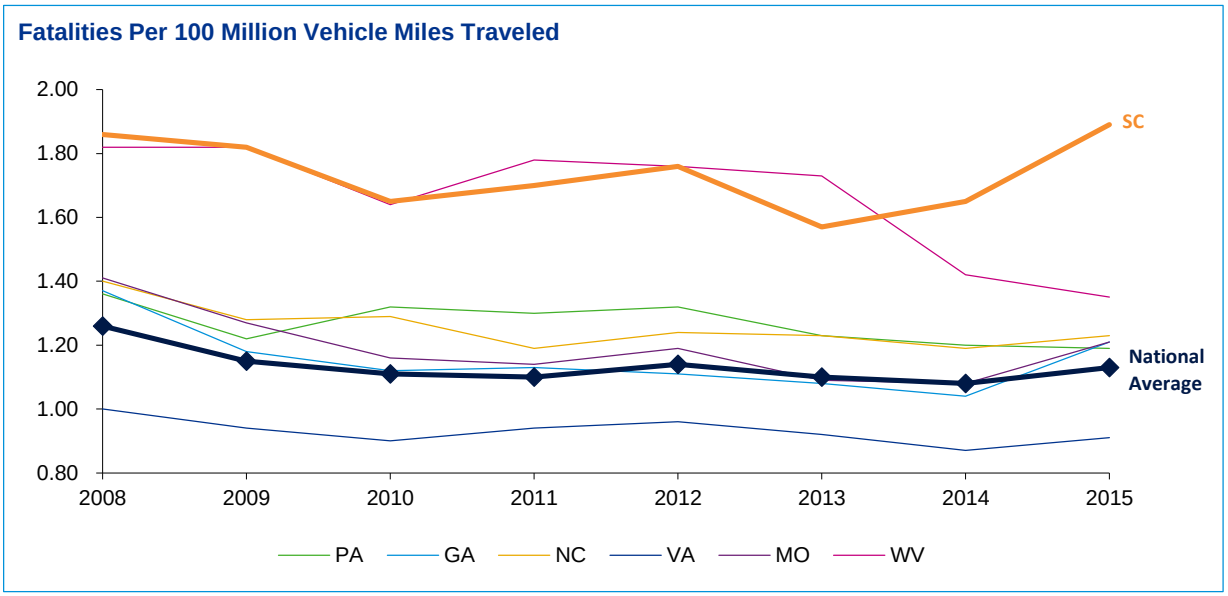
Nationally, 9.1 percent of bridges are determined to be structurally deficient. SCDOT compares well among its peers—both in terms of percentage of the bridges that are structurally deficient as well as the percentage of total deck area that is structurally deficient. From the peer group, only Georgia and Virginia are have lower percentages of structurally deficient bridges and structurally deficient bridge deck area when compared to South Carolina.

Fatality Rate per Vehicle Mile Traveled

SCDOT, as part of its vision and goals identified in the South Carolina Highway Safety Plan, is taking steps to improve the safety and security of the transportation system by implementing transportation improvements that reduce fatalities and serious injuries as well as enable effective emergency management operations. However, there has been a steady increase in reported fatalities in the State over the past four years. Total number of annual reported fatalities have increased from 768 in 2013 to more than 1,000 in 2016—representing an increase of approximately 30 percent over a period of four years.

Exhibit 2.7 presents a comparison of reported fatalities per 100 million vehicle miles traveled (VMT) for SCDOT and its peer group.

Exhibit 2.7: Fatality Rate per 100M VMT



Source: Peer Group Benchmarking Analysis

As shown in Exhibit 2.7, the State has the highest reported fatality rate per VMT among its peer group. The fatality rate is almost double in comparison to Virginia. From 2013, there has been an increase in the reported fatalities in the State while fatalities reported during the same period by the peer group have either decreased or remained relatively constant, except for Georgia and Missouri. This increase in the fatality rate has corresponded with an increase in VMT. In terms of year-on-year increase, the State has experienced an increase of 19 percent (per VMT) from 2011 to 2015—the highest among its peer group.

Summary of Roadway Network

Exhibit 2.8 presents a snapshot of a consolidated summary of roadway network and annual spending of SCDOT and its peer group reported to FHWA for Fiscal Year 2014-15.

Exhibit 2.8: Consolidated Summary of Roadway Network – SCDOT and Its Peer Group

Data	Centerline Miles	Lane Miles	# Bridges	# Bridges Structurally Deficient	Staff (FTEs)	Annual Capital Outlay[2] (in $million)	Annual Total Maintenance (in $million)
NCDOT	79,559	171,687	16,820	1,645	12,591	2,442	807
VDOT	58,648	127,258	12,021	789	7,601	1,766	1,337
SCDOT	41,359	90,465	8,444	787	4,592	959	334
PennDOT	39,756	88,297	15,181	2,235	10,490	3,531	612
MoDOT	33,873	76,289	10,364	1,081	5,444	1,103	364
WVDOT	34,403	70,987	6,921	1,196	5,646	744	221
GDOT	17,949	49,074	6,668	82	5,023	1,149	227

Source: FHWA (https://www.fhwa.dot.gov/policyinformation/statistics/2014/sf12.cfm)

Key Findings

The Project Team performed a high-level review of SCDOT's internal structure to improve the delivery of transportation services and increase organizational efficiency and cost-effectiveness. Additional revenues from the Roads Bill have created an opportunity for SCDOT to make real and significant strides in improving transportation infrastructure. The review of SCDOT's internal structure resulted in the following findings.

Finding # 2.1: A comprehensive workforce strategy is needed to enhance alignment between SCDOT's organizational structure and strategic goals

With the passage of the Roads Bill, SCDOT has begun its journey to address deficiencies and make overall improvements to the transportation network in the State. As part of its 10-Year Plan, the Agency has identified four key priorities for investment: Rural Road Safety, Pavements, Bridges, and Interstate Widenings. The Roads Bill is estimated to provide approximately $600 million in additional funding by 2024 (i.e., approximately $100 million annually over the next six years). The current situation presents an opportunity for SCDOT to:

— Enhance its organizational performance and accountability through better alignment of functions and effective utilization of resources to deliver higher service levels.

— Enhance coordination among business units to promote collaborative culture across the Agency.

[2] Annual capital outlay includes maintenance activities such as resurfacing, bridge rehabilitation, capital projects, etc.

— Improve transparency and accountability for the delivery of projects, programs, services, and initiatives.

— Expand coordination with other transportation agencies (i.e., MPOs, COGs) for planning, designing, delivering, and maintaining projects led by local programs.

During the review, it was noted that there is a need for baselining to examine how staffing levels and the organizational structure would need to be structured to deliver an expanded program, assess the skill sets and training required to increase the Agency's preconstruction and program management capabilities, consider where project delivery capabilities should reside within SCDOT (e.g., within SCDOT's HQ or distributed across Districts), and study how to increase standards of performance and promote best practices. An evaluation of different labor model options will help SCDOT identify functions or tasks that might be better and more cost effectively performed using in-house resources and those that can be outsourced to the private sector.

During the Project Team's review, SCDOT indicated that each DEA is preparing a Resource Plan for the upcoming three to five years to reflect increased funding in their respective Districts. SCDOT has an opportunity to integrate each of the individual plans into an Agency-wide plan and collaborate with the DEAs to identify where there might be opportunities for shared resources, recruiting efforts, and technology investments.

In summary, a comprehensive workforce strategy is needed to improve organizational efficiencies, transparency, and accountability across the Agency.

Finding # 2.2: SCDOT is facing several human resource challenges such as recruiting and retaining key employees

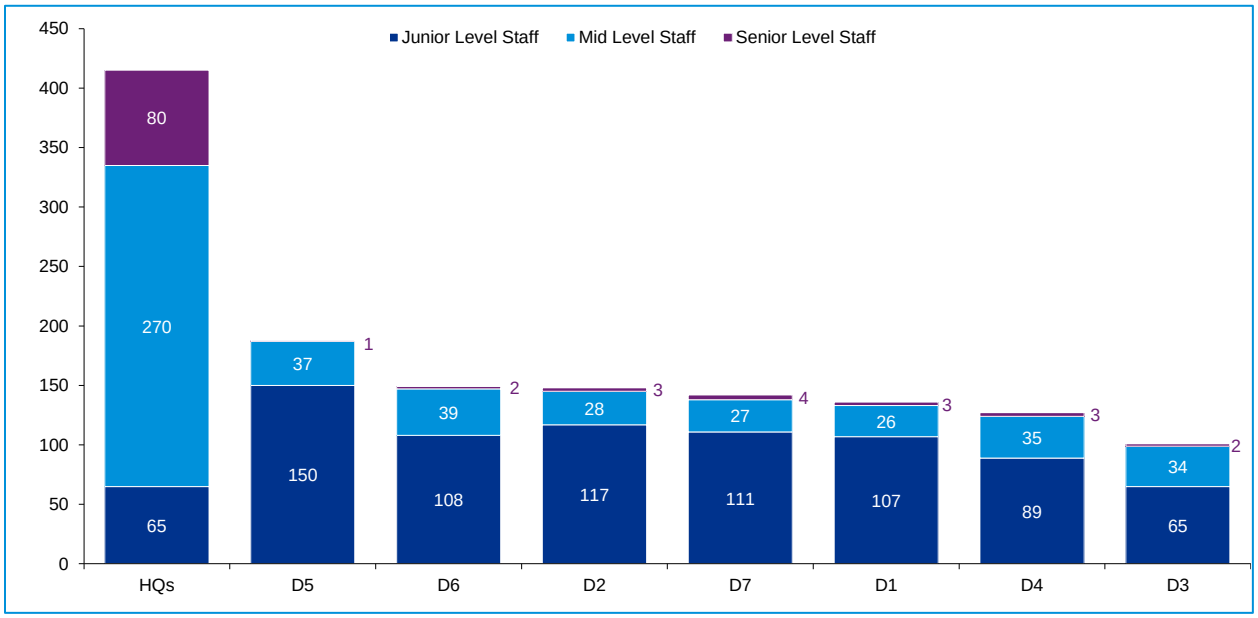
The Project Team's review of SCDOT employees indicated that approximately 30 percent of the current workforce across all levels is eligible for retirement over the next five years. This group of employees fall under three categories:

— Teacher & Employee Retention Incentive (TERI) Program: Approximately 341 employees are eligible under the TERI Program.

— Currently Eligible: Approximately 379 employees are eligible to retire.

— 5-year Eligible: Approximately 686 employees are eligible to retire within the next five years.

Exhibit 2.9: TERI and Retirement Eligible (as of March 8, 2017)



Source: SCDOT

The Project Team's review indicated that approximately 395 SCDOT senior staff[3] are eligible to retire over the next three to five years. Preserving institutional knowledge from these employees is critical to the Agency's operational continuity. This challenge is not specific to SCDOT as many DOTs nationwide are losing their senior and experienced staff, as a growing number of state DOT employees are eligible for retirement. Additionally, midcareer employees with valuable technical skills have more career options both within the organization and in the private sector, leading to increased attrition rates.

The risk of losing senior and experienced employees, combined with an increased level of competition for the lower-level workforce, means that SCDOT will face an increasing challenge of recruiting and retaining valuable employee expertise. If not managed proactively, this loss of experience, institutional knowledge and know-how can severely impact SCDOT's organizational efficiency and effectiveness.

Finding # 2.3: Opportunities exists to enhance the tracking and reporting of performance measures

As part of its 10-Year Plan, the Agency has begun taking required action to repair and rebuild the State's transportation network, increasing safety and reliability of the existing system. The Agency's Strategic Plan provides direction through SCDOT's vision, mission, goals, strategies, and objectives to guide SCDOT initiatives, and a Transportation Asset Management Plan (TAMP) provides desired service level targets and performance management principles. The Strategic

[3] Pay grade criteria is used to define staffing levels, please see below:
- Band 8-10: Senior-level staff
- Band 5-7: Mid-level staff
- Band 1-4: Junior-level staff

Plan and TAMP will, together, enable SCDOT to determine how well the Agency is doing in achieving its stated goals and objectives.

SCDOT has established a set of performance measures for tracking and reporting progress towards stated goals through outcome-based measures and to guide decisions regarding changing or adjusting goals, targets or investment levels. These measures cover several categories, including manpower, procurement, project delivery, expenditures, maintenance response, maintenance risk management, and planning.

The Project Team's review of these performance measures indicated that SCDOT's performance on core transportation service metrics is on par or better than those reported by the peer group; however, there are opportunities for improvement. For example, the Project Team could not independently verify SCDOT's performance on capital projects (on-schedule and on-budget) as the current system does not track the timeline of the delivery of a project from project inception all the way through to completion.

As the volume of project activity continues to grow, it will be important for SCDOT to track these performance measures against the strategic goals and target service level outcomes. The Project Team would like to recognize the ongoing efforts by SCDOT leadership to communicate key priorities across the organization and DEAs working within their Districts to guide day-to-day activities in concert with SCDOT's strategic goals and overall objectives. These efforts are intended to align the organization with a small set of strategic goals to deliver efficient and cost-effective transportation services to citizens and businesses.

As described above, SCDOT has an opportunity to align key performance measures (i.e., safety, system preservation, mobility, project delivery, workforce safety and development, etc.) with strategic goals and enhance accountability and transparency for programs that are responsible for delivering transportation services. Additionally, consideration should be given to develop decision-critical reports/dashboard(s) so that SCDOT leadership and the senior management team can have useful and timely access to information for effective decision-making.

Key Recommendations

The following recommendations provide a roadmap and some strategies the Agency can utilize to improve the organizational efficiencies and to achieve the Agency's strategic goals.

Recommendation # 2.1: Implement a Target Operating Model for the Agency

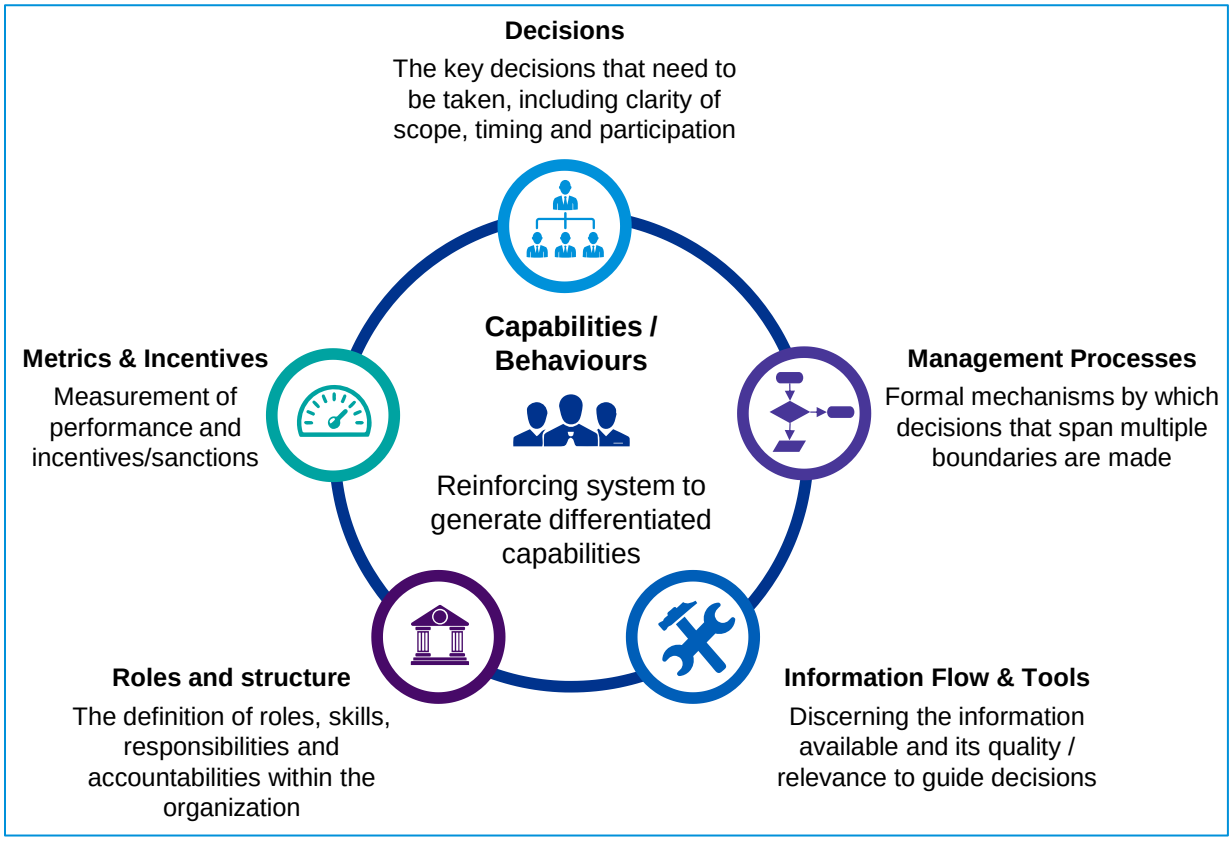
The State's roads have deteriorated over the past six years – the percentage of the approximately 41,000 centerline miles of primary and secondary roads rated in poor condition has increased during this period[4]. To address this challenge, SCDOT has prepared the 10-Year Plan to improve the State's highway system through a series of targeted capital projects. SCDOT leadership recognizes that business as usual will not achieve the Agency's stated goals and objectives. The current environment presents SCDOT with an opportunity to assess the suitability of its operating model to effectively deliver its priorities.

The Project Team recommends that SCDOT implement a Target Operating Model (TOM) plan to address elements that are integral to achieving sustainable results (i.e., key processes and work flows, decision-making, information flows, performance metrics, and roles and responsibilities).

[4] Legislative Audit Council Audit Report 2016

Exhibit 2.9 presents an operating model framework to guide the process of organizational transformation.

Exhibit 2.10: Operating Model Framework



Source: KPMG Methodology

As illustrated in Exhibit 2.10, the operating model framework includes five key elements which, when designed in conjunction with one another, can help create a desired capability or behavior. Considering the size and complexity of SCDOT, it is essential that all operating model elements be in place and well-aligned with each other to achieve an organizational solution that is aligned with the Agency's strategic plan and is sustainable over the long term.

The TOM framework allows SCDOT to baseline the current organization and identify new opportunities in terms of:

— Augmenting project delivery capabilities: Focus on opportunities to increase preconstruction, project procurement, Quality Assurance/Quality Control (QA/QC), and project management capabilities through organizational alignment, sharing of best practices, recruiting, training, and supporting technology investment.

— Reengineering existing management processes to improve coordination of goals and priorities between the HQ and Districts (i.e., how each District, team, and function contributes to achieving these priorities).

— Determining the ideal service delivery model (i.e., which functions should be retained in-house, where should existing functions reside (HQ/Districts), which functions should leverage private sector capabilities, etc.).

— Identifying opportunities to improve communication throughout the organization and with external parties.

Recommendation # 2.2: Revise the current organizational structure

One of the key outcomes of the TOM evaluation (i.e., Recommendation # 2.1) would be an opportunity for the leadership team to align the organizational structure, roles, and functions to achieve the Agency's strategic goals. As discussed previously, the anticipated increase in the volume of work due to passage of the Roads Bill requires SCDOT to reconsider its operational strategies and restructure the way it is currently organized to enhance project development and project delivery capabilities.

The Project Team recommends that SCDOT evaluate and revise the current organizational structure, reporting relationships, span of control, core functions, and workload and staffing levels to determine an approach tailored towards the Agency's vision and strategic goals.

The process of evaluating and revising the effectiveness of the current organizational structure and developing an optimized organizational structure that focuses on aligning efficient processes with organizational goals and strategies should be based on the following approach:

— Baselining the existing organization structure, size (headcount), levels of supervision, job/work design, span of supervisory control, and delegation of authority.

— Benchmarking the current organization and capabilities against the peer group to identify opportunities for enhancement.

— Realigning the current organizational structure to maximize mission performance (i.e., linking the strategic objectives and organizational goals with how managers and staff are working to achieve them).

— Clearly defining roles and responsibilities between HQ and Districts to allow SCDOT to fully leverage organizational strengths and increase ownership, accountability, and productivity.

— Aligning functions, roles, responsibilities, capacity, skill requirements, jobs and positions, and reporting relationships to support achieving the Agency's plan.

— Developing effective communications to increase awareness, understanding, buy-in, and ownership among employees and stakeholders to drive the adoption of changes.

Recommendation # 2.3: Enhance SCDOT's Existing Key Performance Indicators (KPIs) and Management Reports

Performance measures are indicators of progress toward attaining a goal, objective, or target/desired level of service. SCDOT regularly monitors and reports on the transportation system and organizational performance and is always looking for ways to improve the transportation services it provides to the citizens and businesses of the State. Presently, the Agency uses seven primary measures to assess its performance in several categories: manpower, procurement, project delivery, expenditures, maintenance response, maintenance risk management, and planning. The results are presented at the Agency's Organizational Performance Dashboard, which is located at http://www.scdot.org/inside/dashboards.aspx.

The Project Team's review of the performance measures reported by the peer group indicated that SCDOT has an opportunity to expand the list of performance measures that include both quantitative and qualitative measures as well as those secondary Accounting for these secondary measures is important given the valuable contributions SCDOT is making to the State's economy and quality of life of its citizens.

The current position of the State's transportation system (i.e., percentage of State-maintained roadways rated in poor condition, percentage of structurally deficient bridges, and deferred maintenance needs) indicates that total improvement needs far exceed available resources. As such, it is necessary to ensure that planned investment is made in the most strategic, effective, and efficient manner possible.

To ensure planned investments are made appropriately, the Project Team recommends that SCDOT expand the current level of measures to monitor and evaluate progress toward attaining a desired level of future performance. The process of adding new, modifying existing, or replacing old KPIs should be guided by SCDOT's business practices on the following levels:

— At the strategic level: Monitor attainment of strategic goals/objectives.

— At the decision-making level: Monitor attainment of transportation system performance.

— At the project delivery level: Monitor the efficiency and effectiveness of project delivery.

Exhibit 2.11 presents a list of candidate performance measures that can help SCDOT measure progress towards achieving its strategic goals. The Project Team recognizes that not all suggested measures (i.e., economic development, seatbelt usage, etc.) are monitored by the Agency and cooperation from other State and local agencies will be essential to collect, share and report required data/information in order for SCDOT to report these performance measures on its website.

These measures, some of which SCDOT is currently monitoring and reporting, are presented for SCDOT's consideration as they will allow the Agency to:

— Assess how well the State's highway system is operating.

— Make informed decisions regarding planned investments.

— Assess how effectively and efficiently transportation projects and services are being delivered.

Exhibit 2.11: Candidate Performance Measures for the Agency's Dashboard

Category	Candidate Performance Measures
Safety	— Fatalities and Serious Injuries/Fatality Rate — Fatalities in Work Zones — Fatalities Involving Lane Departures and Intersections — Fatalities by Engineering Area — Safety Belt Usage/Restraint Usage
System Preservation	— Pavement Conditions: Percentage of pavement meets the level of service — Bridge Conditions: Percentage of bridges with weight restriction/structurally deficient — Maintenance Rating Measures: roadways, roadside, traffic signs and signals, guardrails, drainage, etc.
Mobility	— VMT: Total and per capita — Annual Freight Tonnage — Vehicle Hours of Delay during Daily Peak Period: statewide and MPOs

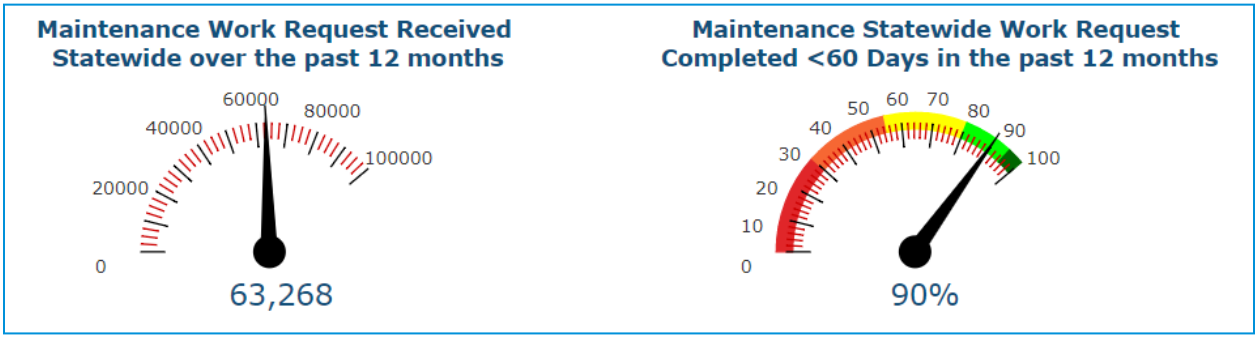
Category	Candidate Performance Measures
	— Travel Time Reliability
Project Delivery	— Design Projects Completed On-Time — Design Projects Completed Within Budget — Construction Projects Completed On-Time — Construction Projects Completed Within Budget
Economic Development	— Annual Capital Spending: Per 1,000 centerline mile per million VMT — Annual Maintenance Spending: Per 1000 centerline mile per million VMT — State Share of National GDP — State-Originating Export of Goods and Services — State Value of Freight — State Jobs by Transportation-Intensive Sector — State Visitors
Environment	— Tons of SCDOT Recycled Asphalt Pavement — Transportation Alternatives and Transportation Enhancement Project Funding — Air Quality: Emissions from the State transportation sector

Source: Peer Group Benchmarking Analysis

The quality and accessibility of the State's transportation system impacts the State's prospects for economic growth. Implementing these performance measures will allow SCDOT leadership to enhance transparency and accountability, make timely and informed decisions, and improve efficiencies and effectiveness of programs, projects, and services being delivered. At present, SCDOT has a relatively comprehensive public-facing web dashboard communicating the current status of the Agency's strategic and performance metrics.

Exhibit 2.12 presents two specific examples of these metrics: the SCDOT maintenance work response dashboard.

Exhibit 2.12: SCDOT Maintenance Work Response Dashboard



Source: SCDOT

Appendix II presents the website links of management and performance dashboards of the SCDOT as well as the peer group.

Recommendation # 2.4: Formalize a Talent Management Plan for the Agency

DOTs are facing an increasing attrition rate of experienced managers and leaders. SCDOT, in particular, is facing significant risk of losing substantial institutional knowledge due to retirement of its more senior and experienced staff. Approximately 350 SCDOT senior and mid-level staff are eligible to retire over the next three to five years. Additionally, vacancy rates for front-line positions (i.e., maintenance workers) have remained at 10 percent or higher for the past several years. SCDOT has implemented a number of programs to acknowledge and reward valuable contributions made by employees.

In terms of professional training and development, SCDOT has implemented a number of courses to prepare the next set of leaders:

— **Paving the Way for Foreman** is a one-day course for crew leads.

— **Essence of Leadership** is a two-day course covering general leadership principles required for all supervisors above crew lead-level.

— **Construction Project Delivery Training** is a five-day course for Resident Construction Engineers addressing all aspects of construction projects.

— **Leader Education and Development** is a year-long program (approximately two days per month) aimed at preparing individuals (12–18 per year) to move into senior leadership positions within the Agency.

— **Certified Public Manager** is an 18-month leader development program administered by the State, generally authorizing SCDOT to send five candidates to each class.

— **Annual Maintenance and Engineering Training Workshop** is conducted annually, over the course of a three day period. All Maintenance Crew Leads, Foremen, and Engineers undergo a day of training, discussion, and policy dissemination in Columbia. The training agenda differs from year to year, being based on issues of particular interest or importance**.**

— **AASHTO[5] Leadership Training** represents three tiers of leadership and management training offered by AASHTO. Several National Transportation Management Conferences held annually offer mid-level managers skills they need to transition from technical to management positions. The National Transportation Leadership Institute is an annual program which supplements engineering expertise with leadership and management techniques oriented to DOT operations.

— **National Transportation Advanced Leadership Institute**, sponsored by AASHTO, is a catalyst for organizational and technical excellence and to promote the development of a cadre of executive-ready senior managers to fill executive positions as they occur. The program has helped develop working knowledge of executive leadership competencies through discussions with experienced transportation executives.

The Project Team recommends that SCDOT formalize a Talent Management Plan to enhance current practices and programs associated with attracting, developing, and retaining skilled employees.

Exhibit 2.13 presents an example of a talent management framework using KPMG's proven methodology for how organizations can approach talent development and management.

[5] American Association of State Highway and Transportation Officials

Exhibit 2.13: Talent Management Framework Example

Traditional Talent Framework	Workforce Planning	Acquisition	Engagement	Development	Retention	Evaluation
Future Workforce Considerations	■ Demographics shift, available talent pools ■ Digital labor impact, requirements and opportunities	■ Candidates behave like educated consumers ■ Candidates view employers as brands	■ Employees seek active leadership involvement ■ Influence is achieved through networks and digital communities	■ New technologies impact learning styles ■ Employees desire more diverse work experiences	■ Employees reward values fit ■ Rotational assignments offer a variety of employment experiences	■ Cross-functional skillsets are more important ■ Include KPIs in performance discussions
Illustrative Opportunities	■ Proactively address succession planning options	■ Communicate attractive attributes vs. alternatives	■ Facilitate employee definition / development of networks	■ Utilize virtual reality training methods	■ Create multi-track development	■ Refine evaluation criteria

Source: KPMG Methodology

The Talent Management Plan should focus on workforce planning, talent acquisition, employee engagement, skill development, and retention. Additionally, the Talent Management Plan should expand existing leadership training and incentive programs to develop talent for key functions, implement development measures such as assessing leadership readiness of supervisors and managers, and developing internal talent pools to fill key roles, and address succession planning for key leaders who are approaching retirement.

Another important element of this recommendation is developing a knowledge management strategy and system for creating, sharing, using, and managing the knowledge and information of an organization due to the significant amounts of valuable information/data that DOTs generate on a daily basis. To effectively manage the projected workforce transition over the next five years, SCDOT should draw upon knowledge management techniques to retain institutional knowledge, foster innovation, enhance organizational efficiency and effectiveness, and improve the delivery of transportation services with increasingly limited resources.

III. Project Prioritization and Selection

Project Prioritization and Selection

Introduction

The State General Assembly enacted Act 114 in 2007, which requires that SCDOT establish a priority list of projects to the extent permitted by federal laws or regulations, taking into consideration the following:

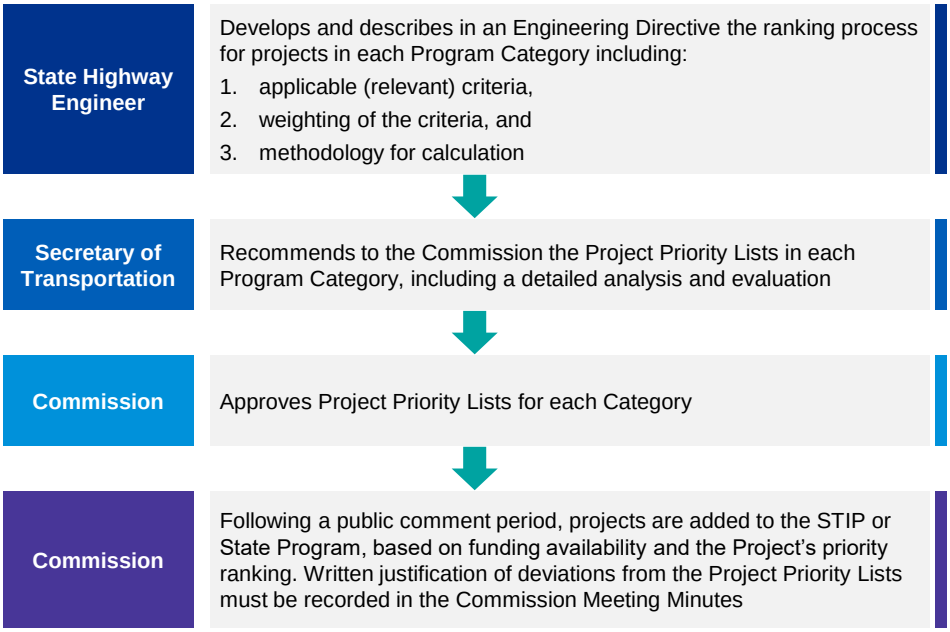
- Public safety
- Potential for economic development
- Traffic volume and congestion
- Truck traffic
- Pavement quality
- Environmental impact
- Alternative transportation solutions
- Consistency with local land use plans

This requirement is now codified in Section 57-1-370(B)(8) of the State Code of Regulations 63-10, as amended. Act 114 served as the impetus for the establishment and implementation of the Agency's project prioritization and selection process, with the goal of promoting transparency and consistency across the project selection and transportation decision-making processes by making the process more analytical and objective.

Project Prioritization Process Overview

SCDOT's current project selection protocol centers on a ranking process and methodology developed by the Deputy Secretary for Engineering, or the "State Highway Engineer." The State Highway Engineer ensures the application of objective criteria relevant to each similar group of projects, or "program categories".

Exhibit 3.1 – SCDOT Prioritization Process



Source: SCDOT

To begin, the State Highway Engineer develops a ranking process and methodology, which includes determining, scoring, and weighting relevant criteria for each program category, and ultimately producing a project priority list for each program category.

Following the State Highway Engineer's development of a project priority list for a program category, the program category is then reviewed by the Secretary, who analyzes and evaluates the development of the project priority list, and makes a recommendation to the SCDOT Commission (the Commission).

The Commission evaluates the Secretary's recommendations regarding the project priority list for each program category and once approved, proposed projects are added to the State Transportation Improvement Plan (STIP) or State Program, barring substantive opposition during the public comment period. To ensure transparency, projects are available for public review and comment on SCDOT's website, for a minimum of 21 days following approval from the Commission. Projects are added to the STIP or State Program based on funding availability and each project's priority ranking.

Project priority lists are updated based on the established timelines for each program category, as indicated in Department Directive 51. The State Highway Engineer, or the Secretary, may update the priority list schedule on a more frequent basis, if necessary.

Exhibit 3.2 – SCDOT Project Priority List Example

Program Category	Types of Projects	Update Schedule for Priority Lists
Rural Safety	Intersection improvement projects, section/corridor improvements, interstate safety improvements	Annually or as funding is available to advance additional projects
Interstate Capacity	Interstate segments that are candidates for widening, as well as operational and travel demand management projects. Includes interchanges that are candidates for reconstruction to address functional and capacity deficiencies	Every five years in conjunction with the statewide Multimodal Transportation Plan
Bridge Replacements	Includes bridge replacement projects on the interstate, National Highway System (NHS), non-National Highway System (non-NHS), State-maintained local, and minor collector roadways	Biennially (every two years) or as funding is available to advance additional projects for bridges eligible to receive Federal aid. Updated only as funding is available to advance additional projects for all other bridges.
Non-Interstate Resurfacing	Includes resurfacing and pavement reconstruction projects on State-maintained major collectors, arterial roadways, local and minor collector roadways	Annually or as funding is available to advance additional projects

Source: SCDOT

The State Code of Regulations requires the Office of Planning to review priority lists for all MPOs and COGs every three years, to ensure all priority lists consider the Statutory Criteria. Any deviations in established criteria are reviewed to ensure the deviation demonstrates significant financial and/or engineering considerations, delayed permitting, force majeure considerations, bypassed pending legal actions, federal law or regulation, or economic growth.

Project Prioritization Criteria Overview

The criteria utilized to develop a priority ranking of projects in a program category is segregated into two primary categories: Statutory Criteria, or the criteria required by the State Code Section 57-1-370(B)(8), and Relevant Criteria, or the criteria determined by the State Highway Engineer as relevant to each program category. Sections within the Statutory Criteria used to develop priority rankings are as follows:

— **Financial Viability:** Includes an evaluation of the anticipated funding sources for each project, the total estimated cost to complete the project, and an analysis of total maintenance and repair costs over the life of the project.

— **Public Safety:** Includes the development of a safety score, which is based on crash frequency, severity, and vehicle exposure and is adjusted based on average annual daily traffic (AADT).

— **Potential for Economic Development:** Includes the evaluation of transportation economic models from the State Department of Commerce that measures economic activity, viability, and the future economic benefits the project may bring to the region and State.

— **Traffic Volume and Congestion:** Includes the analysis of volume-to-capacity calculations and other delay measurements that quantify traffic flow delay resulting from current and/or projected traffic volumes.

— **Truck Traffic:** Includes the measurement of the volume of truck traffic along the corridor.

— **Pavement Quality Index:** Includes the measurement of the overall condition of the pavement surface, and is based on a five-point-scale with categories ranging from “Poor” to “Good.” The index comprises two measurements: the rutting and roughness of pavement and the distresses such as cracking and raveling.

— **Environmental Impact:** Includes the measurement of the impact to social and natural resources along the corridor.

— **Alternative Transportation Solutions:** Includes potential alternatives to the project, which are explored during the planning and environmental process of a project.

— **Consistency with Local Land Use Plans:** Includes the determination of whether a project is consistent and will remain consistent with zoning or other local land use plans.

Relevant Criteria is more discretionary and is ultimately determined by the State Highway Engineer, based on the aforementioned Statutory Criteria. Relevant Criteria may or may not include all of the Statutory Criteria, as Statutory Criteria are not always relevant to each program category. However, each Statutory Criterion must, at a minimum, be considered.

Summary of Project Prioritization and Selection Review

Objectives

As part of the Study, the Agency requested a review of SCDOT’s project prioritization and selection process with the goal of enhancing efficiency of the process and identifying leading

practices from other states with comparable transportation systems to better allocate the State's limited resources.

The objective for the review of project prioritization and selection process was to evaluate the efficiency and effectiveness of the current process and identify potential opportunities for improvement. The Project Team compared SCDOT's process to industry leading practices used by the peer group to identify potential enhancements to SCDOT's current process, with a specific focus on communication strategies with respect to external stakeholders.

Key Activities Performed

The Project Team focused its efforts on three key areas to conduct its analysis of SCDOT's project prioritization and selection process:

1) Baseline SCDOT's existing project prioritization and selection process to better understand current practices.
2) Review practices of the peer group to identify potential improvements to the efficiency and effectiveness of SCDOT's project prioritization and selection process.
3) Identify challenges experienced by SCDOT in the project prioritization and selection process.

