



ANNUAL IMPLEMENTATION REPORT
for
GDOT RESEARCH ADVISORY COMMITTEE
OFFICE OF RESEARCH
SEPTEMBER 29, 2014



INTRODUCTION

This report is the third Annual Implementation Report presented to the Research Advisory Committee (RAC) of the Georgia Department of Transportation (GDOT). The report summarizes implementation activities for two primary sets of research conducted under the GDOT Research and Development (R&D) program by the Office of Research (OR): (1) contract research completed since the last RAC meeting that has either been implemented or is pending implementation; and (2) examples of ongoing implementation under the Transportation Pooled Fund (TPF) program. Contract research is normally funded with 80% federal/20% state, State Planning and Research (SP&R) dollars, while TPF projects are funded with 100% federal SP&R dollars. The report also summarizes implementation activities associated with the Strategic Highway Research Program 2 (SHRP-2) and take-homes from the 2014 TRB Annual Meeting.

All research activities are intended to solve a particular problem or provide useful information. R&D projects contain work elements to ensure that GDOT implements research findings and new technologies as much as possible. Consequently, each research project that is approved for conduct is approved with implementation of its findings as the project goal and within the official project objectives (*GDOT Research and Development Manual, 2013*).

The project implementation summaries are organized according to the Research Technical Advisory Group (RTAG) that the subject is most pertinent to, i.e. Asset Management, Mobility, Policy/Workforce, or Safety. The projects discussed herein demonstrate that both federal and state research dollars are being well leveraged to conduct and implement research with tangible benefits to GDOT and the traveling public. GDOT's R&D program is in direct alignment with its strategic goals, and the implementation products enhance operations in a cross-section of major GDOT divisions. This in turn supports GDOT's overall mission to provide "a safe, connected and environmentally sensitive transportation system that enhances Georgia's economic competitiveness by working efficiently and communicating effectively to create strong partnerships."

Types of Research Implementation

This section provides brief descriptions of the types of implementation in GDOT's R&D program. Depending on the scope and deliverable(s) of each research project (RP), the implementation type may differ considerably from project to project.

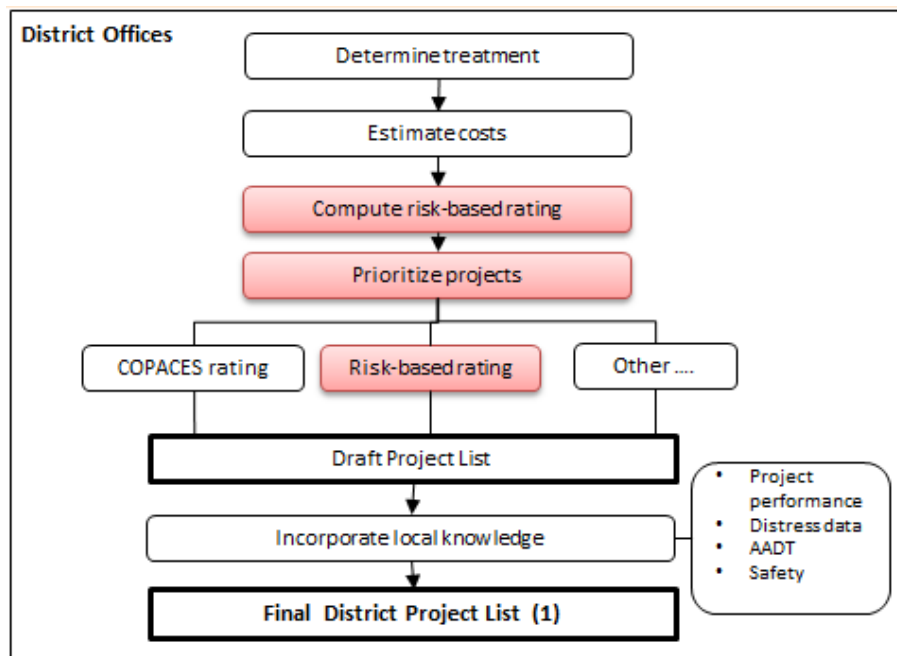
- *Developmental.* In this most traditional type of implementation, the research produces a new or modified material, technology, policy, or process; and the product is implemented during and/or after the research project timeline. Progressive implementation of research products during the project timeline is encouraged as appropriate (see page 3 for an example).
- *Response.* The research provides an answer to a question or concern from any of the various stakeholders of GDOT's R&D program (see page 4 for an example).
- *Feasibility.* This type of implementation is guidance for GDOT on the feasibility of a 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 work on it, eliminating further funding risks (see page 5 for an example).

