FY 2022

GDOT's Annual Research Implementation Report

Office of Performance-based Management and Research

Georgia Department of Transportation

600 W Peachtree St. NW
Atlanta, GA 30308

August 2022

Executive Summary

This report is the Annual Research Implementation Report to the Georgia Department of Transportation's (GDOT's) Research Advisory Committee (RAC). It summarizes implementation activities, completed or in progress, under the GDOT's Research and Development (R&D) program or the Transportation Pooled-Fund (TPF) program in Fiscal Year (FY) 2022. After the projects were completed, the Post Completion Survey Form was used to track/collect the implementation status of completed projects. 56 completed GDOT research projects from FY 2020-2022 were tracked. Deliverables of 18 projects are either implemented or implementation is in progress, whereas 34 projects will be implemented in the future and 4 were not implementable as the purpose was to find ideas, and implementation would come later in the form of future research projects. In FY 2022, the projects that were implemented or implementation is in progress had an impact on policy, procedure, work method, standard drawing, or specifications. Among implemented and implementation in-progress projects, most of these projects recorded changes in procedure. The research discussed herein demonstrates that GDOT is leveraging both federal and state research dollars well to conduct and implement research with tangible benefits to GDOT and the traveling public.

Introduction

In the context of state Departments of Transportation (DOTs), research implementation may be defined as effective research results to enhance an agency's capacity to achieve its strategic goals. Effective research implementation matters because it is a critical driver of agency business performance. Research conducted without serious and systematic attention paid to its effective implementation can be a tremendous missed opportunity for continued improvement of organizational performance. For every research initiative, (either-one-time or ongoing), an associated implementation deliverable can be managed and improved. Implementable deliverables go beyond final reports to include demonstration software, websites, policy guidance, training manuals, etc.

This report is the Office of Performance-based Management and Research's (OPMR's) Annual Research Implementation Report to the Georgia Department of Transportation (GDOT) Research Advisory Committee (RAC). This report summarizes implementation activities, completed or in progress, under the GDOT Research and Development (R&D) program or the Transportation Pooled-Fund (TPF) program in Fiscal Year (FY) 2022. GDOT normally funds contract research with 80% federal State Planning and Research (SP&R) dollars and 20% state dollars, while it funds Transportation Pooled-Fund (TPF) projects with 100% federal SP&R dollars. All research activities are initiated to solve a problem or provide useful information. Each research project approved for the contract includes a specific objective and plan to implement its findings. R&D projects contain work elements to ensure this implementation takes place.

R&D projects are recommended by the Research Technical Advisory Groups (RTAGs)—Asset Management, Mobility, Policy/Workforce, or Safety. They are then vetted by the Research Advisory Committee (RAC). They aim to improve GDOT's operations. The research projects discussed herein demonstrate that GDOT is leveraging both federal and state research dollars responsibly to conduct and implement research with tangible benefits to GDOT and the traveling public. The implementation products enhance operations in a cross-section of GDOT divisions. Depending on the scope and deliverable(s) of each research project (RP), the implementation type may differ considerably from project to project. These types include:

• Developmental – In this traditional type of implementation, the research produces a new or modified material, technology, policy, or process; and GDOT implements the product during and/or after the research project timeline. Progressive implementation of research products is encouraged, as appropriate, during the project lifecycle.

• Response – This type of implementation provides an answer to a question or concern from any of the various stakeholders of GDOT's R&D program.

• Feasibility – This type of implementation is a guidance for GDOT on the feasibility of new or modified material, technology, policy, or process. This type of research can be valuable in encouraging GDOT to move forward with further research and development on something or discouraging further study on it, eliminating further funding risks.

Implementation outcomes/benefits are specified using either time saved/money saved as quantitative measures or other types of measures appropriate to the project. This consists of quantitative or qualitative measures specified by the project Technical/ Implementation Manager in the implementation report. The use of other measures also requires that data sources and potential metrics for valuation also be specified. Likewise, implementation impact is specified as a change in policy, procedure, work method, standard drawing, or specifications.

Implementation rating for each implementation project completed based on the extent to which it fulfills the requirements stated in the implementation deliverables is also generated. A simplified rating scale is of: (1) above expectation, (2) below expectation, and (3) met expectation is used.

STATUS OF RESEARCH PROJECTS IMPLEMENTED IN FY 2022

In FY 2022, 27 GDOT research projects were completed. Deliverables of 6 projects are either implemented or implementation is in progress, whereas 20 projects will be implemented in future and 1 is not implementable as the purpose was to find ideas and implementation would come later in the form of future research projects. In addition, projects completed but not implemented in previous fiscal years were tracked.

56 completed GDOT research projects from FY 2020-2022 were tracked. Deliverables of 18 projects are either implemented or implementation is in progress, whereas 34 projects will be implemented in the future and 4 were not implementable as the purpose was to find ideas, and implementation would come later in the form of future research projects.

After the projects were completed, the Post Completion Survey Form was used to track/collect the implementation status of the projects. The status of implemented or implementation in progress projects is presented per RTAG and Division.

Table 1. Chart. Projects Completed by RTAG

RTAG	Count
Asset Management	17
Mobility	7
Policy/Workforce	22
Safety	10
Total	**56**

Table 2. Chart. Projects Completed by Division

Division	Count
Administration	1
Construction	10
Engineering	16
Finance	1
Intermodal	1
P3	3
Permits and Operations	18
Planning	5
Program Delivery	1
Total	**56**

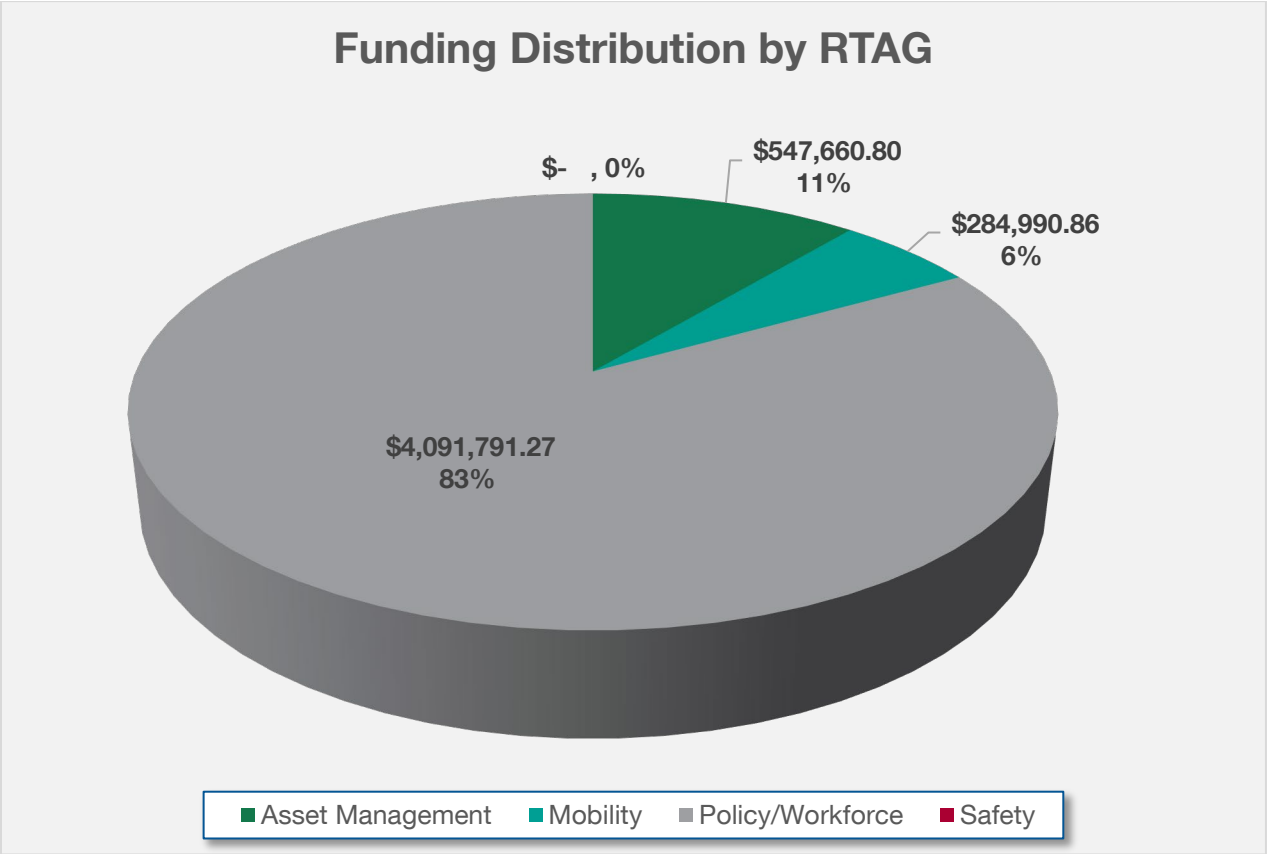


Figure 1. Chart. Funding Distribution by RTAG

Table 3. Chart. Funding Distribution by Division

Division	Cost
Administration	$ 180,000
Construction	$ 374,989
Engineering	$ 1,516,605
P3	$ 458,325
Permits and Operations	$ 865,373
Planning	$ 29,151
Program Delivery	$ 1,500,000