The baselining exercise entailed a comprehensive review of existing documentation and data, conducted concurrently with a series of interviews with SCDOT leadership and senior management to better understand current SCDOT practices with regard to its project prioritization and selection process. The document and data review process included a review of SCDOT's Engineering Directives (which define the overall project prioritization and selection process and the Agency's program category-specific prioritization procedures), supporting data and information that was provided to the Legislative Audit Council (LAC) for use in its 2016 audit of SCDOT, and publicly available prioritization materials provided on the Agency's website.

The interviews that were conducted included an initial workshop and follow-up meetings that focused on the step-by-step process, the methods by which the process is performed, the Agency's constraints and challenges with the current process, and the Agency's goals for the project prioritization and selection process.

The baselining exercise was supported by a benchmarking analysis of comparable transportation systems of the peer group to identify leading practices and potential areas of improvement of the project prioritization and selection process.

Peer Group Analysis

SCDOT has extended its project prioritization framework to its entire program, unlike some peer states that only focus on prioritizing specific aspects of their programs. A summary of the benchmarking analysis is presented in the section below:

1) GDOT: The GDOT prioritization process is highly standardized, which minimizes ambiguity and promotes transparency. The project selection criteria are well defined and segregated, leading to increased effectiveness and efficiency of project selection. For more information regarding GDOT's project prioritization and selection process, please refer to Appendix III.

2) MoDOT: MoDOT utilizes a transparent prioritization process that involves key stakeholders who develop their own regional improvement plans, allowing MoDOT to assist in prioritization based on factors such as road and bridge conditions, traffic safety data, and overall mobility. MoDOT assigns a flexible weighting criteria for regional projects based on project type and

location, which allows MoDOT to address individual region needs. For more information regarding MoDOT's project prioritization and selection process, please refer to Appendix III.

3) **NCDOT:** The prioritization process employed by NCDOT for its capital improvement program combines the transparency of a data-driven approach with knowledge and insight of local planning partners. By ranking projects by goal and transportation tier, NCDOT is able to align its goals with the selection of individual projects. Furthermore, the individual selection criterion tailored to each asset class helps ensure NCDOT's most critical needs are addressed first. For more information regarding NCDOT's project prioritization and selection process, please refer to Appendix III.

4) **VDOT:** Given VDOT's data-driven and open project prioritization approach that takes into account public comments, the "SMART SCALE" web tool promotes transparency to all stakeholders. VDOT's process helps ensure that the most vital projects are completed first as criteria weights are customized to individual geographic regions on safety, congestion, accessibility, environmental quality, economic development, and land use. For more information regarding VDOT's project prioritization and selection process, please refer to Appendix III.

5) **WVDOT:** WVDOT's project prioritization methodology uses a two-phased approach, which blends a qualitative and quantitative approach. WVDOT utilizes a benefits-cost analysis to prioritize the projects, and, following the two-step analysis, the Division of Highways (DOH) recommends an equitable distribution of funding throughout the state. The process gives WVDOT and DOH the discretion to program lower-ranked, shovel-ready projects, and ensure geographic fairness of its limited funding. For more information regarding WCDOT's project prioritization and selection process, please refer to Appendix III.

During the Project Team's analysis of the transparency level of SCDOT's peer group, it became clear that both VDOT and NCDOT have the highest-level of transparency in their prioritization processes. For more information regarding VDOT's and NCDOT's transparency levels with regard to their project prioritization and selection processes, please refer to Appendix III.

Summary of Peer Group Comparison

Prioritization processes are often shaped by their respective agency's project program and strategic goals and seek to create value by standardizing the selection process. Successful processes include those that are highly data-driven, open, transparent and that drive stakeholder engagement and support. DOTs may achieve these results by performing the following activities:

— Establishing a highly defined prioritization and programming process that advances projects from prioritization scoring to inclusion in the STIP. By utilizing a ranking and prioritization system, stakeholders trust the integrity of the process, as they ultimately view how projects get ranked along with the supporting data underlying the established ranking. Both quantitative and qualitative data can be used successfully as long as the data is described openly and transparently to the public.

— Disclosing a uniform set of criteria and how they are measured and calculated to ensure consistent and accurate comparisons between projects.

— Outlining the factors that are used to program projects, as not all high-priority rankings will receive immediate programming. Factors that affect project programming may include geographic balances, available funding, environmental issues, and right-of-way (ROW), and/or utilities relocation issues, among other considerations. DOTs may also publish details surrounding projects that have been evaluated but are not selected for programming.

— Evaluating project delivery as a performance measure. Although it follows prioritization and programming, more informed DOTs that evaluate project delivery can implement lessons learned on the selection of future projects.

— Developing multiple prioritized project lists to reflect the complexities of delivering a capital program that is molded to meet its stakeholders' various needs. The need for multiple prioritized lists can be driven by constraints for the usage of varying funding sources, desire to distribute project funding geographically, or challenges in comparing multiple transportation modes or several project goals on a like-for-like basis. No peer DOT reviewed for this analysis developed a single prioritized list for projects throughout its respective state. VDOT comes closest to presenting one prioritized list, however, its projects are ultimately selected by region, not necessarily prioritized score.

Ultimately, the most efficient, effective, and transparent prioritization and programming processes that include some or all of the aforementioned considerations, will likely result in higher project delivery rates that help DOTs meet their performance measures.

Key Findings

Review of SCDOT's project prioritization and selection process resulted in the following findings:

Finding # 3.1: A single prioritized project list per Program Category appears to be the best solution to enhance the project prioritization and selection process

Generally, SCDOT agrees with the concerns raised by the LAC in its performance audit review and has made substantial effort towards improving its prioritization process based on LAC's recommendations. These enhancements include the development and issuance of Engineering Directive 51, which provides a succinct and transparent overview of SCDOT's prioritization process. Additionally, SCDOT is in the process of revising all of its Engineering Directives that govern the prioritization of each respective Program Category (Safety, Interstate Rehabilitation/Capacity, Federal Aid/Off-System Bridge Replacement, Federal Aid/Non-Federal Aid Resurfacing, statewide MPO/COG Widening, and CMAQ). SCDOT has also updated its website to provide additional detail on the project prioritization process. Collectively, these efforts are expected to result in a more defined and transparent prioritization process.

It is notable that SCDOT has taken exception to LAC's recommendation that SCDOT create one, statewide- list of prioritized projects. Instead, SCDOT has elected to continue to develop prioritized lists by Program Category. The Project Team agrees with SCDOT's position on this matter. The scope and performance measures for projects including each Program Category can vary drastically, and there is no one-size-fits-all approach to equitably prioritizing projects with varying scopes and success factors across Program Categories.

For SCDOT to maximize the value received from its prioritization process, the Project Team recommends that the prioritization criteria for each Program Category be aligned with the goals and desired outcomes from that respective Program Category. This necessitates the use of multiple prioritization lists that are each generated using their own, unique evaluation criteria. Therefore, the development of one prioritized project list per Program Category appears to be in the best interests of SCDOT as this practice will help SCDOT to put forward projects that best align with the unique goals for each Program Category.

Finding # 3.2: Opportunities exist to refine SCDOT's prioritization process to better align it with the Strategic Plan goals and further review the Guideshare program to achieve greater efficiency and effectiveness

Opportunity for Alignment with the Strategic Plan 2018-2020

As evidenced by the varying processes employed by the peer DOTs, each agency's prioritization process is unique and is shaped by that respective agency's program of projects and specific goals. Similarly, in accordance with the provisions established in Act 114, SCDOT's existing process is both shaped by the structure of its Program Categories and is driven by the prioritization criteria, which is performed in accordance with the criteria mandated by Act 114.

The annual funding allocation between SCDOT's Program Categories has historically been based on past precedent funding levels. In compliance with MAP-21[6] and FAST Act[7] regulations, SCDOT has begun initiating performance management principals and aligning business rules and practices with its strategic goals by increasingly leveraging the TAMP to make informed investment decisions. This has presented an opportunity for SCDOT to reconsider the basis for which it allocates funding to each of its Program Categories.

In addition to its increased reliance on the TAMP, the adoption of a new Strategic Plan 2018–2020 with an accompanying set of strategic goals offers SCDOT an opportunity to refine its prioritization process to better align with the goals in the Strategic Plan. While reviewing the latest prioritization process Engineering Directives, it is important to note that specific goals are not stated for each Program Category.

SCDOT has the opportunity to both define specific goals for each Program Category and to reconsider the prioritization criteria for each Program Category such that they align with the Strategic Plan and result in the delivery of projects aligned with SCDOT's goals.

Guideshare Program

Annually, SCDOT distributes approximately $138 million in Guideshare funding to the State's 21 MPOs and COGs, which is unique to South Carolina. The distributions are made based on an equity- or population-centric basis. The State's MPOs are located in more urban regions, and conversely, the State's COGs tend to represent more rural regions.

The MPOs and COGs receive Guideshare funding at an approximate 70-30 split, respectively. Projected demographics throughout the State predict that an increasing proportion of residents are expected to move into the urban regions of the State. As Guideshare funding is distributed on an equity basis, this is expected to further erode the already small fraction of Guideshare funding received by the COGs.

This trend is diminishing the COGs' ability to develop larger, more substantive projects that help to drive SCDOT's performance measures. Instead, the COGs are focusing on smaller, more locally driven projects, such as pedestrian access projects or intersection improvements.

Roads on the Strategic Freight Network and National Highway System (NHS) are of high importance to SCDOT, as these networks are critical for the provision of safe access to all regions of the State, both urban and rural. However, projects currently put forward by the MPOs and COGs may not reflect that priority. In particular, the focus on increasingly smaller local COG projects is preventing investment in these strategic corridors in and around rural areas and effectively limiting access, and potential economic growth, to those regions. As the Federal government increasingly looks to leverage statewide performance measures, it will be important

[6] The Moving Ahead for Progress in the 21st Century Act
[7] Fixing America's Surface Transportation Act or "FAST Act"

for SCDOT to leverage its limited funding to push forward projects that move the needle on its statewide performance measures.

The Project Team is aware that SCDOT currently has a working group made of representatives from SCDOT, MPOs, and COGs reviewing the Guideshare program in order to achieve greater efficiency and effectiveness for the program.

Finding # 3.3: Opportunities exist to streamline the project prioritization process to provide clarity and increase confidence in the process

The development of SCDOT's prioritized project lists is a large-scale, protracted process, and SCDOT staff should be commended for shepherding such a complex program. The process requires substantial coordination between SCDOT, MPO, and COG staff. The development of project lists for each Program Category in the various regions are handled by each respective SCDOT office and or MPO/COG at the local level. Staff preparing the prioritization lists individually reach out to the appropriate SCDOT or MPO/COG office to obtain the necessary data for each project. As such, during the prioritization process, SCDOT offices charged with the provision of prioritization data are inundated with multiple competing requests.

Concurrently, staff compiling the prioritization lists are tasked with coordinating various data inputs from multiple data sources. This process introduces two potential areas for error in data collection: (1) from the reporting agency, given the number of simultaneous requests they are handling and (2) from the staff members preparing the prioritized lists, given the multiple data sources from which they are compiling required information.

The sheer number of data sources and data compilers creates challenges with respect to memorializing backup prioritization data in one central location. During the Project Team's review of the process, it was reported that project data resides in the Director of Planning's office. However, data is not organized in one central database. This introduces a potential source of error in the data process.

It was also reported that SCDOT staff perform the quality assurance/quality control of data prior to the calculation of project scores. This places data integrity risk in the hands of SCDOT staff. The Project Team's review of the peer group indicated that some DOTs work collaboratively with key stakeholders to review the data before the project scores are calculated. This helps ensure a more transparent and open process as well as preclude potential data errors in the scoring process.

Finally, the calculation methodology for some prioritization criteria is not clearly defined. For example, with regard to the Public Safety prioritization category, the "safety score" is calculated by crashes within a given segment divided by the volume and multiplied by the number of years, however, the number of years is not defined. Additionally, the Financial Viability prioritization category is based on the project cost with additional consideration given for projects with supplemental funding. This level of ambiguity can potentially lead to multiple interpretations of calculation methods being used to score projects (or the perception of such), and can undermine confidence in the process.

Finding # 3.4: Opportunities exist to enhance transparency of prioritization scores and back-up data

As previously noted, updated Engineering Directives and increased clarity on the Agency's website are all positive steps that SCDOT has taken to increase public understanding of the breadth and integrity of the prioritization process. However, the Project Team found that SCDOT has an opportunity to further improve the openness and transparency of its prioritization process.

Going forward, the amount of annual funding allocated to each Program Category will be driven by a combination of SCDOT's TAMP and past funding allocations. This shift in its approach to Program funding presents an opportunity for SCDOT to demonstrate to stakeholders the integrity of its decision-making process and the modern tools employed to help guide the decision-making process.

It was observed that SCDOT has a clear rationale for the manner in which it programs (or funds) prioritized projects. Sometimes, projects with a lower-priority ranking are advanced prior to higher-ranking projects due to funding constraints, permitting or environmental process delays, longer procurement lead times, or other project delivery challenges. While the reasoning behind SCDOT's programming decision making is clear and justifiable, the overall framework that governs programming decisions has not been clearly communicated to SCDOT's stakeholders. Clearly communicating the programming process and reasons supporting each project funding decision can result in a more transparent program that instills a greater degree of confidence in stakeholders.

The Project Team found that prioritization scores, backup data, and un-programmed project lists are not currently included on the Agency's website. This is primarily due to concerns with providing too much technically advanced data that may be difficult for non-subject matter experts to comprehend. The Project Team's review of the peer group indicated that a number of DOTs provide all prioritization scores and backup data on their websites. The provision of this material can help to assure stakeholders that the process is transparent, accurate and has been conducted in a fair and equitable manner.

Key Recommendations

Recommendation # 3.1: Align program funding and the prioritization and selection process with SCDOT's strategic goals

The TAMP is an industry leading asset management tool whose output will help SCDOT to better manage the long-term maintenance of its transportation assets. It is recommended that SCDOT continue to leverage the TAMP when allocating funding to its Program Categories, regardless of past funding levels. Using an asset management approach to program-wide funding will allow SCDOT to prolong the useful life of its entire transportation network, while verifying that capital spending allocation is made in a manner that is aligned with SCDOT's strategic goals.

It is also recommended that SCDOT establish specific project output goals for each respective Program Category and memorialize them in the Engineering Directives that outline the prioritization process for each Program Category.

Once goals are established, it is recommended that SCDOT evaluate the existing prioritization criteria being used for each Program Category and determine if those criteria are aligned with SCDOT's established goals for each respective Program Category. Criteria that are not aligned with SCDOT's strategic goals should be removed. Conversely, it may be necessary for SCDOT to consider new criteria for some Program Categories to ensure that the goals for each Program Category are met.

To the extent possible, it is recommended that SCDOT consider quantitative evaluation criteria for its prioritization process, as quantitative criteria is transparent and can be easily verified. However, the Project Team acknowledges that under certain circumstances, particularly with respect to older data sets that cannot reasonably be updated in unison with the prioritization process and may not capture the dynamic conditions experienced throughout SCDOT's system, some level of qualitative criteria based on field observation and/or local need may be necessary

to accurately capture a project's need. While the use of such prioritization criteria is beneficial to SCDOT's prioritization process, it is less transparent and leads to difficulty in justifying conclusions and results. As such, SCDOT should detail the process used to determine these need-based results to its stakeholders and justify its importance within the larger prioritization process. This will help to alleviate stakeholders' concerns about the integrity of the prioritization process.

Once prioritization criteria have been established, it is recommended that SCDOT review the weightings for the prioritization criteria contained under each Program Category to verify that the criteria weights are appropriately aligned with the desired outcomes for each Program Category.

It is expected that the realigned program funding and prioritization process will help SCDOT meet its goals for safety, maintenance, and preservation of existing infrastructure, improve road and bridge delivery, and increase transparency. This will result in an asset management-based approach to project prioritization that is better focused on SCDOT's long-term needs.

Recommendation # 3.2: Develop a standardized and integrated project prioritization process/system

As discussed earlier in this chapter, the current prioritization process is a large-scale, protracted process, requires substantial coordination between statewide SCDOT, MPO, and COG staff, and is housed in numerous spreadsheets that are dispersed throughout the State. This is onerous for SCDOT, MPO, and COG staff and increases potential for inadvertent errors as the process is difficult to memorialize and data is not stored/managed in one system.

To help ease the administrative burden on SCDOT and local entities and reduce the risk of errors, it is recommended that SCDOT develop an automated prioritization system of record to manage the prioritization process. It is envisioned that this system would serve as the prioritization hub for the State and that it would house all pertinent prioritization input data and project prioritization scores. It is anticipated that SCDOT, MPO, and COG project planners would enter projects into the system while relevant data is uploaded into the system on a rolling basis as the data become available, thus reducing the interface between data providers and project planners. The system should also, to the extent possible, calculate all prioritization scores. This would help to substantially reduce the risk of human error in the development of the prioritization lists.

Additionally, it is recommended that SCDOT identify and memorialize detailed, formal methodologies for use in the calculation of all prioritization criteria (for example safety or financial viability). Calculations using these methodologies should be included within the prioritization system to the extent possible. This would help to promote consistent scoring between projects, increase transparency, and build confidence in the overall process.

In summary, this recommendation helps to promote a more defined prioritization process that is less burdensome to SCDOT, COG, and MPO staff, is more transparent, and has a lower risk for calculation errors. This, in turn, will help SCDOT meet its strategic goals for safety, maintenance and preservation of existing infrastructure, improve delivery of road and bridge assets, and improve transparency.

Recommendation # 3.3: Improve transparency of the project prioritization and selection process

As previously noted, SCDOT has taken several steps to convey both the breadth and integrity of its prioritization process. Given the recent adoption of the Strategic Plan 2018-2020 and its increased reliance on the TAMP, SCDOT has an opportunity to further enhance how it

communicates prioritization processes to its stakeholders. This will help SCDOT to improve the transparency of its prioritization process.

SCDOT's prioritization Engineering Directives serve as the baseline information source for the process underlying project selection for each Program Category. Given their importance for defining the prioritization process, the Project Team recommends that SCDOT further refine and enhance its Engineering Directives to convey a more comprehensive view of the prioritization process for each Program Category, in a manner that can be easily understood by stakeholders. It is recommended that, at a minimum, the Engineering Directives include the following, much of which is presently included in the existing Engineering Directives:

— Specific Program Category goals and desired outcomes

— Detailed description of the prioritization process for each Program Category, including specific steps, participant/stakeholder roles and responsibilities, and a timeline for each step

— Detailed description of prioritization ranking criteria, including data sources for each category

— Prioritization criteria weights

— Detailed methodology calculating prioritization criteria, if necessary. For example, this would be relevant for safety scores, or financial viability

It should be noted that a key point of confusion for stakeholders is their understanding of prioritized rankings lists versus projects that are actually programmed. As such, it is recommended that SCDOT develop a detailed prioritization to programming crosswalk for stakeholders and publish the information on its website. This crosswalk would start at the TAMP and describe its role in establishing long-term goal setting and decision-making for the funding of Program Categories. SCDOT should also detail why/when projects can be programmed and why some lower-ranked projects may be programmed prior to other higher-ranked projects. Consideration should be given to developing a standardized approach to programming projects.

A few members of the peer group publish backup prioritization data on their websites. The Project Team found that this practice helps to (1) increase public understanding of the prioritization process, and (2) builds faith in the integrity of the process. Consideration should be given to publishing all prioritization back-up data for each Program Category on the Agency's website, including data for all programmed and un-programmed projects. For projects not programmed, it is recommended that justification be provided for why those projects were not included in the STIP.

SCDOT's Programmed Project Viewer demonstrates the advances SCDOT has made in leveraging advanced visualization tools to communicate with its stakeholders. It is recommended that SCDOT further enhance the capabilities of its Programmed Project Viewer to provide additional detail on both programmed, and un-programmed projects. Additionally, SCDOT should consider leveraging its advanced Geographic Information System (GIS) tools to better convey need and demonstrate alignment of the prioritized/programmed project lists with SCDOT's goals. SCDOT could overlay the currently programmed Safety projects over that map and visually demonstrate to stakeholders that SCDOT's prioritization process is addressing the State's transportation needs.

Finally, SCDOT should consider increasing the public comment period to 30 days upon rolling out its revised prioritization program and also consider a shorter public comment period for subsequent revisions to the prioritization program. This will afford SCDOT the opportunity to both interact with and listen to its stakeholders while gaining their insights on the prioritization process.

The aforementioned recommendations will serve to build stakeholder confidence in SCDOT's prioritization process and help SCDOT reach its strategic goal for increasing transparency.

Recommendation # 3.4: Incentivize the MPOs/COGs to promote projects that align with SCDOT's strategic goals

As discussed earlier in this chapter, projects that are being advanced by the MPOs and COGs under the Guideshare program often do not help SCDOT meet its strategic goals and system performance requirements. In general, these projects are smaller in nature and are locally focused. It is recommended that SCDOT incentivize MPOs and COGs to promote projects that better align with SCDOT's strategic goals by communicating the importance of the Strategic Freight Network and NHS, as well as aligning local, county, and State-level planning initiatives.

It is vital for the MPOs and COGs to understand the important role the Strategic Freight Network and NHS play in serving the citizens and business of the State. SCDOT should utilize its advanced analytical and visualization tools to better convey the importance of the Strategic Freight Network and NHS on local and regional economies and to demonstrate the importance of regional connectivity and its impact on the movement of goods and services that drive economic development and job creation. Such action can help to incentivize the COGs and MPOs to consider larger, more State-focused projects. Additionally, using GIS tools to connect local, county, and State-level planning initiatives will help to communicate the connection between local, county, and State planning efforts and visually demonstrate how local projects can help to boost statewide economic growth.

While conveying the benefits of promoting larger projects that support the Strategic Freight Network and NHS is important, it is also imperative for SCDOT to provide the means for COGs and MPOs to promote projects that move the needle on SCDOT's performance requirements. As such, it is recommended that SCDOT create a program that provides incentives using some portion of the Guideshare funding in excess of SCDOT's statutory funding requirements to encourage the COGs and MPOs to team up and promote more regionally significant projects.

The better promotion of the Strategic Freight Network and NHS, coupled with the creation of an incentive program will help SCDOT utilize more of its available funding towards projects that move the needle on its performance requirements. This will help SCDOT better meet its established goals for safety, maintaining its existing assets, and improving roadway and bridge delivery.

IV. Project Delivery

Project Delivery

Introduction

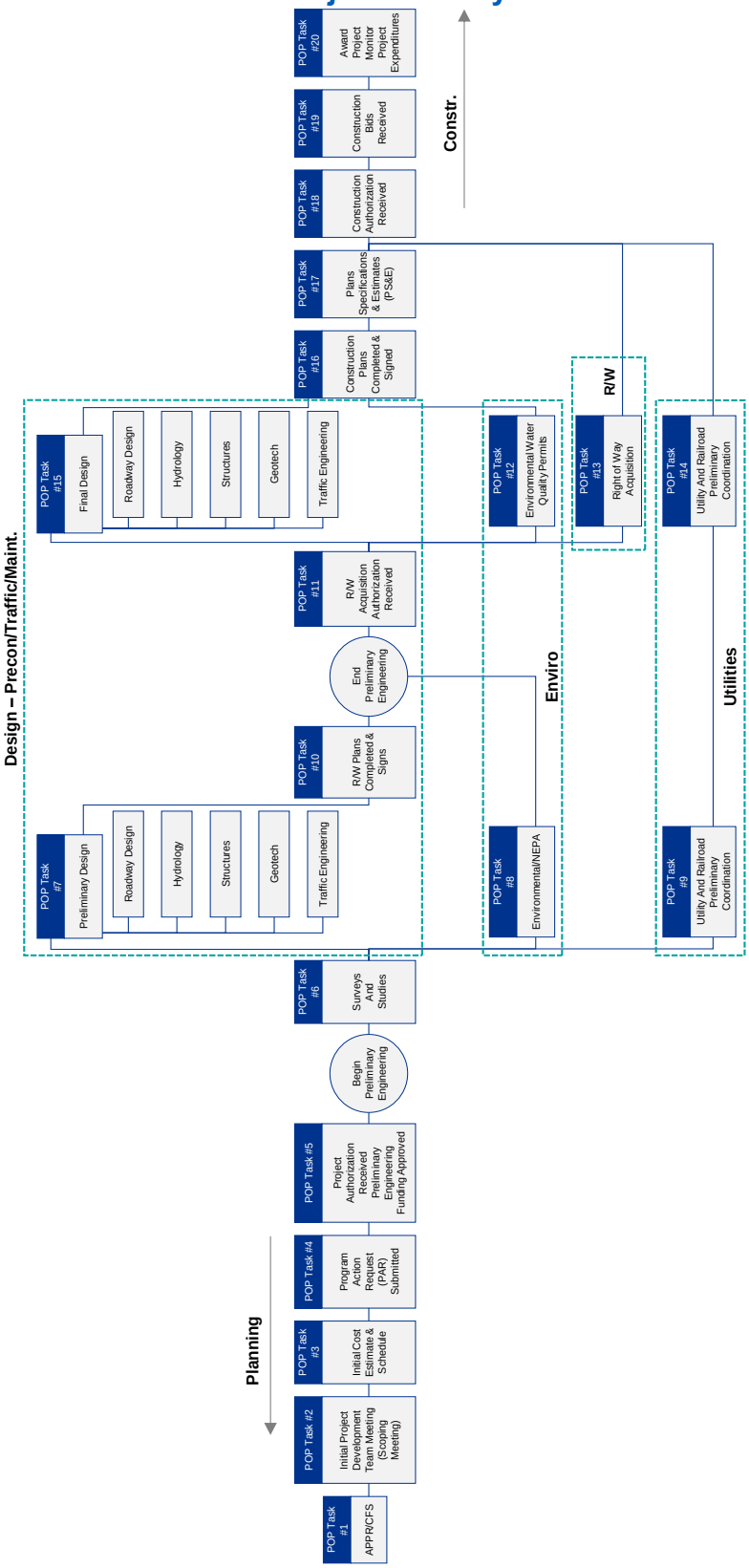
The project delivery process at SCDOT is distributed among a large number of groups, working in a non-sequential manner to advance projects from the conceptual phase through to the procurement phase. Key role(s) played by various business units in support of the Agency's project delivery process are summarized below:

- **Planning** – Coordinates the development of the purpose and need for the project and establishes a preliminary planning cost estimate and budget for the project. Coordinates the project being approved by the Commission and being placed into STIP.
- **Preconstruction** – Refines the final construction cost estimate. Once the project is placed in the STIP, is responsible for the project's implementation from surveys and initial design to the bidding of the project. Develops the plans and specifications and coordinates the public involvement. Infuses input for Traffic Engineering, Environmental, Rights of Way, Construction, Maintenance and the Districts into the project's development. After bidding, supports construction with plan changes and funding coordination.
  - Environmental – Responsible for developing the environmental documentation and the permitting efforts supporting the project. Also coordinates environmental compliance during the construction phase of the project.
  - Traffic – Supports the project development process by developing needed traffic studies and/or reports and also develops traffic control plans, signal plans, and pavement marking plans for project. The deliverables are added to the baseline plans produced by Preconstruction prior to bidding.
  - Rights-of-Way – Upon approval of an environmental document, implements right-of-way acquisition for the project. Also provides utility and railroad coordination supporting the project development process.
    - *Utilities (a subsection of the Rights of Way Office) – coordinates utility impacts on a project and secures agreements for utility relocation within SCOOT right of way.*
  - **Construction** – Coordinates the bidding of the project, performs bid review and analysis and coordinates the contract and award with the contractor. Also supports the District Field Offices by establishing construction policy and procedures, performs and approves construction material certification and testing and perform quality control inspections. Also leverages Construction Engineering and Inspection (CEI) contracts to support Field Offices.
  - **Maintenance** – Once a project is complete, accepts responsibility for routine maintenance of the facility.

During the post-procurement/award phase, the Program Controls Unit (PCU) is responsible for reviewing project invoicing and financial management updates from the District field staff. Additionally, the PCU coordinates with project managers in RPGs to update them on the financial status of projects, as well as progress against CPM scheduling.

Exhibit 4.1 on the following page illustrates SCDOT's project delivery process, as described in the above bullet points, in its current form.

Exhibit 4.1 – Overview of SCDOT's Project Delivery Process



Source: Chief Engineer for Project Delivery, SCDOT

Summary of Project Delivery Review

Objectives

As part of the Study, the Agency requested a review of SCDOT's project delivery process with the goal of improving SCDOT's project delivery capabilities. The objectives for reviewing the existing project delivery and associated processes were to examine and evaluate roles, responsibilities, decision-making steps, outsourcing strategy, and accountability for project delivery at SCDOT; assess the suitability of project management tools in use; and compare SCDOT's performance standards for project delivery with industry leading practices used by the peer group.

Key Activities Performed

The Project Team focused its efforts on three key areas to conduct its analysis of SCDOT's project delivery process:

1) Conduct data analysis of the existing SCDOT project delivery process to better understand current practices.
2) Review practices of the peer group with comparable transportation systems to identify industry leading practices.
3) Identify challenges experienced by SCDOT in the project delivery process.

With the goal of improving SCDOT's project delivery capabilities, developing a thorough understanding of the current state of project delivery processes was essential. To this end, the Project Team conducted a series of interviews with representatives from SCDOT, MPOs, COGs, and the industry; collected and analyzed data/information from multiple sources; and reviewed internal documents (i.e., project status reports and procurement policies). Collectively, these interviews and documents resulted in a valuable understanding of how the Agency makes decisions, delineates responsibilities — including taking ownership of or deciding when to outsource various functions — and, ultimately, measures performance. Additionally, the Project Team reviewed the project delivery practices and processes of the peer group—a summary peer group analysis is presented in a later section of this chapter.

Interviews with SCDOT Staff and Representatives from Other Organizations

The Project Team conducted a series of interviews with representatives from key project delivery areas including District Engineers, preconstruction personnel, construction personnel and staff from several Districts. Additionally, separate interviews were conducted with representatives from the American Council of Engineering Companies (ACEC) and the Association of General Contractors (AGC). All interviews and meetings were conducted in an open and collaborative manner to encourage participants to give their candid input regarding the challenges associated with the project delivery processes and potential opportunities for improvement.

One of the benefits of conducting interviews with a broad range of key personnel, both internal and external to SCDOT and associated with project delivery, was that the process helped ensure that differing perspectives were considered in the analysis. Topics such as the merits of DB versus DBB project delivery methods, the Quality Management Team (QMT) Field Audit process, project monitoring, and outsourcing were discussed, providing valuable insights from diverse perspectives. Despite the diverse backgrounds of participants, there were broad areas of consensus, which helped shape and inform the findings and recommendations presented in this chapter.

Data Analysis

In addition to the interviews and meetings conducted with key personnel related to project delivery processes, a thorough analysis of data was undertaken, including on reports related to procurement policies and manuals. A detailed list and brief description of the categories of documents reviewed are presented in Exhibit 4.2. The review and analysis of the data/information listed in Exhibit 4.2 allowed the Project Team to gain an understanding of the evolution and refinement of SCDOT's procurement process and the processes used for delivery of planned projects.

Exhibit 4.2 – Description of Data Reviewed

Category	Documents Falling Under this Category (File Names)	Document Description
DB Program	DB Projects in Development and Under Contract	Description, key facts, and summary of bids for DB projects
	DB Procurement Manual	SCDOT's internal manual which describes the procurement process, dated February 2017
	DB Best Practices	Developed with FHWA, AGC, and ACEC in 2012.
Budget vs. Actual	Budget versus Actual – 2012-2015 and May 2015	Categories include intermodal planning, tolls, maintenance, and agency summary and personnel
Delivery Data	CE&I Project Specific	Key data for CE&I contract and DB construction (bid versus revised amount, percentage complete)
	DB versus DBB time and cost 2013-2016	DB versus DBB data on project differences between forecast and actuals
	RCE staff with contract information	Work performed versus remaining and projects by county
Project Delivery Process	Checklists	Project development and procurement files
	Templates and Samples	Project Definition Report, Project Delivery Selection Matrix, Cost Estimate Guidelines, procurement and evaluation documents/guides
	Project Development Process	Preconstruction description of tasks and responsibilities
Procurement Policy	2011 SCDOT Manual for Procurement of A&E Services	Requirements and process for advertisement, selection, negotiation, contracts, payment, and record retention
	Internal Procurement Policy	General guidelines on procurement
	Procurement Policy and Procedures	Above policy manual revised in May 2017
	Professional Services Manual	A more comprehensive version of "Internal Procurement Policy," updated June 2017

Source: Data and information furnished by SCDOT

Peer Group Analysis

The review of SCDOT's project delivery process was supported by a benchmarking analysis of comparable transportation systems to identify leading practices and potential areas of improvement. Like other transportation agencies and DOTs across the nation, SCDOT is constantly striving to improve its project delivery process to deliver efficient and cost-effective

transportation services to the citizens and businesses of the State. To gain a better understanding of SCDOT's effectiveness and efficiency in project delivery, and to guide further assessment of SCDOT's performance, the Project Team performed a benchmarking analysis against six DOTs, referred to as the peer group in Chapter I.

Summary of Peer Group Comparison

The following measures were assessed to gain an understanding of how well SCDOT performs in comparison to its peer DOTs:

— Utilization of the DB program

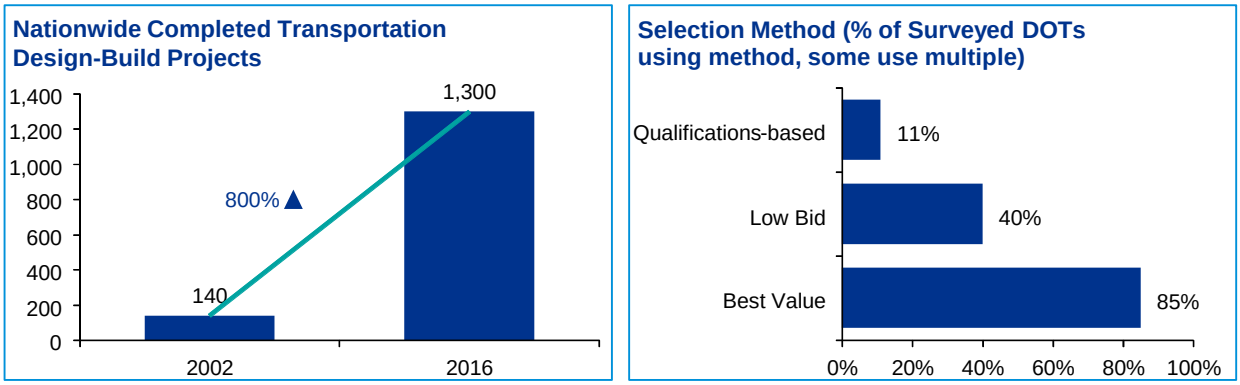
— Approach to outsourcing

— Dashboard reporting

The discussion below presents a brief summary of the peer review analysis regarding practices employed by the peer group to delivery their capital programs and projects in a timely and cost-efficient manner.

Comparison of DB Programs

Exhibit 4.3 – Illustration of Growth in DB Procurements and Spread of Bid Evaluation Frameworks



Source: Design-Build Institute of America 2016 Survey of DOTs

Many public agencies and states have expanded their procurement laws to authorize the use of DB, and as such, there has been substantial growth in the use of the DB procurement method. Over the past 15 years, the number of projects delivered via DB has risen from approximately 140 projects in 2002 to 1,300 in 2016. Over this period, DOTs have been able to evaluate the effectiveness of various project delivery methods. The DB method of project delivery has yielded favorable results as compared to the traditional or DBB method, specifically when compared to on-time delivery of projects and project costs.

An increasing number of DOTs (85 percent during a 2016 DBIA survey) are using Adjusted Low-Bid to evaluate DB proposals

With greater use of the DB method of procurement for delivering infrastructure projects, DOTs are using the Best Value/Adjusted Low Bid (ALB) approach for selecting the winning bidder—this represents a major shift from evaluating proposals on a low-bid basis. As per the DB industry sources, approximately 85 percent of the 35 DOTs surveyed have indicated their preference for the ALB-based selection process.

SCDOT has made great strides in advancing its DB program in recent years. Following a series of regular meetings and workshops with representatives from ACEC, AGC, and FHWA throughout 2015-2016 to understand key considerations and leading practices with regards to DB delivery, SCDOT has developed a strong foundation. The DB Team, part of the Preconstruction Group, has developed a DB candidate project evaluation methodology and policy which states that the method should be used for high value, complex projects that can benefit from the design and construction team having additional room to innovate. The Team developed a standardized process for evaluating candidate projects for DB delivery, including review and approval protocols. In early 2017, the Team released a DB Procurement Manual to supplement already released procurement document and bid evaluation templates. Given a growing project delivery pipeline (discussed later in this section), SCDOT has started to set a strong foundation for its DB program at the right time.

Dashboard Reporting

DOTs generate large amounts of data and information. Therefore, selecting the most appropriate performance measures to report, sourcing the right data to feed into those measures, and presenting them in an easy-to-understand manner is critical for effective decision-making, particularly in regard to project delivery. SCDOT has a dashboard available on the Agency's website that tracks and reports several key project delivery performance measures, including: the number of projects by delivery stage/phase across each system, planned value of project delivery for the fiscal year versus actual value delivered, a breakdown of contract/contractor performance over the last twelve months (LTM), and on-budget performance relative to initial project bid amount.

Within the peer group, NCDOT, GDOT, VDOT, and MoDOT have comprehensive dashboard systems, with performance management reports that track a multitude of performance measures and goals. For example, NCDOT measures an "infrastructure health index," which tracks at a divisional level the combined performance measures for pavements, bridges, and roadway assets. GDOT has two dashboard elements – a Performance Management Dashboard and an agency-wide set of performance measures. VDOT has a comprehensive dashboard system that tracks performance across project delivery both from a DOT and citizen survey perspective. MoDOT's TRACKER system measures performance of the DOT against broadly stated organizational goals. WVDOT has no performance dashboard reporting system in place that could be identified through the Project Team's desktop research. Exhibit 4.4 summarizes the key features and differences between the peer groups with regard to the use of dashboards for reporting purposes.