HIGHLIGHTED IMPLEMENTATION ACTIVITIES

RESEARCH TECHNICAL ADVISORY GROUPS

Asset Management

Safety on Pavement Preservation Projects, Phase 2 (RP 11-01, Ernay Robinson), [Developmental]



Integrating risk into asset management is essential to meet MAP-21 requirements and protect transportation agencies' interests. Traditionally, pavement preservation planning and decisions (e.g., project prioritization and selection) were mainly based on pavement conditions, i.e. PACES ratings. In establishing a risk-based asset management program, there was a need to develop a framework and program to systematically incorporate risks into the pavement preservation planning and programming. This research developed such a framework and program, which have been deployed to seamlessly incorporate risks relating to the impacts on freight logistics, community, safety, etc., into GDOT's fast-paced project preservation planning and programming. The project streamlined the processes for computing risk-based ratings, determining treatment methods, and estimating costs; and provided a set of functions to facilitate the prioritization of resurfacing projects at the District offices. Finally, this work provided a basis for risk management decisions on pavement projects in the future Agile Assets system.

Implementation of Mechanistic-Empirical Pavement Design Guide (MEPDG) in Georgia DOT (Steve Pahno), [Development]

RP 10-04: Determination of Coefficient of Thermal Expansion for Portland -Cement Concrete Pavements for MEPDG Implementation

RP 10-09: Traffic Load Spectra for Implementing and Using the MEPDG in Georgia

RP 11-17: AASHTO MEPDG Calibration and Validation for Georgia Pavements

RP 12-07: Measurements of Dynamic and Resilient Moduli of Roadway Test Sites

RP 13-11: Georgia Long-Term Pavement Performance (GALTPP) Program

This suite of four projects supported implementation of the new MEPDG statewide. In RP 10-04, testing was performed on a variety of concrete materials used for paving in Georgia, primarily relating to the coefficient of thermal expansion (CTE), an important parameter in the MEPDG. In RP 10-09, the use of weigh-in-motion (WIM) and traffic data for needed MEPDG inputs was developed. An ancillary benefit of the project was in the use of this data to identify future WIM data collection needs and add to GDOT's knowledge on quality assurance for WIM data collection. In RP 12-07, dynamic modulus- and resilient modulus testing were performed on typical Georgia materials used for pavement construction. Different asphalt mixes were tested along with graded aggregate base (GAB) material from various parts of Georgia. Some typical Georgia soil types were also categorized according to MEPDG requirements. Finally, RP 13-11 provided a method to identify local MEPDG calibration sections and maintain information on these sections.

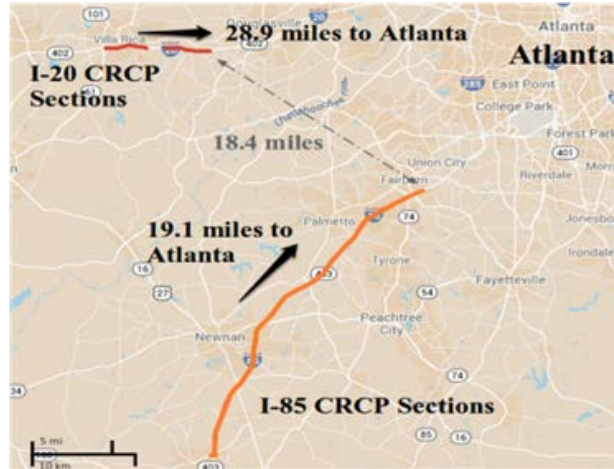
The results from the testing performed in RP 10-04 and RP 12-07 were used in MEPDG training held at OMAT in summer 2014 and will also be included in a user manual being developed for GDOT employees for future pavement designs. The mechanism developed in RP 13-11 to store the final MEPDG calibration data and site information will facilitate future recalibrations as MEPDG software is improved. The WIM data examined in RP 10-09 was set up as different input files that will also be included in the GDOT MEPDG user manual. RP 11-17 is to develop an overall MEPDG implementation plan for GDOT and is nearing completion.

MOBILITY

Critical Assessment of Transverse Crack Patterns of Continuously Reinforced Concrete Pavements on I-85 and I-20 Using Sensing Technologies (RP 12-39, A.J. Jubran) [Response]

Due to concerns relating to the unusual construction method used in the I-85 CRCP project in Coweta County, this research project was initiated to monitor and compare transverse cracking patterns. Though transverse cracks are natural for a CRCP, an abnormal pattern might indicate the potential of developing undesirable distresses, such as punchouts and spalling. Thus, the newly constructed I-85 CRCP sections were evaluated by studying and comparing the I-85 crack patterns to the I-20 crack patterns in the sections that are known to have good performance.

The overall benefit from this research is that the early stage of crack pattern on CRCP was studied and continuously monitored. The accurate lane-based location reference has established a solid foundation and framework for potential follow-on studies to correlate crack patterns with the actual pavement performance, such as punch-out, smoothness, and structure-foundation deficiency.



Sustainable Streets and Highways: An Analysis of Green Roads Rating Systems (RP 10-13, Habte Kassa) [Feasibility]

Sustainability as a design element has gained momentum and strength over much of the past decade. Many disciplines are considering methods to consider the relative ‘greenness’ of projects undertaken, and the transportation sector is no exception. There are programs emerging to consider the level of sustainability of a project from consulting, academia, state and local DOT’s, as well as federal and international initiatives that consider how the current population is managing environmental and economic stewardship for generations to come. GDOT has studied and adopted a rating system for sustainable streets and highways in order to stay ahead of the curve, and to ensure that the institution is able to refer to a rating system that tailored to Georgia-specific conditions and addresses unique regional differences.