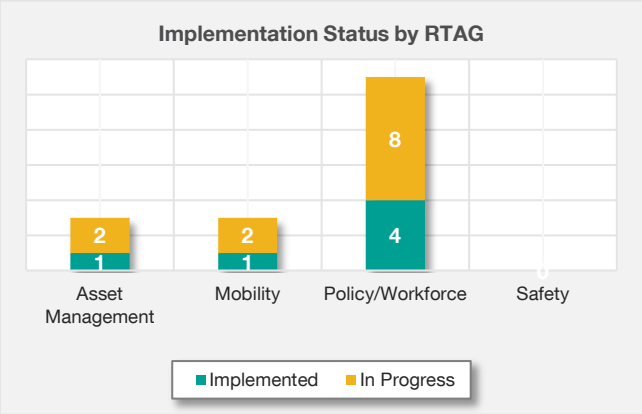


Figure 2. Chart. Implementation Status by RTAG

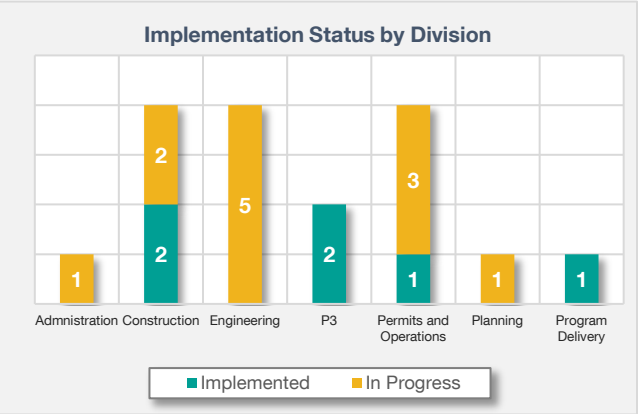


Figure 3. Chart. Implementation Status by Division

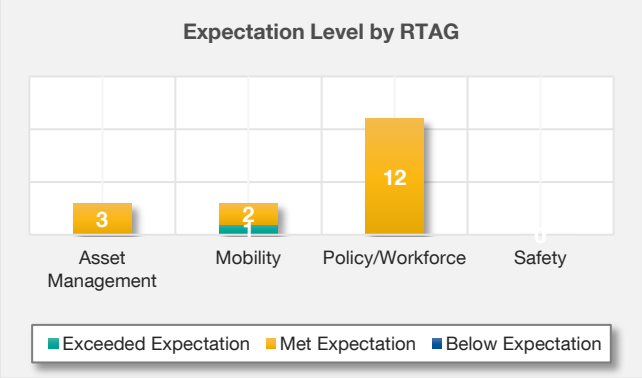


Figure 4. Chart. Expectation Level by RTAG

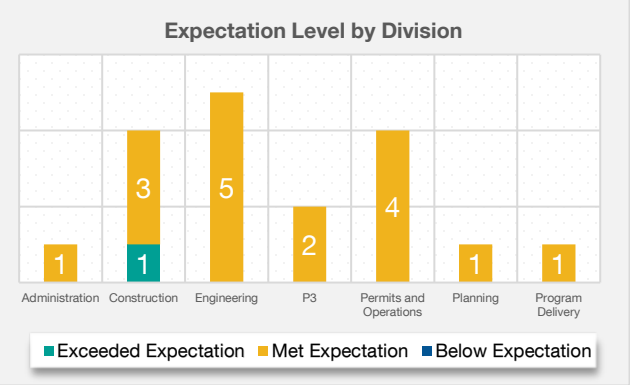


Figure 5. Chart. Expectation Level by Division

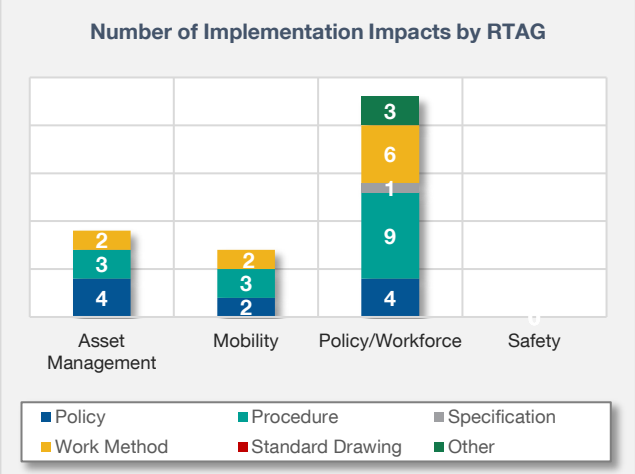


Figure 6. Chart. Number of Implementation Impacts by RTAG

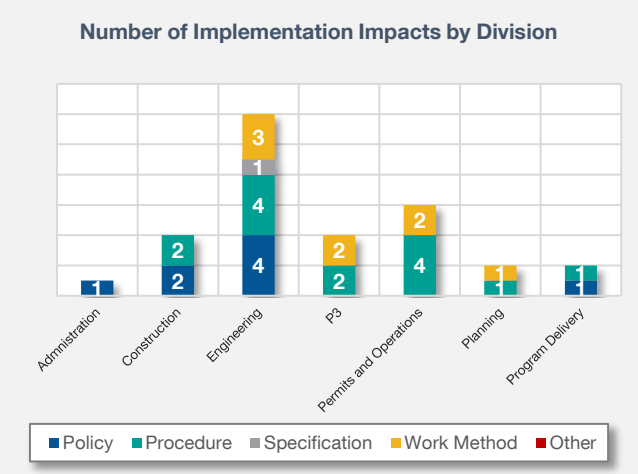
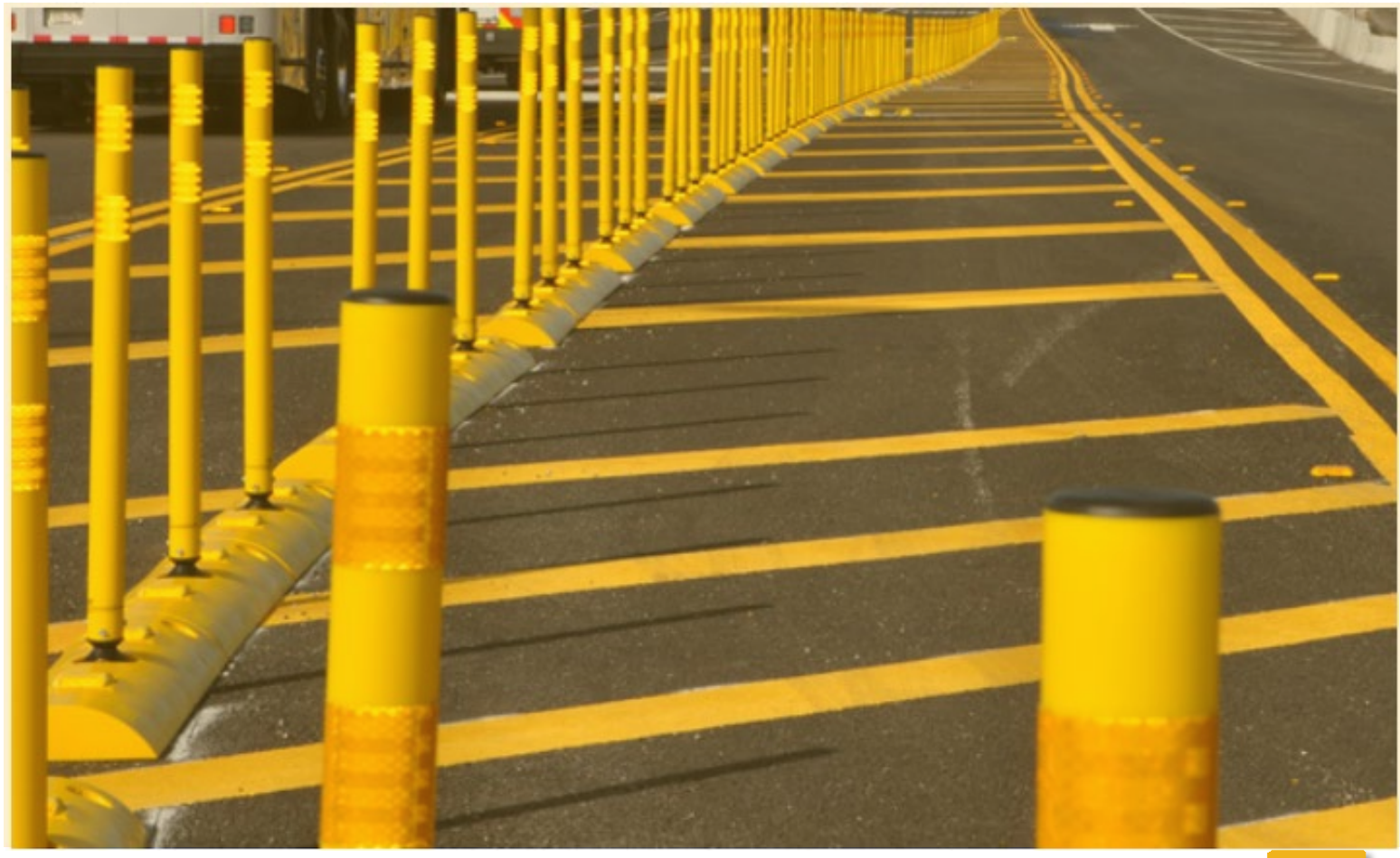