Exhibit 4.4 – Key Features of Peer DOTs Dashboards

DOTs	Key Dashboard Features
SCDOT South Carolina Department of Transportation	Online dashboard available focused on Project Delivery as an element of broader Organizational Performance Dashboard. Specific focus of Project Delivery dashboard includes: — Number of projects by phase (preliminary engineering, ROW, entering construction) year-to-date by project type (authorized, pending, and moved) — Planned value of projects vs. actual value of projects delivered

DOTs	Key Dashboard Features
	— Breakdown of contract/contractor performance, evaluating contracts that have: been achieved at original completion cost, been realized at adjusted completion cost, triggered liquidated damages, and/or required remaining closeout actions over the LTM analysis period — On-budget performance over the LTM analysis period relative to initial bid amount
GDOT Georgia Department of Transportation	Two dashboard elements – a Performance Management Dashboard and individual Agency (GDOT) Performance Measures. PMD tracks progress across safety investments and improvements, asset maintenance, and planning and construction. Includes assessment of 15 different specific data sources to track performance (e.g. project schedule performance, asset condition ratings, etc.) GDOT has 11 performance measures and goals it tracks against, with 5-10 data sources flowing up into each including: — Construction Administration — Capital Maintenance Projects — Intermodal — Routine Maintenance
	Two project delivery related dashboard reporting processes: 1) organizational performance dashboards and associated quarterly reporting; and 2) an annual performance report: 1) Organizational performance dashboards: — Infrastructure health index — Delivery rates (on time, on budget, biddings planned vs. actual) 2) Annual performance report — STIP Project Delivery Rate — Economic Indicators (impacts of project investments)
VDOT	VDOT has its Dashboard 3.0 system that tracks performance across Highway (safety, traffic performance, condition, finance), Management Performance, Citizen Surveys, and Project Delivery (schedule, due to let in terms of total cost, etc.) VDOT also uses a Quarterly Report Card system. The report shows performance on core business outcomes and construction and maintenance contracts. By depicting contracts completed on time and on budget, it provides a snapshot of how well current projects are meeting their schedules and budgets.
	WVDOT has no performance dashboard reporting system in place that could be identified through the Project Team's desktop research.
MoDOT	MoDOT uses the MoDOT TRACKER Measures of Performance system. Key items covered (each includes 5-10+ specific data sources flowing into analysis of performance of that area) are: — Keep Customers and Ourselves Safe

DOTs	Key Dashboard Features
	— Keep Roads and Bridges in Good Condition — Provide Outstanding Customer Service — Deliver Transportation Solutions of Great Value — Operate a Reliable and Convenient Transportation System — Use Resources Wisely

Source: Peer Group Benchmarking Analysis

Outsourcing

The decision regarding whether or not to outsource specific activities or functions is an exercise in evaluating trade-offs. Nationwide, the technical expertise residing in DOTs is increasingly transitioning from project development to project management — leveraging help from the private sector for technical activities such as engineering surveys, technical designs, and construction inspections. Given the changing business reality, as well as increased attrition of more experienced staff and seasoned project managers, private sector participation in what was previously considered DOTs' core business areas is steadily increasing, and looks to mark the start of a longer-term shift towards enhanced collaboration between public and private parties in the DOT context. Presently, the outsourcing level for SCDOT is comparable to those of its peer group; however, the Agency has taken a balanced approach to ensure that crucial in-house project management and engineering expertise is maintained.

Nationwide, the private sector is playing an increasingly large role in project delivery activities at DOTs

Going forward, the question for SCDOT is not whether to outsource activities, but rather, how to change the way the DOT outsources, defining the specific outsourcing needs and goals for private sector firms providing technical services, and creating a robust management regime and framework for managing these contracts. Most importantly, the Agency should leverage the Target Operating Model (TOM) to evaluate areas where leveraging help from the private sector firms will be beneficial in achieving SCDOT's objectives in an efficient and cost-effective manner and those activities/functions that should be retained by the Agency to ensure responsiveness and business continuity. In essence, a new, robust outsourcing framework needs to be included as an output of the TOM development process discussed earlier in this report. The goals, organizational vision, and strategic focus that drive the new organizational framework and TOM for the DOT will drive how SCDOT identifies outsourcing needs, processes, and performance measures.

Key Findings

SCDOT is taking a number of actions to further improve its project delivery capabilities to meet program needs in the most efficient and cost-effective manner, without compromising project quality. The Project Team's review of SCDOT's project delivery process resulted in the following findings.

Finding # 4.1: Simplifying the project delivery process and establishing a formal Project Delivery Office could expedite project delivery

SCDOT has established a formal Project Delivery Office as part of its organizational structure. However, the roles and responsibilities of this office are distributed among multiple business units. This is primarily due to the evolution of the Agency over the past several years as it has endeavored to meet the growing demands of the project delivery program with limited available resources. As such, the Project Delivery Office, in its current form, consists of select personnel and processes from various business units.

The current project delivery process requires close coordination among several business units/divisions and representatives that are involved in a given project at different points of the delivery cycle. This situation has led to potential concerns around accountability and authority of project delivery. Simplifying the project delivery process should take place in conjunction with developing and refining a TOM, streamlining the number of business units responsible for "owning" project delivery at any given point in the project lifecycle and working towards a single point of project delivery and accountability.

Finding # 4.2: To effectively manage SCDOT's 10-Year Plan and meet expectations, an efficient project delivery process is crucial

As part of SCDOT's 10-Year Plan, the Agency is planning to more than double the current number of resurfacing projects, replace 465 bridges statewide, improve 140 miles of interstate highways and add more than 1,000 miles of safety features on rural roads.

SCDOT recognizes the challenge it faces in terms of ensuring that the Agency is able to plan, design, procure, and deliver a growing volume of projects in an efficient and cost-effective manner. To manage commitments made as part of the 10-Year Plan, SCDOT will have to increase project delivery capabilities through increased coordination, accountability, and efficiency from SCDOT project managers, as well as assigning available resources to SCDOT priority projects. This is important considering the high workload of SCDOT project managers who are responsible for managing 50-70 different projects at any one time.

Finding # 4.3: SCDOT can further improve its outsourcing program for preconstruction services

SCDOT routinely relies on on-call and turnkey/project-specific contracts for a variety of activities, including safety engineering services, roadway/intersection/bridge design services, DB projects, traffic signal system, the National Environmental Policy Act (NEPA) process and permitting, and geotechnical services. Presently, SCDOT on-call and turnkey/project-specific contracts support approximately $2 billion worth of projects in development and over $1 billion in active construction projects.

The Project Team's review of SCDOT's project delivery process indicated that the Agency does not have a formal policy and process in place that would provide guidance to SCDOT project managers in determining whether or not to outsource preconstruction services using the turnkey/project-specific or on-call contracts. Additionally, the feedback received from SCDOT project managers suggests that the current procurement process for Turnkey/project-specific and on-call contracts is somewhat cumbersome and that on average, it takes several months to successfully negotiate the scope of work and associated costs.

Establishing formal policies that provide guidance to SCDOT project managers regarding how to best leverage the help from turnkey/project-specific and on-call contractors to supplement in-

house resources for timely and efficient delivery of projects will help SCDOT to increase project delivery capabilities.

Finding # 4.4: Districts' role in project delivery should be further examined

Based on the input received from SCDOT staff interviewed as part of this Study, both those in Columbia as well as those in the field, the Project Team understands that District/field staff, in many instances, rely on central headquarters in Columbia to make project delivery and management-related decisions. Feedback indicated that this over-reliance on Columbia may be an unintended consequence of how SCDOT's QMT Program is delivered and used.

While the intent of the QMT Program is well-documented as a QA/QC tool, views expressed by field staff suggest that there is a perception among them that the QMT Program is highly prescriptive and restricts the decision-making ability of regional engineers, requiring them to consult with the central office. SCDOT should evaluate the validity of these views emerging from field staff and assess how best to engage field staff and make them feel empowered to make project delivery and management decisions without heavy reliance on Columbia. As part of this process, consideration should be given to update standard specifications in the Black Book as it serves as the basis for the QMT Program. Ultimately, it appears that there is an opportunity to further clarify central office's expectations of field staff to make project delivery and management decisions and to be accountable for those decisions. SCDOT should work closely with field staff to achieve greater comfort with decision-making, as the looming amount of project delivery and management work coming over the next several years is substantial. Without empowered field staff, central office staff in Columbia are likely to spend additional time answering questions and inquiries from the field, creating additional workload and burden on central office staff.

Finding # 4.5: Opportunities exist to expand the DB program to a stand-alone office

The Project Team's review of SCDOT's DB program indicated that the DB program's performance in terms of timely delivery of critical transportation projects has been positive. Both SCDOT and industry representatives support using the DB procurement method for delivering large, complex projects where there are opportunities to leverage private sector expertise for innovation and value engineering. Representatives from the construction industry were particularly complimentary of the good work done in the central office and indicated that SCDOT should train the field staff on nuances of this procurement method and such training should be supported with the DB Manual and related documents and processes.

From an organizational perspective, the DB group is located within the Preconstruction Division and comprises a team of 12 people responsible for driving DB projects. SCDOT has an opportunity to expand the current DB program into a stand-alone office to address increased volume of the capital program. The construction industry has shown notable interest in DB procurements and as a result, there is a substantial competitive interest for these procurements. The formation of a stand-alone office would further streamline the DB process and enhance the Agency's project delivery capabilities.

DOTs with large alternative delivery programs like VDOT and GDOT have created stand-alone offices

Finding # 4.6: While SCDOT is commended on making an effort to move to Adjusted Low Bid (ALB) in evaluation of bids, more can be done to increase innovation in project bids

Many DOTs and public entities have successfully utilized the ALB method of evaluation for awarding contracts. ALB does not equate to evaluating bids exclusively on the basis of

qualifications. Rather, ALB is the practice of normalizing the weighting of qualifications to an optimal alignment between cost (low-bid) and qualifications.

In general, SCDOT evaluates contract bids where bidders' qualifications are weighted at five percent of the evaluation score and costs are weighted at 95 percent. The Project Team learned that in a number of cases, this evaluation method results in contract change orders, which ultimately results in SCDOT not realizing the potential benefits of the "low-bid" evaluation method. While ALB evaluation is not guaranteed to eliminate the risk of post-award adjustments, it creates much more incentive for innovation and value creation over the life of the contract than does low-bid, which carries a significant risk of post-award adjustments as evidenced by recent SCDOT experience. Ultimately, by placing greater emphasis on qualifications and innovation, SCDOT is better able to assess value. For example, the DOT may find an innovative design or engineering technique to be an improvement over others proposed, but still not worth a 15 percent increase in cost. ALB simply affords SCDOT a tool/mechanism to be more flexible in choosing the best option for the DOT and greater clarity in terms of maximizing value – it doesn't force the DOT to pick a more expensive option. The Project Team recognizes that appropriate measures should be taken to prevent "gold plating" of projects procured under the ALB evaluation method. SCDOT has the required experience and expertise to gradually increase the number of procurements using the ALB method while keeping a close eye on limiting project over-design and "gold plating."

As part of a transition towards ALB, SCDOT may need to revisit the weighting of the QMT program in its evaluation of bidders. The current use of the QMT score to calculate the Contractor's Performance Score, which is used in the evaluation process, has the unintended consequence of providing firms with no prior experience working with SCDOT a median QMT score. The impacts of this scoring process could increase as SCDOT's construction pipeline increases and firms new to working with the DOT are increasingly drawn to bid on projects as the market expands.

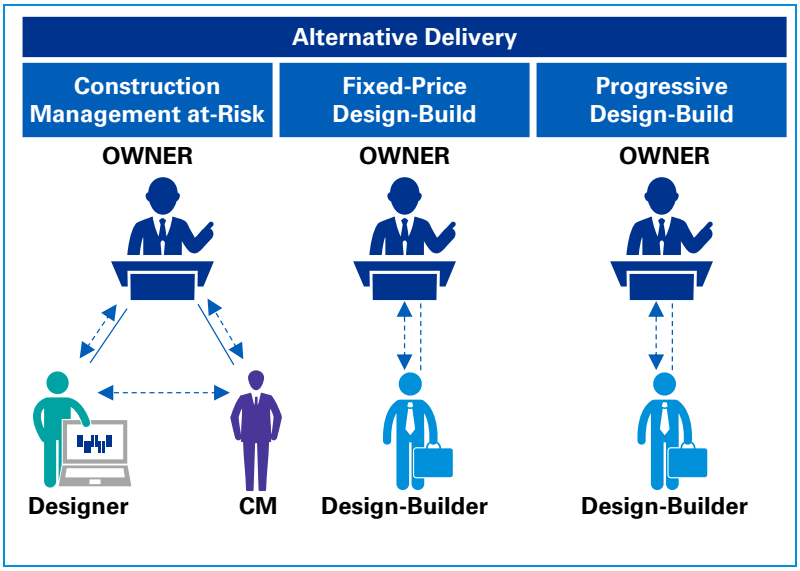
Key Recommendations

The review of SCDOT's project delivery process, along with the leading practices used by the peer group, has provided a basis for the recommendations presented in this section. These recommendations are intended to help SCDOT enhance project delivery capabilities and continue to strive towards innovation and delivering on its goal of providing adequate, safe, and efficient transportation services for the citizens and businesses of the State.

Recommendation # 4.1: Increase the role, authority, and structure of the Project Delivery Office

The Project Team recommends that as SCDOT reviews its organizational structure and defines a TOM, the Agency should consider combining key project delivery-focused resources from the various business units/departments into a formal, stand-alone Project Delivery Office. Project delivery-focused resources from preconstruction, construction, traffic, and project control group (PCG) can be housed in the Project Delivery Office to support efficient delivery of planned projects. This action is intended to improve coordination among various business functions, increase accountability and transparency, and support efficient project delivery processes. Additionally, the Project Delivery Office would consolidate responsibility for project delivery monitoring and reporting, integrating PCG and field functions into one central location.

Exhibit 4.5 – Alternative Project Delivery Examples



Source: Design-Build Institute of America

The Project Delivery Office should expand its focus to explore other project delivery methods (i.e., DB, Design-Build-Maintain (DBM), Construction Manager at Risk (CMAR), etc.). Consideration should be given to establish an Alternative Project Delivery (APD) section with the Project Delivery Office to evaluate and deliver APD projects, including DB projects, as well as projects procured under other types of innovative project delivery methods. The APD office would conduct evaluation of candidate APD projects and make recommendations to the leadership team (i.e., Secretary of Transportation, Deputy Secretary for Engineering, Deputy Secretary for Finance & Administration, and Deputy Secretary for Intermodal Planning) for final approval/selection. The APD office should take the lead in project procurement, negotiation, and overall management of APD projects, coordinating with DOT leadership at each step to secure approval before proceeding. In this sense, the APD office would service as a single point of contact for the alternative delivery process for DOT leadership. The Office would take the lead on evaluating modifications and enhancements to the APD program, including examining the weight of qualifications relative to price in APD proposal evaluations, evaluating implementation of warranties for select, high-impact projects, and developing a process that would allow for weighting of evaluation criteria to be determined on a project by project basis. Again, the APD Office would drive these improvements, coordinating closely with DOT leadership to approve program changes and project-specific decisions.

Recommendation # 4.2: Evaluate trade-offs between project delivery methods

One of the findings included in the LAC audit conducted in 2016 was that SCDOT does not have any way of knowing whether the DB model of procurement has resulted in cost savings as compared to the traditional delivery of projects. As stated earlier, SCDOT has demonstrated that the DB procurement method has resulted in improving on-time delivery of projects; however, no information is currently available to compare whether the DB procurement method also results in cost savings.

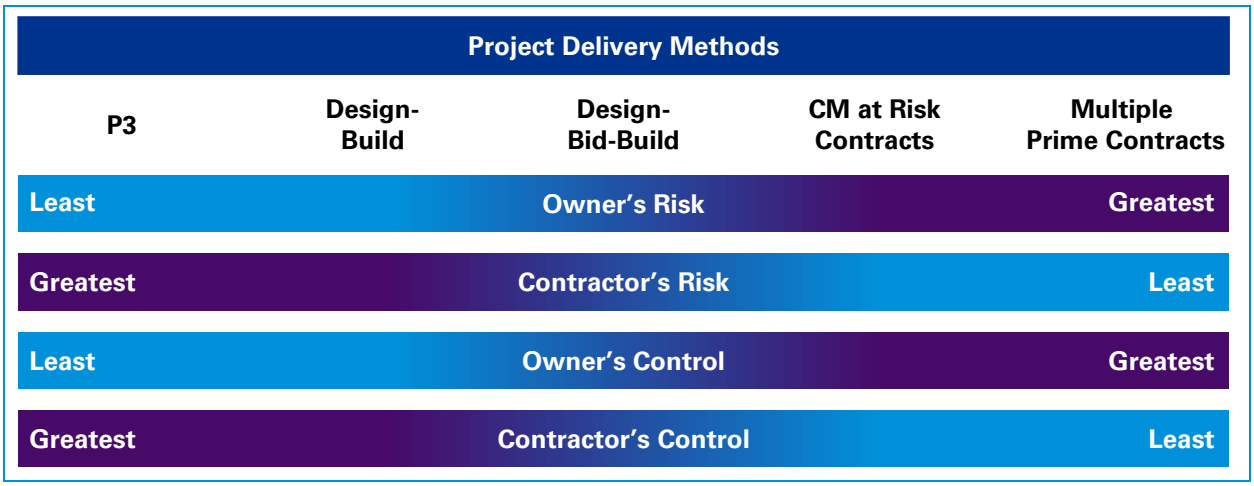
The Project Team recommends that SCDOT conduct its own evaluation to determine any advantages the DB procurement method has as compared to the traditional project delivery, with regard to the Agency. Considering that the DB procurement method is typically more suitable for projects of a certain size and complexity (i.e., not all SCDOT projects are suitable for the DB procurement method), SCDOT should develop project screening criteria to identify suitable candidate projects that can be further evaluated for procurement under the DB method.

For this group of projects, SCDOT should compare—side-by-side—trade-offs in cost, schedule, and overall effectiveness of traditional versus alternative project delivery methods. This action

would allow SCDOT to determine and demonstrate Value for Money (VfM) and benefits of selecting the most beneficial procurement method for a given project. It should be noted that such a comparison is only needed for projects that are being considered under the APD program.

The Project Team would like to acknowledge that SCDOT is undertaking a research project of best practices to improve the Agency's current DB delivery method for highway transportation projects and to evaluate the effectiveness of SCDOT's current DB program, review current project selection processes, identify best practices, identify cost estimating procedures, and develop future effectiveness measuring processes.

Exhibit 4.6 – Alternative Project Delivery Methods



Source: Design-Build Institute of America

With this analysis, SCDOT will be able to develop a list of comparative advantages and disadvantages of each delivery method. Based on these findings and other industry data, SCDOT should develop an indicative decision tree/project delivery methodology decision framework. This framework should build on existing processes for deciding whether or not a project is a good candidate for DB (or APD) versus traditional project delivery method.

Recommendation # 4.3: Develop an outsourcing strategy to deliver the growing volume of capital projects

As discussed in Chapter II of this report, the annual capital outlay is expected to steadily increase over the next six years as a result of the Roads Bill; however, at the same time SCDOT is faced with increased retirements of senior and experienced resources. As such, SCDOT will be required to be innovative in terms of how it manages project delivery capabilities using all available options. The Project Team's review of the project delivery process indicated that SCDOT's outsourcing program for preconstruction activities — namely the on-call and turnkey/project-specific contracts — could be a potential source of additional resources to help SCDOT address growing demands for project delivery resources. Presently, SCDOT does not have any formal policies that provide guidance on when and whether or not to use the on-call pool to supplement in-house resources. The Project Team recommends that SCDOT develop a formal procedure to decide early during the project delivery process whether or not to outsource activities and leverage the Turnkey/project-specific and/or on-call contracts for delivery of planned projects. The formal decision-making process supported by the framework will help SCDOT project managers make a go/no-go decision on outsourcing early in the project delivery process.

Additionally, for the on-call contracts, SCDOT should consider further streamlining the procurement process for individual scopes of work by including an estimated level of effort/hours and scope, where feasible. The on-call pool contractors should be required to provide their costs for the associated scope. This action would significantly reduce the need for lengthy negotiations with the service providers.

Consideration should be given to bundle smaller on-call projects/contracts to reduce the overall number of active procurements, thus reducing transaction costs and management burden for both contractors as well as SCDOT staff. SCDOT has begun bundling smaller bridge projects into larger contracts to attract requisite bidding interest from industry and has experienced success doing so; the DOT should evaluate expanding this practice/approach to other projects of similar size/scope.

Recommendation # 4.4: Expand the use of an APD program for appropriate projects to address SCDOT's growing capital program

The APD method serves as a viable option for SCDOT to further enhance project delivery capabilities of the Agency. The Project Team learned that the results and experience to-date have been very positive for SCDOT's DB program.

The Project Team recommends that SCDOT expand its current screening process to include the systematic screening of planned capital projects (i.e., projects included in the STIP) worth $50 million or higher ($25 million or higher if projects are bundled) and/or projects that meet pre-defined complexity requirements (i.e., projects with opportunities for risk transfer and/or innovation) to evaluate their feasibility to be delivered using the DB/APD procurement method(s). This action will build on the robust process SCDOT has already developed and will help SCDOT to streamline the project evaluation timeline for APD candidate projects and further accelerate the overall project delivery process.

The DB/APD feasibility assessment should focus on technical, operational, and financial viability of delivering a given project using the DB/APD procurement method. Additionally, as part of the candidate project review, SCDOT should explore potential opportunities for bundling projects, developing corridor projects, and expediting delivery of critical system improvements as it has done to-date successfully with its small bridge replacement program.

As the DB/APD program grows in size and importance in terms of overall project delivery volume, SCDOT should consider providing DB/APD training to District/field staff, based on the manual already developed by the DB Team. Based on interviews conducted with the field staff, the Project Team understands that not all field staff are necessarily familiar with the key tenets of contracting and management of DB projects. These training sessions should focus on how to effectively manage/deliver a DB project versus a traditional/DBB project and provide guidance on efficient review and approval processes for DB projects. The training can also address the QMT Program requirements for DB projects and should be supported by an easy-to-understand "How-to-Manual" for easier reference for field staff to effectively manage DB projects and empower them to make independent decisions – and be accountable for those decisions.

Recommendation # 4.5: Work in partnership with industry participants to augment market capacity

SCDOT recognizes that the engineering and construction industry will play a vital role in delivering the projects planned as part of the 10-Year Plan. Similar to the State, neighboring DOTs in Georgia, North Carolina, and Florida are also expected to ramp up their capital programs. As such, the region is expected to experience increased competition for private sector resources

among DOTs as the same pool of consulting firms and construction contractors are operating in the region. Often, such situations leads to lower competition and higher costs.

The Project Team recommends that SCDOT create a favorable environment to attract new market entrants and enhance the current partnership with industry participants to increase market capacity, capitalizing on the goodwill generated from the positive working relationship SCDOT has with the industry. As part of further strengthening its partnering program with industry participants, SCDOT should continue to:

— Continue to increase sharing of information regarding the capital program and upcoming projects with Architecture/Engineering (A/E) firms and construction contractors

— Routinely communicate the types of services SCDOT will need in support of its capital program

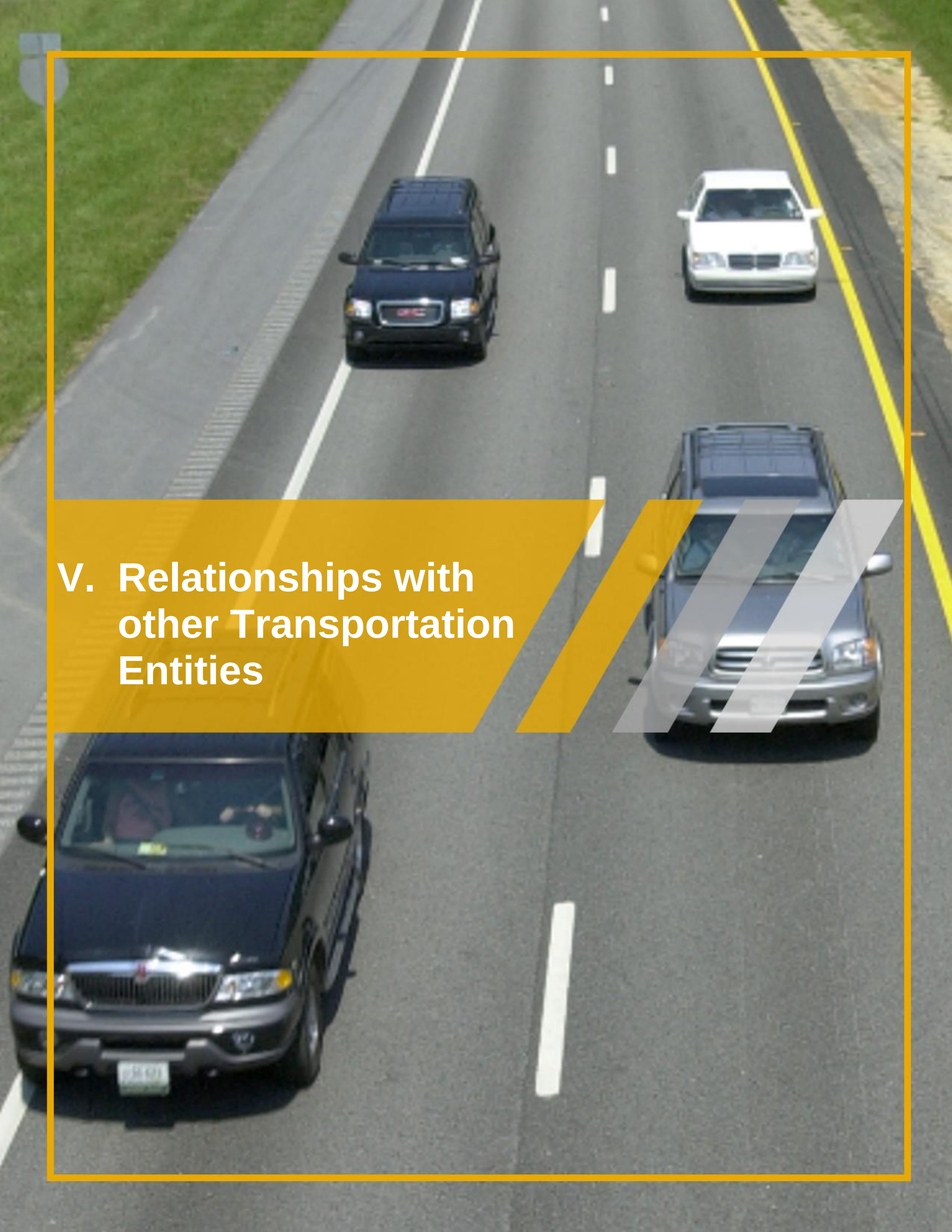
— Provide information about upcoming procurement projects and the preferred procurement method(s) for these projects

— Enhance coordination with engineering and construction associations, and trade groups to increase competitive interest for SCDOT projects

— Help expand the market size by encouraging small and medium businesses/service providers to participate on SCDOT projects

— Host an Industry Day on a biannual basis to collaborate with industry participants and attract new market entrants

Taking these actions will allow SCDOT to ensure that there is adequate market capacity available to meet the growing demand of the Agency's capital program.



V. Relationships with other Transportation Entities

Relationships with other Transportation Entities

Introduction

The State is unique as the responsibility for local roads is split between SCDOT and local jurisdictions. SCDOT maintains 41,359 centerline miles of roads within the State, including the responsibility for maintaining approximately 29,700 centerline miles of local roads that are typically owned by Counties in other states. Approximately 10,000 centerline miles of these secondary roads are federal aid eligible, while the remainder are assumed to be relatively low-traffic-volume local roads that are not eligible for federal aid.

The following discussion provides a brief summary of key elements of SCDOT's relationships with other transportation agencies and programs.

Local Roads

With respect to responsibility of systematic planning, construction, maintenance, and operation of the transportation system, SCDOT is unique when compared to the other DOTs in the nation. Data published by the Bureau of Transportation Statistics (BTS) indicates that the overwhelming majority of DOTs are responsible for a relatively small percentage of the public road mileage within the boundaries of their states. In general, DOTs are responsible for managing approximately 20 percent of the total public roads (SCDOT is responsible for maintaining approximately 54 percent of the total public roads), on centerline miles basis, comprising of the higher-trafficked interstate and primary highway routes. The remaining mileage is typically the responsibility of local jurisdictions such as counties, cities, or townships. Only a handful of DOTs, including SCDOT, have the responsibility for substantial portions of the local (secondary) road network.

MPOs and COGs

Aside from the use of federal funds, the functions of external transportation entities are typically tied to State-specific statutes, with the exception that MPOs receive direct federal funds that are passed through to them by SCDOT. The funds are primarily intended to cover the costs associated with transportation planning services performed by MPOs. There are federal regulations that govern the roles and responsibilities of MPOs and compliance with these regulations resides with the Federal Highway Administration (FHWA). Like other states, the State MPOs are responsible for conducting planning studies, performing modeling, and developing long-range plans aimed at addressing regional transportation needs. Each state has its own process, subject to federal regulations, for how these proposed programs are considered and the respective projects incorporated into the STIP.

SCDOT is unique with respect to other states in that its Commission has opted to allocate funds beyond the required federal Directly Attributable (DA) funds to MPOs as well as to regional COGs for selecting and programming transportation projects. Approximately $138 million, inclusive of DA funds, is allocated between the 10 COGs and 11 MPOs on annual basis. The allocated funds are referred to as Guideshares. The MPOs and COGs develop multiyear transportation programs with their allocation of funds which are submitted to SCDOT for inclusion in the STIP. The MPO/COG transportation improvement programs (TIP), however, are constrained by the annual allocations they receive from SCDOT, although allocated project funding can be used over

multiple years. Additionally, the County local option sales tax programs can be leveraged for augmenting the Guideshare funds to construct larger improvement projects.

The State's Act 114 provides specific prioritization criteria which must be considered as projects are identified and selected; however, no strategic goals are associated with MPO/COG programs in terms of accountability of funds invested and outcomes achieved. SCDOT planning staff are routinely engaged with the MPOs/COGs through the STIP development and modification process and provide technical guidance. District staff, typically traffic engineers, serve on MPO Technical Advisory Committees (TAC) and provide valuable technical/engineering expertise as well as local knowledge of the roadways under their management. MPO/COG boundaries do not align with District boundaries, therefore staff from more than one district may be engaged with these groups.

C Program

The State's C Program is a long-established partnership between SCDOT and the 46 Counties to fund the improvements of State roads, County roads, City streets and other local transportation projects. Over time, the C Program has evolved into a program aimed at addressing a broader range of road maintenance and improvement needs on and off the State highway network. Funds are generated from a portion of the State motor fuel tax and allocated to the State's 46 Counties on a pro rata basis through a formula that considers rural public road mileage, population, and geographic size. Funds currently distributed through the C Program total approximately $80 million annually; however, it is estimated that the funds will increase over the next six years as a result of the recent fuel tax increase (i.e., the Roads Bill). Program operating requirements are provided via legislation and the program is administered on a statewide basis by SCDOT. From an organizational standpoint, the C Program Manager is part of SCDOT's Pre-Construction Group, and is supported by four RPGs that provide resources for project development and delivery across the State.

The Project Team found SCDOT's C Program website[8] beneficial with respect to understanding the program history, purpose, administrative guidance, and reports. The website is well organized and includes up-to-date and downloadable versions of applicable laws, data and forms, program manuals, project development flow charts, and easy access to required Transportation Plans for each of the State's 46 Counties. It is important to note that SCDOT only has responsibility for administrative management and oversight of the C Program. By law, the responsibility for program development, project selection, and project prioritization processes and decisions are assigned to the County Transportation Committees (CTCs) who are appointed by the legislative delegation in each County. Counties can either self-administer program funds or opt to have SCDOT administer funds on their behalf. Over half of the State's Counties have opted for SCDOT to administer their program funds. SCDOT coordinates the development of required annual reporting on the program, which reflects projects and expenditures. By law, 25 percent of C Program funds are required to be spent on the State highway network (i.e., SCDOT maintained network). However, in practice, closer to 50 percent of C funds are typically programmed for improvements on the State highway network.

The Project Team found that C Program funds are primarily directed toward pavement-related projects such as resurfacing or reconstruction. While SCDOT ultimately derives benefit from the C Program, the Project Team observed that program development and project selection is ultimately at the discretion of the CTCs in each County as there is no prescribed or consistent methodology in place for assessing asset conditions or determining needs and priorities. SCDOT

[8] http://www.scdot.org/doing/cProgram.aspx

has well-established programs and protocols in place for assessing the overall maintenance condition of its network including detailed pavement condition information for all roadway segments which is housed in its Pavement Management System. A Pavement Quality Index value (PQI) is calculated for each roadway pavement section. This information is available through the Districts and is often used for the C Program project selection on the SCDOT network.

County Sales Tax Program

The State, like most states in the southeast region, has experienced steady growth, especially in metropolitan areas. Typically, growth leads to increased traffic and rapid deterioration of transportation infrastructure. Until recently, SCDOT has been operating within a severely constrained fiscal environment and the Agency was not able to fully address capital and maintenance needs of its large highway network. SCDOT's inability to address capital needs such as widening projects to reduce congestion at the regional or County-level has given rise to the use of funds generated by local option sales taxes to fund transportation improvement projects both on and off the SCDOT network. Nearly 30 percent of the State Counties have sales tax programs that can be used to fund transportation infrastructure projects. Additionally, sales tax funding can be combined with MPO and COG funds or C Program funds to provide increased flexibility for addressing local and regional transportation priorities. Sales tax revenues are primarily used to repay debt on bonds that are approved by voters in referendums, with transportation improvement projects generally being identified prior to such bond referendums.

South Carolina Transportation Infrastructure Bank

South Carolina Transportation Infrastructure Bank (SCTIB or the Bank) was authorized by Act 148 of 1997. With partial federal funding in its first year, SCTIB was created as a separate State agency to finance larger transportation projects in South Carolina, and thereby allow SCDOT to devote resources to other important transportation projects.

Since its inception in 1997, the SCTIB has awarded grants and loans for various transportation projects submitted by local governments and the SCDOT. The General Assembly has indicated its desire for the SCTIB and the SCDOT to work together on advancing important infrastructure projects as evidenced by the passage of Act 98 in 2013 and Act 275 in 2016. Accordingly, SCDOT and the SCTIB have been in close coordination regarding possible financing of a portion of SCDOT's aggressive 10 year interstate widening program which has been developed to continue the economic prosperity of the state. Additional points of coordination between the SCTIB and SCDOT include the assignment of SCDOT's Deputy Secretary for Finance to serve as a technical advisor to the SCTIB's Project Evaluation Committee as well as the inclusion of the SCDOT Commission Chairman as a voting member on the SCTIB Board of Directors. Finally, Act 275 of 2016 requires that before providing a loan or other financial assistance to a qualified borrower on a qualified project, the SCTIB Board of Directors must submit the decision to the SCDOT Commission for its consideration. The SCDOT Commission can approve or reject the board of directors' decisions or request additional information from the SCTIB Board of Directors.

Summary of Relationships with Other Transportation Entities Review

Objectives for Review of Relationships with Transportation Entities

The objectives for reviewing SCDOT's relationships with other transportation agencies were to:

— Assess their roles in project prioritization and selection process

— Assess their roles in project delivery process

— Identify leading practices from the peer group that may help SCDOT to improve the efficiency and effectiveness of the State in utilizing statewide transportation funding to address the State's transportation needs

Key Activities Performed

The Project Team conducted interviews with SCDOT leadership, management and staff, representatives from Charleston County, the Business Development Corporation, American Council of Engineering Companies, and MPOs and COGs throughout the State to better understand the role that local entities play in the various processes related to the State's transportation program.

The Project Team focused its efforts on a five-step approach to gain insight into the relationships between SCDOT and other transportation entities in the State that are directly involved in the decision-making process with regard to the State's transportation program and/or delivery of projects on the State's highway network:

— Review information and data provided by SCDOT and data gathered through desktop research, including the recent LAC audit, relevant legislation(s), SCDOT policies, engineering directives, relevant web pages, and other information provided by SCDOT

— Review practices from other states/peer group with comparable transportation systems that may improve the effectiveness SCDOT's relationships with other transportation entities

— Conduct interviews with SCDOT management and staff to gain a ground-level understanding of SCDOT's relationships with other transportation entities

— Conduct interviews with representatives of external entities such as Counties, MPOs and COGs from different regions of the State to better understand the role local entities play in the various processes related to the State's transportation program

— Identify potential opportunities to more effectively engage with local government agencies to streamline effort towards improving the State's transportation network

A summary of the benchmarking analysis is presented in the section below.

Peer Group Analysis

The Project Team reviewed relationships between the peer group and their respective local transportation agencies, however, only a limited analysis was possible due to a lack of commonality in how local agency programs are funded and administered.

As stated previously, according to data published by BTS, a large majority of DOTs are responsible for a relatively small percentage of public road, on centerline miles basis, within their states. The peer group includes most of the states that are responsible for a significant portion of local public roads. Of the peer group, NCDOT, VDOT, and WVDOT have the responsibility for a significant portion of the local road network. The remaining DOTs — GDOT, MODOT, and PennDOT — maintain only a limited amount of mileage of their respective local road networks.

Exhibit 5.1 presents a comparison of transportation system responsibility, represented in centerline miles, among the peer group.

Exhibit 5.1: Comparison of Transportation System Responsibility for the Peer Group

State	DOT	County	Local Government	Other Jurisdiction[9]	Federal Agency	TOTAL
Georgia	17,949	87,413	19,835	121	2,816	128,134
Missouri	33,873	73,343	22,980	110	1,243	131,549
North Carolina	79,559	0	22,685	1,039	3,051	106,334
Pennsylvania	39,756	340	77,824	1,349	821	120,091
South Carolina	41,359	29,928	3,177	194	1,592	76,250
Virginia	58,648	1,730	11,842	39	2,802	75,061
West Virginia	34,403	0	3,251	282	834	38,770

Source: FHWA – Public Road Length by Ownership 2015

Key Findings

The Project Team's review of SCDOT's relationships with other transportation entities resulted in the following findings:

Finding # 5.1: There is extensive engagement and coordination between SCDOT District and County staff

SCDOT District staff provide important engineering expertise and condition information that aids in the selection of transportation projects funded through the C Program. Interviews conducted with representatives from local governments and transportation agencies indicated that SCDOT District and Residency staff meet with County and local government staff on a regular basis and that they have developed an excellent and collaborative working relationship. SCDOT representatives regularly attend CTC meetings and they represent the Agency's perspectives on various transportation-related matters. Transportation projects are commonly developed on SCDOT routes where C Program funding is used to extend SCDOT resurfacing funds (i.e., SCDOT may fund a full-depth reclamation project (FDR), which is followed by an asphalt overlay funded through CTC's resurfacing program).

Finding # 5.2: The majority of C Program funds are programmed for pavement maintenance and rehabilitation projects

Over time, CTCs have moved away from paving unpaved roads and have directed available funds towards improving the condition of paved roads. The majority of the C Program funds are currently used on pavement improvement projects. However, due to the overall poor condition of SCDOT's secondary road network, often pavement maintenance and rehabilitation projects are selected on a reactive basis, addressing the most urgent needs first. This approach is not optimal from a pavement management perspective, as it does not provide much consideration for pavement preservation projects.

[9] Includes state park, state toll, other state agency, other local agency, and roadways not identified by ownership.

Finding # 5.3: Opportunities exist to derive greater benefits from the C Program

Approximately 50 percent of available C Program funds have been used in recent years for resurfacing and other pavement projects on SCDOT routes. This represents twice the amount required by law. However, the C Program is discretionary by design and lacks rigor in areas including guidance on program development and project selection. While legislation provides broad guidance on where funds can be allocated, there is no requirement for data-driven decisions that quantify the relevant need and benefit. SCDOT and Counties could significantly benefit from implementation of asset management strategies to enhance the decision-making process and provide greater transparency.

Charleston County serves as a good case study arising from their implementation of a pavement management system and associated business processes. Charleston County was able to sustain the condition of their network by following a data-driven project selection process using C Program funds. CTC-funded projects are prioritized and programmed based on the Pavement Management System recommendations. The County conducts pavement condition surveys on all County, City, and State secondary roads (SCDOT pavement condition data is not utilized) within the County and imports the data into its Pavement Management System for analysis. The County utilizes an effective mix of treatments that has resulted in stable conditions across the network of more than 1,700 miles inclusive of SCDOT routes.

Finding # 5.4: Opportunities exist with respect to maintenance responsibilities for low-volume roads

South Carolina has a total of approximately 160,359 lane miles of roads – about 118,910 rural and 41,449 urban, along with 9,344 bridges. SCDOT has the primary responsibilities for maintaining approximately 90,000 lane miles of roads and more than 8,400 bridges. Whereas, the local governments (i.e., County and City Public Works Departments) are responsible for maintaining remaining rural secondary road network. The local governments are responsible for road maintenance and construction activities on the local road network, while SCDOT District organizations maintain State-owned routes. System transfers are a routine occurrence between the State and the local governments.

SCDOT may have potential opportunities to cooperatively transfer maintenance responsibility and/or ownership of SCDOT's secondary roads to local governments by providing maintenance funding support, making a one-time payment for transfer of ownership, or improving to a good state of maintenance prior to a transfer of ownership. This will enable SCDOT to focus its efforts and resources on its higher-tier transportation systems.

Finding # 5.5: Opportunities exist to further leverage the sales tax programs in addressing regional transportation needs and priorities

While sales tax-funded improvement projects generally provide mobility and safety benefits, they may also contribute to a maintenance burden over the long-term. SCDOT and Counties have opportunities to work collaboratively for the selection and delivery of mutually beneficial projects. Considering that nearly 30 percent of the Counties have local sales tax programs, a collaborative approach with respect to selection and delivery of projects could help address regional transportation needs and priorities on the SCDOT network.

Finding # 5.6: Opportunities exist to outsource the plan review process for local government-funded projects

Feedback received as part of the Project Team's interviews with SCDOT leadership, management, and staff, as well as representatives from the local governments (i.e., Counties)

indicated that the design plans prepared by the local governments and/or their consultants for transportation improvement projects on SCDOT routes that are funded by the local governments often do not meet SCDOT design standards and requirements. SCDOT resources are investing a considerable amount of their time for the review and comment processes.

SCDOT has an opportunity to establish a pool of experienced consultants to outsource the function of reviewing the plans for the local transportation improvement projects. This will allow SCDOT to free up internal resources for the Agency's priority projects, whereas the local governments will benefit from a more timely review of their project plans.

Key Recommendations

The following recommendations are intended to help SCDOT build on their strong relationships with the local transportation entities to address local, regional, and statewide transportation needs:

Recommendation # 5.1: Work collaboratively with local agencies to develop a shared vision for a transportation program that addresses statewide, regional, and local needs

The Project Team recommends that SCDOT collaborate with local agencies for the strategic and long-range planning processes to channel available transportation funding towards achieving the strategic goals. For the C Program and Guideshare Program, funds are distributed to MPOs and COGs in accordance with the requirements of legislation or Commission Policy, however, SCDOT should proactively work with these entities to explore how transportation improvement projects on the SCDOT network that are funded by the local governments can help address transportation needs on a regional/corridor basis. By establishing a shared vision for statewide transportation, SCDOT can positively influence local project decision making.

The Project Team recommends that SCDOT take the following measures:

— Engage local agencies through regional meetings to communicate to them SCDOT's Strategic Plan goals and TAMP objectives.

— Emphasize priority corridors. By working collaboratively with local MPOs and COGs to analyze the results from transportation models and other data, allocated funds can be leveraged to select regionally significant projects that improve mobility and safety along these corridors, providing both regional and statewide benefit.

— Explore the feasibility of establishing regional safety coalitions to focus efforts on addressing the systemic causes of crashes. The State rural road fatality rate is considerably higher than the national average, as discussed in the previous section of the report.

— Work jointly with MPOs to identify process improvements for modifications to the STIP.

Recommendation # 5.2: Enhance engagement of Districts with local government agencies

SCDOT Districts are the custodians of the SCDOT transportation network and they interact on a daily basis with the local governments to deliver maintenance and construction programs within their jurisdictions. As such, it is important for Districts to foster strong, collaborative working relationships with the respective County and City governments and represent SCDOT at the local government level.

The Project Team recommends that SCDOT further enhance engagement of DEAs with local government agencies and take the following steps:

— Emphasize the District's role in executing the Strategic Plan and TAMP goals. District operations should be aligned with the strategies outlined in these plans as they are on the front line with respect to program delivery and communicating Agency priorities to local governments and elected and appointed officials, such as CTCs, the public, and other stakeholders.

— Encourage Districts to engage in the planning and prioritization process with local governments, including counties, MPOs, and COGs, advocating for projects that enhance network mobility, safety, and performance, and that align with the Strategic Plan. Districts should actively collaborate with local entities and leverage available data, engineering expertise, and experience to guide project selection decisions that help improve SCDOT's network performance.

— Explore the feasibility of Districts serving as a "clearing house" for inquiries, work requests, encroachment permits and project plan reviews requested by the local governments.

Recommendation # 5.3: Improve the process for review and approval of plans submitted by local governments to accelerate delivery of projects on the SCDOT network

SCDOT should initiate a joint SCDOT-local agency task force to document concerns of all parties and develop a proposed framework for streamlining plan review and approval processes. Consultant-prepared plans for County sales tax projects located on SCDOT routes are subject to design review by SCDOT. Depending on the quality of the plans, the review process can be delayed. There are risks that should be considered on both sides as Counties seek to meet project delivery schedules and SCDOT must ensure compliance with applicable design standards. While SCDOT has final decision-making authority, the Agency should evaluate the feasibility of establishment of a pool of prequalified engineering firms to augment SCDOT staff to perform plan reviews.

Recommendation # 5.4: Consider a pilot project that leverages the capabilities of local governments to perform or supplement maintenance work on SCDOT's secondary roads

SCDOT should evaluate the feasibility and potential benefits of contracting with local governments (i.e., Counties and Cities) utilizing the increase in C funds included in the Roads Bill to perform maintenance activities on SCDOT secondary roads. Reimbursing City/County transportation agencies through interagency agreements for performing routine highway maintenance on secondary roads could enable SCDOT to redeploy its maintenance forces to primary system routes which have a higher priority. This would provide the Agency with additional flexibility as it considers organization-related recommendations from this Study pertaining to a TOM.

The Project Team recommends that this approach first be tested through a pilot project. Urban Counties or large Cities may be suitable candidates for a pilot program as it is assumed that they typically have responsibilities for maintaining local road networks and corresponding resources.

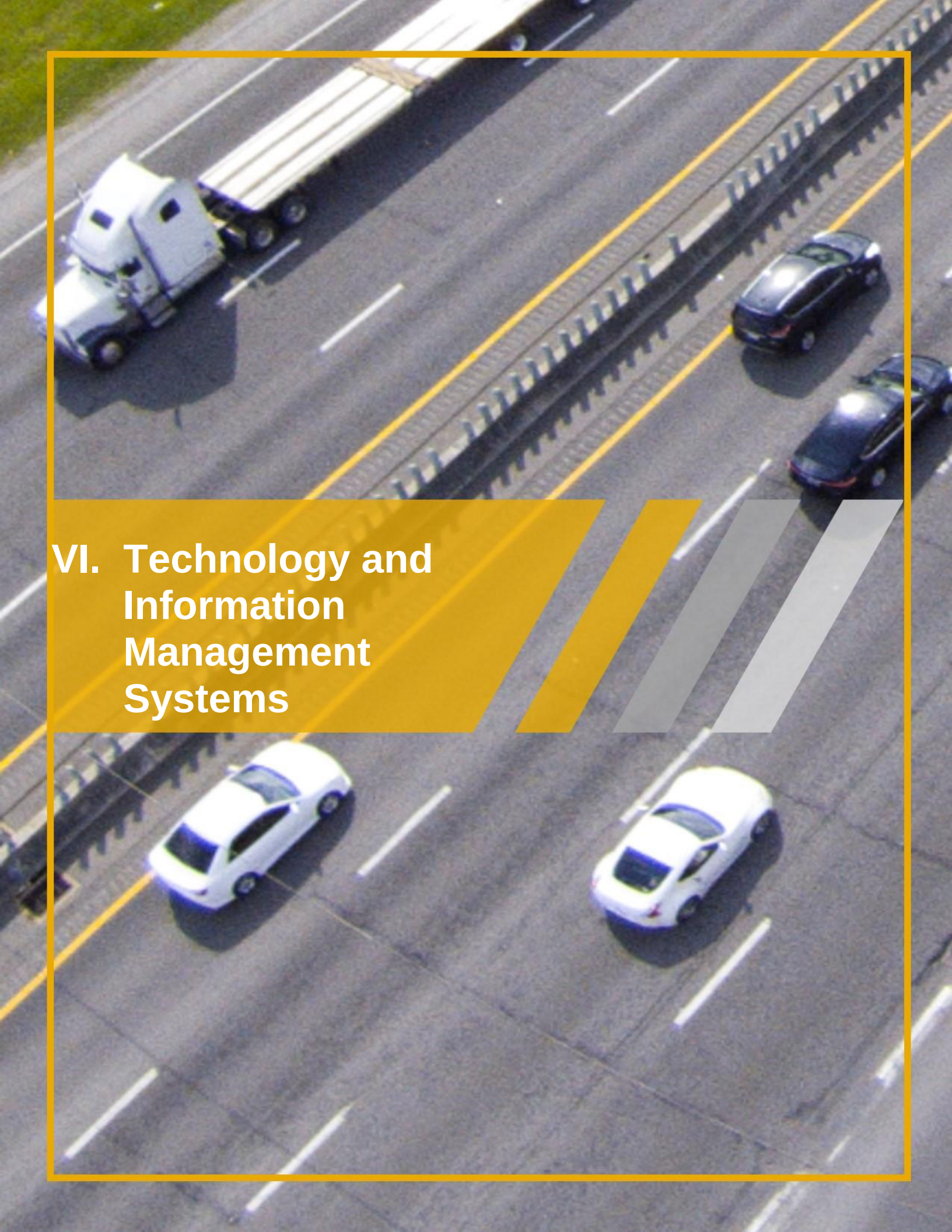
Furthermore, SCDOT should evaluate options for divesting ownership or maintenance responsibility of non- federal aid secondary roads to the Counties/Cities while the General Assembly should consider providing funding support. The County-owned network and SCDOT non-federal aid network are also about the same size. This change would bring SCDOT in line with the majority of DOTs in the nation who have minimal or no responsibility for non-federal aid

secondary routes. While a transition of this nature would require legislative action and occur over a period of time, it would enable SCDOT to better focus its program around the higher-tier (and priority) interstate, National Highway System (NHS), and primary systems.

Recommendation # 5.5: Expand the benefits of asset management beyond the boundaries of SCDOT

SCDOT should sponsor workshops for introducing the concepts of asset management and the potential benefits of developing County-appropriate plans to add value to the C Program. SCDOT should share details of its recently developed TAMP and the expected long-term infrastructure benefits by transitioning to a more data and performance-driven decision-making process. SCDOT should consider leading an effort with interested Counties (on a pilot program basis) to develop a template that could easily be replicated by other Counties.

In addition, SCDOT should promote the use of data-driven methodologies for quantifying infrastructure needs and improving the project selection and prioritization process for the use of C Program funds. Ideally, all 46 Counties would benefit from implementing a common process for inventorying and evaluating roadway pavements, reporting conditions, and developing work plans. Bridge and safety information could be collected and reported in a similar manner. The use of asset management systems for analyzing data and selecting projects is recommended as well. Implementation of these recommendations would enable CTCs to make more informed decisions on the use of available C Program funds, ultimately adding more rigor to the program. Charleston County has been successful in transitioning to this type of model for their C Program and can be used as a model.



VI. Technology and Information Management Systems

Technology and Information Management Systems

Introduction

As part of its Strategic Plan, SCDOT has undertaken the repair and rebuilding of its transportation network to ensure that the citizens and businesses of the State have a safe and reliable road system. In addition to the Strategic Plan, SCDOT is required to develop a TAMP for the FHWA in accordance with MAP-21 and the FAST Act, which includes establishing performance targets for roads and bridges. The maintenance and rehabilitation work necessary to meet these goals includes road and bridge projects aimed at maintaining underlying functional/structural integrity, as well as projects that are aimed at improving safety and mobility.

To plan, prioritize, and deliver the planned projects, SCDOT relies on a set of software systems that support multiple functional areas. These systems help SCDOT to capture, manage and analyze data from the early planning and prioritization phases of planned projects through funding and implementation phases, to ensure that the roadway network continues to operate efficiently.

Examples of the key functional areas that play an important role in helping SCDOT to manage its transportation infrastructure assets are presented below:

- Infrastructure assets: keeping track of the assets under the Agency's purview, including managing information about the location of these assets.
- Condition and performance assessment: keeping track of the condition and performance of assets with respect to strategic goals such as preservation, mobility, and safety, including making this information available to stakeholders.
- Lifecycle planning: modeling and prediction to identify optimum maintenance and rehabilitation strategies, including the maintenance and improvement of mobility and safety.
- Project prioritization: identifying and prioritizing projects.
- Project delivery: ensuring that projects are delivered efficiently once funding is finalized.
- Asset maintenance: tracking costs and maintenance work on the Agency's assets.
- Software systems that support these functional areas are often grouped into:
  - Location Management Systems
  - Pavement Management Systems
  - Bridge Management Systems
  - Maintenance Management Systems
  - Project Delivery Management Systems

As part of the Study, the Agency requested a review of SCDOT's technology and information management systems with the goal of comparing these systems with the peer group to identify potential areas for improvement.

Management Systems Overview

Some of SCDOT's core systems that are involved with management of the State's transportation assets, as well as other closely associated systems, are summarized below:

— Roadway Information Management System (RIMS): This system is a hub that handles many of SCDOT's location referencing functions. It is also the repository for the Highway Performance Monitoring System (HPMS) functionality.

— Highway Performance Monitoring System (HPMS): This system is closely aligned with RIMS and is one of RIMS' main areas of functionality.

— National Bridge Inventory (NBI): This system is also one of RIMS' main areas of functionality and houses the bridge inventory and bridge inspection data.

— Highway Pavement Management Application (HPMA): This is the pavement management system responsible for storing the pavement condition survey data as well as generating road treatment recommendations.

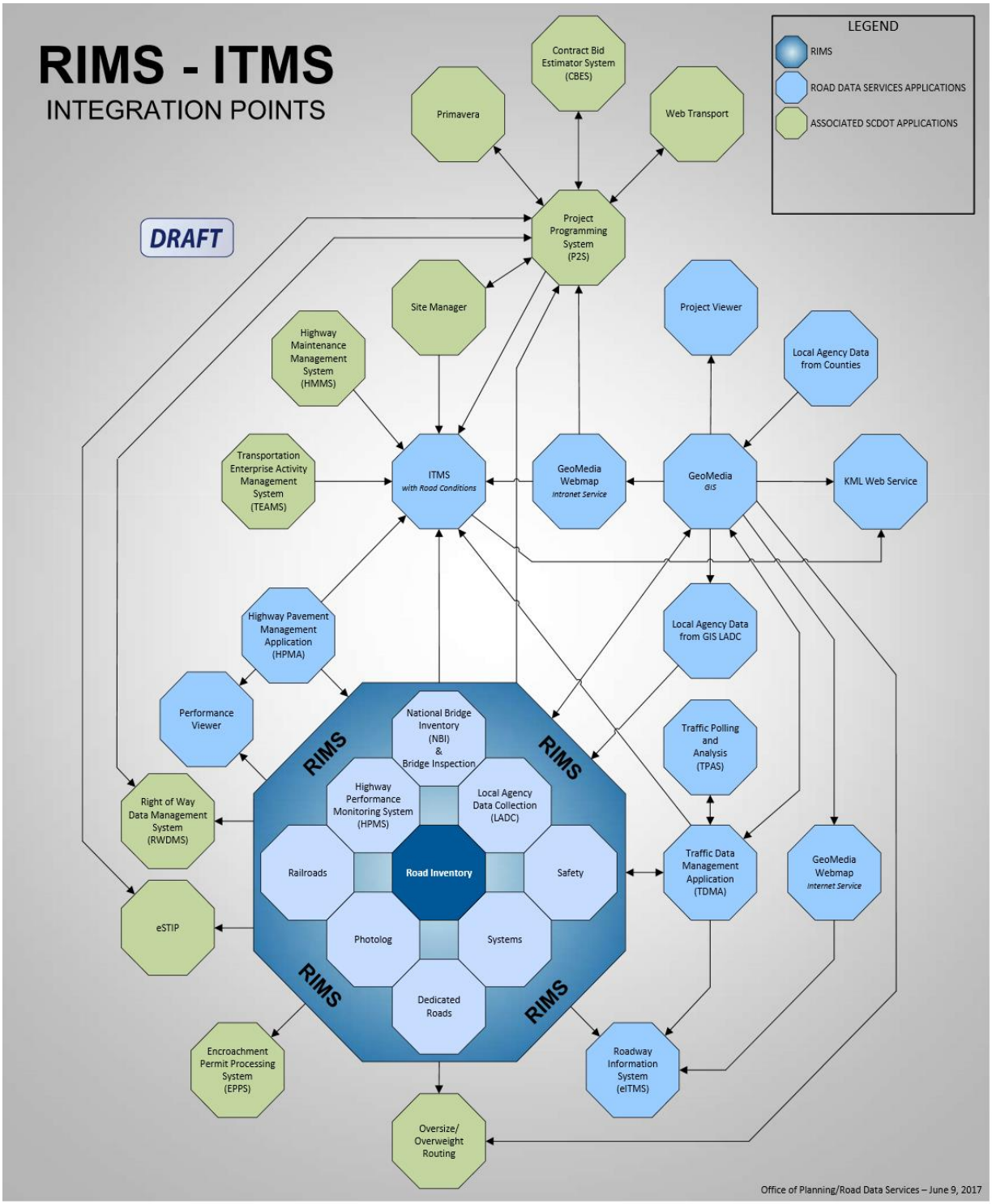
— Highway Maintenance Management System (HMMS): This system is the repository for capturing road maintenance information.

— Integrated Transportation Management System (ITMS): This system is used for collating and viewing data from multiple sources.

— Project Programming System (P2S): This system holds all funded projects and is a hub for multiple associated systems such as Site Manager, Primavera, Web Transport, etc.

The integration points between these systems and their relationships are illustrated in Exhibit 6.1. Replacement of a number of these systems are currently being planned within the next four to five years and SCDOT is beginning the process of developing an RFP for Asset Management Systems for Highway Maintenance, Bridge Management, Pavement Management, Equipment Management, Facilities Management, ROW Management, Traffic Signal Inventory, Road Inventory and Asset Tradeoff Analysis.

Exhibit 6.1: SCDOT Systems Relevant to the Project Delivery Pipeline



Source: SCDOT

Summary of Review of IT and Management Systems

Objectives

The objectives for the review of SCDOT's technology and management information systems (Systems) were to:

— Assess the suitability and effectiveness of Systems as it relates to the delivery of transportation services.

— Identify potential opportunities for improvements, such as integration of systems or the replacement or addition of systems to increase SCDOT's effectiveness and efficiency.

The Project Team reviewed existing technology systems and related processes that support project management and maintenance management functions as well as the management systems that support the Agency's operations. The Project Team conducted a general assessment among SCDOT stakeholders to gain an understanding of the general information technology (IT) landscape, including the Agency's ability to efficiently and effectively identify, prioritize, deliver, and report on projects and programs relating to overall infrastructure asset management within SCDOT.

In support of the Project Team's review of the current situation, the Project Team conducted a series of interviews with SCDOT management and staff to assess the following:

— Asset management systems: This area focuses on systems used to maintain an asset inventory for major assets such as pavements and bridges, as well as common non-pavement and non-bridge assets. It also includes location referencing tools.

— Condition assessment tools: This focuses on pavement rating systems, bridge inspection tools, other asset condition surveys and inspection mechanisms, and the data analysis and integration practices used to compile this data into meaningful indices for use in status reporting and future planning and budgeting.

— Performance communications: This area focuses on the use of website dashboards or other performance reporting mechanisms, as well as the KPIs being utilized.

— Asset maintenance, preservation, and rehabilitation/replacement decision tools: The focus for this area is the use of technology and tools for identification and prioritization of projects and resources used in the maintenance, pavement management, and bridge management programs.

— Lifecycle planning and forecasting: This area focuses on the ability of the Agency to model asset deterioration and predict long-term performance and budget needs based on identification of optimal lifecycle strategies.

— Project delivery management systems: This area focuses on project delivery and includes sub-areas such as project scheduling, critical path management, and budget and cash flow monitoring and management.

— Maintenance management systems: The focus in this area is to evaluate maintenance management systems used for maintenance work tracking, as well as internal labor, equipment and materials tracking, capture of contractor-performed work, and decision-support for making outsourcing decisions and supporting budget needs.

— System planning tools: This area includes STIP development, cross-asset project prioritization, and trade-off tools for considering program trade-offs and infrastructure maintenance needs versus system mobility and capacity projects.

— Financial tools: For this area, focus is on the interoperability of the various asset management, and maintenance management tools with the backbone financial system(s), as opposed to the financial system or systems themselves.

— Planning for and deployment of advanced technologies: This area focuses on SCDOT's forward-thinking initiatives and vision. Example technologies includes the use of mobile device information capture in the field, AVL [10] /GIS/telematics to include V2V and V2I considerations,[11] use of unmanned aircraft (drones), and use of LIDAR[12] or other advanced technologies.

As part of the basic assessment, a few specific areas were identified where more detail was warranted. As a result, a second round of interviews were conducted with SCDOT management and staff in the areas of Bridge Management, Maintenance Management, Cash Flow, and Project Delivery Management. Additionally, the Project Team conducted interviews with representatives from the peer group to review and compare their IT infrastructure, software tools, and processes with those of SCDOT.

Peer Group Analysis

To better understand the effectiveness of SCDOT's technology and management systems, and to guide further assessment of SCDOT's performance, the Project Team conducted a comparative analysis that assessed the Agency against the peer group. Interviews were conducted with representatives of the peer group, assessing the following measures to gain an understanding of how well SCDOT performs in comparison to its peers:

— Performance communications
— Asset management systems
— Asset maintenance, preservation, rehabilitation/replacement decision tools
— Lifecycle planning and forecasting
— Project management systems
— Maintenance management systems
— System planning tools
— Financial tools
— Planning for and deployment of advanced technologies

It is important to note that the feedback collected from the interview participants was anecdotal and solely reflective of that individual's opinion. The Project Team did not perform any due diligence to verify/confirm the accuracy of this information. There was no attempt to accurately sample overall Agency opinion on these systems. In some cases, the interviewee did not necessarily possess detailed knowledge of all the systems used within the Department. Furthermore, the reported Department's satisfaction with those systems may vary significantly from the opinions of each interviewee.

However, these concerns do not negate the value of the information gathered. More importantly, this explains the need for SCDOT to perform, in some targeted areas, a more detailed review of its system support needs within the context of the Agency's strategic needs.

[10] Automatic Vehicle Location
[11] Vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) data communication is the critical component of Connected Vehicle Technology (CVT) applications
[12] Light Detection and Ranging

Summary of Peer Group Comparison

Exhibit 6.2 provides a summary of observations in each area analyzed:

Exhibit 6.2: Peer Group Observations

Category	Candidate Observations
Performance communications	— Three out of five peer states — GDOT, NCDOT, and VDOT — maintain performance dashboards on their websites that communicate current status of performance measures relating to each agency's strategic plan. — NCDOT and VDOT provide further details in their dashboards specific to geographical areas within the state while GDOT and VDOT provide trends over time.
Asset management systems	— Bridges: Two peer states use a combination of AgileAssets and in-house systems; two peer states use AASHTOWare BrM; one uses Deighton dTIMS. — Pavements: Three peer states use AgileAssets, and the other two peer states use Deighton dTIMS for pavement inventories. — For other non-pavement, non-bridge asset inventories, the peer group mostly use their maintenance management system and/or an in-house system that is also used to maintain the Linear Referencing System (LRS). — With regards to the LRS, three peer states are in the process of implementing Esri Roads and Highways. PennDOT and VDOT use an in-house system and do not appear to have immediate plans to move to Esri Roads and Highways. — For fleet and equipment assets, two peer states use SAP Plant Maintenance; two peer states use AgileAssets; and one peer state uses AssetWorks M5.
Asset maintenance, preservation, rehabilitation and/or replacement decision tools	— The peer group varies in use of these tools to generate detailed work plans. — The peer group uses their pavement management systems to inform project selection by generating work plans under various budget and other constraints utilizing future benefit cost and calculations. — The peer group uses their bridge management systems to inform future bridge projects, although to a lesser extent. The peer group is more likely to use only prioritization and not optimization for bridge project identification and prioritization. — The peer group utilizes the preventative maintenance functionality of their fleet systems to inform maintenance decisions. — The peer group does not appear to actively make decisions using management systems for non-pavement and non-bridge fixed assets.

Category	Candidate Observations
Lifecycle planning and forecasting	— The peer group actively utilizes pavement management systems for pavement lifecycle planning purposes. — However, lifecycle planning and forecasting is not yet mature for bridges. — The peer group does not appear to be using lifecycle and forecasting functionality for non-pavement and non-bridge fixed assets. — Lifecycle planning for vehicle/equipment fleets tends to be conducted using a combination of functionality in the fleet management systems and through the use of consultants.
Project management systems	— For construction project contract management, three peer states utilize AASHTOWare SiteManager while the remaining to peer states use in-house systems. — For preconstruction, a large variety of mostly in-house systems are used.
Maintenance management systems	— Maintenance management systems are used by the entire peer group. — Three peer states use AgileAssets, one uses SAP-PM and the other is in the process of implementing DTS.
System planning tools	— The peer group does not utilize specific commercial systems to manage the development of their STIP. — Typically, a combination of source systems combined with spreadsheets and/or in-house databases are used to compile and maintain the STIP project list.
Financial tools	— The peer group uses one of the major Enterprise Resource Planning (ERP) systems.
Planning for and deployment of advanced technologies	— The peer group is seeks to increase the use of mobile devices for collecting data in the field (i.e., for performing asset inspections or for recording maintenance work). — The peer group uses some level of automated data collection while some peer states are exploring the use of LIDAR for collection of visible asset inventory. — Three peer states have considered using drones but these efforts were typically in the form of small decentralized pilot programs. — Four northern peer states use AVL in their fleets: three northern peer states use this in their snow plow fleet and one uses it in their emergency response vehicles.

Source: SCDOT and the Peer Group Analysis

Key Findings

The Project Team's review of SCDOT's technology and information management systems resulted in the findings summarized below.

Finding # 6.1: Opportunities exist to consider lower-end preservation level projects as part of the prioritization process

SCDOT is primarily using their pavement and bridge management systems to provide data used to set priorities for pavement rehabilitation and reconstruction and bridge replacement projects. The information for selecting the preservation projects can also be generated by the pavement and bridge management systems. While identifying preservation projects, the Project Team understands that the current practice of the Agency is to apply select pavements for preservation from a pool of candidates based on the pavement quality index and select the appropriate treatment using information in the Department's "Guidelines for Selecting Preventive Maintenance Treatments for Asphalt Pavements".

Hence, with the future procurement of new state of the art pavement and bridge management systems, SCDOT may have an opportunity to let the management systems generate the preservation candidates. The list of projects selected for preventive maintenance treatments should be released for public comment along with the pavement improvement projects that are approved by the SCDOT Commission. By including this, common public questions regarding the reasons for working on roads (with preservation treatments) in apparently good condition can be addressed. The ability to better identify and optimize the recommended work plan in these systems should be continually assessed and new tools should be employed as they become available to facilitate this improvement.

Finding # 6.2: Opportunities exist to streamline SCDOT's project management systems

The process of identifying, prioritizing, and preparing projects prior to construction will become an increasingly important part of SCDOT's ability to increase project throughput as SCDOT makes use of additional revenue to reverse the trend of deteriorating infrastructure. It will be vital to ensure that there is clear visibility into the current status and performance of project delivery metrics to be able to efficiently plan, design, procure, and deliver the increased number of planned projects.

P2S (an in-house, SQL server, .net web server app) is the primary "hub" application used to track the status of projects; however, it does not necessarily encompass the full spectrum of project management (scheduling, etc., for instance, which may be accommodated in a peripheral system). Once a project is identified (typically as having been funded, but not necessarily so), P2S is used to track the project through to completion. All projects recorded in P2S are viewable on a Google-based map (based on receiving data from RIMS) enabling visibility into possible overlaps and conflicts. Additionally, P2S draws data from multiple systems such as RIMS, SiteManager, Primavera, and Webtransport; however, much of this integration is supported by manual processes.

The Project Team's review of the effectiveness of P2S and input received from SCDOT personnel identified a couple of areas for potential improvement:

— Additional systems support is required to improve/automate integration among various systems.

— Prior to identification for the STIP and inclusion in P2S, there is considerable potential for enhancing the current process to develop more automation in the prioritization of pavement and bridge projects for the STIP.

With the passage of the Roads Bill and the Agency's focus on the 10-Year Plan, SCDOT leadership recognizes the need to increase project delivery throughput to achieve SCDOT's strategic goals. However, this will require sound business processes and supporting IT systems.

Finding # 6.3: Opportunities exist to improve the cash flow projections process

The current process for preparing cash flow projections for the monthly Program and Resource Analysis Meeting (PRAM) is a manual, highly intensive effort, and the tools being used at present are susceptible to errors. Personnel supporting the process have identified this as an area where more IT systems support could be impactful. During the Project Team's review of the cash flow reporting and projection processes, SCDOT personnel indicated that there is potential to better integrate pre-construction project sources and inputs to improve individual project cash flow projections for use in general cash flow management.

Additional funding availability as previously discussed through the Roads Bill and SCDOT's need to increase project throughput will require strong processes and systems to be in place, including the close management of cash flow.

Finding # 6.4: The current dashboard reporting system is in need of realignment

SCDOT's Strategic Plan 2018-2020 identified new goals and objectives for the Agency. These goals and objectives do not align with the current set of performance measures reported on the Agency's website. As such, the current dashboard reporting should be updated and realigned with the Agency's strategic goals.

Based on the new strategic goals and objectives identified in SCDOT's Strategic Plan, the Agency should examine the KPIs currently used to measure progress towards strategic goals to ensure that they continue to remain relevant. Additionally, SCDOT should ensure that decision makers, managers, and supervisors at all levels of the Agency have access to timely, reliable, and accurate information for effective and efficient decision-making in support of the Agency's strategic goals and objectives.

Finding # 6.5: Opportunities exist to leverage modeling tools to expand lifecycle planning and forecasting for bridges and pavements to analyze future scenarios

SCDOT's current pavement and bridge systems have the required capabilities/functionalities to model asset deterioration and predict long-term performance and associated funding/budget needs. Presently for pavements, SCDOT mainly identifies rehabilitation and preservation candidate projects. Going forward, the intention is to analyze the before and after conditions to improve modeling.

For bridges, the focus is on prioritization as opposed to modeling. This data is exported from Pontis into central spreadsheets to compile priority lists for structurally deficient bridges. As newer versions of BrM become available, SCDOT plans to continue to expand its use of available modeling tools to select the best types and timing for projects. However, with regard to the upcoming asset management systems replacement project, SCDOT may have the opportunity to evaluate other bridge management tools. Similarly, for other asset types and maintenance elements, SCDOT will have the opportunity to expand their tool sets to enhance their lifecycle planning and forecasting capabilities as part of SCDOT's implementation of new asset management systems.

Key Recommendations

The analysis of the current state of technology and management systems of SCDOT, along with the best practices of the peer group, has provided a basis for the recommendations presented in this section.

Recommendation # 6.1: Develop an Asset Management Systems Strategic Plan

To address a number of opportunities for improvement, the Project Team recommends that SCDOT take a holistic view on creating robust asset management capabilities within the Agency to meet and exceed requirements and targets such as MAP-21 and the FAST Act. The development of an Asset Management Systems Strategic Plan should be supported by the following actions:

— Conduct comprehensive reviews of long-term, strategic system needs for asset management and develop guiding principles for upcoming asset management system replacement projects.

— Identify the asset types requiring greater visibility with respect to budget needs, performance, and risk so that they can be prioritized in a long-term strategy for systems implementation.

— Develop a strategy with respect to location referencing, and more specifically, linear referencing. In order to accomplish this, SCDOT should identify location types that require coordination and integration across multiple systems, as well as identify commercial systems that can help manage linear referencing systems.

— Develop a future technology strategy and consider if there is an immediate need to change the current technology platform. This will be an important consideration prior to, or in parallel with, the development of an RFP for the replacement of asset management systems.

— Assess in detail the capabilities of the current asset management systems to analyze various future scenarios including the potential of varied funding levels for pavement and bridge assets.

— With regard to long-term asset management, assess whether opportunities exist to enhance lifecycle modeling and optimization to generate more cost-effective and timely preservation and rehabilitation strategies for pavement and bridge assets.

In summary, SCDOT should ensure that requirements for the upcoming Asset Management Systems Replacement RFP match the Agency's long-term strategic direction.

Recommendation # 6.2: Develop an integrated Project Delivery Management System

In order to effectively plan, design, procure, and deliver the volume of capital projects planned as part of the Agency's 10-Year Plan, SCDOT requires visibility into its current performance status and project delivery metrics. To this end, the Project Team recommended the development of KPIs and management reports discussed in earlier sections of this report. SCDOT will require an integrated system that monitors and tracks projects' KPIs during the project development and project delivery phases.

The Project Team recommends that SCDOT develop an automated prioritization system of record to manage the prioritization process and for the STIP development for pavement and bridge projects. To this end, the Agency should implement new and/or enhance current systems to accommodate the growing pipeline of projects from initial generation (e.g., from source pavement and bridge management systems), through further prioritization and approval processes, to a formalized the STIP database repository that includes eSTIP. The Project Team also recommends that the Agency automate the continuous publication and communication of capital project priorities and approved STIP projects through the Agency's website.

Consideration should be given to interface the STIP and other projects into the preconstruction work flow. As a guiding principle for this effort, it is recommended that SCDOT identify key metrics and data requirements to track status of projects in the preconstruction phase and enhance

current systems such as P2S to include new data attributes to support these key metrics. SCDOT is encouraged to integrate current (largely separated) systems to automate data flow updates and obviate the need for manual data transfer, as well as develop processes to improve project schedule projections to promote industry capacity growth.

Recommendation # 6.3: Reengineer current cash flow processes and tools to increase automation

Efficient management of cash flow to fund the Agency's obligations is an important function. The current process for preparing cash flow projections for the monthly PRAM is manual and onerous, and the tools currently being used for cash flow projections are susceptible to error. SCDOT personnel supporting this process identified this as an area where more IT systems support/process automation could be beneficial to prepare accurate and decision-useful cash flow projections that enhance accuracy, consistency, and predictability of the cash flow management process and reduce the risk of errors and wide swings in cash balances.

The Project Team recommends that SCDOT streamline the cash flow reporting process by implementing more standardized systems and business processes for cash flow management and prediction to reduce the need for manual analysis. Consideration should be given to develop automated integration with upstream data sources to reduce manual input, resulting in reduced reliance on knowledge and effort of individual personnel to input and analyze data. Additionally, SCDOT should improve linkages between project schedules and cash flow projections with the objective of increasing robustness and accuracy of projections while reducing the risk of projection errors. This will ultimately increase SCDOT's ability to utilize available financial resources to expedite delivery of projects and transportation services.