Figure 7. Chart. Number of Implementation Impacts by Division

Georgia Department of Transportation



IMPLEMENTATION ACTIVITIES OF RESEARCH PROJECTS COMPLETED IN FYs 2020-2022 AND IMPLEMENTED IN FY 2022

Georgia Department of Transportation

RP 19-21 Use of Ground Penetrating Radar Technology to Assess and Monitor Pavement Structural Conditions for Improved Pavement Maintenance and Rehabilitation Strategies

Implementation Status	Implementation Type	Implementation Impact
In Progress	*Developmental*	*Procedure*

Principal Investigator: Dr. Sonny Kim
Project Manager: Brennan Roney
Technical/Implementation Manager: Ernay Robinson
Available: GDOT Library

Need

Being able to accurately and reliably assess the underlying conditions of pavements is essential to fully understand both functional and structural deficiencies or failures of pavements and associated causality. This improved understanding will lead to the most cost-effective maintenance and rehabilitation treatments and considerable savings in maintenance and rehabilitation expenditures.

Objective

The objectives of this research project were to establish a GIS: GPS/CVR enabled map including locations (from GIS), pavement profiles (from GPR), estimated subgrade dry density, and surface images (from CVR) for critical state routes in District 7 in Georgia, to provide a reliable condition assessment and pavement distress evaluation tool for a cost-effective maintenance program and to identify potential problematic areas based on field GPR survey data and image analyses.

Outcome

The potential pavement foundation issues on critical state highways can now be identified using a non-destructive technique. The new GDT test method for evaluating subgrade soil condition density/water content/surface will be using a ground-penetrating radar (GPR) system.

Figure 8. Photo. GPR system

Benefits

The department is now able to quickly identify locations of atypical/abnormal/unexpected pavement characteristics at highway speeds with no traffic control. This provides the department with much needed data to identify state highways that need to be fixed. The new method will save time needed to identify pavement abnormalities.

(GIS: Geographic Information System; GPS: Global Positioning System; GPR: Ground Penetrating Radar)

Georgia Department of Transportation

RP 18-33 VISSIM™ Simulation Guide

Implementation Status	Implementation Type	Implementation Impact
In Progress	*Developmental*	*Procedure, Work Method*

Principal Investigator: Dr. Michael Hunter
Project Manager: Brennan Roney
Technical/Implementation Manager: Landon Perry
Available: GDOT Library

Need

The development of a safe and efficient transportation system often requires the ability to conduct detailed microscopic simulation (e.g. VISSIM™) for operational analysis.

Objective

This research project aimed to understand prior state-of-the-practice and state-of-the-art in VISSIM™ model development, understand key issues related to the VISSIM™ use by GDOT and its consultants, and develop a guidance document suitable for use by GDOT personnel in the review of GDOT VISSIM™ models as well as GDOT consultants in model development.

Outcome

The project's findings will be implemented both within GDOT and by those utilizing the VISSIM™ Microsimulation Software on behalf of GDOT. Once the guidance document is released, a meeting will be held with several internal Traffic Operations' subject matter experts (SMEs). During the meeting, the SMEs will provide comments related to the document and discuss strategies on how to implement the guidance in both existing and future models. Afterwards, the SME team will coordinate with the Office of Design Policy and Support (ODPS) to address any questions, comments, or concerns. Once comments are addressed, the document will be placed on-line, and a notice will be sent to all consulting firms pre-qualified in area classes 3.06, 3.07, and 3.09 of the document's existence.

Benefits

Money would be saved by ensuring consistency in the creation and Quality Control/Quality Assurance (QC/QA) review of all associated VISSIM™ microsimulation models. If the guidance provided is properly followed, the models would accurately represent existing and future conditions along with driver behavior. These two factors would therefore help to ensure accurate benefit-cost ratios based on driver delay reduction. If the guidance is followed correctly, more accurate assumptions could be made for environmental factors related to vehicle delay and throughput for a given area.

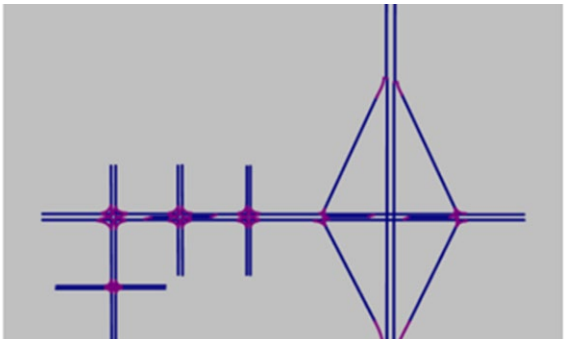


Figure 9. Diagram. Developed Network

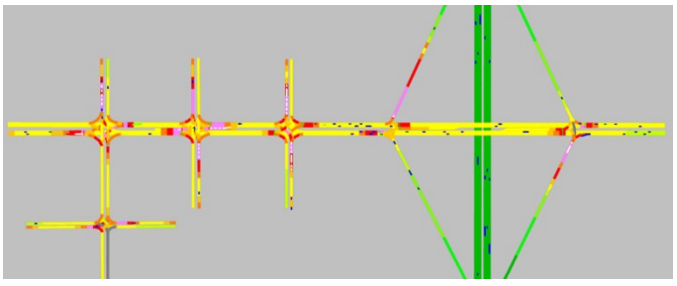


Figure 10. Diagram. Example Speed Heat Map

Georgia Department of Transportation

RP 17-22 Optimizing Design of GDOT Post Construction Stormwater BMPs for Performance while Minimizing Right-of-Way Acquisition and Peak Flows

Implementation Status	Implementation Type	Implementation Impact
In Progress	*Developmental*	*Policy, Procedure, Work Method*

Principal Investigator: Dr. Susan Burns
Project Manager: Sarah Lamothe
Technical/Implementation Manager: Brad McManus
Available: GDOT Library

Need

While the current designs of stormwater Best Management Practices (BMPs) specified on GDOT right-of-way (ROW) are functioning well, research was needed to determine if the design of the most currently implemented BMPs could be optimized to reduce the cost of right-of-way acquisition while still maintaining the required environmental protection.