Recommendation # 6.4: Reassess current strategic dashboards in light of the new strategic goals

The objective of maintaining public-facing KPI dashboards is to inform, educate and communicate the current status and historical trends of the Agency's stated goals and objectives with the public and stakeholders. In light of the new strategic goals and objectives, SCDOT should consider revising the KPIs currently used to measure progress towards strategic goals to ensure that they continue to remain relevant. At the strategic level, these KPIs should provide feedback in terms of monitoring attainment of the Agency's strategic goals and objectives. At the decision-making level, these KPIs should help SCDOT leadership examine attainment of transportation system performance targets and consider course corrections on the basis of performance status and trends. At the project delivery level, leadership and industry participants can monitor the project delivery statistics and make more informed decisions.

The Project Team recommends that SCDOT:

— Explore automation of data flow to dashboards housed within the Agency's website to streamline the process of maintaining the information. Reducing manual processes will help increase accuracy and timeliness of data presented on the Agency's dashboards.

— Identify opportunities to access source data automatically, both internally and beyond immediate SCDOT jurisdiction to enhance high-level metric reporting for corridors that span jurisdictional boundaries, as well as for the State as a whole.

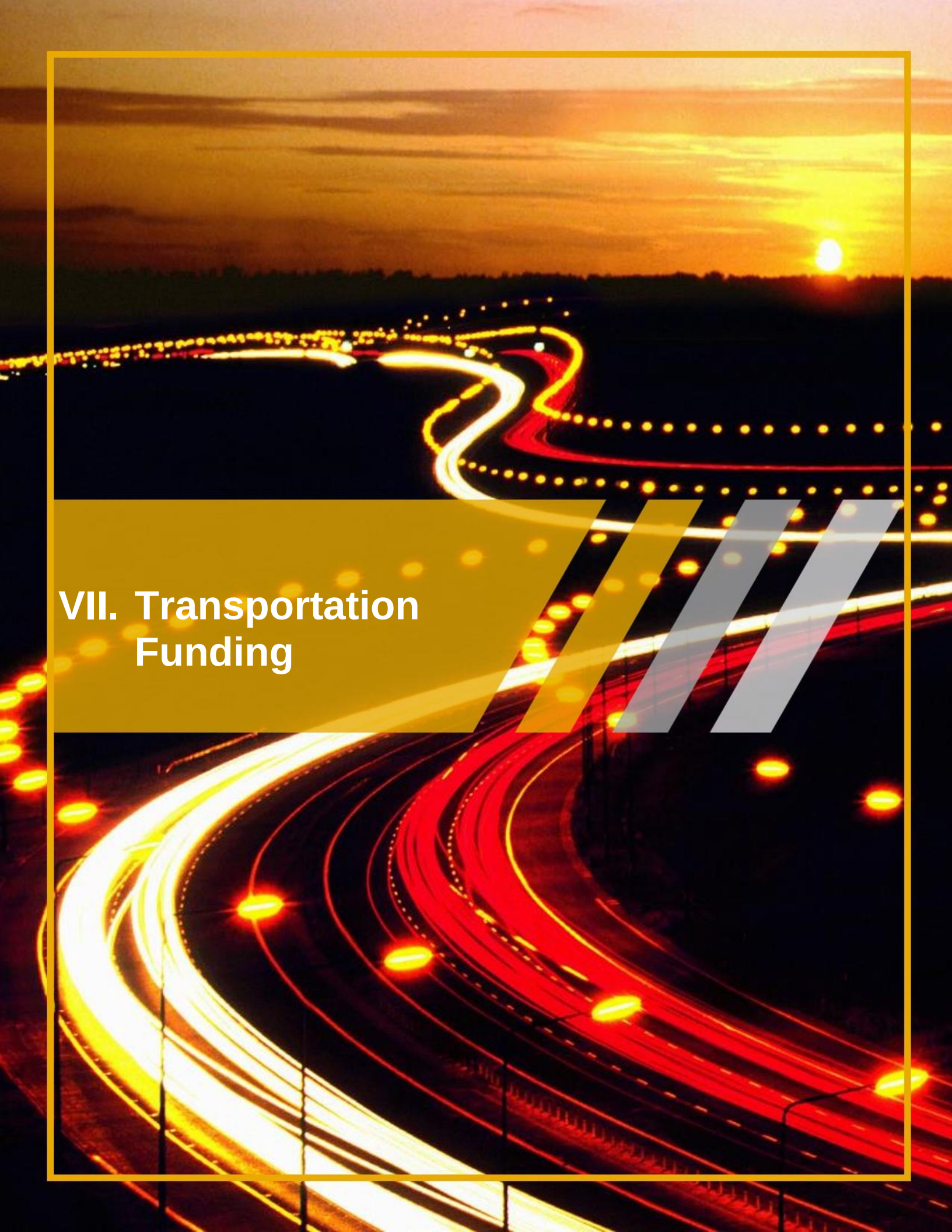
— Define a long-term data reporting systems strategy to encourage partner organizations to share data/information related to SCDOT's strategic goals in the areas of safety, preservation, and mobility.

In addition to displaying current performance status on SCDOT's public-facing website dashboards, consideration should be given to display trends over a period of time to better communicate progress towards achieving SCDOT's strategic goals. Increased visibility into medium-term trends will be valuable in making decisions regarding course corrections and anticipating potential challenges and issues.

Recommendation # 6.5: Develop a strategic plan for increasing mobile data collection

The Project team recommends that SCDOT develop a strategic plan for increasing mobile data collection in areas such as field inventory data collection (for assets such as small culverts that are not visible from automated data collection vehicles), field inspection and condition survey data collection (bridge and other asset inspection data), and at least maintenance time entry, location and accomplishment data collection. SCDOT should also consider investigating the use of AVL technologies being deployed in such vehicles and herbicide and striping vehicles to aid in the capture of time entry, location and accomplishment data collection in these areas so as to increase accuracy of the data capture and reduce manual entry.

Additional recommendations can be found in Appendix IV.



VII. Transportation Funding

Transportation Funding

Introduction

For FY 2017-2018, SCDOT has projected revenues of approximately $2.36 billion. The State's two largest revenue sources are Federal Funds derived from the Federal Motor Fuel User Fees and State Motor Fuel Revenues derived from the State Motor User Fees. These two revenue sources account for over 65 percent of SCDOT's total projected revenues with the Federal Funds contributing approximately 44 percent and the State Motor User Fees contributing approximately 21 percent of the projected $2.36 billion in revenues. The remaining 35 percent of the projected revenues are contributed by other sources that include fees, fines, tolls, non-federal aid, general funds, and other State agency funds.

Exhibit 7.1 – SCDOT's FY 2017-2018 Projected Revenues

SCDOT FY 2017–2018 Projected Revenues		
Sources	**Percentage of Total (%)**	**Amount ($ thousands)**
Federal reimbursements	44%	$1,032,000
State motor fuel tax	21%	$495,000
Other	35%	$672,000

Source: SCDOT

The federal reimbursement portion of funding is based on eligible project expenditures at a blended rate of approximately 84 percent. This share of the federal reimbursement requires that the State provide approximately $194 million in matching funds. It is important to note that while the State collects the fuel tax, not all fuel tax revenue collected is allocated to SCDOT as approximately 22 percent of the fuel tax revenue is transferred to other State agencies such as the Department of Revenue, the Department of Agriculture, and the Department of Natural Resources Water Fund.

In May 2017, the State legislature passed the Roads Bill that raised the state's gasoline tax for the first time since 1987. The Roads Bill raised the state's gasoline tax by two cents a gallon annually for the next six years, totaling to an increase of $0.12 a gallon on the sixth year onwards, culminating in the Agency expecting approximately $600 million in additional revenue by 2024. A large majority of this additional funding is scheduled to be directed to four key priorities for investment: Resurfacing, Interstate Widening, Bridges, and Rural Road Safety programs.

Summary of Transportation Funding Review

The initiation of this Study coincided with the passage of the Roads Bill; as such, the Secretary and her leadership team requested that the Project Team conduct a high-level review of the Agency's transportation funding, compare the state's transportation funding to the peer group, and explore potential opportunities for cost reduction or revenue generation from underutilized assets. The objective was to utilize savings and additional revenues gained from the disposition of underutilized assets or cost reductions achieved within the existing transportation system, allowing the Agency to do more with the same amount of revenue.

The Project Team, in consultation with SCDOT leadership team, selected the following three areas for further examination to identify potential cost savings opportunities:

— Fleet

— Strategic sourcing

— Highway striping

Key Activities Performed

The Project Team focused its efforts on the following areas to conduct its analysis and examine potential challenges faced by SCDOT with regard to statewide transportation funding and to identify potential opportunities for improvement:

1) Evaluate SCDOT's current transportation funding structure and process to better understand the current funding environment with the goal of increasing efficiency of funding uses.
2) Evaluate SCDOT's fleet services and assets to identify potential vehicles that could be disposed based on their age, utilization, and ability for the requisite transportation needs to be provided via alternative modes (i.e., moving the miles from a specific unit to another vehicle(s) in order to increase vehicle utilization).
3) Evaluate SCDOT's strategic sourcing process to identify SCDOT spending that occurs outside of competitively procured contracts in order to aggregate them into established sourcing categories to achieve greater pricing efficiency.
4) Evaluate SCDOT's highway striping services to understand the framework of services provided in order to enhance service delivery pricing and responsiveness.
5) Review practices from the peer group with the goal of incorporating leading practices in order to improve the effectiveness of **SCDOT's transportation funding framework**.

The Project Team reviewed information and data provided by SCDOT, including the FY 2017-2018 Budget Submittal, annual reports, fleet inventory, and usage history, and conducted a series of interviews with SCDOT leadership, senior management, and relevant staff to assess the Agency's transportation funding framework.

The review of SCDOT's transportation funding framework was supported by a benchmarking analysis of the peer group to identify leading practices and potential areas of improvement. A summary of the benchmarking analysis is presented in the section below.

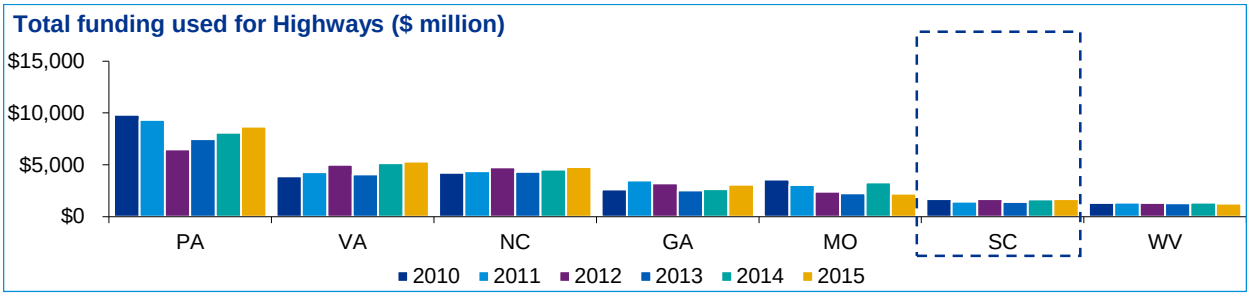
Peer Group Analysis

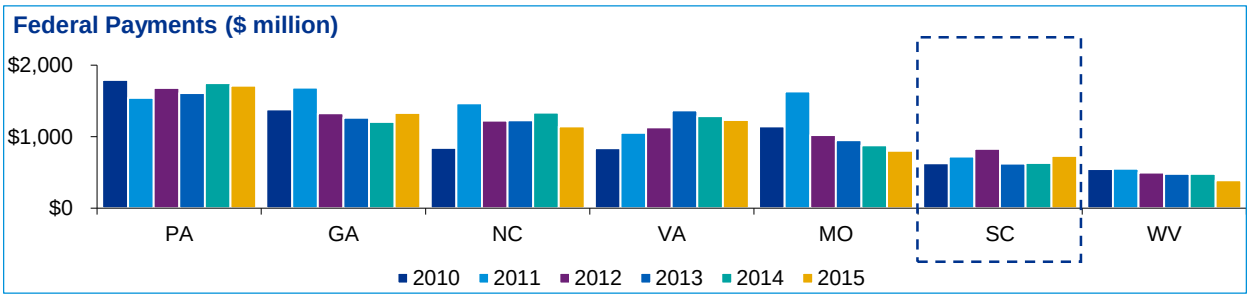
It is important to note that different DOTs categorize their expenses and services that make up their respective General Ledger (GL) codes in different ways. As such, the Project Team relied on FHWA aggregated data to conduct the benchmarking analysis. This allowed the analysis to be conducted on a comparable basis as the statewide budget figures are reported by all DOTs using the same framework or structure.

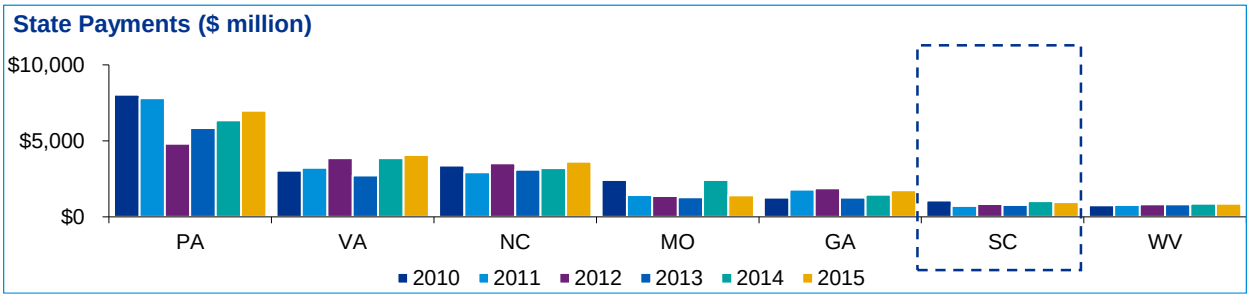
Exhibit 7.2 presents three key elements of DOTs' funding[13] portfolio: Total dollars spent on the transportation system, and federal and State payments. The comparison provides insight into how SCDOT's statewide transportation funding compares to the peer group.

[13] Analysis is based on "revenues" received by the State for highways and not "disbursements."

Exhibit 7.2 – Funding Profiles



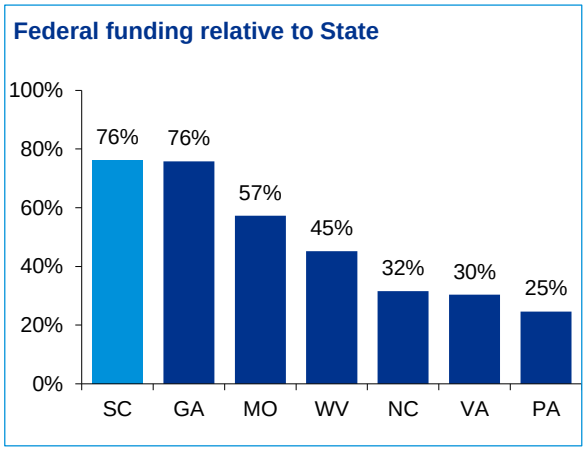




Source: Peer Group Benchmarking Analysis

Notwithstanding having the fourth-largest transportation system in the nation, SCDOT ranks relatively low across all three parameters as compared to its peer group. The analysis indicates that SCDOT is tasked with operating and maintaining a large transportation system with relatively less resources. Several factors contribute to a small revenue base, including a low population, large geographic area, and reliance on motor fuel tax as the primary State funding source.

Exhibit 7.3 – Federal Funding Levels



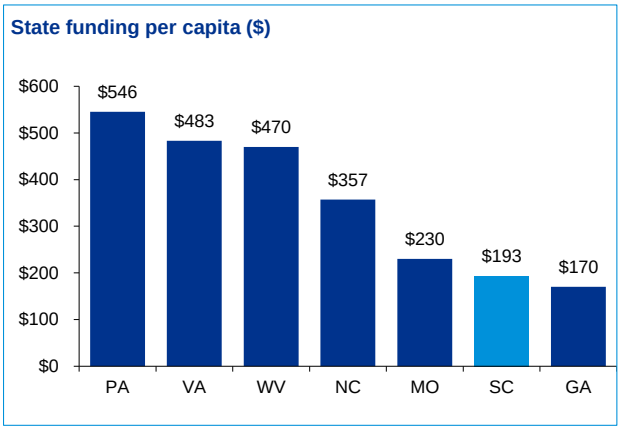
Source: Peer Group Benchmarking Analysis

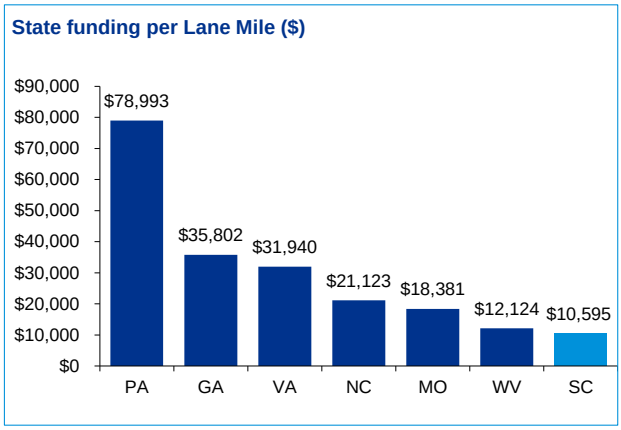
As shown in Exhibit 7.3, SCDOT has the highest-level of federal funding (76 percent) relative to the peer group with only Georgia having the same federal funding level as the State. The Project Team's review of the peer group's federal funding levels indicated that Virginia, Missouri, and West Virginia have experienced a downward trend in federal payments in the last several years. Whereas, state funding has increased in the peer group from FY 2010-2011 to FY 2015-2016, with the exception of Pennsylvania and Missouri. For the State, state funding has decreased from $1.07 billion in FY 2010-2011 to $958 million in FY 2015-2016. As compared to the peer group, SCDOT is leveraging federal funds well.

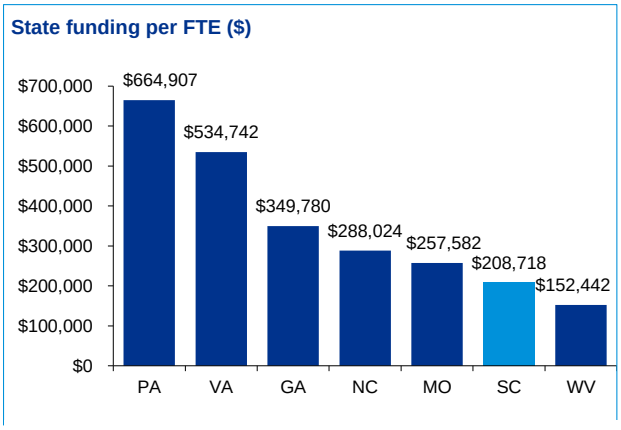
The Project Team analyzed the ratio of funding against the total population of the states (per capita), lane miles, and the FTE employees employed by the peer group to assess how these organizations are funding their transportation needs.

Exhibit 7.4 below presents the results of our analysis.

Exhibit 7.4 – Funding Levels by Population, Lane Miles, and FTEs







Source: Peer Group Benchmarking Analysis

Taking into account that SCDOT has a large system and relatively low transportation funding, the Agency ranks low among the peer group. In terms of state funding per lane mile, SCDOT ranks the lowest among the peer group, whereas, SCDOT ranks the second-lowest among the peer group in terms of state funding per capita and state funding per FTE employee.

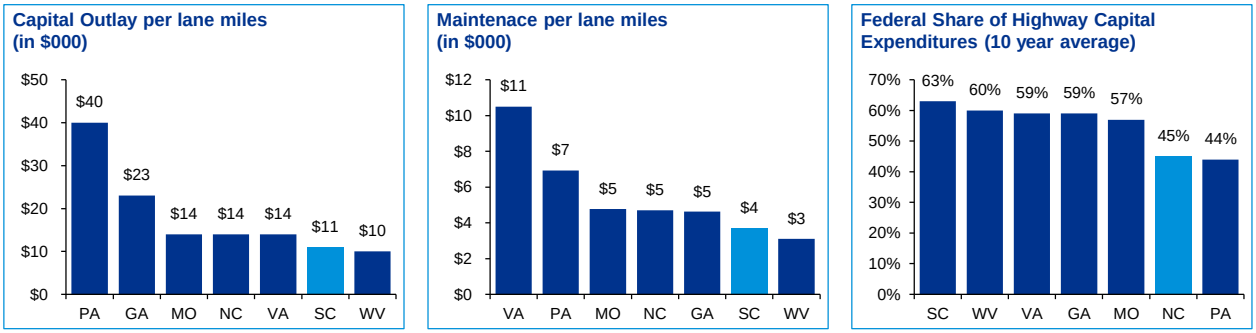
From the annual capital and maintenance outlays, SCDOT has the second-lowest capital outlay per mile (approximately $23,000 per centerline mile or about $11,000 per lane mile)

among its peer group and the annual maintenance outlay per centerline mile follows a similar trend.

Similarly, from the annual maintenance outlay, SCDOT ranks the second-lowest among its peer group with approximately $4,000 in maintenance expenditures per lane mile. It is important to note that with the passage of the Roads Bill, these comparisons may look different in the coming years as the recent action is projected to bring additional revenues to SCDOT over the next six-year period, as discussed at the beginning of this chapter.

Exhibit 7.5 presents annual capital and maintenance outlays for SCDOT and the peer group.

Exhibit 7.5 – Annual Capital and Maintenance Outlays per Centerline Mile



Source: Peer Group Benchmarking Analysis

It should be noted that for highway capital expenditure, the State relies heavily on federal contribution and that federal funds can only be used on about half of the State-controlled highway system. In the past 10 years, the average federal contribution as a percentage of the total highway capital expenditure for the State was as high as 63 percent, highest among the peer group.

Key Findings

Finding # 7.1: On comparable measures, the revenue received from fuel taxes is lower compared with the peer group

SCDOT has the responsibility for operating and maintaining a large transportation system across a sizeable geographic area. Revenues generated from the motor fuel tax (applied to petroleum products) represent a large majority of SCDOT's funding. As such, the amount of fuel sold annually in the State plays an important role in determining the level of resources that might be available to SCDOT for managing the transportation system.

As stated earlier, SCDOT has the fourth-largest transportation system in the nation; however, the State ranks 24th in the nation in terms of population. This means that the demand for fuel, and subsequent revenues, are not in proportion to the size of the transportation system. Additionally, considering the recent trend towards more fuel-efficient vehicles and the use of alternative fuels, fuel sales and the corresponding fuel tax revenues are likely to fall. With the passage of the Roads Bill, this funding challenge has been addressed to some extent as approximately $600 million in additional revenue is expected by 2024.

Finding # 7.2: Opportunities exist to reduce fleet inventory through underutilized fleet disposition

The fleet operations at SCDOT are decentralized and units are controlled by the Districts. The central office staff based in the HQ monitors performance and makes recommendations on fleet

disposal. SCDOT's Supply and Equipment Office collects a large amount of data on the fleet utilization and maintenance costs. This office has a good process in place to determine which vehicles require replacement based on a set of criteria to guide the replacement decisions.

The Project Team's review of the fleet data indicated that urban and rural Districts have similar fleet compositions. Typically, fleet requirements of an urban District will be different from those of a rural District, as urban Districts have more opportunities for outsourcing transportation services. Based on the Project Team's review of the September 2015 fleet utilization report, SCDOT's fleet inventory included 95 "sedans, SUVS, vans, and pickups" that do not meet the "minimum utilization" threshold established by the central office for each vehicle type.

This vehicle category of "sedans, SUVs, vans, and pickups" was selected for analysis considering that the transportation service provided by these units are easily interchangeable (i.e., functions as a commodity). Of the 95 units that did not meet the minimum utilization threshold, 39 vehicles had greater than 100,000 miles (i.e., vehicle may have reached or exceeded its useful life). For these 39 vehicles, the vehicle with the highest annual usage was less than 4,000 miles for the year (i.e., equates to approximately 77 miles per week). The Project Team recognizes that there are many factors other than utilization that may influence the decision to replace or remove a vehicle from the inventory. SCDOT may have an opportunity to evaluate its fleet inventory to identify vehicles that may be removed from the inventory without impacting the operational efficiencies of transportation services.

Finding # 7.3: Opportunities exist to aggregate SCDOT spending into competitively procured bids from the private sector

For the most part, SCDOT purchases goods and services in two ways: (1) using contracts (approximately $397 million in annual spending), and (2) through purchase cards, typically called "p-cards" (approximately $17.7 million in annual spending). Considering that goods and services procured through contracts are competitively bid through the SCDOT procurement process, the Project Team did not evaluate them for the purpose of this Study. SCDOT may have an opportunity to aggregate multiple contract items into larger contracts; however, further analysis would be required to validate this premise.

The Project Team's review and analysis of the p-card purchases indicated that there may be value in aggregating spending into sourcing categories and then procuring those categories through competitive bids from the private sector. Market benchmarks and leading practices suggest that SCDOT could realize potential savings in the range of 5 to 15 percent as compared to retail pricing from category sourcing.

Exhibit 7.6 below presents the aggregation of similar products and vendors into natural sourcing categories.

Exhibit 7.6 – Potential Savings from Category Sourcing

Category	Total P-Card Spending	5% Savings	15% Savings
Maintenance, repair & operations/tools etc.	$734,934	$36,747	$110,240
Machinery	$914,140	$45,707	$137,121
Parts	$777,588	$38,879	$116,638
		$121,333	**$363,999**

Source: Analysis Conducted by the Project Team

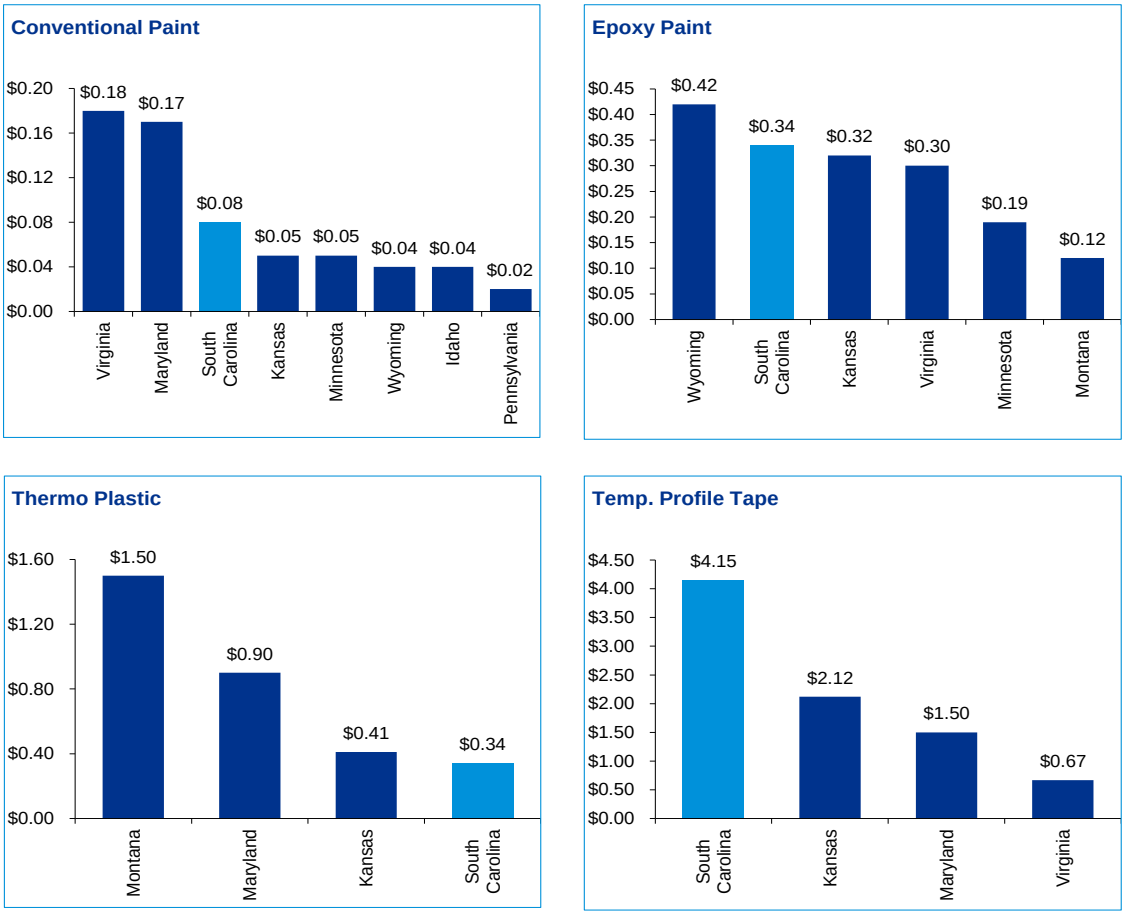
For illustrative purposes, the Project Team selected these three categories to analyze annual spending across the various retailers that SCDOT made purchases from. The potential savings could range from $121,000 to $364,000 annually for these three categories. SCDOT should examine the viability of aggregating spending into sourcing categories. Additional analysis will needed to fully build out the categories and the vendors that would potentially fall under each category.

Finding # 7.4: SCDOT's costs for highway striping services are comparable to its peer group

The Project Team collected and analyzed a large amount of data through open source research to understand how the peer group and other DOTs address their striping needs. Based on the review of highway striping data for nine DOTs[14], the Project Team learned that SCDOT's costs for most of its highway striping products were within a normal range on a cost per unit basis to the other DOTs analyzed.

Exhibit 7.7 presents highway striping costs per unit basis for SCDOT and other DOTs.

Exhibit 7.7 – SCDOT's Highway Striping Costs per Unit Comparison



Source: Peer Group Benchmarking Analysis

[14] The project team explored state DOTs that are outside of the original peer group as limited data was available for the peer group state DOTs.

Key Recommendations

The following recommendations are intended to help SCDOT build on their strengths and various ongoing efforts taken by the leadership team to improve the Agency's transportation funding framework to better achieve SCDOT's strategic goals.

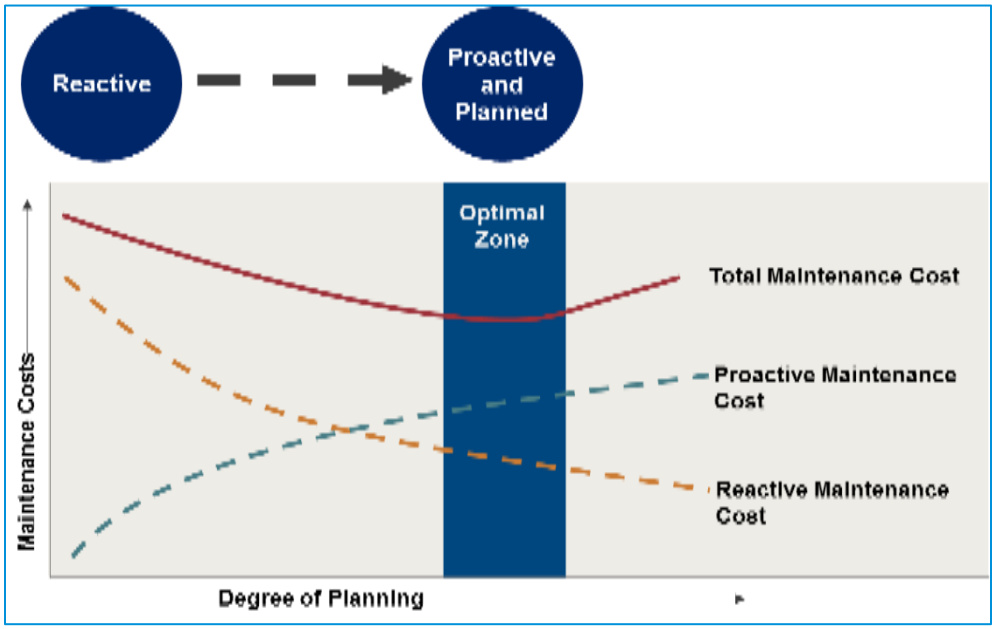
Recommendation # 7.1: Evaluate maintenance requirements in the context of planned improvements under the 10 Year Plan

SCDOT is in the unique position of enabling a step-change in the way maintenance activities are delivered across the State on the back of a significant funding boost from the 2017 Roads Bill. As part of the Agency's 10 Year Plan, it is estimated that the resurfacing budget will be increased by four times over the next six years. This significant increase in highway resurfacing activity puts SCDOT in the unique position of being able to review and potentially reallocate some portion of routine maintenance effort to ensure their roads are being preserved in the most efficient and cost effective manner.

Historically, highway maintenance services were more often delivered in a triage type environment – i.e., addressing maintenance on a reactive basis, giving priority to the most urgent, significant maintenance needs. This is an inefficient way to deliver maintenance activities but, unfortunately, becomes the primary approach when the network is suffering from over 30 years of chronic under-investment. Consequently, the percentage of primary and secondary roads rated in poor condition has gradually increased from a range of 31 percent to 33 percent in 2008 to a range of 53 percent to 55 percent in 2016[15].

Exhibit 7.8 graphically illustrates potential benefits that can be achieved by gradually moving towards a proactive maintenance planning strategy.

Exhibit 7.8 – Making the Right Asset Decisions and Optimizing Expenditure



[15] SCDOT Pavement Condition Trendiness Presentation

With additional funding and increased focus on resurfacing activities, SCDOT should gradually transition from a reactive to a proactive planned maintenance approach employing more scheduled routine and preventive maintenance activities. As the resurfacing program is deployed, the opportunity to move away from a reactive approach to maintaining the highway system in a proactive manner increases. The percentage of network in "triage" condition will continue to decrease as more highways are rejuvenated through the resurfacing program. SCDOT can leverage the benefits of having the time to ascertain and quantify the maintenance need for each District before deploying resources. The Project Team recognizes that decision-making in terms of how to allocate maintenance resources will become more difficult in this situation and that SCDOT will need a supporting framework to guide decision making. Performance-based maintenance (PBM) can serve as a framework to help field staff make more informed and evidenced based decisions on where to allocate limited maintenance effort as well as demonstrate the downstream impacts of maintenance expenditure on network performance.

PBM will guide SCDOT to developing maintenance-centric levels of service by highway class, ensuring consistency across the State. PBM will also demonstrate the cost of maintenance – ensuring that funding forecasts for a given level of service can be determined and communicated with the Commission, legislature, and stakeholders. Over a period time, it will allow SCDOT to adopt a more needs based approach for future funding allocation across the State. In summary, PBM can be the enabler that allows SCDOT to make more informed decisions on investment allocation ensuring that the additional investment made in resurfacing is protected and preserved.

Recommendation # 7.2: Right-size fleet services to optimize SCDOT's fleet portfolio

SCDOT has an opportunity to potentially reduce its fleet service costs through a right-sizing initiative. The Agency is going through an internal transformation process and efforts are underway to examine how transportation services should be provided going forward. As part of this process, SCDOT should examine the fleet compositions of various Districts (i.e., urban versus rural) and identify vehicles/mechanical units that are deemed to be underutilized. Right-sizing the fleet inventory will help SCDOT increase fleet utilization and reduce costs.

SCDOT should consider the following:

— Conduct an analysis of the fleet portfolio to identify vehicles that could be disposed of

— Work collaboratively with Districts/Offices to build consensus around right-sizing the fleet

— Conduct a fleet composition analysis across the Districts/Offices to ensure that the proper equipment is located in each area (rural versus urban Districts)

Recommendation # 7.3: Implement a strategic sourcing initiative to aggregate spending under competitively procured contract categories

SCDOT has an opportunity to reduce p-card procurement costs through the implementation of a strategic sourcing initiative. Considering the size of SCDOT's annual spending, aggregation of spending, and competitively bidding those categories is expected to result in cost savings over a period of time.

SCDOT should consider the following actions:

— Conduct an analysis of the p-card spending to develop natural sourcing categories

— Competitively bid categories at advantageous commercial and financial terms

— Analyze annual contract spending to identify further potential to aggregate contract actions

VIII. Implementation Considerations

Implementation Considerations

Introduction

The assessment of SCDOT's strategic plan, organizational structure, project prioritization and selection, project delivery, relationships with other transportation entities, technology and management systems and project funding identified a number of improvement opportunities to further enhance SCDOT's organizational efficiencies and enable the Agency to operate more effectively and cost efficiently.

While the Study's focus areas were diverse – and the recommendations have been tailored to the specific needs and opportunities identified in each of the Study focus areas – the recommendations throughout this report fall under five broad classifications. These classifications are:

— External communications: recommendations that are focused on improving SCDOT's communications with other transportation entities and external stakeholders.

— IT/technology improvements: recommendations that are focused on improving the way SCDOT manages its business from a technology and management systems, and data management perspective.

— Key Performance Indicators (KPIs) and management reports: recommendations that are focused on helping SCDOT to improve how the Agency tracks KPIs and links KPIs to management and execution of its core responsibility of providing safe and reliable transportation network.

— Organizational improvements: recommendations that are intended to help SCDOT to optimize the organizational structure and delivery of transportation services.

— Business process improvements: recommendations that are designed to help SCDOT enhance key business processes, review and approval workstreams, and program functions to ensure that the Agency achieves its strategic objectives.

Exhibit 8.1 on the following page summarizes the suggested grouping of recommendations – by classification – across the Study focus areas.

Exhibit 8.1 – Suggested Grouping of Key Recommendations

Focus Area	External Communications	IT/Tech Improvements	KPIs/Mgmt. Reports	Organizational Improvements	Process Improvements
Internal Structure			✓	✓	
Prioritization/ Selection	✓	✓			✓
Project Delivery	✓	✓		✓	✓
Other Transportation Entities	✓			✓	✓
Technology and Information Systems		✓	✓		✓
Project Funding			✓	✓	✓

Implementation Complexity vs Benefit Assessment

These recommendations vary in terms of both implementation complexity and benefit. To assist SCDOT in evaluating the potential trade-offs between implementation costs and benefits, a matrix below plots the recommendation classifications on two axes – complexity of implementation versus implementation benefit. Both monetary and non-monetary factors were taken into account, including, but not limited to:

— Degree of cultural/organizational change required

— Stakeholder considerations

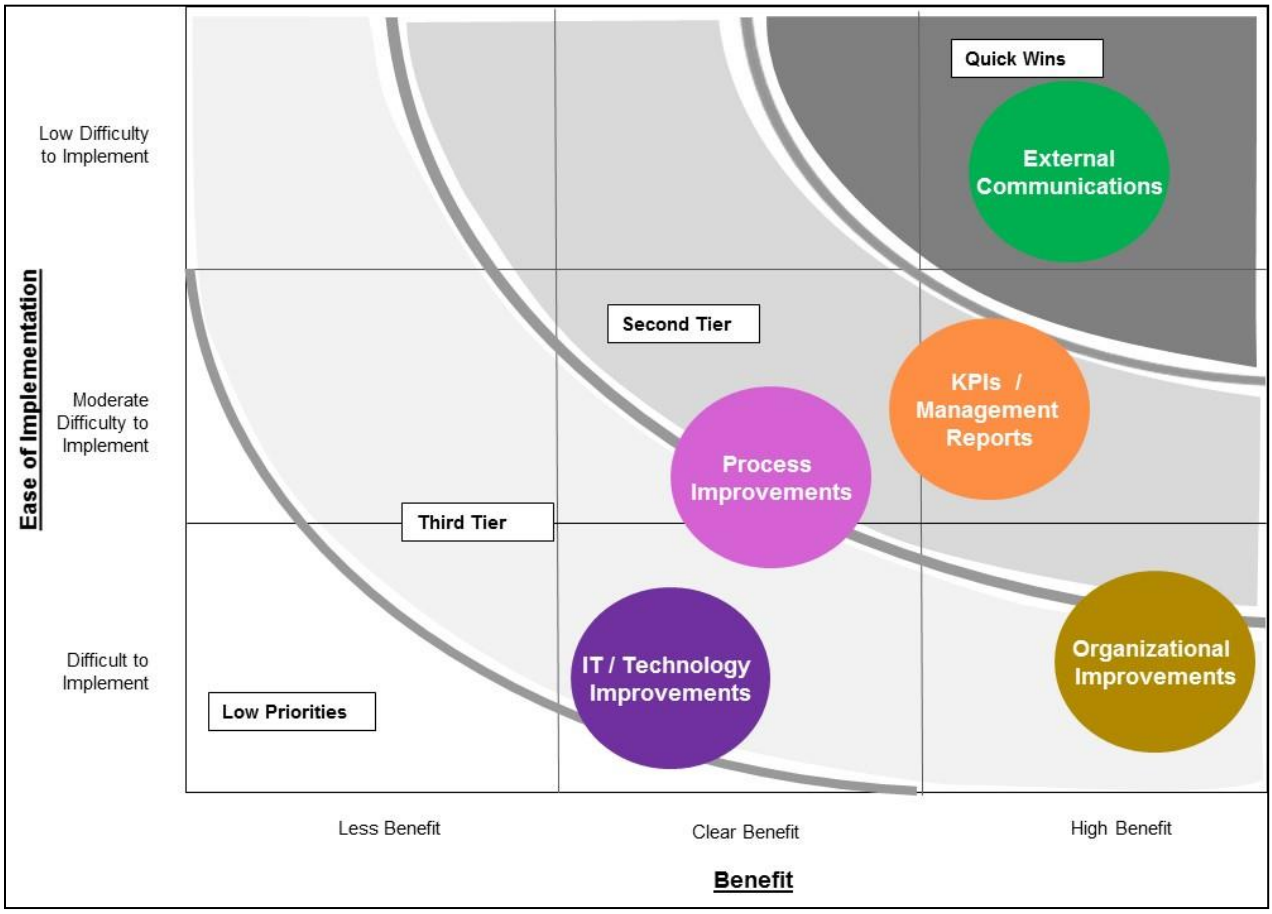
— Policy initiatives

— Implementation complexity

— Leadership preferences

Exhibit 8.2 was developed based on valuable input received through interviews conducted with the leadership team and key managers as part of this Study. As presented in Exhibit 8.2, recommendation tiers vary from “clear wins” at the top right to “low priorities” at the bottom left.

Exhibit 8.2 – Implementation Complexity vs. Benefit



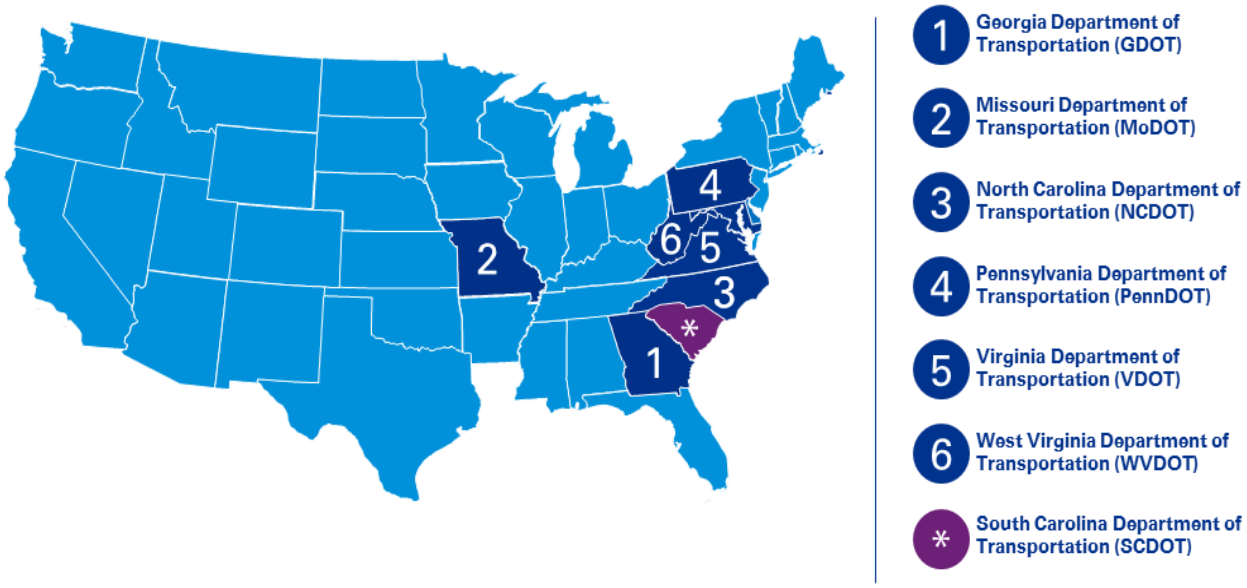
Source: The Project Team

While the specifics of each recommendation will vary, and relative to the universe of recommendations made, recommendations focused on external communications tend to offer the greatest benefit relative to implementation costs. KPIs/management report recommendations are similar, however, the process for tracking and reporting KPIs could increase its implementation complexity. While organizational improvements – those focused on driving improvements to SCDOT's organizational structure – have the highest benefit, they also tend to be difficult to implement, considering the number of employees, business processes, and policies involved in delivering transportation services. Technology and management systems improvements and business process improvements have clear benefits – however, technology improvements, such as procuring/developing and implementing new systems, can become very expensive, both in terms of systems acquisition as well as on-going operational/maintenance costs.

Appendices

I. Strategic Plan

Appendix Exhibit 1.1 – Peer Group Map



Source: The Project Team

As shown in Exhibit 1.1, the peer DOTs selected are within close proximity to the State.

THE FIVE GOALS FOR SCDOT'S 2018-2020 STRATEGIC PLAN ARE:

GOAL 1:

Improve safety programs and outcomes in our high-risk areas.

GOAL 2:

Maintain and preserve our existing transportation infrastructure.

GOAL 3:

Improve SCDOT program delivery to increase the efficiency and reliability of our road and bridge network.

GOAL 4:

Provide a safe and productive work environment for SCDOT employees.

GOAL 5:

Earn public trust through transparency, improved communications and audit compliance

South Carolina Department of Transportation

Executive Summary

The South Carolina Department of Transportation (SCDOT) leadership team has developed an agency-wide Strategic Plan to reflect the Department's current priorities, align the entire organization towards these priorities and instill accountability on achieving mission-critical goals. This Strategic Plan was built considering the Governor's vision for South Carolina's infrastructure which is to build a world-class and safe public infrastructure to enhance the quality of life of our citizens and to promote the state in global competiveness as a location for business, investment, talent, innovation and visitors. Additionally, the Strategic Plan was presented to and discussed with the governing body for the agency in order to ensure that the goals identified are consistent with the policy desires of the SCDOT Commission.

SCDOT is now positioned to be able to make dramatic improvements in the condition and performance of the existing road and bridge network over the next ten years. The 2017 legislative session included a recurring, sustainable funding increase for SCDOT to deploy towards reconstructing our existing infrastructure system. The "Fix-It First" approach for utilization of the new funds will begin the long term process of beginning to bring the system back into a state of good repair. The SCDOT team must ensure that these funds are put to good use and a sound return on the investment is provided to our citizens. Therefore, it is important now more than ever, that SCDOT have a solid Strategic Plan that provides a roadmap for the agency to follow that establishes goals and actions necessary to be successful. This Strategic Plan supports SCDOT's vision to rebuild our transportation system over the next decade in order to provide adequate, safe and efficient transportation services for the movement of people and goods in the Palmetto state.

Strategies, objectives, targets and measures have been identified for each of these overarching goals in order to help guide, align, assess and adjust our activities as we begin our long journey of rebuilding our state's infrastructure. Alignment sessions on the Strategic Plan will be held across the various units within the agency in order to inform and educate our team about the Strategic Plan as well as how each unit fits into achieving our shared goals. Progress will be reported annually and the overall plan will be reviewed by the leadership team every two years in order to determine if changes are needed to the goals, strategies, objectives, targets or measures.

Introduction

The leadership team has prepared this Strategic Plan to serve as our roadmap for success. This Strategic Plan has been carefully crafted to clearly articulate our highest priorities, mesh with our desire to continue our migration towards performance-based management, seed our Transportation Asset Management Plan, formulate our budget policies and establish SMART(specific, measurable, achievable, realistic, and time-bound) objectives. Through regular assessment of these measures and associated trend lines, the leadership team will be able to determine if resource allocation or other adjustments are needed in order to achieve the overall goals and hold ourselves accountable to the taxpayers of South Carolina.

When considering which goals should be included in the 2018-2020 Strategic Plan, the leadership team first assessed the existing condition and performance of South Carolina's infrastructure system as well as SCDOT internal operational items that the Secretary of Transportation had previously targeted for improvement such as:

- **Effectively Communicate the Condition and Performance of the Existing System**
- **Succession Planning**
- **Establish a culture of good customer service**
- **Deliver projects on-time and on-budget**
- **Make DOT a good place to work**

Key System Performance and Condition Measures

Over the past several years, South Carolina has unfortunately seen an increase in traffic fatalities as shown on the below chart. Of particular note is South Carolina's deadliest ranking as having the highest fatality rate in the Nation for our roads outside of the urban areas.

While SCDOT has traditionally embraced a programmatic approach to safety, through the incorporation of basic safety features into existing projects, the establishment of an intersection improvement program and select safety improvements along our interstates, it is clear that an increased emphasis has to be placed on highway safety as part of the agency's annual programs. SCDOT has the best opportunity to influence a better outcome for roadway safety through a data-driven analysis and strategically-developed safety programs using engineering-based solutions. The development and implementation of a strategic Rural Road Safety Program to supplement our existing safety programs is imperative to address the portion of our network that is comprised of the deadliest roads in the state.

The condition of South Carolina's existing pavements and bridges is also deficient and has been identified as a major concern by drivers on South Carolina roads. It is important for the lead transportation agency in the state to establish that one of its top goals is to invest in the existing pavements of a seriously decayed road network. Additionally, since the SCDOT is responsible for owning, operating and maintaining the fourth-largest state highway system in the nation, the agency must prioritize the funding levels for the various functional classifications of the roads in order to drive better system condition and performance for the motoring public.

Chart 1: Traffic Fatalities in South Carolina

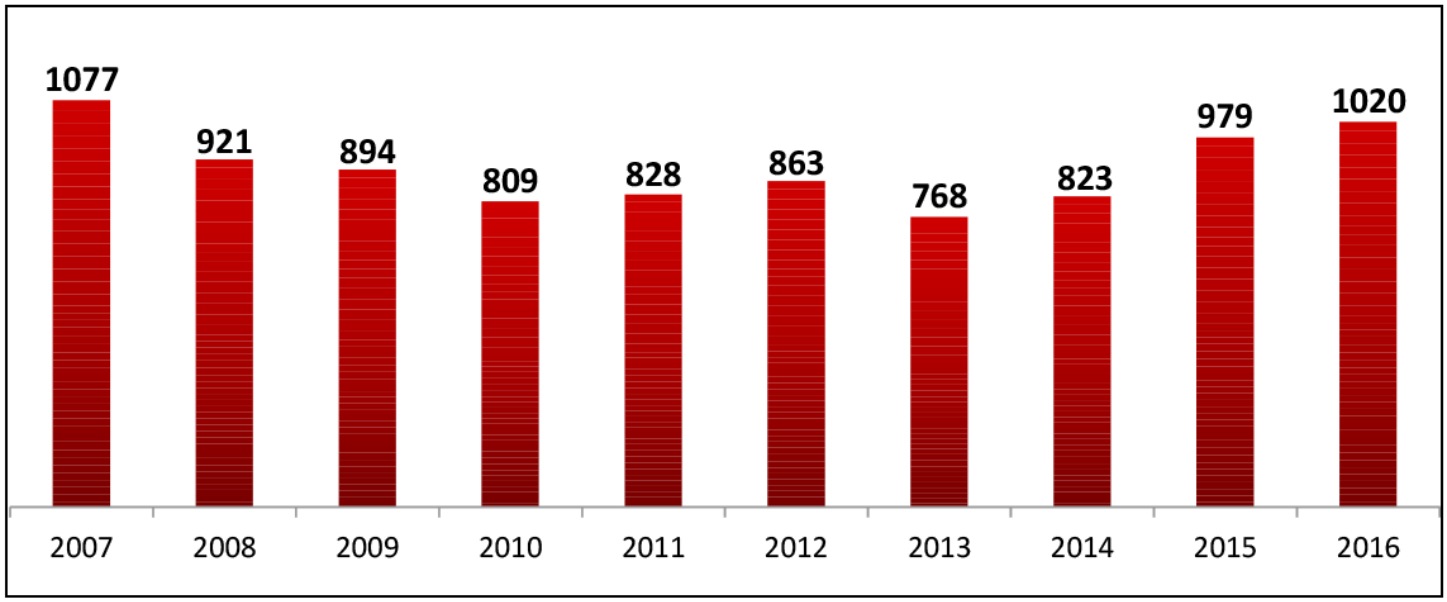


Chart 2: 2016 Statistics of the State Highway System in South Carolina

Roadway Functional Class	Centerline Miles	Lane Miles	% of Traffic Carried Daily	% Good Pavements
Interstate	851	3,819	31%	65%
Primary	9,465	23,994	46%	23%
Federal-Aid Eligible Secondaries	10,409	21,423	17%	19%
Non Federal-Aid Eligible Secondaries	20,633	41,369	6%	15%
	41,358	90,605		

As evidenced in the 2016 statistics, nearly half of all travel in South Carolina daily occurs on the Primary System (US and SC shielded routes). These 9,465 miles of highway in South Carolina represent our major roads into and out of our urban areas and they connect our rural communities together. They include major east-west and north-south corridors crossing our state, such as US 301 and SC 72, and as such are key to the movement of people and freight that drive our economy. Yet, this particular network has decayed to where more than half of the pavements on this heavily travelled network are considered to be in "Poor" condition as depicted in the chart on the right.

Optimizing SCDOT's investments in pavements under a fix-it-first approach to target this critical network is essential to returning our road system to a state of good repair and meeting the public's expectation that the paving funds are utilized in a manner to deliver the best possible outcomes for the state system.

The SCDOT Commission and leadership team have also decided to focus our bridge replacement program to target our structurally deficient bridges that impact our state's economy and daily lives of our citizens. A statewide map of all of the structurally deficient bridges across the state is depicted below.

Another key component to keeping our state's economy moving is addressing the pinch points that most significantly affect the movement of freight and goods across the state. SCDOT's current multimodal plan identified the key freight bottlenecks in the state as shown in the map below. These freight bottlenecks are primarily associated with interstate-to-interstate connection points in the urban areas of the state and align with SCDOT's highest priority interstate widening projects. South Carolina's continued economic growth will be aided by the timely completion of the priority interstate-to-interstate interchange improvement projects.

Map 1: Structurally Deficient Bridges in South Carolina

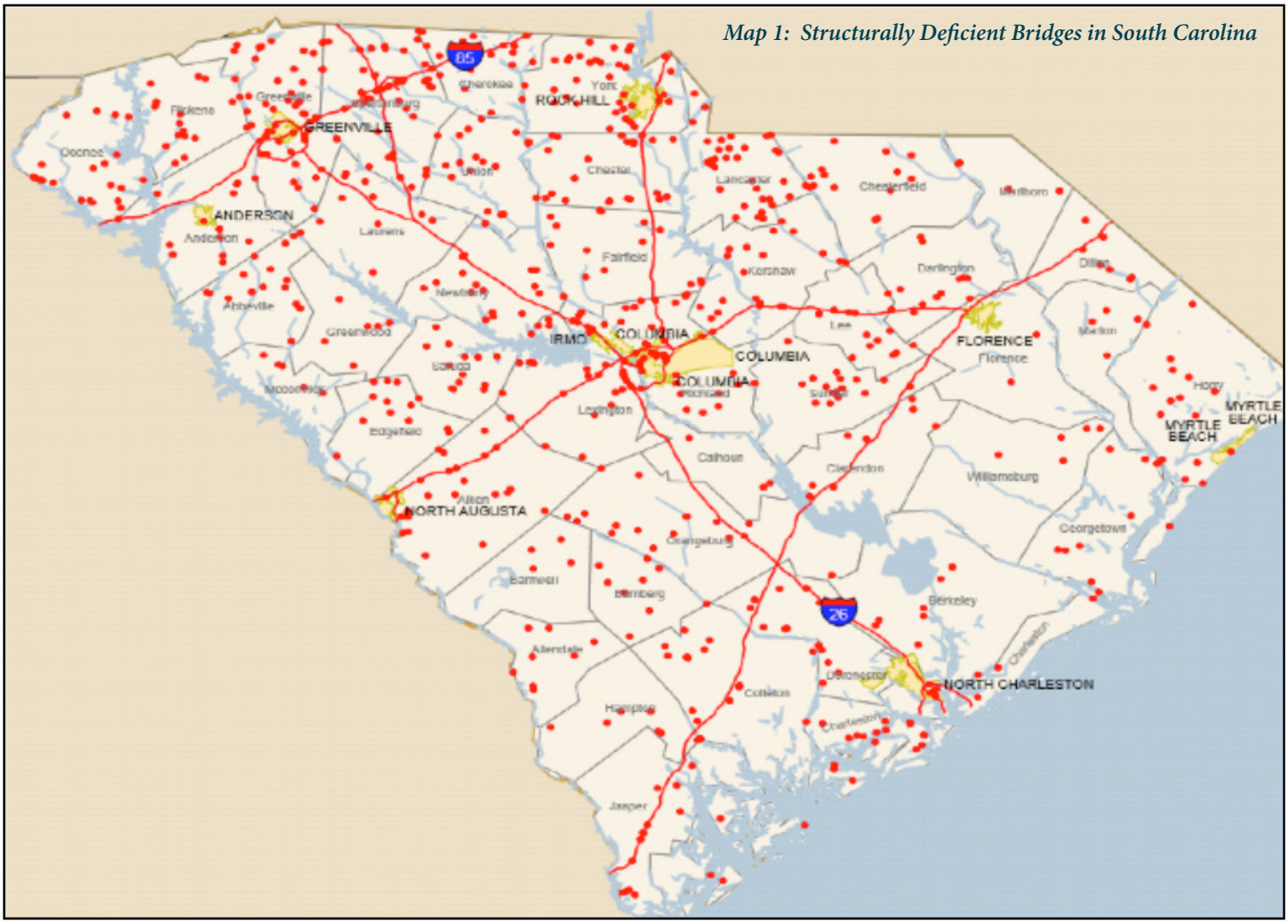
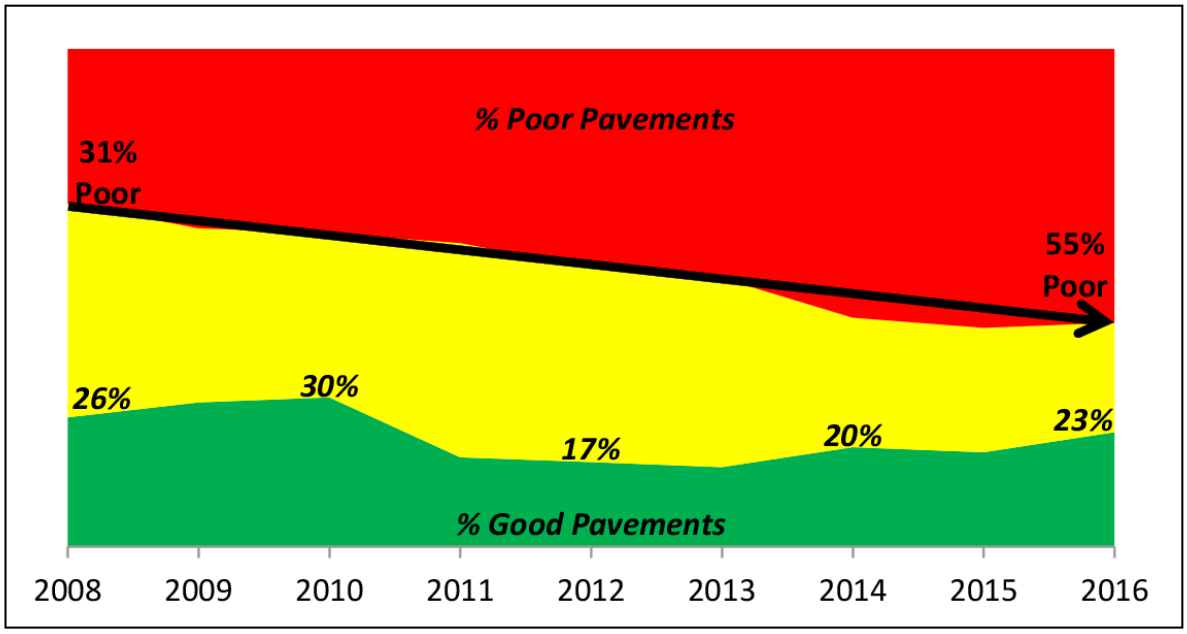
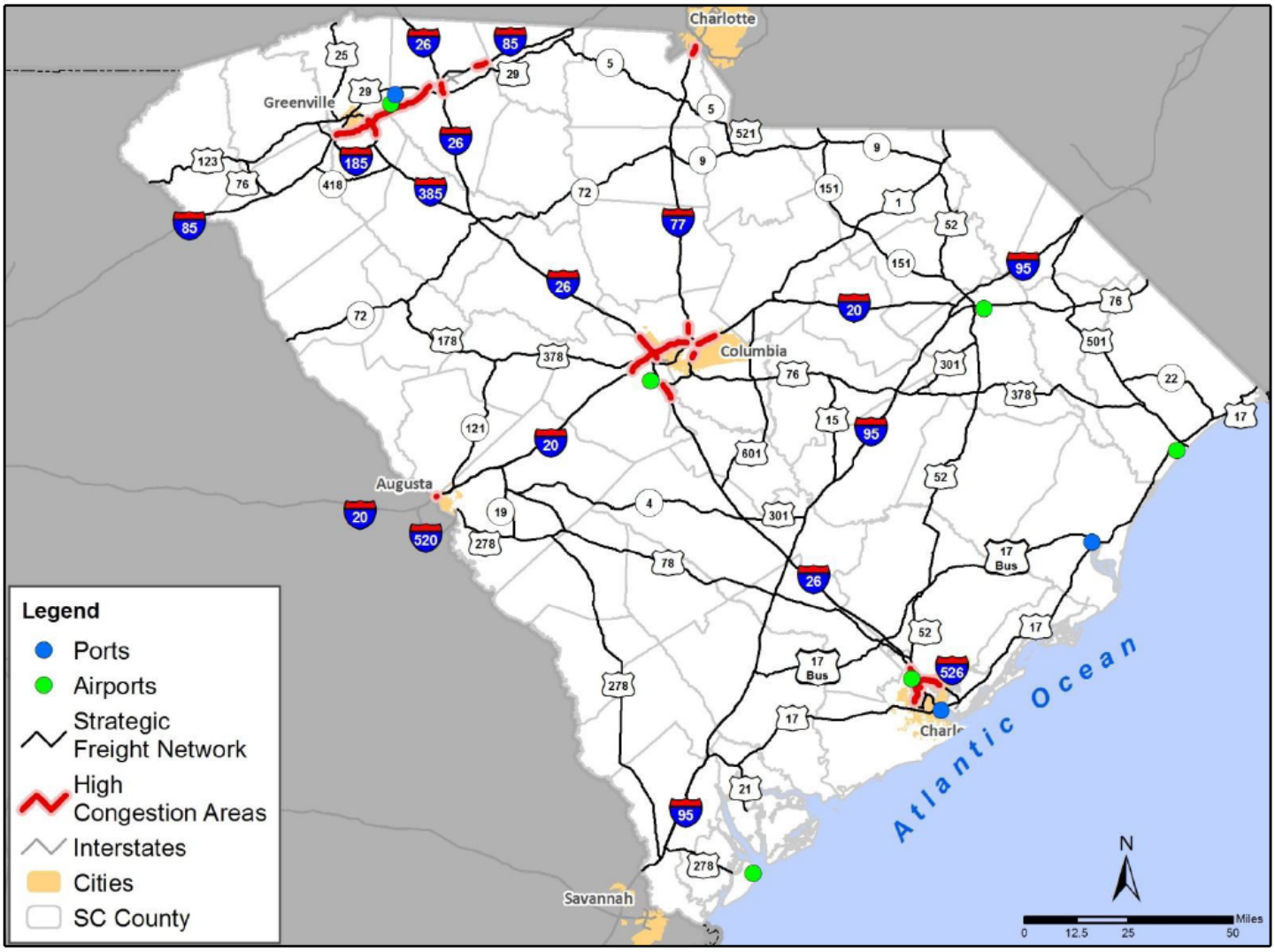


Chart 3: Decay of the Primary System Pavements in South Carolina



Map 2: Freight Bottlenecks in South Carolina



Our Strategic Plan: A guide to help us Rebuild our Roads

Our task over the next 10 years and beyond is to repair and rebuild our transportation network to ensure that our citizens and businesses can travel on a safe and reliable system. This is a core function of government and SCDOT is entrusted with the responsibility to effectively and efficiently utilize tax payer funds to turn the status of the state-owned transportation network around. We will accomplish this mission by establishing an overarching Strategic Plan to guide our initiatives, a Transportation Asset Management Plan to articulate our targets and embrace performance management principles that will enable us to determine how we are doing in achieving our goals. We will also utilize risk management strategies to help us identify and mitigate potential obstacles to achieving success.

Strategic Plan

- **Provides direction through Vision, Mission, Goals, Strategies and Objectives.**

TAMP

- **Transportation Asset Management Plan: Implements priorities by establishing investment levels and desired targets.**

Performance Management

- **Tracks Progress towards Goals through outcome-based measures and provides information to guide decisions regarding changing or adjusting goals, targets or investment levels.**

OUR MISSION: SCDOT connects communities and drives our economy through the systematic planning, construction, maintenance and operation of the state highway system and the statewide intermodal transportation and freight system.

OUR VISION: It is SCDOT's vision to rebuild our transportation system over the next decade in order to provide adequate, safe and efficient transportation services for the movement of people and goods in the Palmetto state.

OUR VALUES: The SCDOT team recognizes the importance of all SCDOT divisions, units, and offices functioning as one team – One SCDOT. Our team not only serves our citizens and businesses to accomplish the mission and achieve the vision, it also exemplifies the qualities and holds the values that make us one of the top DOT's in the nation.

OUR CORE VALUES ARE:

Team
Excellence
Accountability
Make a Difference

Strategic Plan 2018 – 2020

Goal 1: Improve safety programs and outcomes in our high-risk areas.

Strategy:	**Continue implementation of Highway Safety Plan.**
Objective:	**Reduce fatalities by 6% by end of calendar year 2020.**
Division Responsible:	Traffic Engineering
Measure:	Number of fatalities in the calendar year.
Target:	Decrease by 2% as compared to previous calendar year.
Strategy:	**Develop and implement a data-driven, rural road safety program.**
Objective:	**Reduce fatalities on roads in our rural areas.**
Division Responsible:	Traffic Engineering.
Measure:	Miles of Rural Roads treated annually.
Target:	300 miles of rural roads treated by close of calendar year 2020.

Goal 2: Maintain and preserve our existing transportation infrastructure.

Strategy:	**Improve SCDOT's reliability on resolving reported maintenance issues.**
Objective:	**Increase responsiveness regarding customer service requests for routine maintenance items.**
Division Responsible:	Maintenance.
Measure:	Annual average of percentage of routine maintenance work requests resolved within 30 days.
Target:	75% resolved within 30 days in each county, each state fiscal year.
Strategy:	**Utilize the Transportation Asset Management Plan to drive outcomes on system and asset condition.**
Objective:	**Increase the % Good Pavements on the road network across the state.**
Division Responsible:	Maintenance.
Measure:	Percentage of Pavements in Good Condition.
Target:	By June 30, 2020, increase the % Good Pavements on the Interstate System from 65% Good in 2016 towards a 92% Good target for year 2026.
Target:	By June 30, 2020, increase the % Good on the Major roads (Primary System) from 19% Good in 2016 towards a 53% Good target for year 2026.
Target:	By June 30, 2020, increase the % Good on the Farm-to-Market roads (FA Secondaries) from 19% Good in 2016 towards a 40% Good target for year 2026.
Target:	By June 30, 2020, increase the % Good on the Neighborhood streets (NFA Secondaries) in the State System from 13% Good in 2016 towards a 25% Good target for year 2026.
Objective:	**Decrease the number of structurally deficient bridges across the state.**
Division Responsible:	Maintenance and Preconstruction.
Measure:	Number of Load-Restricted bridges.
Target:	By June 30, 2020, decrease the number of load-restricted bridges on the State System from 348 towards a zero target for 2026.

Measure:	Number of Structurally Deficient Bridges on the National Highway System.
Target:	By June 30, 2020, decrease the number of structurally deficient bridges on the National Highway System from 70 towards a zero target for 2026.
Objective:	**Improve the level of service of our day-to-day maintenance of the State System for key safety-related items.**
Division Responsible:	Maintenance.
Measure:	Maintenance Assessment Program Scores for individual asset categories.
Target:	By June 30, 2020, the statewide percentage of deficient pavement markings will be reduced by 10%.
Target:	By June 30, 2020, the statewide percentage of unacceptable shoulders will be reduced by 10%.
Target:	By June 30, 2020, the statewide percentage of roadway with deficient brush management will be reduced by 10%.
Target:	By June 30, 2020, the statewide percentage of roadway with deficient limb height will be reduced by 10%.
Target:	By June 30, 2020, all counties statewide are conducting 4 mowing cycles annually for all route types.
Objective:	**Decrease the number of mass transit vehicles in poor condition.**
Division Responsible:	Intermodal & Freight Programs
Measure:	Number of SCDOT titled public transit vehicles operating past their useful life.
Target:	By June 30, 2020, decrease the percentage operating past their useful life from 47% in 2016 towards a 40% target.
Strategy:	**Increase competition by growing the number of South Carolina contractors capable of bidding on road and bridge work.**
Objective:	**Enhance the network of small businesses that are ready, willing and able to assist the Agency in meeting its infrastructure goals.**
Division Responsible:	Minority & Small Business Affairs.
Measure:	Number of certified Disadvantaged Business Enterprises (DBEs) and Small Business Enterprises (SBEs) that receive technical training, business development and management assistance through SCDOT.
Target:	From July 1, 2017 to June 30, 2020, annually serve a minimum of 125 DBE and SBE firms that align with the Agency's needs.

Goal 3: Improve SCDOT program delivery to increase the efficiency and reliability of our road and bridge network.

Strategy:	**Target known congested areas.**
Objective:	**Improve the reliability of the movement of people and goods across the major portions of our road network.**
Division Responsible:	Construction and Preconstruction.
Measure:	On-time delivery of critical interstate-to-interstate interchanges improvement projects.
Target:	By June 30, 2020, all lanes are fully open to traffic for the I85/I385 interchange improvement project in Greenville.
Target:	By December 31, 2019, award a design-build contract for the I26/I20/I126 interchange improvement project in Columbia.
Target:	By June 30, 2020, the design-build contract Request for Proposals is issued for the I26/I526 interchange improvement project in Charleston.
Division Responsible:	Traffic Engineering.
Measure:	Average time to clear travel lanes for traffic incidents along our Incident Management Zones.
Target:	20 minutes or less.

Strategy:	**Increase SCDOT's reliability of delivering projects on-time and on-budget.**
Objective:	**Projects proceed on schedule and within budget in accordance with SCDOT's 10-year Program Delivery Plan.**
Division Responsible:	Preconstruction.
Measure:	Percent of phases authorized on schedule for Interstate Widening and Bridge Replacement projects.
Target:	From July 1, 2017 through June 30, 2020, 75% of ROW phase on schedule.
Target:	From July 1, 2017 through June 30, 2020, 80% of Construction phases on schedule.
Division Responsible:	Construction.
Measure:	Percent of projects completed on time and construction budget.
Target:	From July 1, 2017 through June 30, 2020, complete construction of 80% or more of all projects within contract time.
Target:	From July 1, 2017 through June 30, 2020, 90% of all projects are completed within budget.
Objective:	**Expedite the environmental permitting process for road and bridge projects.**
Division Responsible:	Environmental Management.
Measure:	Development and initiation of a watershed mitigation strategy.
Target:	Successful launch by June 30, 2018.
Target:	By June 30, 2020, secure mitigation availability within the four highest priority watersheds.

Goal 4: Provide a safe and productive work environment for SCDOT employees.

Strategy:	**Promote workforce safety throughout the state.**
Objective:	**Increase the public's awareness of highway worker safety in our work zones.**
Division Responsible:	Communications.
Measure:	Number of "Let'Em Work, Let 'Em Live" messages transmitted to the public.
Target:	Beginning July 1, 2017, issue at least 100 messages each state fiscal year.
Objective:	Establish programs to provide unit and individual safety awards and incentives.
Division Responsible:	Safety Office.
Measure:	Number of SCDOT fatalities in our workzones.
Target:	Zero each state fiscal year.
Measure:	Number of reportable workplace injuries at SCDOT.
Target:	Beginning July 1, 2018, achieve a 5 percent annual reduction over the previous 5-year rolling average.
Strategy:	**Reinforce a culture of excellent customer service at SCDOT.**
Objective:	**Launch updated Customer Service Training.**
Division Responsible:	Human Resources.
Measure:	Number of SCDOT Team members that have received updated Customer Service Training.
Target:	100% of workforce has received training by July 1, 2019.
Objective:	**Increase responsiveness.**
Division Responsible:	Call Center.
Measure:	Percentage of customer inquiries responded to within 2 business days.
Target:	From July 1, 2017 through June 30, 2020, 95% of customer inquiries to call center are acknowledged by the responsible unit within 2 business days.
Division Responsible:	Maintenance.
Measure:	Number of days to decision for commercial development permits following complete package submittals.
Target:	90% processed within 30 calendar days, each state fiscal year between July 1, 2017 and June 30, 2020.

Strategy:	**Plan for an evolving workforce.**
Objective:	**Prepare for an anticipated loss of workforce experience and expertise due to TERI program completion and other retirements.**
Division Responsible:	Human Resources.
Measure:	Development and implementation of Succession Management planning.
Target:	Prior to January 1, 2018, 100% of our Divisions have developed and are utilizing a Succession Management plan.
Division Responsible:	Maintenance
Measure:	National Bridge Inspection Standards certified inspectors are readily available to assist in the inspection and monitoring of our bridges.
Target:	Prior to January 1, 2018, an outsourcing bridge inspection contract is in place to assist our staff.
Objective:	**Train and develop a strong bench of future leaders through participation in leadership programs.**
Division Responsible:	Human Resources.
Measure:	Number of graduates of the LEAD, CPM and AASHTO leadership development programs.
Target:	From July 1, 2017 through June 30, 2020, add 60 leadership program graduates to our ranks.
Objective:	**Continue and enhance efforts to promote a more diverse and inclusive workforce.**
Division Responsible:	Minority & Small Business and Human Resources.
Measure:	Number of employees that participate in Affirmative Action Overview training, including requirement for a 3-year refresher.
Target:	By July 1, 2019, 100% of SCDOT workforce will have received training.
Measure:	Development and implementation of an Affirmative Action training component for newly hired managers and supervisors.
Target:	By January 2018, the new component has been incorporated into the Human Resources Fundamental course.

Goal 5: Earn public trust through transparency, improved communications and audit compliance.

Strategy:	**Utilize multiple ways to facilitate interactive communication about SCDOT.**
Objective:	**Simplify the website to create a more user-friendly interface.**
Division Responsible:	Information Technology and Communications.
Measure:	Revamping the website to focus on the core areas.
Target:	By January 1, 2018, the website has been simplified to no more than 6 main buttons.
Objective:	Launch Speaker's Bureau to provide forums for agency personnel to provide updates directly to the public and our industry partners.
Division Responsible:	Communications.
Measure:	Number of public speaking engagements.
Target:	Between July 1, 2017 and June 30, 2018, SCDOT staff to engage in at least 100 speaking engagements.
Strategy:	**Re-tool our existing reports to make them easier to understand.**
Objective:	**Simplify public reporting on the use of taxpayer dollars.**
Division Responsible:	Finance.
Measure:	Statewide, District and County reports are published monthly on the webpage.
Target:	By January 1, 2018, the financial reports have been updated and are published monthly on the webpage.
Objective:	**Develop an effective method for communicating how projects are prioritized.**
Division Responsible:	Communications and Planning.
Measure:	A simpler description of the process has been published on the webpage.
Target:	By January 1, 2018, a simpler description of the process has been published on the webpage.