Objective

The objective of this research was to provide quantification of the performance in BMPs throughout the state, with guidance on how to optimize design for the multi constrained problems: contaminant removal, hydraulic control, and limited right-of-way acquisition.

Outcome

ODPS has determined that changes to the filter strip Total Suspended Solid (TSS) removal efficiency in Chapter 10 of the Drainage Manual can be made to aid in environmental compliance. This research has taken into account the 2 to 8 feet of 2% slope edge of pavement into calculating the Total Suspended Solids removal to shorten right of way acquisition, to maintain environmental compliance, and to understand places in the future where GDOT cannot purchase the 15 ft strip needed for the 60% TSS removal. These calculations will reduce the need for as many mitigation credits.

Benefits

The inclusion of partial credits for solids removal in the design of vegetated filter strips that may be shorter than the required 15 feet will result in significant savings in right-of-way acquisition and it will still be in compliance with environmental regulations.

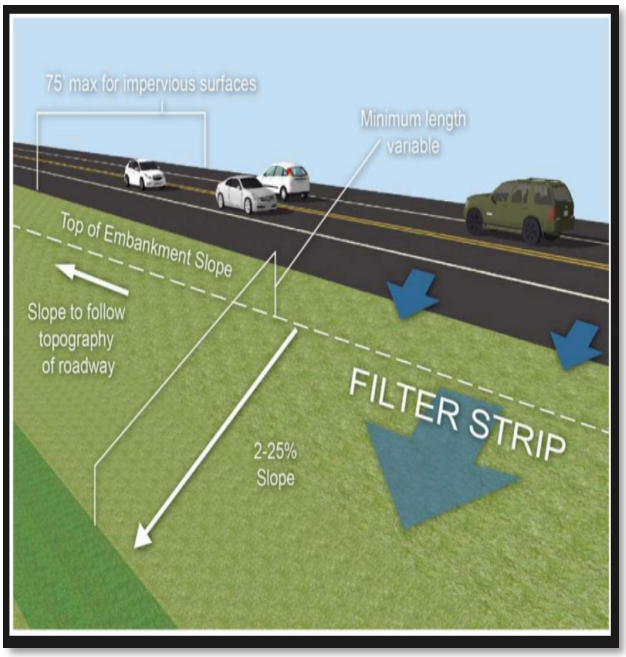


Figure 11. Illustration. Slope of Embankment from Highway.

Georgia Department of Transportation

RP 19-25 Transportation Performance Management for System Operations: Development of Processes, Tools, Measures and Targets

Implementation Status	Implementation Type	Implementation Impact
In Progress	*Developmental*	*Procedure, Work Method*

Principal Investigator: Dr. Adjo A. Amekudzi-Kennedy
Project Manager: Sarah Lamothe
Technical/Implementation Manager: Habte Kassa
Available: GDOT Library

Need

This study identifies effective practices for Transportation Systems Management and Operations (TSMO) at the strategic, programmatic, and tactical level and assesses Georgia Department of Transportation's status using the TSMO Capability Maturity Model (CMM), and offers recommendations to move the agency to the next level.

Objective

The objectives of the project were to identify effective practices, including business processes, institutional arrangement, and TSMO strategies for transportation performance management at the agency; to determine the current status (i.e., existing) and establish the desired status (i.e., next level) of GDOT on the Operations Performance Management Capability Maturity Model (OPMCMM), to develop an analytic tool for calculating transportation system performance metrics and targets using the National Performance Management Research Data Set (NPMRDS) and other data sets, and, finally implement the tools within the OPMCMM framework for GDOT for TSMO.

Outcome

The Research Team and GDOT worked on a tool and software to be used internally by the Planning Office.

Outcome

The tool consists of an input/output platform that draws data from 1) the American Community Survey, 2) the Congestion Mitigation & Air Quality (CMAQ) Public Access Database, 3) the National Performance Management Research Data Set (NPMRDS), and lastly 4) GDOT.

Benefits

The collected data will provide: 1) Level of Travel Time Reliability, 2) Travel Time Reliability Index, 3) Peak-Hour Excessive Delay, and 4) Non-Single Occupancy Vehicle Travel. These outputs consist of important Performance Measure Rule 3 (PM3) metrics that GDOT is required to report on to the FHWA, which will save an enormous amount of time and manpower in not having to collect and analyze the data from these sources individually.

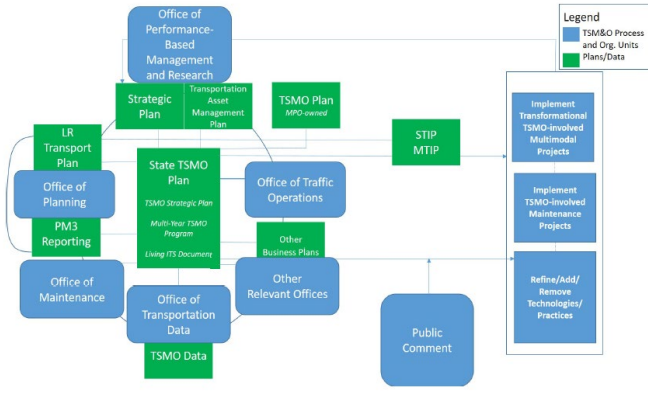


Figure 12. Process. Next-Level TSMO Map for GDOT

Georgia Department of Transportation

RP 19-09 Entrusted Engineer-in-Charge: A New Critical Position in the Design–Build Team

Implementation Status	Implementation Type	Implementation Impact
Implemented	*Developmental*	*Procedure, Work Method*

Principal Investigator: Dr. Baabak Ashuri
Project Manager: Sunil Thapa
Technical/Implementation Manager: Darryl VanMeter
Available: GDOT Library

Need

One of the main challenges that state Departments of Transportation (DOTs) face in their design–build (DB) projects is to ensure that the design–build team upholds the highest standard of care in making complex engineering decisions involving multidisciplinary works. In addition, during the construction phase of the project, all critical decisions, must be made with direct inputs and the approval of a professional engineer licensed in the state. Thus, it is crucial to understand the underpinnings of engineering-related problems during both the design and construction phases and identify an effective approach to address these issues in the innovative delivery environment.

Objective

The objectives were as follows: to examine the main issues related to upholding the highest standard of care in the engineering decision-making process by the design–build team, to identify the emerging challenges that the current Design–Build market is experiencing, and to define a new key position in the Design–Build team to be in charge of ensuring that all engineering-related decisions are made by skilled and qualified engineers consistent with GDOT's policies and guidelines.

Outcome

Project Chief Engineer was added to Key Personnel required in major projects undertaken through DB or Public Private Partnerships (P3).

Outcome

The research was used to fill a unique gap that will help ensure that the full scope of engineering interests are undertaken and accounted for in the course of prosecution of the Alternative Delivery contracts.

Benefits

The implementation precipitated engagement from the engineering community that helped promote clearer understanding of the drivers of insurability as well as how this role can function effectively in the contractual structure of a Major P3 or DB project. In the future, on Major Complex DB or P3 projects, areas of work where multiple specialist designers of record are required will be more organized, synchronized and accountable in the output of the constructed product for the traveling public, promoting higher integrated quality, durability and safety. Some benefits will translate to clarity of accountability, which can contribute to reduction of claims.

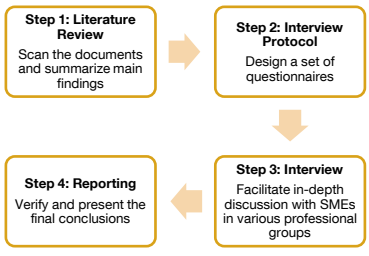


Figure 13. Diagram. Overview of research methodology steps for project.