Strategy:	**Provide continuous assurance of audit compliance.**
Objective:	**Institute a process for providing verification that corrective actions implemented as a result of an audit are continuous.**
Division Responsible:	Internal Audit Services.
Measure:	Creation of a repository with regular updates, including verified management action plans.
Target:	By January 1, 2018, a repository has been created and regular verification procedures established for assurance to responsible SCDOT leadership.

Developing Action Plans in support of the Strategic Plan

The most important part of a Strategic Plan is the execution phase. Without proper alignment of the entire organization to these most important goals and regular assessment of progress towards achieving these goals, the Strategic Plan is of little value to the agency. Therefore, SCDOT will hold internal overview sessions for each unit to discuss the Strategic Plan and how their individual unit can contribute towards the goals. As part of aligning our activities for these most important items, each unit will be asked to develop action plans to identify specific activities that are within the control of that unit and will provide the best opportunity to influence progress on the agency's overall goal(s). Regular assessments will be held by SCDOT managers and the leadership team to determine if adjustments are recommended in the target or resource allocation or if there is a common obstacle to success across multiple units.

Below is the process that has been outlined for the SCDOT Team by the Secretary of Transportation:

First Action Plans are Due October 1, 2017

1. Each organizational unit that is provided an annual budget should review the strategic plan to determine how their unit fits into achieving the agency's overall 5 goals. This review should be conducted with your key team members that assist you in leading your unit.

2. After reviewing the strategic plan, each unit leader should identify 3-5 of the targets within the overall strategic plan that their unit has a great deal of influence over. In other words, what are the items that your team can definitely help us move the needle on? Within your 3-5 items, you must include 1 relating to Goal 4 (Providing a safe and productive work environment). Again, you are encouraged to include your key team members in this discussion as they will be instrumental in helping your unit successfully contribute to our overall mission.

   Next, prepare your action plan relating to those 3-5 items. Again, it is meant to be the 3-5 items that your unit has control over and through your actions as a team help us move the needle in the right direction in order to hit our targets as a whole and achieve our overall goal. It is not meant to be all inclusive….strictly the items that your unit has the greatest influence over.

3. Track progress within your action plan by quarterly reviewing with your next-level-up supervisor on how you are progressing, share your success stories and discuss any hurdles that you are encountering that are preventing your unit from meeting the items identified in your Action Plan. As part of your review, check the relevant Strategic Plan dashboard item that relates to your action plan item. Care should be taken to look at trend lines and the direction of the trend line versus a single data-point from a particular quarter. Discuss with your supervisor any adjustments or modifications to your action plans that are needed based on recent accomplishments or changed conditions. Once you check something off of your action plan as complete, pick another item to add back into an updated action plan. Your action plan should always be 3-5 items that are high on your to-do list that align to our overall strategic goals.

4. The Directors should hold meetings every 6 months with their respective units and the BFFs (Strategic Planning Leaders Rob Manning & Susan Johnson plus Mark LaBruyere with Internal Audits) to review the action plans, identify obstacles in the way of success in achieving the action plans, identify potential

Your action plan should be in the following format:

Division:	Section:	Unit:				
Goal:						
Strategy:						
Action Steps/Tasks	Resources Assigned	Responsible person	Timelines	Challenges/Hurdles	Possible Solution(s) to the Challenge/Hurdle	Date Completed
Identify what steps or actions are needed by your unit for those 3-5 items. List each item separately.	List resources assigned to accomplishing the items.	Identify a Champion for each item.	Clearly define the timelines you are setting to accomplish the action step/task.	List any challenges/hurdles you think you may encounter that may affect your ability to accomplish the items.	What are some ways to solve the challenges?	
Example at the DEA level: *Identify at least 1 potential candidate for the LEAD leadership program from within our district.*	*DEA and District leadership team to identify candidate(s).*	*DCE Smith & DME Lee each to identify 1 from their respective areas for DEAs consideration in addition to DEAs review of District Office staff.*	*Candidate pool identified for DEAs consideration by May 1.*	*Matching potential candidates up with needs for succession planning.* *Allowing time for employees to be away from their work stations.*	*Make it a priority for the long-term success of the District.* *Institute a cross-training program within the District to continue to groom a bench of candidates.*	
Example at RME level: *US 29 in my county is identified as one of the deadly roads in the Rural Road Safety Program. The brush may be blocking sight lines and the shoulders may be too high.*	*2412 and 2424 crews*	*RMF Hall*	*By Thanksgiving 2017, have the limbing and shoulder clipping done.*	*Our Athey loader is in the shop.*	*Work with a neighboring RME to borrow their loader and/or ask them to provide an operator.*	

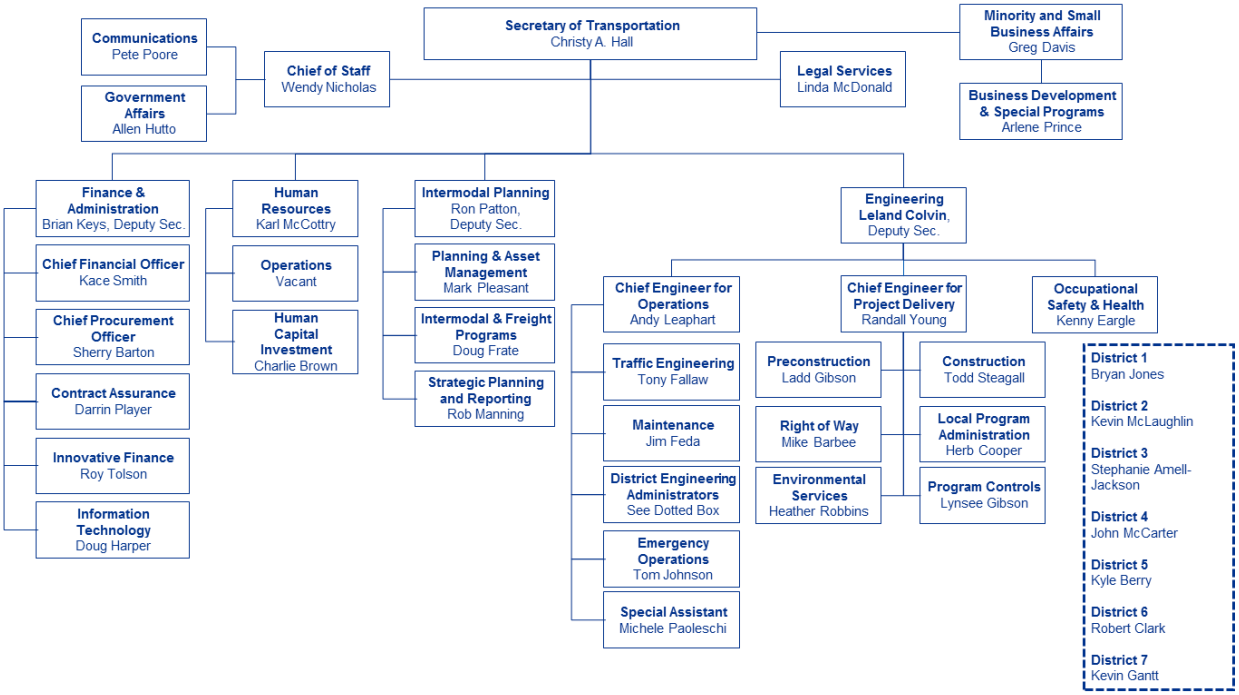
solutions to addressing those obstacles and share success stories. Again, as part of the review, check the relevant Strategic Plan dashboard item that relates to the action plan items. Care should be taken to look at trend lines and the direction of the trend line versus a single data-point from a particular quarter. The Directors should discuss with the units any adjustments or modifications to the action plans that are needed based on recent accomplishments or changed conditions. The BFFs should provide information flow, including possible solutions, up to the Division Directors and Division Heads regarding the unit's un-mitigated risks to achieving success.

5. Each Division should hold meetings every 6 months to review the progress of the Directors in achieving their action plans, discuss obstacles and possible solutions, share success stories and note any adjustments or changes to the action plans that may be needed in order to provide the greatest influence on a particular targeted item. The BFFs should be included in this meeting. Again, as part of the review, check the relevant Strategic Plan dashboard item that relates to the action plan items. Care should be taken to look at trend lines and the direction of the trend line versus a single data-point from a particular quarter. The Division Head should discuss with the units any adjustments or modifications to the action plans that are needed based on recent accomplishments or changed conditions. The BFFs should provide information flow, including possible solutions, up to the Direct Reports of the Secretary of Transportation regarding the unit's un-mitigated risks to achieving success. The Direct Reports of the Secretary and the BFFs should schedule a subsequent meeting with the Secretary to discuss any mission-critical risks that may impact our ability to be successful on achieving our strategic goals.

6. The Division Heads and Direct Reports should review annually with the Secretary progress made in achieving the strategic goals, remaining obstacles in achieving success, analyze solutions relative to those obstacles, share success stories and discuss whether any adjustments to the strategic plan are needed. The annual review should also include an analysis of the remaining highest risks identified across the entire agency and a determination made on how to mitigate those risks. The BFFs should organize and lead the annual review process. The results of the annual review should be communicated throughout the agency.

II. Study of SCDOT's Internal Structure

Appendix Exhibit 2.1 – SCDOT Organization Structure

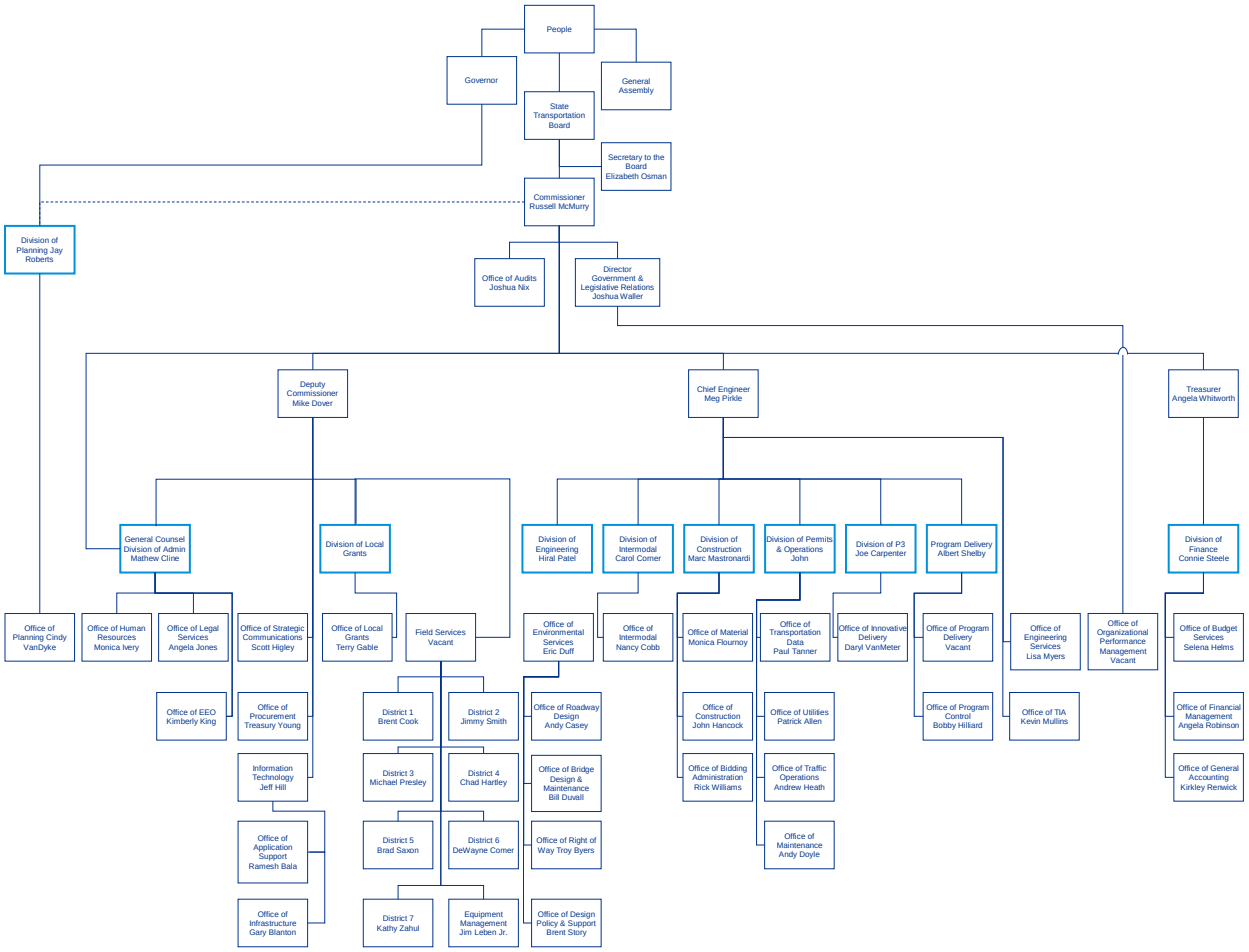


Source: SCDOT

Data	Centerline Miles	Lane Miles	# Bridges	# Bridges Structurally Deficient	Staff (FTEs)	Total Annual Capital Outlay (in $million)	Total Annual Maintenance (in $million)
SCDOT	41,359	90,465	8,444	787	4,592	959	334

Source: FHWA (https://www.fhwa.dot.gov/policyinformation/statistics/2014/sf12.cfm)

Appendix Exhibit 2.2 – GDOT Organization Structure

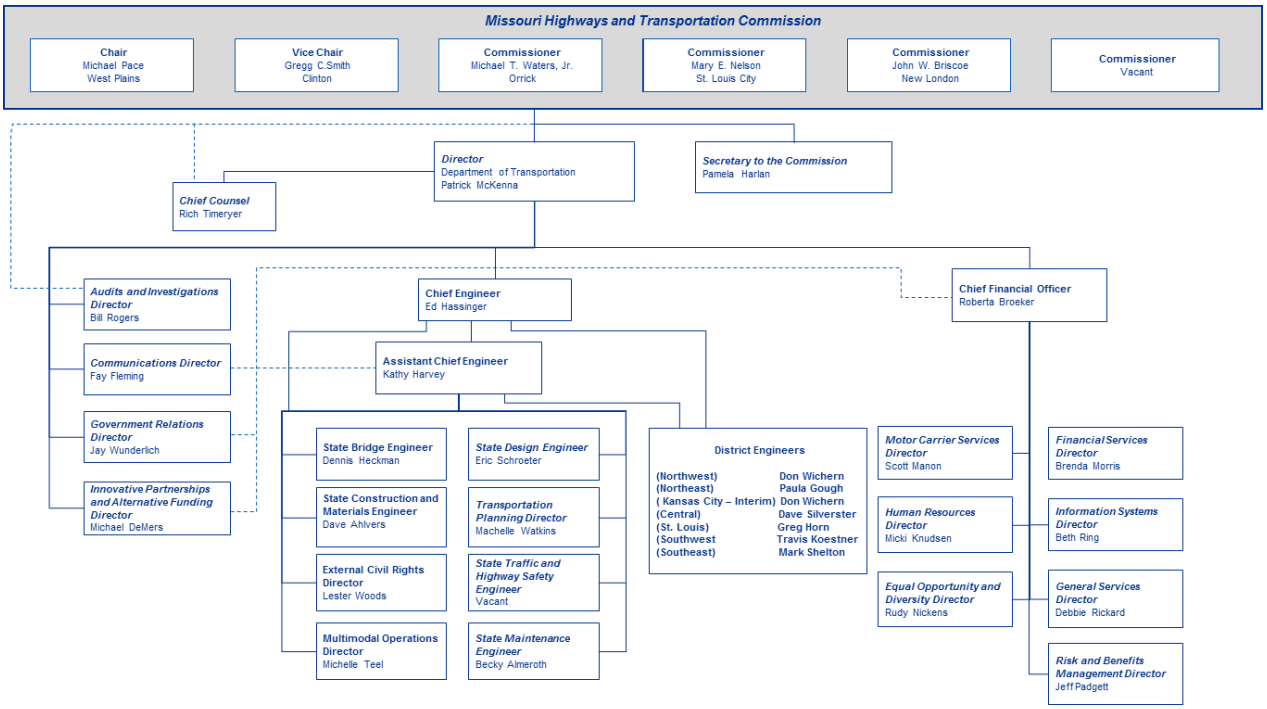


Source: GDOT

Data	Centerline Miles	Lane Miles	# Bridges	# Bridges Structurally Deficient	Staff (FTEs)	Total Annual Capital Outlay (in $million)	Total Annual Maintenance (in $million)
GDOT	17,949	49,074	6,668	82	5,023	1,149	227

Source: FHWA (https://www.fhwa.dot.gov/policyinformation/statistics/2014/sf12.cfm)

Appendix Exhibit 2.3 – MoDOT Organization Structure

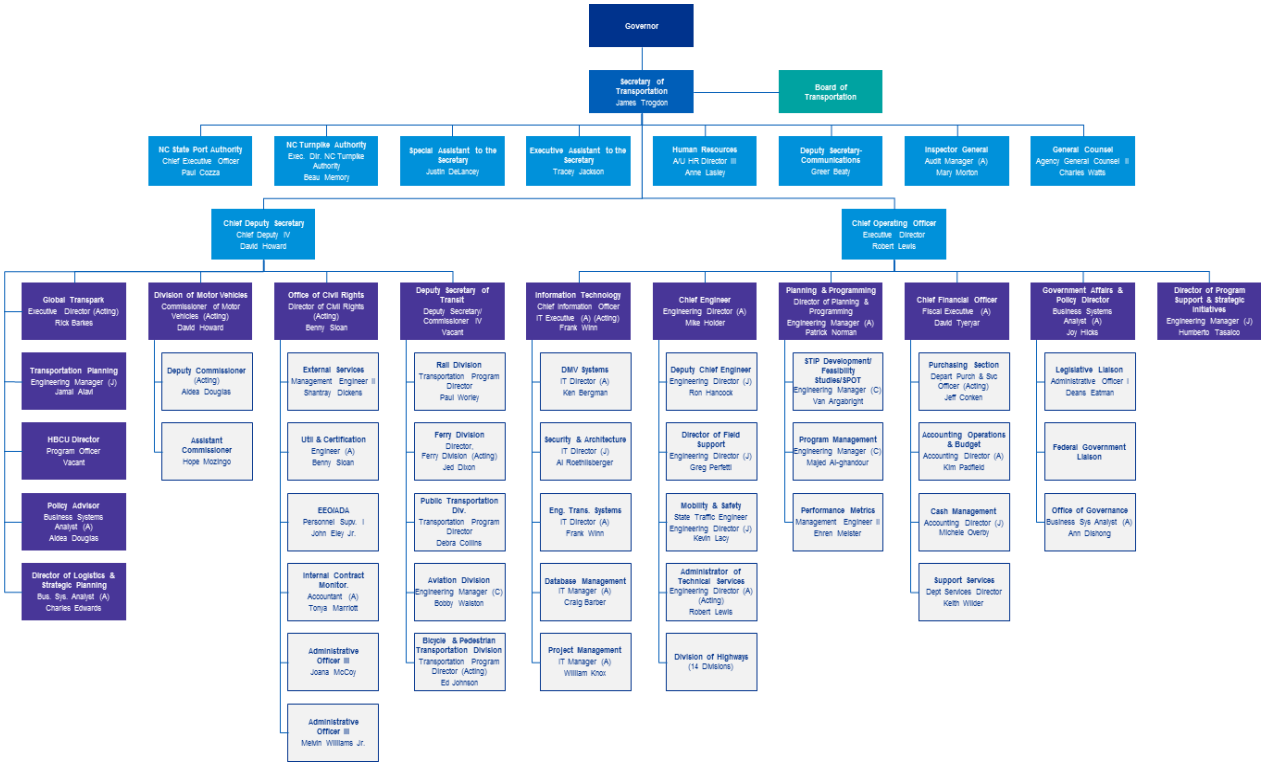


Source: MoDOT

Data	Centerline Miles	Lane Miles	# Bridges	# Bridges Structurally Deficient	Staff (FTEs)	Total Annual Capital Outlay (in $million)	Total Annual Maintenance (in $million)
MoDOT	33,873	76,289	10,364	1,081	5,444	1,103	364

Source: FHWA (https://www.fhwa.dot.gov/policyinformation/statistics/2014/sf12.cfm)

Appendix Exhibit 2.4 – NCDOT Organization Structure

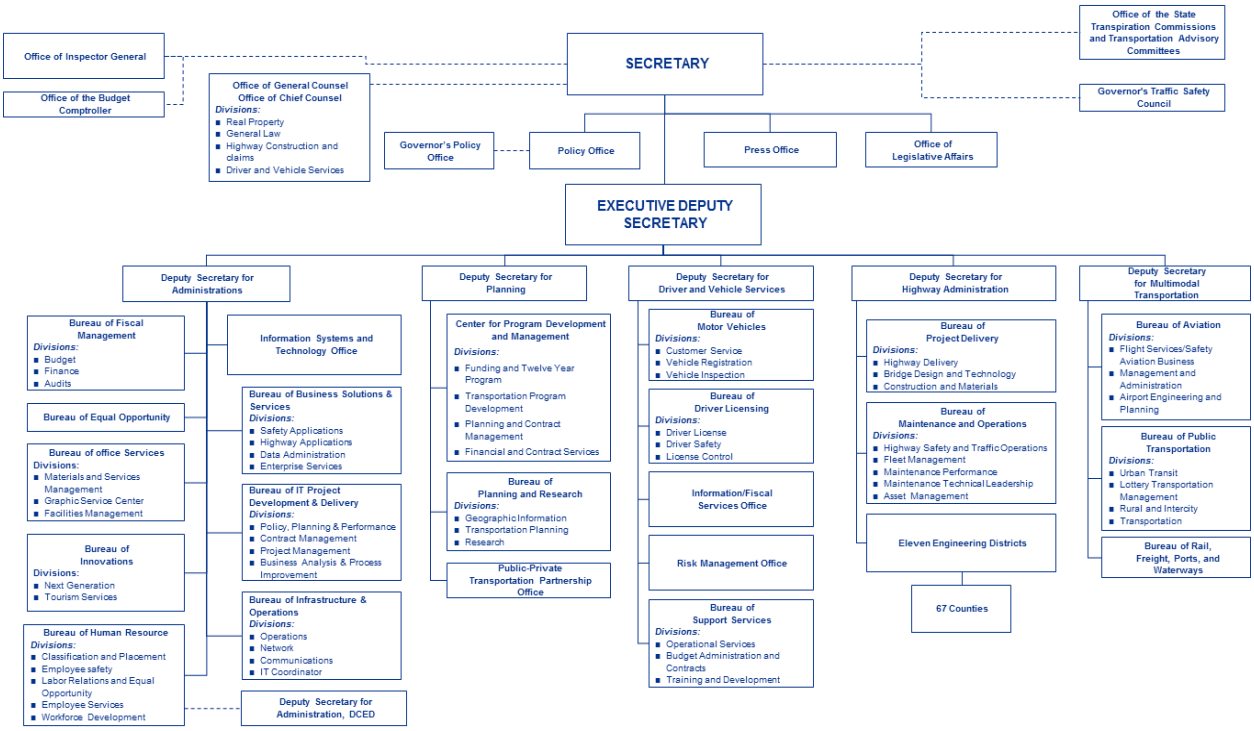


Source: NCDOT

Data	Centerline Miles	Lane Miles	# Bridges	# Bridges Structurally Deficient	Staff (FTEs)	Total Annual Capital Outlay (in $million)	Total Annual Maintenance (in $million)
NCDOT	79,559	171,687	16,820	1,645	12,591	2,442	807.

Source: FHWA (https://www.fhwa.dot.gov/policyinformation/statistics/2014/sf12.cfm)

Appendix Exhibit 2.5 – PennDOT Organization Structure

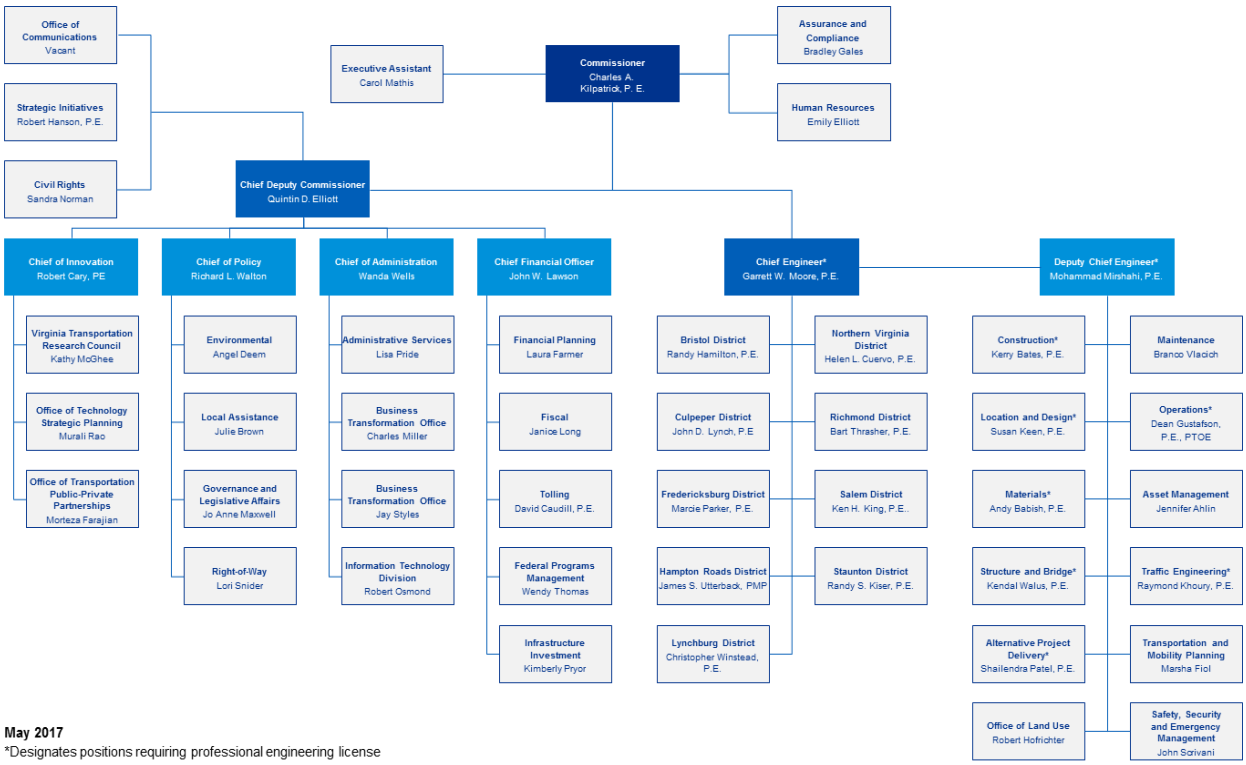


Source: PennDOT

Data	Centerline Miles	Lane Miles	# Bridges	# Bridges Structurally Deficient	Staff (FTEs)	Total Annual Capital Outlay (in $million)	Total Annual Maintenance (in $million)
PennDOT	39,756	88,297	15,181	2,235	10,490	3,531	612

Source: FHWA (https://www.fhwa.dot.gov/policyinformation/statistics/2014/sf12.cfm)

Appendix Exhibit 2.6 – VDOT Organization Structure

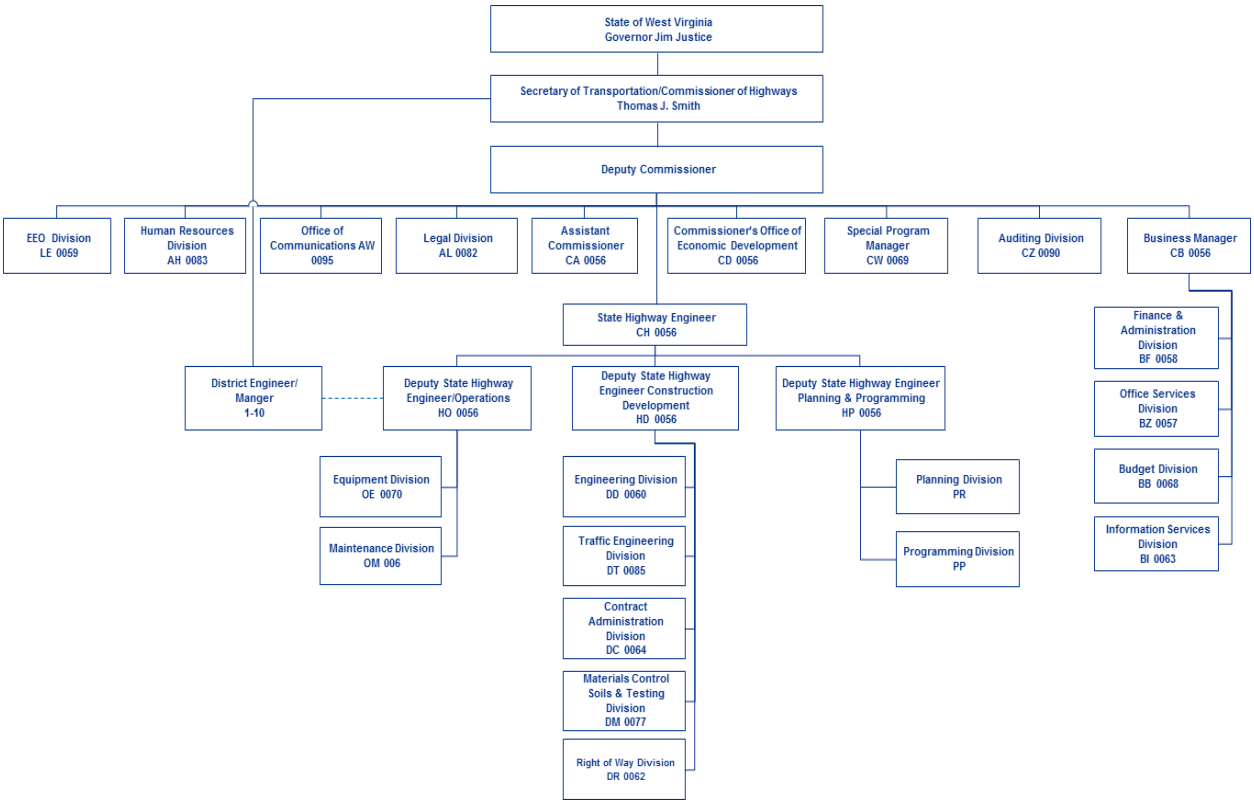


Source: VDOT

Data	Centerline Miles	Lane Miles	# Bridges	# Bridges Structurally Deficient	Staff (FTEs)	Total Annual Capital Outlay (in $million)	Total Annual Maintenance (in $million)
VDOT	58,648	127,258	12,021	789	7,601	1,766	1,337

Source: FHWA (https://www.fhwa.dot.gov/policyinformation/statistics/2014/sf12.cfm)

Appendix Exhibit 2.7 – WVDOT Organization Structure



Source: WVDOT

Data	Centerline Miles	Lane Miles	# Bridges	# Bridges Structurally Deficient	Staff (FTEs)	Total Annual Capital Outlay (in $million)	Total Annual Maintenance (in $million)
WVDOT	34,403	70,988	6,921	1,196	5,646	744	221

Source: FHWA (https://www.fhwa.dot.gov/policyinformation/statistics/2014/sf12.cfm)

Appendix Exhibit 2.8 – SCDOT and Peer Group Management and Performance Dashboards

Performance Dashboards	
DOTs	**Links for Management and Performance Dashboards**
SCDOT	http://www.dot.state.sc.us/inside/pdfs/Strategic_Plan_FINAL_2018_Printed102.pdf http://www.dot.state.sc.us/Monthly-Mgmt-Dashboard/maintenance.shtml http://www.dot.state.sc.us/Monthly-Mgmt-Dashboard/manpower-trends.shtml http://www.dot.state.sc.us/Monthly-Mgmt-Dashboard/procurement-pro-services.shtml http://www.dot.state.sc.us/Monthly-Mgmt-Dashboard/project-delivery.shtml
GDOT	http://www.dot.ga.gov/BS/Performance https://opb.georgia.gov/agency-performance-measures
MoDOT	http://www.modot.org/about/Tracker.htm
NCDOT	https://www.ncdot.gov/performance/ https://www.ncdot.gov/download/performance/2016_NCDOT_AnnualReport.pdf
PennDOT	http://talkpatransportation.com/docs/TPR%202015--2-24-15.pdf
VDOT	http://dashboard.virginiadot.org/Help/DB%20User%20Guide.PDF http://www.virginiadot.org/info/ctb-qtrlyrpt.asp
WVDOT	http://www.transportation.wv.gov/highways/programplanning/gti/Highway_Data_Services/Pages/Factbook.aspx

III. Project Prioritization and Selection

Peer Group Analysis

GDOT

Georgia State law (O.C.G.A. 32-5-27.1) establishes priority for highway maintenance, expansion, and improvement projects in areas most impacted by traffic congestion and areas in need of highway infrastructure for economic development. Annually, GDOT develops a ten-year strategic plan to outline the use of resources in accordance with O.C.G.A 32-5-27.1 and designates a percentage of funds to be expended in the following areas:

— Construction of new highway projects

— Maintenance of existing infrastructure

— Bridge repairs and replacement

— Safety enhancements

— Administration expenses

GDOT typically updates the STIP annually, the process begins at the end of each calendar year. The proposed STIP is typically submitted to the Board for approval by September. Once a STIP has been approved, first year of projects constitutes an “agreed to” list for project selection purposes.

Prioritization Process Overview

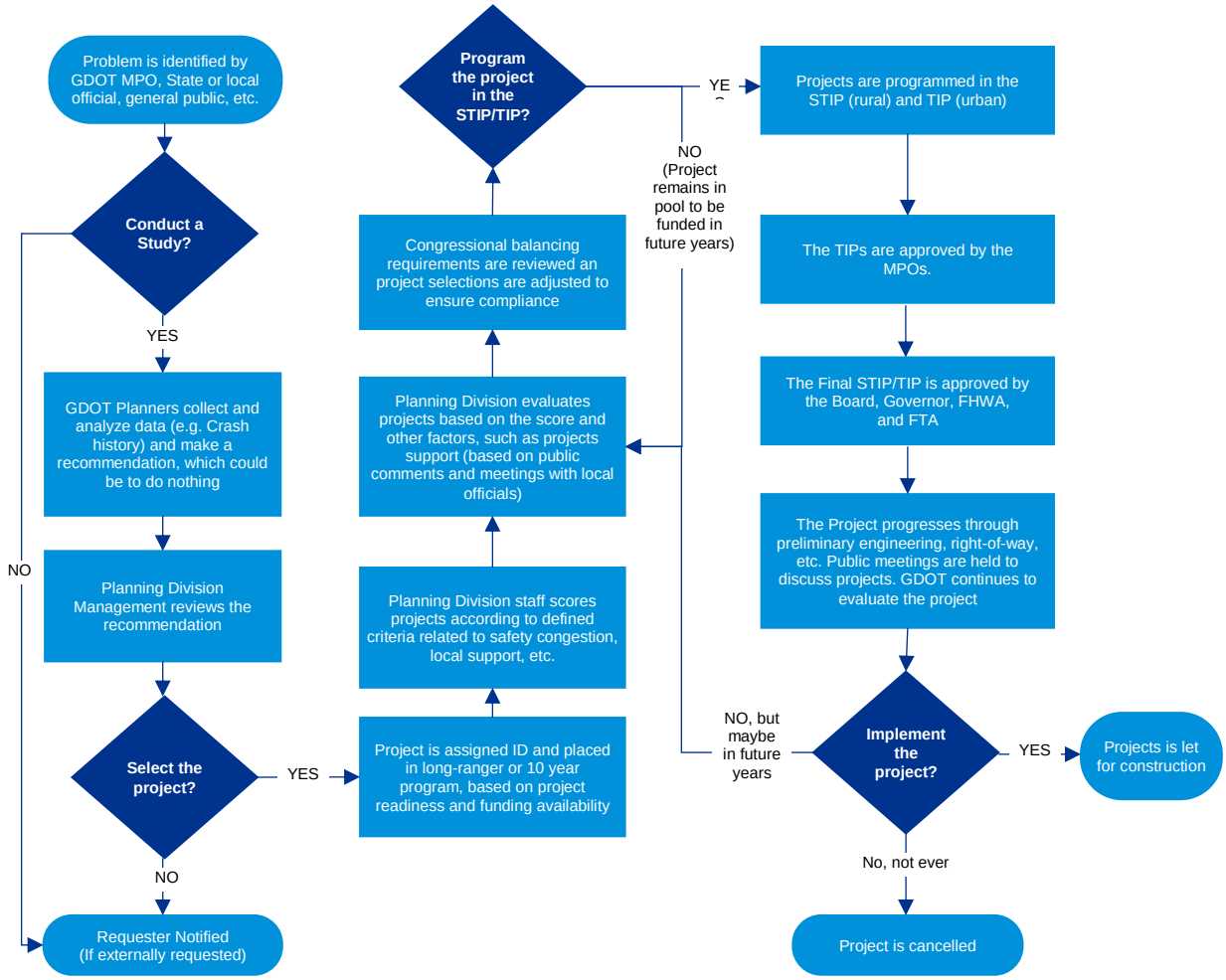
GDOT utilizes prioritization processes that are customized to each of its project types, which include capacity projects, maintenance/pavement projects, bridge projects, safety enhancement projects, and operational improvement projects.

GDOT’s prioritization process for capacity projects begins with the identification of a problem within their network by GDOT, a state or local official, MPO, or the general public, among others. A study is conducted to analyze historical data and make recommendations on a project’s feasibility. If the project is determined to be feasible, it is scored using a variety of factors, including safety, congestion, and project support, and is then adjusted to ensure compliance with congressional balancing requirements. A project that meets these requirements is the programmed in the STIP or TIP, for approval by the Board, Governor, FHWA, and FTA, and if approved, is then let for construction. If a project is not approved, it is either cancelled or put on hold for evaluation in future years.