RP 17-07 Research and Support to Implement Recommendations of the GDOT Small Business Program Evaluation

Implementation Status	Implementation Type	Implementation Impact
In Progress	*Developmental*	*Policy*

Principal Investigator: Dr. Thomas Boston
Project Manager: Supriya Kamatkar
Technical/Implementation Manager: Kimberly King
Available: GDOT Library

Need

The need was to assist the Georgia Department of Transportation (GDOT) in implementing the recommendations of a previous study, GDOT RP 13-29, "Task A: Evaluation of GDOT's Small Business Program," which concluded that the most effective way for GDOT's Small Business Program (SBP) to level the playing field for small businesses is to implement a set-aside provision for emerging small businesses (ESBs).

Objective

The objectives were the following: to provide ongoing assistance in implementing the current race-neutral activities of the Small Business Program, to document the economic impact of the Small Business Program on jobs, income and economic activity in the state, to examine whether there is an improvement in scale and capacity of firms in the Small Business Program, and whether firms in the program are able to compete more successfully in open competition for larger prime contracts, to develop a framework for annually evaluating the effectiveness of the Small Business Program and finally, to identify firms that are eligible to participate in the Small Business Program.

Outcome

The small business consideration relative to an implementation plan for legislative change continues to be a point of internal discussion.

Outcome

Some of the elements identified in the white paper have been included in the Supportive Services activity that has been created for GDOT small business community.

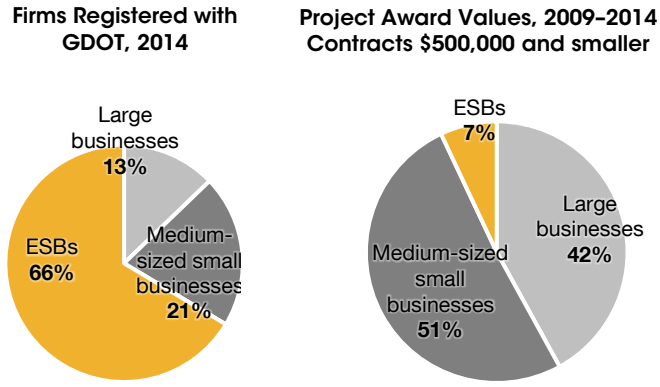


Figure 14. Charts. Firms Registered and Project Award Values Distribution

Benefits

The project caused the Equal Employment Opportunities (EEO) office to look more closely at the small business activity and determine how it could better serve that community with existing supportive services resources. EEO continues to add practical elements to that resource to ensure the highest level of service to GDOT small businesses. Moreover, if legislation is passed, then there will be a framework in place to make sure small businesses have equal opportunities to receive business from GDOT.

Georgia Department of Transportation

RP 19-18 Assessing the Impact of Federal Requirements on GDOT Project Portfolio

Implementation Status	Implementation Type	Implementation Impact
In Progress	*Developmental*	*Procedure*

Principal Investigator: McKinsey & Company, Inc.
Project Manager: Brennan Roney

Technical/Implementation Manager: Albert Shelby
Available: GDOT Library

Need

New administrative complexity was introduced alongside the benefits of House Bill (HB) 170: GDOT had to make an initial decision on process and funding source and revisit those decisions over time. GDOT felt a need to formalize and standardize the process and funding decisions, ensuring the right inputs were present early to make better decisions across the project lifecycle.

Objective

The objectives for this project were as follows: to assess existing projects post-mortem for best practices on federal vs. state funded projects, to re-design the process for decision making on funding types and finally to create an assessment tool for federal vs. state funding.

Outcome

This research project provided a decision matrix for funding decisions for Planning and Preconstruction to be implemented in the plan development process (PDP). The results were published in the new version of PDP and the Planning Manual. The incorporation into the PDP needed to go through the Program Control committee before adoption.

Benefits

The matrix is now in the PDP manual. This will streamline the process for decision-making and will save time by making this change to the procedure.

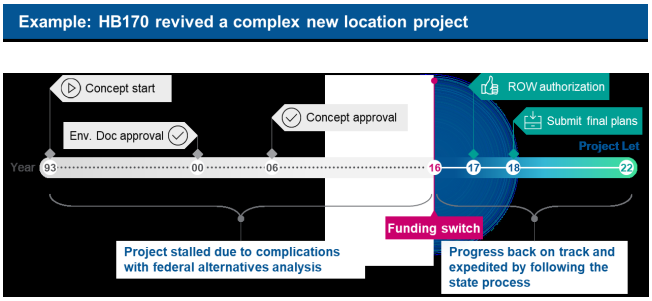


Figure 15. Diagram. Example Revival of a Complex New Location Project.

Georgia Department of Transportation

RP 19-10: Flash Tracking Implementation Guidelines Complementing Existing Design-Build Manual

Implementation Status	Implementation Type	Implementation Impact
In Progress	*Response*	*Procedure, Work Method*

Principal Investigator: Dr. Pardis Pishdad-Bozorgi
Project Manager: Sunil Thapa
Technical/Implementation Manager: Darryl VanMeter
Available: GDOT Library

Need

The current GDOT Design-Build (DB) Manual (modified in October 2016) lacks explicit guidelines for converting a fast track project into a flash track project, in spite of the success of the Courtland Street bridge project. To replicate this success, the agency needed to standardize the flash track delivery practices used on the project and set them out as generalized flash track delivery guidelines in an appendix to the manual.

Objective

The overarching objective of this research was to develop Flash Tracking implementation guidelines that would complement the existing Design-Build Manual.

Outcome

The research product will be published as an appendix to the DB Manual for inclusion in standard process for aligning goals of projects with procurement and contracting methods and documents.

Benefits

The benefits include an estimated $250,000 in savings in terms of efficiency in selecting proven methods, not including the savings included in the project specific selected methods which will vary but could be in the millions on project specific applications. Moreover, there will be enhanced readiness of proven toolbox of available best practices in promoting accelerated delivery efficiency and effectiveness, which can be selected and deployed easily as needed in context of each project delivered in Alternative Delivery.

Figure 16. Graphic. CII Flash Track Readiness Tool Results for I-16 & I-95

Georgia Department of Transportation

RP 18-22: Full Depth Pavement Reclamation: Performance Assessment and Recommendations for Best Performance

Implementation Status	Implementation Type	Implementation Impact
In Progress	*Developmental*	*Policy*

Principal Investigator: Dr. Jayhyun Kwon
Project Manager: Brennan Roney
Technical/Implementation Manager: Philip Snider, Peter Wu, Ian Rish
Available: GDOT Library

Need

The assessment of variability of the in-situ materials is a key element of the Full-Depth Reclamation (FDR) process. Therefore, research is needed to 1) assess the condition and structural capacity of the FDR sections completed and constructed by GDOT and 2) consolidate information regarding project selection, mix and structural designs, and construction.

Objective

The objectives of this study were twofold. First, conduct a performance assessment of completed FDR sections. Second, consolidate the information for refinement and update of the specification, with the objective of minimizing the risk of premature failure and maximizing the benefits of FDR.

Outcome

Pre-mix (pulverization of the roadway prior to spreading Portland cement) is an effective method to adjust moisture content of the parent material, produce a homogeneous mix, and locate soft spots or shallow utility lines. Sufficient moisture addition is one of the most important factors in FDR construction to ensure desired layer strength. Further, any large chunks of asphalt concrete can be removed during the pre-mix stage. Therefore, a layer coefficient of Full Depth Pavement Reclamation will be added to the pavement design manual.

Benefits

Expertise was provided to solve the problem—so time will be saved in the decision-making process.