MPOs have their own project selection and prioritization processes for project proposals to be included in their long range plans. The Planning Division selects projects in non-MPO areas through an informal review process. Once a project is programmed and included in the prioritization spreadsheet, the Planning Division utilizes a project scoring process to help determine funding order. It should be noted that projects included in MPO TIPs are also subject to the Planning Division’s scoring process to determine when they will be funded. Projects are scored according to 13 criteria (five key criteria and eight additional criteria) related to economic development, congestion, safety, and other considerations.

The following flow chart presents GDOT's prioritization process for capacity projects. It should also be noted that MPOs are involved in identifying, selecting and prioritizing projects but that role can vary by MPO.

Exhibit 3.1 – GDOT Project Prioritization Overview for Capacity Projects



Source: GDOT

GDOT's project selection process for non-capacity projects is as follows:

— **Maintenance/Pavement Projects**: GDOT's Office of Maintenance is responsible for preserving and managing state maintained roadways. The office prioritizes and selects projects based on an asset-management approach, which emphasizes well-defined goals, objectives and targets, quality data and information, and considerations for risk.

— **Bridges**: Bridge projects are prioritized and selected by GDOT's Bridge Maintenance Unit. This Unit inspects bridges and collects data for the Bridge Prioritization Ranking formula. The formula is based on structural capacity (e.g., strength and condition of the structure) and user demand (e.g., amount of traffic crossing the bridge).

— **Safety Enhancements**: Typical safety enhancement projects include cable barrier, rumble strips, improved signage and striping, pedestrian safety, corridor improvements, or intersection improvements. These projects are prioritized and selected by the Office of Traffic

Operations and the Office of Utilities, for railroad crossing projects. The selection process varies based on project type: site-specific projects (e.g., traffic signals, pedestrian upgrades); system-wide projects (e.g., guardrails); and railroad highway crossings.

— **Operational Improvements**: Typical projects include traffic signal coordination, ramp metering, signs, and intersection improvements (e.g., roundabouts). Project requests are submitted from stakeholders. Projects are initially screened by GDOT's District Operations staff and the Office of Traffic Operations staff. The screening process involves reviewing each location using online mapping to evaluate the availability of right of way, potential utility conflicts, possible environmental impacts, programmed projects in the area, and the planning-level cost of the recommended improvement.

Prioritization Criteria Overview

GDOT allocates approximately 50 percent of highway funding annually for capacity projects, and projects are scored based on a variety of criteria to determine the funding order. The five key criteria that are assessed include Connectivity (up to 30 points), State Route Prioritization (up to 18 points), Freight Network (up to 10 points), Freight Plan (up to 8 points), and Governor's Road Improvement Program (up to 5 points). The eight additional criteria are largely weighted on Safety (no maximum of points) and Congestion/Level of Service (up to 28 points). The remaining 6 minor criteria such as pavement conditions, identification in planning studies and concept reports add few points.

The remaining allocation of funding is prioritized for other projects using the following methodology:

— Maintenance/Pavement projects factor in both asset condition and risk

— Bridge projects utilize a prioritization ranking formula based on structural capacity (e.g., strength and condition of structure) and user demand (e.g., amount of traffic crossing the bridge)

— Safety enhancement projects use a selection process that varies based on project type: site-specific projects (e.g., traffic signals, pedestrian upgrades), system-wide projects (e.g. guard rails), and railroad highway crossings

— Operational improvements projects (e.g., traffic signal coordination, signs, and ramp metering) are screened by GDOT District Operations and Traffic Operations staff

It is notable that GDOT prioritizes its capacity, maintenance/pavement, bridge, safety enhancement, and operational improvement projects using difference methodologies and on separate project lists.

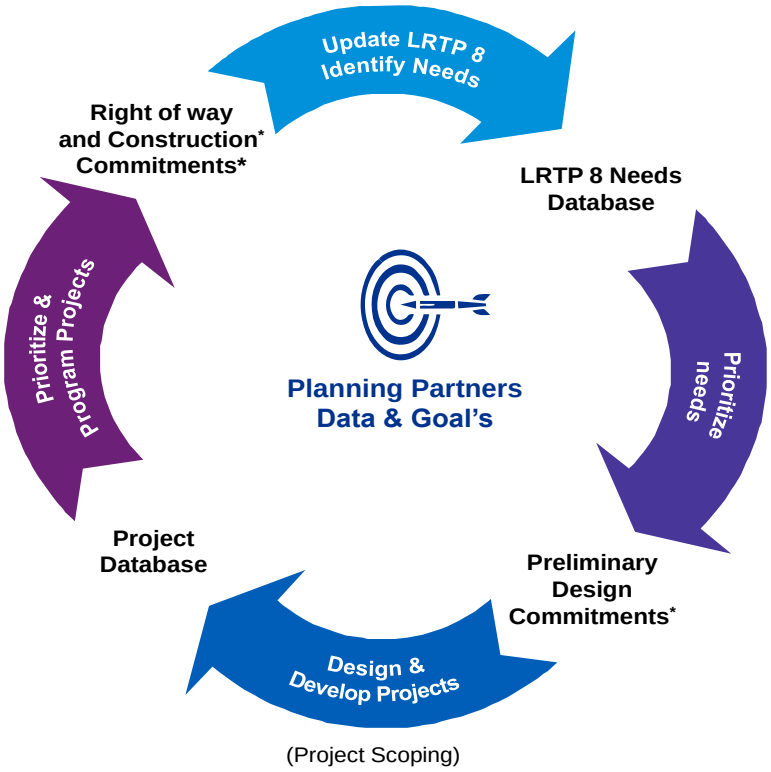
MoDOT

Missouri Revised Statutes Section 21.795.3(2) provides a detailed explanation of the methods and criteria employed to select construction projects and transportation planning, which governs the MoDOT project prioritization process. Transportation improvement plans are brought together to form the Department's five-year STIP.

Prioritization Process Overview

In Missouri, the approach seeks involvement from four groups: MPOs, regional planning commissions, local officials and the general public. Transportation planning consists of a series of decisions to accomplish Missouri's transportation goals.

Exhibit 3.2 – MoDOT Project Prioritization Overview



Source: MoDOT

Prioritization Criteria Overview

The project prioritization process evaluates projects primarily using a data-driven approach, based on the weights assigned to various parameters for each of the MoDOT's project categories:

— Safety Projects (congestion and safety)

— Taking Care of the System Projects (access to opportunity, congestion relief, economic competitiveness, efficient movement of freight, etc.)

— Regional and Emerging Needs Projects (access to opportunity, congestion relief, economic competitiveness, quality of communities, environmental protection, etc.)

— System Expansion Major Projects (access to opportunity, congestion relief, economic competitiveness, quality of communities, environmental protection, safety, etc.)

Each project category is prioritized separately. Further, MoDOT collaborates with regional planning groups to develop local priorities based on projected available local, state and federal funding. Each region develops a program that addresses its asset management goals of maintaining the current condition. Planning groups refine projects into three categories, high priority (selected for commitment), medium priority (may be addressed as additional resources become available), and low priority (no work at this time). Funding for each region is based on an annual forecast by MoDOT and takes into account the prioritization weights, priority value, and the region's population, employment, and other economic statistics.

NCDOT

Passed in 2013, NCDOT's prioritization legislation, the Strategic Transportation Investments law ("STI"), allows NCDOT to use its funding more efficiently and effectively to enhance the state's infrastructure, while supporting economic growth, job creation, and a higher quality of life.

NCDOT communicates its overall project election process and the methodology and scoring criteria used to evaluate each project on its website. The website provides transportation stakeholders access to all project data, scoring, and final selection decisions, as well as a published list of prioritized projects. Further, NCDOT publishes the project scorings associated with the draft and final STIP. The publications provide justification for projects that do not receive funding.

Prioritization Process Overview

STI established the Strategic Mobility Formula ("SMF") as a new way of allocating available revenues based on data-driven scoring and local input. The SMF was used for the first time to develop NCDOT's current construction schedule, the 2016-2025 STIP. The STIP is updated on biennial basis.

SMF funds projects in three categories: Statewide Mobility (projects receive 40 percent of available revenue distributions), Regional Impact (30 percent), and Division Needs (30 percent). Each category has its pre-defined weightage criteria to prioritize projects. State Mobility projects are also analyzed separately in the Region Impact and Division Needs categories and can be funded under those categories if they are not funded in the Statewide Mobility category. Regional Impact projects can also cascade down to the Division Needs category.

Local planning partners play a key role in contributing to the development of the prioritization process through webinars and regional meetings. Quantitative data points are weighed more heavily for higher-tier statewide projects, and decrease for regional and sub-regional tier projects. Local input points are weighed more heavily for sub-regional tier projects, and decrease for regional and statewide projects. Additionally, a project's benefit/cost (measured by travel time savings) and economic competitiveness criteria are included in project prioritization and selection process.

Prioritization Criteria Overview

For highway projects, each individual scoring category is analyzed based on a data driven and/or a local rankings scoring method. The data driven scoring method is weighted and evaluated based on five to six criteria, including congestion, benefit/cost analysis, safety, freight operations, multimodal operations, military operations, accessibility and connectivity, and economic competitiveness. Local rankings are evaluated on an individual needs basis, with criteria that typically varies by region and/or division.

Similar to highway projects, non-highway project (aviation, bicycle, pedestrian, public transportation, ferry, and rail) scoring criteria is divided into three categories, including Statewide Mobility, Regional Impact, and Division Needs. The scoring criteria within each category is weighted based on individual factors, such as cost effectiveness, safety, access, connectivity, market share, impact, project support, and/or benefits. Each of the scoring categories within asset classes exhibits unique weighting and criteria.

VDOT

VDOT's prioritization process, named "SMART SCALE", or "System Management and Allocation of Resources for Transportation", stemmed from the 2014 legislation "House Bill Two", in an effort

to balance the transportation needs and prioritize investments for both urban and rural communities throughout the Commonwealth of Virginia. SMART SCALE requires the Commonwealth Transportation Board (CTB) to develop and implement a quantifiable and transparent prioritization process for making funding decisions for capacity enhancing projects within the six-year capital improvement program. CTB updates this on a biennial schedule. VDOT's non-capacity enhancing projects are programmed using an asset management approach.

The SMART SCALE method promotes transparency and accountability to stakeholders through its website that is dedicated to project selection and includes frequently asked questions about the process. Examples include, information on "how to read a project scorecard," and a link to the policy guide, which describes the criteria and scoring methodology in detail.

The website also publishes a list of projects that did not pass the initial screening process, with rationale and a spreadsheet containing all project scores and ranks, including individual scores for each measure, total project score, and district and statewide ranks.

Prioritization Process Overview

The projects under the SMART SCALE program are evaluated based on a uniform set of measures that are applicable statewide, while recognizing that factors should be valued differently based on regional priorities. The overall process includes five steps, including:

— Eligibility funding (completed by VDOT, Department of Rail & Public Transportation, among others)

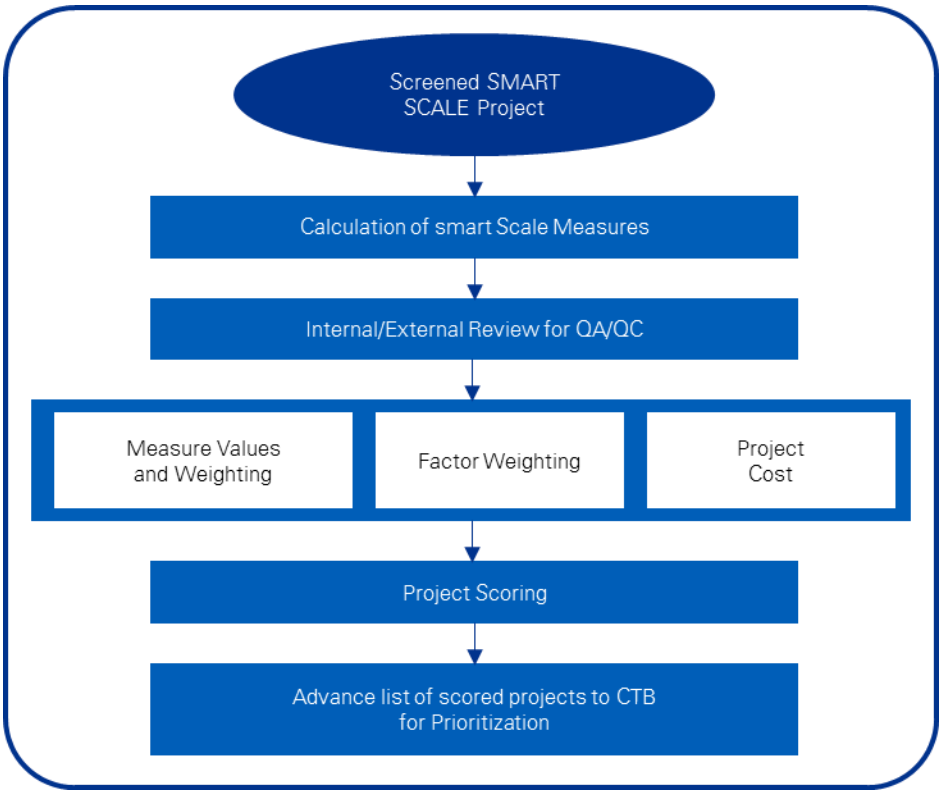
— Project Application (completed by local parties and eligible entities)

— Project Screening (completed by VDOT, Department of Rail & Public Transportation, among others)

— Evaluation/Scoring (completed by VDOT, Department of Rail & Public Transportation)

— Prioritization/Programming (completed by CTB following public review and comment)

Exhibit 3.3 – VDOT Project Prioritization Overview



Source: VDOT

For each SMART SCALE cycle, the screening and scoring results and presented to the CTB and the public. A draft 6-year improvement plan (SYIP) is developed based on CTB's direction and the SMART SCALE scoring results. The CTB considers public comments and ultimately approves the final SYIP.

Prioritization Criteria Overview

VDOT's SMART SCALE projects utilize evaluation measures that quantify the benefits of each project for six different factors including safety, congestion mitigation, accessibility, environmental quality, economic development, and land use.

These factors are weighted for four typologies (Category A, Category B, Category C, and Category D), that are established based on an analysis of transportation, land use, and demographic indicators to facilitate the evaluation of each project's benefit on a scale relative to the needs of that region as compared across the Commonwealth.

Eligible entities who can submit SMART SCALE projects include public transit agencies and regional entities, including Metropolitan Planning Organizations (MPO), the Northern Virginia Transportation Authority, and Planning District Commissions (PDCs), along with counties, cities, and those towns that maintain their own infrastructure. There are some limitations on the grant program for which entities can apply and the types of projects that can be submitted.

WVDOT

Prioritization Process Overview

WVDOT's project prioritization methodology is a two-phased approach. Phase one uses a qualitative approach to screen projects before moving to phase two, which quantitatively compares projects based on a benefit-cost ratio.

Prioritization Criteria Overview

Initially, WVDOT evaluates projects is based on a qualitative approach. This phase includes screening for purpose and need, independence, duplication, a project sponsor, projects bundling, and sorting projects into modal and funding groups. To confirm a project is eligible for prioritization, WVDOT defines the project's general purpose, level of support, and ensures there is no duplication from other projects for each of the aforementioned qualitative categories. Further, WVDOT will group the project with related projects based on funding source and mode, resulting in multiple prioritized project lists. Eligible projects are then ranked using a quantitative approach, and grouped by district and funding decisions to meet statewide balancing requirements.

The second phase of WVDOT's project prioritization methodology assumes a project meets all of the aforementioned qualitative criteria. The quantitative prioritization methodology applies a spreadsheet ranking approach based on a set of defined criteria, to determine the benefit-cost ratio for comparison purposes. Specific data inputs into the spreadsheet include the existing and proposed facility type, number of lanes, volumes, accident rates, estimated cost, value, and number of jobs created, among others. Following quantitative prioritization, projects could be further divided into categories for safety, maintenance, rehabilitation, or new capacity, among others, to ensure highway funding distribution is geographically balanced.

Leading Transparency Examples

During the team's analysis of the transparency level of SCDOT's peer agencies, it became clear that both VDOT and NCDOT showed the most transparency in their prioritization process. The following section provides a summary of the information provided by each respective peer agency.

VDOT

VDOT's SMART SCALE leads transparency and promotes accountability for all stakeholders through the use of its SMART SCALE website. The website allows users to efficiently access information regarding project selection, development and delivery, and spans the entire screening process to final award, including key individual and aggregate statistics on the current timing and budget of projects.

The website allows users to view a spreadsheet for all projects, including the prioritization process scorecard, which is a key input to VDOT's data-driven selection process. The scorecard promotes transparency and accountability by allowing users to view and compare project scores across VDOTs range of project selection criteria. For example, Phase I of the Route 7 widening, between Colvin Forest Drive and Jarrett Valley Drive, was awarded as the project will improve intersections, add bicycle and pedestrian facilities, increase capacity, decrease congestion and improve safety. An excerpt of the project's scorecard is below:

Exhibit 3.4 – VDOT Project Scorecard Example

Project Located in Typology													
Category A	**Congestion Mitigation**		**Safety**		**Accessibility**			**Environment**		**Economic Development**			**Land Use**
	Increase in Daily Person Throughput	Decrease in Person Hours Delay	Reduction in Fatal and Severe Injury	Reduction in Fatal and Severe Injury	Increase in Access to Jobs	Increase in Access to Jobs for Disadvantaged Populations	Improved Access to Multimodal Choices (Users Benefit Value)	Air Quality (Total Benefit Value)	Acres of Natural/Cultural Resources Potentially Impacted	Economic Development Support (Sq. ft.)	Intermodal Access improvements (Tons Benefit Value)	Travel Time Reliability improvements	Transportation Efficient Land Use
Measure Score	3.4	24.5	11.6	0.3	1.2	0.4	0.3	0.2	0.0	2.5	1.4	46.4	4.3
Measure Weight	50%	50%	50%	50%	60%	20%	20%	50%	50%	60%	20%	20%	100%
Weighted Measure Score	1.7	12.3	5.8	0.2	0.7	0.1	0.1	0.1	0.0	1.5	0.3	9.3	4.3
Raw Factor Score	14.0		6.0		0.8			0.1		11.1			4.3
Factor Weighting	45%		5%		15%			10%		5%			20%
Weighted Factor Score	6.3		0.3		0.1			0.0		0.6			0.9

Source: VDOT

The Project received a total score of 8.1, based heavily on its ability to mitigate congestion (weighted 45 percent in VDOT's criteria), while ensuring the efficient use of land, economic development, and increased safety. While economic development scored very highly for the project (11.1), the ultimate score was insignificant as that portion of VDOT's criteria totals just 5 percent.

Users may also group projects based on timing (in development or delivery) or budget. Each project can then be selected individually, which allows users to view information grouped in the following categories:

— General Project Information: This section includes the current status of a project, including whether the project is on time and under/on/over budget, actual versus estimated costs, project type, status, MPO, timing, location, and the entity administering the project, among others.

— Development: This section includes the development schedule, including project milestones dates, and is updated based on achievement of the milestones.

— Delivery: This selection allows users to view the companies involved in the development of the project, the cost to date, contract amounts, and the current estimated completion date, among others.

— Map: The final selection locates the project's exact location on an interactive map.

Project selection scorecards as well as individual project information can be viewed on all of VDOT's projects, whether ultimately awarded or set aside, so that users can compare and contrast different project features and the criteria scores utilized in evaluating them. This data-driven prioritization process allows for high transparency and accountability in selecting projects. The SMART SCALE process allows VDOT and its stakeholders the ability to develop the right projects at the right time, ensuring the best use of limited funds.

NCDOT

Similar to VDOT, the North Carolina DOT's project selection process is available on its website. The website promotes transparency and accountability for project selection as it establishes a clear set of criteria, the methods for evaluating the criteria, and makes available all project data, scoring, and final selection decisions.

NCDOT's website allows users to view the criteria for its selection process, and as explained above, is based on individual weighted criteria within its three project categories, Statewide Mobility, Regional Impact, and Division Needs. The criteria allows users to clearly view the weights that VDOT applies to individual projects as well as the necessary score needed for a project to receive funding.

NCDOT publishes the project scorings associated with the draft and final STIP, which allow users to compare and contrast project scores based on the weights that NCDOT applies in accordance with its criteria. For example, of the three highway projects listed below, the I-40 project's selection status is demonstrated by its high scores within the aforementioned categories.

Exhibit 3.5 – NCDOT Project Score Example #1

Route	Statewide Mobility Quantitative Score (Out of 100)	Regional Impact Quantitative Score (Out of 70)	Division Needs Quantitative Score (Out of 50)	Funded Status
US 74 (New Route - Corridor K)	31.67	22.02	14.79	
US 64	20.16	17.53	13.29	
I-40	70.15	45.84	33.97	FY2021

Source: NCDOT

The weighted criteria within each category details the high total scores for the I-40 project. The criteria within this example includes congestion, benefit/cost, safety, freight, multimodal, economic competitiveness, and accessibility/connectivity. As shown in the example below, the scores on the I-40 project are much higher than peer projects in the majority of criteria, suggesting higher value from the implementation of the project. This data-driven approach indicates that the I-40 project should be of higher priority than its two peers in this example, though other factors may have an effect on DOT decisions.

Exhibit 3.6 – NCDOT Project Score Example #2

Route	Congestion (Statewide Mobility)	Congestion (Regional Impact)	Congestion (Division Needs)	Benefit/ Cost (Statewide Mobility)	Benefit/ Cost (Regional Impact, Division Needs)	Safety	Freight	Multimodal	Economic Competitiveness (Statewide Mobility)	Accessibility/Connectivity (Regional Impact and Division Needs)
US 74 (New Route - Corridor K)	25.24	25.01	24.79	10.40	5.48	45.68	24.43	48.48	85.54	89.11
US 64	41.23	44.45	47.67	10.40	15.81	20.59	6.57	0.00	11.17	27.64
1-40	92.40	90.50	88.60	84.10	86.07	50.00	50.97	0.00	62.56	4.32

Source: NCDOT

The examples above can be duplicated for all of the projects included in NCDOT's draft STIP, including highway projects (excerpt shown), aviation, bicycle and pedestrian, ferry, rail, and transit. It clearly and effectively allows users to identify the criteria for project selection, evaluate the criteria, and compare selected projects. This process allows NCDOT to remain transparent, systematic, and data-driven in prioritizing the major transportation projects in the state, allowing the DOT to make the smartest investment decisions and implement the highest value projects, at the right time, and the lowest cost.

IV. Technology and Information Management Systems

Key Recommendations

Additional Recommendations

The following additional recommendations are captured from the findings not already covered from the assessment arrears:

Additional Recommendation # 4.1: Develop long-term strategic plan for additional information/data needed as transportation program grows

The Agency should consider what information it may need to add to existing asset records, and any new asset types it may need information for in the future, and develop a long-term strategic plan for this effort. This should be accomplished in parallel with the development of the RFP for acquiring new asset management systems.

Additional Recommendation # 4.2: Utilize automated processes to capture and transfer data to manage bridge and pavement assets

With regard to asset condition data being captured, both for bridges and pavements, there is further opportunity to increase the efficiency of data capture and transfer in this area by use of both automated processes and mobile devices and the Agency should continue working toward this longer term goal.

Additional Recommendation # 4.3: Consider additional data analytics solutions to increase functions and interphase capabilities for more efficient data availability

In the area of performance communications, in addition to revising the public facing website dashboards, the Agency should consider ways to both better track, and boost, the page views from both internal and external stakeholders of these KPI Dashboards. Some possible solutions will be to add Google Analytics for these pages, and then to provide links to the dashboards from the main SCDOT landing web page, or at least from other pages with high volumes of views that attract visits by relevant stakeholder groups.

V. Transportation Funding

Peer Group Analysis

Federal Highway Administration

FHWA define maintenance activities under items A.2., A.7.b., and A.9.b in Chapter 12. Please refer to the FHWA definition below:

"*Item A.2. Maintenance of State system.*—Enter all expenditures classified as maintenance for highways, roads, and streets that are part of the State highway system.

The cost of materials and supplies that are used in maintenance activities and maintenance equipment costs should be included in the maintenance expenditures reported. As with construction expenditures, the maintenance expenditures reported should include all administrative and engineering costs directly assignable to maintenance projects.

The term maintenance as used on form FHWA-532 is defined as the function of preserving and keeping the entire highway, including surface, shoulders, roadsides, structures, and traffic control devices, as close as possible to the original condition as designed and constructed. For improved or reconstructed facilities, subsequent maintenance work only insures continued service as redesigned.

Maintenance on form FHWA-532 also includes preventive maintenance activities. These activities extend pavement and bridge service life to at least achieve the design life of the facility. Preventive maintenance involves programs that delay or eliminate the necessity for future resurfacing, restoration, rehabilitation, and reconstruction of the roads or structures.

General maintenance does not include improvements, additions and betterments, or resurfacing, restoration, rehabilitation, and reconstruction expenditures (3R/4R) which should be recorded in item A.1. The purpose of maintenance is to offset the effects of deterioration from age, weather, use, damage, failure, and design and construction faults.

Roadway maintenance includes all expenditures for routine roadway surface, shoulder, roadside and drainage operations. Structure maintenance includes expenditures for repair and maintenance of bridges, tunnels, subways, overhead grade separations, and other structures, including substructure, superstructure, stream bed operations, and bridge painting. Highway and structure maintenance also includes: spot patching and crack sealing of roadways and bridge decks, the maintenance and repair of highway utilities and safety devices, including repair and painting of route markers, signs, guard rails, fences, signals and highway lighting. Maintenance expenditures for toll facilities should not be included on form FHWA-532."

"Item A.7.b. Maintenance and traffic services.—Enter all expenditures for State maintenance and for highway and traffic services for State roads and streets that are not on the State system."

"*Item A.9.b. Maintenance and traffic services*.—Enter all State expenditures for maintenance and highway and traffic services on local roads and streets."

Exhibit 5.1 – Highway Striping Analysis

State	Approximate Quantities of pavement Marking Products Used		Party responsible for applying markings	Cost summary for installed pavement Markings (All Prices are reported in $/linear foot)					Additional comments
	Conventional Products (approx. use)	Durable Products (approx. use)		Conventional Paint	Epoxy Paint	Thermo-plastic	Sprayed Thermo-plastic	Temp. Profile tape	
South Carolina			Contractor	$0.08	$0.34	$0.34		$4.15	
Pennsylvania	94%	6%	Penn DOT	$0.02	–	–	–	–	— Of all the states considered in this review, Pennsylvania reported the lowest cost per linear foot (LF) of installed pavement markings
Kansas	21%	79%	Contractor (~79%)	$0.05	$0.32	$0.41	$0.19	$2.12	— Kansas DOT has an integrated preventative maintenance program that tracks all pavement markings by the year applied, expected life of pavement, type of material used, and performance guarantees of the pavement markings
Minnesota	90%	10%	MoDOT	$0.05	$0.19	–	–	–	— The cost of applying striping materials is directly related to the quantities, traffic control requirements, materials costs, and mobilization and from the job site. The more work that is planned and coordinated under a single contract, the greater the efficiency, thereby making more cost-effective
Virginia	–	–	–	$0.18	$0.30	–	$0.26	$0.67	— Paint, thermoplastics, and waffle tape make up 90 percent of the pavement markings used by the Virginia department of Transportation (VDOT). The remainder of the pavement markings used includes epoxy paints polyester paints, and other miscellaneous tapes.

State	Approximate Quantities of pavement Marking Products Used		Party responsible for applying markings	Cost summary for installed pavement Markings (All Prices are reported in $/linear foot)					Additional comments
	Conventional Products (approx. use)	Durable Products (approx. use)		Conventional Paint	Epoxy Paint	Thermo-plastic	Sprayed Thermo-plastic	Temp. Profile tape	
Maryland	–	–	–	$0.17	–	$0.90	–	$1.50	
Wyoming	Majority	Minority	WYDOT	$0.04	$0.40 - $0.45	–	–	–	— The Wyoming department of transportation predominantly uses alkyd conventional paints for pavement markings. WYDOT applies all conventional paint markings on Wyoming state highways. Epoxy markings are used in areas of high wear, and these markings are installed by outside contractors. Even through the cost of epoxy paint is much higher than conventional paint, it is required for safety reasons in areas where pavement markings are unable to withstand wear experienced during the winter season
North Dakota	–	–	–	–	–	–	–	–	— The North Dakota department of Transportation (NDDOT) bases its selection of pavement markings on several criteria, including: type and condition of the road surface, the level of anticipated traffic, and where on the road the delineation will be used, (e.g., Center of edge). The Materials it considers for use include conventional paint; inlaid, patterned, performed plastic; and grooved, patterned, performed plastic.
Idaho	98%	2%	ITD (60-80%)	$0.04	–	–	–	–	— Contracts bid for all of the state's interstate work in large contracts that

State	Approximate Quantities of pavement Marking Products Used		Party responsible for applying markings	Cost summary for installed pavement Markings (All Prices are reported in $/linear foot)					Additional comments
	Conventional Products (approx. use)	Durable Products (approx. use)		Conventional Paint	Epoxy Paint	Thermo-plastic	Sprayed Thermo-plastic	Temp. Profile tape	
									cover multiple districts, which results in lower installation costs. Idaho currently applies paint approximately two times per year in high wear areas. Idaho investigating the possibility of using epoxy paints in high wear areas to reduce costs.
Montana	60%	40%	MDT/ Contractor (50/50%)	–	$0.10 - $0.14	$1.50	–	–	— Like Idaho, Montana practice has been to release large, district-wide pavement marking contracts that utilize mainly one material for delineation. Thus Montana been able to realize extremely low prices for epoxy paint

Source: SCDOT

VI. Glossary

A/E Firms – Architecture/Engineering firms

AADT – Average Annual Daily Traffic

AASHTO – American Association of State Highway and Transportation

AASHTOWare BrM – Industry standard bridge management software used by transportation agencies across the U.S. and internationally

ACEC – American Council of Engineering Companies

AGC – Association of General Contractors

ALB Adjusted Low Bid, a practice of normalizing the weighting of qualifications to an optimal alignment between cost (low-bid) and qualifications.

Alternative Transportation Solutions – Potential alternatives to the project, which are explored during the planning and environmental process

APD – Alternative Project Delivery, a project delivery system in which the contractor bids per unit of specific work with a guaranteed minimum amount of work units over the life of the contract

Autonomous Vehicles – Vehicles in which operation occurs without direct driver input to control the steering, acceleration, and braking and are designed so that the driver is not expected to constantly monitor the roadway while operating in self-driving mode

AVL – Automatic Vehicle Location

Best-Value/Adjusted Low Bid (ALB) – A practice of normalizing the weighting of qualifications to an optimal alignment between cost (low-bid) and qualifications.

Bridges per FTE – Number of bridges per full-time equivalent employees

BTS – Bureau of Transportation Statistics

C Program – A partnership between the South Carolina Department of Transportation (SCDOT) and the forty-six counties of South Carolina to fund the improvements of state roads, county roads, city streets, and other local transportation projects, that is legislatively established in State law

Capital Outlay per CL Mile – Capital expenditure per centerline mile

CE&I – Construction Engineering & Inspection, services which are required for contract administration, inspection, and materials sampling and testing for the construction projects

Centerline Miles – Centerline mile is a term for one mile of a single roadway, it is calculated by measuring down the center of all lanes of traffic for each specified route

CMAQ – Congestion Mitigation and Air Quality

CMAR – Construction Manager at Risk, delivery model which entails a commitment by the Construction Manager to deliver the project within a Guaranteed Maximum Price, which is based on the construction documents and specifications plus any reasonably inferred items or tasks

COG – Council of Government

Commonwealth Transportation Board – the board oversees transportation projects and initiatives for the Commonwealth of Virginia

Connected Vehicles – vehicles that use any of a number of different communication technologies to communicate with the driver, other cars on the road, roadside infrastructure, and the "Cloud"

Consistency with Local Land Use Plans – it includes the determination of whether a project is consistent and will remain consistent with zoning or other local land use plans

CPM – Critical Path Method

CTC – County Transportation Committee

DA funds – Directly Attributable funds

DB – Design-Build, procurement process in which the private sector is responsible for the design and construction of the asset under a single contract during the construction period, through a competitive process

DBB – Design-Bid-Build, procurement process in which the private sector is responsible for the design and construction of the asset under separate contracts, through a competitive process

DBE – Disadvantaged Business Enterprise

DEA – District Engineering Administrator

Deighton dTIMS – An infrastructure asset management software

District – Highway Engineering District

DOT – Department of Transportation

Environmental Impact Statement – Includes the measurement of the impact to social and natural resources along the corridor

Epoxy Paint – Normally used on portland cement concrete pavements

Esri Roads and Highways – A linear referencing system solution, which makes it possible for Departments of Transportation to integrate data from multiple linear referencing system (LRS) networks to get a comprehensive view of their roadways

FAST ACT – Fixing America's Surface Transportation Act

Fatality Rate per 100M VMT – Fatality rate per 100 million vehicle miles travelled

FDR – Full-Depth Reclamation Project

Federal funding relative to State – Federal funding for a state relative to the peer group

Federal Payments – Federal share of total dollar spent on transportation system

Federal Share of Highway Capital Expenditure – Federal contribution of capital expenditures for highway

FHWA – Federal Highway Administration

Financial Viability – An evaluation of the anticipated funding sources for each project, the total estimated cost to complete the project, and an analysis of total maintenance and repair costs over the life of the project

FTE – Full-time equivalent

FTEs per 1000 Lane Miles – Full-time equivalent employees per 1000 lane mile

Functionally Obsolete Bridges – Bridges that do not have adequate lane widths, shoulder widths, or vertical clearances to serve current traffic demand, or those that may be occasionally flooded

GDOT – Georgia Department of Transportation

GDP – Gross domestic product

GIS – Geographic Information System

GL – General Ledger

Highway and Transport Commission – Missouri's six-member board that governs the MoDOT

HMMS – Highway Maintenance Management System, it is the repository for capturing road maintenance information

HPMA – Highway Pavement Management Application, a pavement management system responsible for storing the pavement condition survey data as well as generating road treatment recommendations

HPMS – Highway Performance Monitoring System, it is closely aligned with RIMS and is one of RIMS' main areas of functionality

HQ – headquarters

IT – Information Technology

ITMS – Integrated Transportation Management System, it is used for collating and viewing data from multiple sources

ITS – Information Technology Services

KPI – key performance indicator

LAC – Legislative Audit Council

Lane mile – one mile of roadway that is intended for driving, it is calculated by measuring down the center of all lanes of traffic for each specified route

Legislature – South Carolina Legislature

LIDAR – Light detection and Ranging, a remote sensing method used to examine the surface of the Earth

LRS – Linear Referencing System

Maintenance per CL Mile – Maintenance expenditure per centerline mile

MAP-21 – Moving Ahead for Progress in the 21st Century Act

MBE – Minority Business Enterprise

MoDOT – Missouri Department of Transportation

MPO – Metropolitan Planning Organization

NBI – National Bridge Inventory, it is also one of RIMS' main areas of functionality and houses the bridge inventory and bridge inspection data

NCDOT – North Carolina Department of Transportation

NHS – National Highway System

Non-NHS – Non-National Highway System

One-SCDOT – Integration of all SCDOT divisions, units, and offices functioning as one team

OPD – Office for project delivery

P2S – Project Programming System, it holds all funded projects and is a hub for multiple associated systems such as Site Manager, Primavera, Web Transport, etc.

Pavement Quality Index – Measurement of the overall condition of the pavement surface, and is based on a five-point-scale with categories ranging from "Poor" to "Good

PBM – Performance based maintenance

PCU – Program Control Units

PennDOT – Pennsylvania Department of Transportation

PMD – Performance Development Dashboard

Poll Everywhere – An online meeting participation toll

Potential for Economic Development – Evaluation of transportation economic models from the State Department of Commerce which measures economic activity, viability, and the future economic benefits

PQI - Pavement Quality Index

PRAM – Program Resource Analysis Meeting

QA – Quality assurance

QC – Quality Control

QMT – Quality Management Team

RFP – Request for Proposals

RFQ – Request for Qualifications

RIMS – Roadway Information Management System, a repository for the Highway Performance Monitoring System functionality

Road Bill – Act 40 of 2017, which initiates an annual two-cent increase on the State gas tax for the next six years, beginning the State fiscal year 2017-2018

ROW – Right-of-way

RPG – Regional Production Groups

Safety Score – Calculated by crashes within a given segment divided by the volume and multiplied by the number of years

SCDOT – South Carolina Department of Transportation

Senate – South Carolina Senate

SOQ – Statement of Qualifications

SQL – Structured Query Language

State Fiscal Year – South Carolina's Fiscal Year from July-June

State funding per capita – state funding per each individual of the state

State funding per FTE – state funding per each full-time equivalent of the DOT

State funding per Lane Mile – state funding per each Lane Mile within the state

State Payments – State share of total dollar spent on transportation system

STIP – Statewide Transportation Improvement Program

Strategic Plan – a plan focused on addressing the transportation challenges facing the State and moving the Agency forward as an organization

Structurally Deficient Bridges – it means there are elements of the bridge that need to be monitored and/or repaired

Structurally Deficient Bridges Area – Deck area that belongs to structurally deficient bridges

TAC – Technical Advisory Committees

TAMP – Transportation Asset Management Plan, which provides desired service level targets and performance management principles

TAP – Transportation Alternative Program

Temp. Profile Tape – Temporary pavement markings are placed and maintained during the construction stage, these are used in lieu of permanent traffic markings

TERI – Teacher and Employee Retention Incentive

The Agency – South Carolina Department of Transportation

The Secretary – South Carolina Secretary of Transportation

The State – South Carolina

Thermo Plastic – Material normally used on HMA pavements

TIP – Transportation Improvement Program

TOM – Target Operating Model, a plan to address elements that are integral for achieving sustainable results

Total funding used for Highways – total dollar spent on transportation system

Transportation Commission – South Carolina Transportation Commission

V2I – Vehicle-to-infrastructure

V2V – Vehicle-to-vehicle

VDOT – Virginia Department of Transportation

VfM – Value for money, a process used to compare the financial impacts of a project against those for the traditional public delivery alternative

VMT – Vehicle miles traveled, it is calculated by multiplying the amount of daily traffic on a roadway segment by the length of the segment, then summing all the segments'

WVDOT – West Virginia Department of Transportation

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