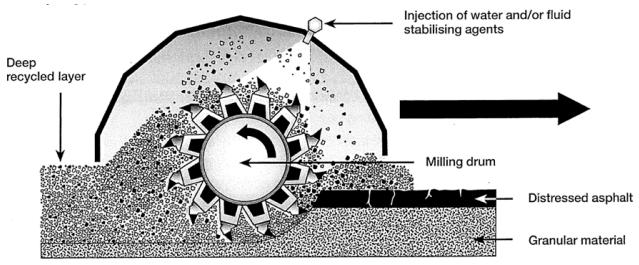


Figure 17. Illustration. Full-Depth Reclamation (FDR) process

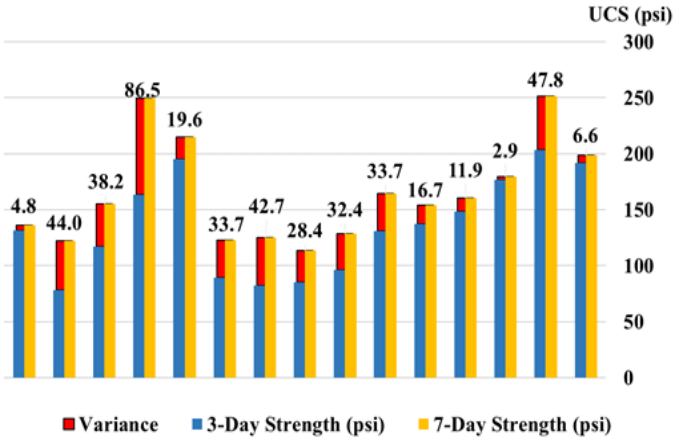


Figure 18. Chart. Unconfined Compressive Strength

Georgia Department of Transportation

RP 19-07: Investigation and Guidelines for Drilled Shaft Excavation Inspections

Implementation Status	Implementation Type	Implementation Impact
In Progress	*Developmental*	*Procedure*

Principal Investigator: Dr. Adam Kaplan
Project Manager: Brennan Roney
Technical/Implementation Manager: Michael Murray
Available: GDOT Library

Need

An entry into a drilled shaft requires compliance with Occupational Safety & Health Agency (OSHA) requirements, which may include testing for toxic and flammable gases. Due to such safety concerns, field inspectors have been reluctant to carry out such inspections. In this study, a range of drilled shaft excavation inspection equipment with the capability to eliminate sending a human into the dry shaft excavation has been investigated.

Objective

This study aimed to provide the Georgia Department of Transportation with guidelines for engineers to inspect dry caisson excavations prior to placing concrete. The guidelines will include a comprehensive summary of all available tools and methods used to assess base cleanliness and shaft verticality without the need for human entry into a dry caisson excavation.

Outcome

The field effectiveness of several equipment types was evaluated during field demonstration events. Important aspects of all equipment and field observations have been summarized in tables to serve as a guideline for equipment selection decisions. Finally, equipment selection recommendations have been made based on six criteria: safety, cost, mobility, accuracy, speed, and state DOT experience.

Benefits

Based on the results of the research project, the Office of Materials and Testing (OMAT) will be implementing new equipment requirements into the Special Provision 524 to replace the current inspection requirements. These will be done through editing the Special Provision 524 outlining the equipment to be used, inspection requirements, and verticality/allowable debris thickness in the bottom of the shaft. The purchase of the new equipment will increase safety by not having to have an inspector go down the shaft to do the inspection.

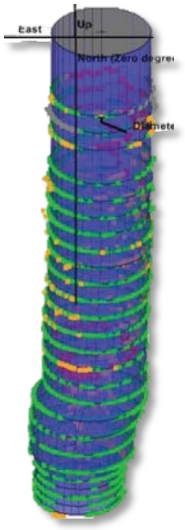


Figure 19. Illustration. Simulated view of a dry shaft.

Figure 20. Photo. Entry view of a dry shaft.

Georgia Department of Transportation

RP 18-04: Determination of Equivalent Single Axle Load (ESAL) Factor for Georgia Pavement Design

Implementation Status	Implementation Type	Implementation Impact
Implemented	*Developmental*	*Policy*

Principal Investigator: Dr. Sonny Kim
Project Manager: Sunil Thapa
Technical/Implementation Manager: Ian Rish
Available: GDOT Library

Need

The Georgia Department of Transportation (GDOT) is currently using the 1972 AASHTO Pavement Design Guide in which the damage caused by traveling vehicles in the pavement's design life is defined in terms of Equivalent Single Axle Load (ESAL). The last updates of truck ESAL factors in Georgia were made in 1984. Thus, there is a need to update ESAL factors due to the changes in traffic patterns over time, especially during recent years.

Objective

The objectives were to develop a method to calculate the truck ESAL factors using data from permanent weigh-in-motion (WIM) sites in Georgia, to develop updated truck ESAL factors for both flexible and rigid pavements, to update the FHWA's existing default traffic inputs in the AASHTO Mechanistic Empirical Pavement Design Guide (MEPDG) Manual of Practice (MOP), if needed, to develop Truck Traffic Classification (TTC) groups to facilitate the adoption of the MEPDG in Georgia, and to develop a standard operating procedure (SOP) that allows GDOT to maintain and update the ESAL factors beyond the project completion, as necessary. The SOP would include references to evaluate/update the ESAL factors and timing of a future update.

Outcome

The results indicated that direct application of the national default Truck Traffic Classification groups resulted in over-design of pavement structure, especially for the jointed plain concrete pavement (JPCP), in Georgia. Therefore, it is recommended that customized TTC groups derived from state-specific WIM data should be used.

Benefits

After internal discussion and review of the data from the project, the Office of Materials and Testing (OMAT) confirmed that the existing ESAL factors were not as far off from reality as originally thought. Therefore, current ESAL factors will be kept. So, money was saved for GDOT from deciding not to increase the thickness of pavement in the Manual of Practice (MOP). Also, during the study, it became apparent that additional WIM sites are needed to better categorize ESAL factors for other types of routes for potential future optimization of pavement designs for less high-volume State Routes.

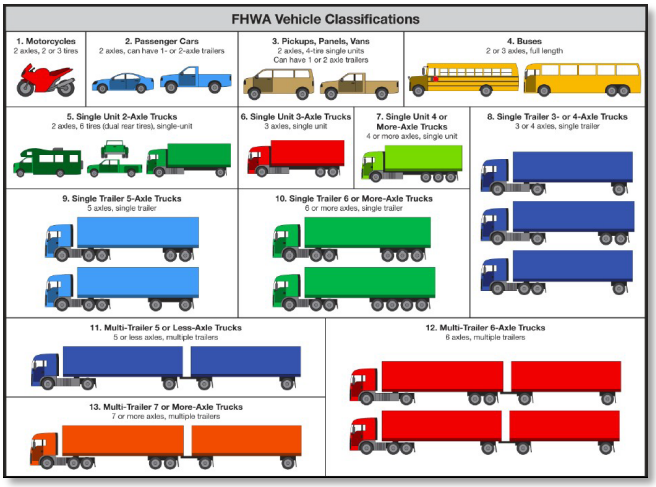


Figure 21. Chart. FHWA vehicle classification system

Georgia Department of Transportation

RP 17-27: Hydraulic Effects of Temporary Bridge Construction Activities

Implementation Status	Implementation Type	Implementation Impact
In Progress	*Developmental*	*Procedure*

Principal Investigator: Dr. Brian Bledsoe
Project Manager: Sunil Thapa
Technical/Implementation Manager: Susan Beck
Available: GDOT Library

Need

Bridge construction often necessitates placement of temporary features such as rock jetties and coffer dams in stream and river channels during the construction process. Environmental permitting agencies seek documentation, and in some cases quantification, of the potential effects of these temporary features on instream velocities, and channel bank and bed scour; however, there is no existing guidance or standard method for evaluating the potential effects of these temporary construction features on hydraulics, bank stability, and biological habitats.

Objective

The objectives were as follows: to improve GDOT's ability to respond to resource agency concerns about effects of temporary bridge construction practices, to develop a tool to predict velocity changes in channels as a function of discharge, channel characteristics and temporary obstructions during construction and to assess bank stability and potential for instability during construction.

Outcome

Implementation will begin by comparing results obtained using the tool to calculated results obtained by modeling obstructions on existing projects. Results will be collected for a period of 6 months to give enough time to collect a reasonable sample size. Then, Bridge Design will meet with the Office of Environmental Services (OES) to discuss results of comparison as well as to assist with rollout of tool's results in lieu of modeling that is currently done.

Benefits

Time will be saved from the use of the data that is collected from the tool. The Office of Bridge Design and Office of Environmental Services will also know the true effects from these construction activities that will help with safety issues and environmental compliance measures.

Figure 22. Photos of jetties. Temporary riprap construction structures implemented for bridge construction (a) and dam removal (b). The bridge construction picture (a) was taken at the Chattooga River Georgia Department of Transportation bridge construction site.

Georgia Department of Transportation

RP 18-09: Investigation on Water Quality Impacts of Bridge Stormwater Runoff from Scupper Drains on Receiving Waters

Implementation Status	Implementation Type	Implementation Impact
In Progress	*Developmental*	*Procedure*

Principal Investigator: Dr. George Yuzhu Fu
Project Manager: Brennan Roney

Technical/Implementation Manager: David Hedeen and Donn Digamon
Available: GDOT Library

Need

Bridges have been traditionally designed to discharge their stormwater runoff through scupper drains directly to streams and rivers underneath. The runoff carries a variety of pollutants such as suspended solids, heavy metals, polycyclic aromatic hydrocarbons (PAHs), oil and grease, etc., which may have adverse water quality impacts on receiving waters. These adverse impacts could also have negative effects on environmentally sensitive aquatic species. Research is needed to explore stormwater runoff quality impacts.

Objective

The objectives of this research project were to investigate water quality impacts of bridge stormwater runoff from scupper drains on receiving waters, and to develop an efficient simulation tool so that the Georgia Department of Transportation (GDOT) and the resource agencies can accurately anticipate potential effects and better evaluate whether scupper drains would adversely affect waters and the protected species.

Outcome

This research project explored the potential to employ a modeling tool, Stochastic Empirical Loading and Dilution Model (SELDM) to facilitate decision-making. Since the existing dataset within the state of Georgia is currently limited, the capabilities of this tool are currently limited. Until additional data becomes available to support this tool in Georgia, the applicability of SELDM will remain limited.

Outcome

Looking ahead, one way this tool can be enhanced is if GDOT finds a meaningful way to support the development of a “Regional Curve” for the Georgia Piedmont and Mountain Regions.

Benefits

For now, the benefit is the foundational information that enhances a GDOT practitioner’s understanding of the relationship between open scuppers and water quality. Environmental SME’s and Designers will be better-able to understand and discuss these concerns with various resource agencies including the bridge design community and the environmental community. With some additional work, this baseline research may also facilitate time-efficiency and cost-effectiveness when it comes to preconstruction coordination, design, and construction of bridges in the future.

Figure 23. Photo. Bridge site SR297 from Google Maps showing scupper drain.

Georgia Department of Transportation

RP 18-35: Estimating ROW Acquisition Project Timelines for Major Projects based on Analyzing ROW Acquisition Processes: Phase I

Implementation Status	Implementation Type	Implementation Impact
In Progress	*Developmental*	*Policy, Procedure, Specifications*

Principal Investigator: Baabak Ashuri
Project Manager: Sarah Lamothe
Technical/Implementation Manager: Katrina Anderson and Troy Hill
Available: GDOT Library

Need

Right-of-Way (ROW) acquisitions represent critical activities in the plan development process (PDP), especially for major highway projects. Identifying practical opportunities to expedite the ROW acquisition process can help the GDOT to facilitate project delivery for major projects. With the increasing project complexity and evolving conditions surrounding the uncertain project environment, ROW administrators and project managers face a great challenge to expedite required acquisition tasks in a timely manner.

Objective

The overarching objective of this research project was to develop a data-driven model for identifying opportunities to expedite ROW acquisition process for major projects. The specific objectives were to identify the best practices, with the potential to expedite ROW acquisition, among the ones currently used by state Departments of Transportations (DOTs), and to develop a data-driven approach to estimate the ROW acquisition timeline considering unique project features and important external factors surrounding the project environment.

Outcome

The research team evaluated opportunities to estimate the ROW acquisition timeline by considering unique project features and important external factors surrounding the project environment. Those project features and external factors include identifying important aspects in setting the ROW acquisition timeline, collecting required data, and conducting data mining to evaluate the estimated ROW acquisition timeline.

Benefits

The spreadsheet provided allows for the Office of Right of Way to include aspects of the project's ROW phase such as project type, number of parcels/relocations, length of project, and to determine the number of months needed to acquire the ROW phase. It will help with time saved during the planning phase of these projects.

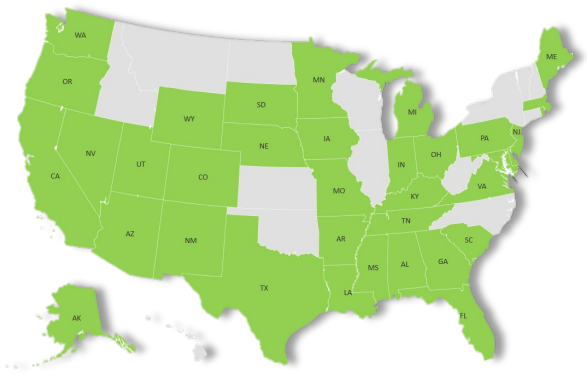


Figure 24. Map. States responding to survey

Georgia Department of Transportation

RP 17-20: Detection Technology Testbed in I-475: Technology Feasibility Study

Implementation Status	Implementation Type	Implementation Impact
Implemented	*Feasibility*	*Procedure*

Principal Investigator: Dr. Angshuman Guin
Project Manager: Brennan Roney
Technical/Implementation Manager: Roderick Ware and Marc Plotkin
Available: GDOT Library

Need

This project evaluates the feasibility of use and potential benefits of a video-based automatic incident detection (AID) technology relative to existing detection via the Georgia 511 (NaviGAtor) incident reports and Transportation Management Center operators' manual observations. This study proposes a clustering machine learning framework for developing consolidation strategies and filters that will eliminate most noncritical alarms and associate confidence values with the alerts, thereby allowing for a focus on higher confidence alerts during busy periods.

Objective

The key objectives of this project were to evaluate the accuracy of the vehicle detection technology deployed in the I-475 testbed, to evaluate the feasibility of using crowdsourced smartphone application–based incident detection for reducing incident detection times, and, finally, to evaluate the accuracy of the selected AID technology and the feasibility of use of that technology in improving incident management.

Outcome

The project was implemented as a pilot and comparison study to test the functions of the Automated Incident Detection (AID) feature as well as an accuracy of the detection based on similar industry vehicle detection devices.

Outcome

This study was conducted in a rural environment to evaluate its baseline features to assess if this technology is feasible for a scalable deployment within the Metro-Atlanta area. The findings were in favor of the Department moving forward with a small-scale deployment at critical interchanges and weave points in the Metro-Atlanta area.

Benefits

The results of this project had led to 7-15 minute quicker response time from reporting an accident to first responder arriving at the incident. The time saved can result in saving human life.

Figure 25. Photos. Examples of incident types (stopped, congestion, slow, wrong-way, and pedestrian).

Georgia Department of Transportation

RP 20-24: AERMOD, RLINE, and RLINEXT Case Study Analyses in Atlanta, Georgia

Implementation Status	Implementation Type	Implementation Impact
In Progress	*Response*	*Procedure and Work Method*

Principal Investigator: Dr. Randall Guensler
Project Manager: Sarah Lamothe
Technical/Implementation Manager: Sarah Lamothe
Available: GDOT Library

Need

This research assessed the impact of U.S. Environmental Protection Agency's AERMOD dispersion model (version of 19191) source types on predicted pollutant concentrations via a case study for the I-75/I-575 Northwest Corridor (NWC) in Atlanta, GA.

Objective

The objective of this study was to perform AERMOD microscale dispersion modeling for an entire Atlanta I-75/I-575 Northwest Corridor (NWC) subarea, including freeway corridors, managed lanes, connecting arterials, and intersections serving the NWC system and compare the model results across all AERMOD source types (AREAPOLY, LINE, VOLUME, RLINE, and RLINEXT). The project was designed to assess the relative impacts of various AERMOD input parameters by processing model runs on the PACE supercomputing cluster and using machine learning to assess the relative impacts of model input parameters.

Outcome

The research results contribute to the understanding of how the RLINE and RLINEXT source types perform. While not a validation exercise, this evaluation of the AERMOD RLINE and RLINEXT source types will help determine usability,

Outcome

investigate the time it takes to run the new source type compared to existing AERMOD source types as well as
improve understanding of where further development may be needed prior to regulatory approval and identify and define possible ways to guide future development of the new source types when they become regulatory options.

Benefits

A better understanding of the AERMOD source types using this case study data highlights the opportunities and challenges in the application of these dispersion models in a near road setting. This research could be used to inform and define possible ways to guide future development of the RLINE/RLINEXT source types moving forward.

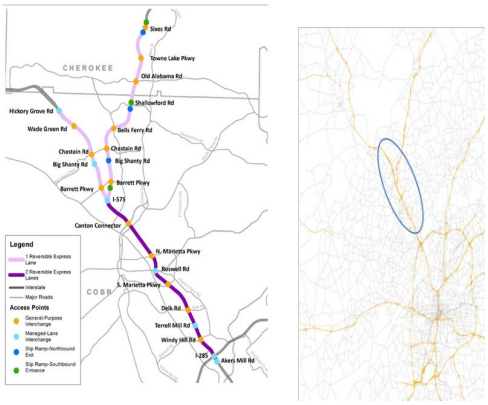


Figure 26 – I-75/I-575 Managed Lanes Corridor and the Modeled Sub Area

RP 17-04: Economic Impact of Bicycling in Georgia

Implementation Status	Implementation Type	Implementation Impact
In Progress	*Developmental*	*Procedure*

Principal Investigator: Dr. Shatakshee Dhongde
Project Manager: Sarah Lamothe

Technical/Implementation Manager: Jack Anninos
Available: GDOT Library

Need

The number of trips made by bicycle in the U.S. has been on a steady rise. As the number of bicyclists and supporting infrastructure increases, it is important that government agencies can measure the impact of bicycling on the state and local economy.

Objective

The overall objective of this research project was to undertake a comprehensive analysis of how bicycling and related activities benefit Georgia's economy. The research analyzed the impact of businesses related to bicycling, studied the impact of construction of bicycle trails in Georgia and collected data on bicycle related events and quantified their economic impact.

Outcome

The project provides economic justifications for bicycle infrastructure that will be used to program and develop bicycle projects. GDOT and local governments can use these findings to help build bicycle related planning and engineering projects with a better understanding of the benefits for communities.

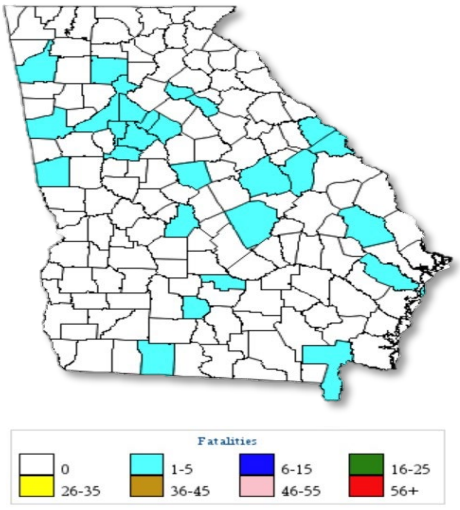
Benefits

The findings will help plan and justify future projects related to bicycle safety and access. Moreover, there will be a conscious effort to make bicycle infrastructure safer for cyclists in Georgia.

Table 4. Summary of Georgia bicycle report card score.

Bicycling Friendliness	Overall Rank	Letter Grade
Overall	19th	N/A
Infrastructure & Funding	15th	B-
Education & Encouragement	21st	C
Legislation & Enforcement	17th	C+
Policies & Programs	11th	B
Evaluation & Planning	26th	C+

Source: League of American Bicyclists 2019b; N/A = Not applicable.



Source: The Performance Measures of Georgia section of the annual NHTSA State Traffic Safety Information (STSI) reports (2018).

Figure 27. Map. Georgia pedalcyclist fatalities in 2018, from NHTSA.

RP 18-06: Review of Special Provisions and Other Conditions Placed on GDOT Projects For Imperiled Aquatic Species Protection

Implementation Status	Implementation Type	Implementation Impact
In Progress	*Developmental*	*Procedure, Specifications, Work Method*

Principal Investigator: Dr. Seth Wenger
Project Manager: Brennan Roney
Technical/Implementation Manager: Christopher Goodson
Available: GDOT Library

Need

Georgia has numerous protected freshwater species, which means that the Georgia Department of Transportation (GDOT) must frequently consult with federal and state agencies to identify measures to avoid, minimize and mitigate impacts to imperiled aquatic organisms. Some of these measures, such as restrictions on in-water work during the reproductive season, impose substantial costs and delays on GDOT projects, but their efficacy has not been thoroughly evaluated.

Objective

The overarching goal of this project was to add flexibility of means and methods during construction and increase the efficiency of GDOT consultation and management for imperiled organisms, while providing protection to species at a level equal to or higher than current practice.

Outcome

The goal of the research was to add flexibility and cost savings for GDOT pre-, during, and post-construction, while ensuring adequate protections for aquatic organisms. GDOT has been able to allow work such as oil changes and stockpiling of erodible material within 200 feet of streams that was previously restricted, by implementing simple, cheap protective measures (e.g., spill pads and tarps). A template Special Provision 107.23H has been developed to help streamline agency consultation during pre-construction.

Benefits

This partial implementation of the research has likely resulted in significant time (and associated cost) savings on numerous construction projects since early 2021. For projects that did not have necessary Right of Way (ROW) to facilitate certain activities outside of 200 feet of a stream, partial implementation of the research has prevented the need for easements, which are a cost savings on top of those associated with time. Moreover, reduced travel distance for oil changes and retrieving needed stockpiled materials has likely improved safety for construction personnel. Protective measures associated with these changes have likely improved safety for aquatic organisms. There has been utilization of spill mats for oil changes and tarps or other tackifiers for erodible stockpiled material within 200 feet of streams to prevent pollution and sedimentation of waterways. This benefits water quality, as well as both protected and non-protected aquatic species.

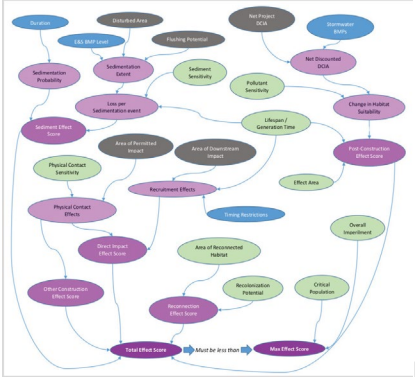


Figure 28. Diagram. Illustrating the calculation of Total Effect Score for a species

GDOT
Georgia Department of Transportation

IMPLEMENTATION ACTIVITIES OF TRANSPORTATION POOLED FUND STUDIES

Georgia Department of Transportation

TPF-5 (178): Implementation of the Asphalt Mixture Performance Tester (AMPT) for Superpave Validation

Implementation Status	Implementation Type	Implementation Impact
Planned in Future	*Feasibility*	*Procedure, Work Method*

Technical/Implementation Manager: Peter Wu

Available Here

Need

State highway agencies, as well as industry, have expressed the need for simple load tests to use during the mix design process and in field quality control to evaluate permanent deformation and fatigue cracking of Superpave-designed Hot Mix Asphalt.

Objective

The objectives of this pooled fund study were to: (i) nationally procure the Simple Performance Tester (SPT) for highway agencies interested in obtaining and using the SPT to characterize asphalt mixtures designed using Superpave technology; (ii) provide support in training technicians to use the SPT to perform the proposed standard practices for measuring dynamic modulus, flow number and flow time of asphalt mixtures compacted using the Superpave Gyratory Compactor (SGC); and (iii) evaluate the nation-wide implementation and use of the SPT for assessing performance of asphalt mixtures over a wide range of climatic conditions, materials, and structures.

Figure 29. Photo. Asphalt Mixture Performance Tester

Outcome

The Simple Performance Tester (SPT), now called AMPT, is reasonably priced, however, it is not a user-friendly device for testing stiffness and permanent deformation properties of asphalt concrete. For the very reason, the testing of permanent deformation (rutting) for asphalt mixtures, has been replaced with another popular machine, called Hamburg Wheel-Track Tester (AASHTO T324), which has been implemented in GDOT's 2021 Specification Section 828.

Recently, Office of Materials and Testing is exploring the use of AMPT and re-purpose it to Overlay Tester for the testing of asphaltic concrete cracking, which could be part of the future Balanced-Mix-Design (BMD).

Key Personnel

Meet Our Team

Bio Sheet

Supriya Kamatkar / OPMR Assistant Office Head

Brennan Roney / Program Manager

Bradley Bilsback / Research Engineer

Adey Ketema / Office Manager

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