The study findings were presented to GDOT executive management, and the Offices of Engineering Services and Planning are collaborating on implementation of the findings. The rating system would enable uniform consideration of sustainability characteristics for GDOT projects. Cobb County DOT (CCDOT) initiated the PEACH Roads program, incorporating GreenLITES, a transportation environmental sustainability rating program developed by New York State DOT. In support of the PEACH Roads program, CCDOT cited the GDOT study in its 2013 Annual Report.

GDOT Landscape Mitigation Program Overview and Evaluation (RP 11-32, Chad Carlson) [Developmental]

The Office of Environmental Services (OES) and the Office of Maintenance (OM) jointly proposed a protocol for environmental landscaping mitigation procedures to (1) address the recurrent problems in these procedures; (2) reduce project delays due to insufficient or overly complex landscape plans; and (3) save money. Also, OES saw a need to evaluate the landscaping installed at various historic properties over the years. This landscaping had been installed as mitigation for road projects that had been found to adversely affect properties determined to be eligible for, and listed in, the National Register of Historic Places. OES plans to use this evaluation to guide future landscaping mitigation decisions. The project findings were presented to the State Historic Preservation Office (SHPO), FHWA, and history consultants. FHWA commented that the report was an “outstanding effort” and “brought a

number of concerns that perhaps were not considered previously for the projects reviewed. It was a good learning experience.” The report and feedback received from these organizations was used to streamline the proposed GDOT protocol even further.

GDOT Historic Landscape Mitigation Evaluation



Developing Extension Recommendations for Establishing Native Species for Georgia Roadsides (RP 12-14, Davie Biagi) [Developmental]

GDOT Office of Maintenance (OM) is responsible for establishing and maintaining roadside vegetation for vehicle safety, aesthetics, and soil stabilization. GDOT roadside projects statewide require establishment of new vegetation to mitigate soil erosion. Several species native to Georgia are currently being used in riparian mixes that stabilize soil near plantings in disturbed streams and may also have potential for establishment beyond stream buffers as roadside vegetation. This research was needed to determine the potential performance of these plants for best management practices in roadside areas. Additionally, the diversity of soils, climates, and environments throughout the four hardiness zones of Georgia may influence establishment and growth of these species. The project provided new recommendations for (1) modifying 29 native grass and forb (non-grass flowering) species listed in GDOT SP 700 specifications for roadside vegetation; and (2) seeding establishment operations. Per OM:

“[It is recommended from the research] to increase the minimum seeding rate, especially on steeper slopes. GDOT may even want to increase the required seeding rate by 4 or 5 times the current minimum. The researchers discovered that adding fertilizer only encouraged more weeds. Supplemental watering is not practical for our roadsides, since GDOT does not have the forces available to provide maintenance for the areas. **That is why this research was so helpful!** It provided realistic and baseline results for what we can expect on dry slopes at an actual stream relocation site. Within the limitations we face, it looks like going with the die-

hard species and boosting the seeding rate will provide the most effective improvement to the current practices.”



Traffic Control Device (TCD) Consortium (TPF-5(065), Kathy Zahul) [Developmental]

This TPF study has initiated numerous substudies with products used by GDOT and other agencies nationwide. Studies have focused on evaluation of the comprehension and/or legibility of new symbols that could be considered for inclusion in the *Manual on Uniform Traffic Control Devices* (MUTCD). MUTCD guidance for roundabout signing and diagrammatic and arrow-per-lane freeway guide signs was also developed through this study. Recently approved substudies that are expected to provide further benefits to GDOT include the following:

- Countdown pedestrian signals
- Pavement signing
- Legends for incident management signs
- Lane line markings in advance of lane-reduction transitions
- Intersection conflict warning systems human factors research (joint initiative with TPF-5(231), ITS Pooled Fund Program, (Enterprise))

Southeastern Transportation Consortium (STC, TPF-5(212), David Jared) [Developmental]

The Southeast Transportation Consortium (STC) was initiated through the TPF program to foster coordination among member states and provide funding for and management of collaborative studies. STC addresses high-priority transportation research topics of common interest to the AASHTO Region 2 states and, secondarily, to other interested states. STC has completed four synthesis studies and initiated four others on practical topics such as “Regional Implementation of Warm Mix Asphalt” and “Best Practices for Determining Value of Research Results.” The findings of the syntheses have been used by STC members and AASHTO’s Research Advisory Committee, representing the 50 state DOT’s at-large. STC has developed and initiated one full-scale TPF study, “Design and Analysis Procedures for Asphalt Mixtures Containing High RAP Contents and/or RAS,” with others likely pending from the completed and ongoing syntheses.

POLICY/WORKFORCE

Economic and Workforce Impact of GDOT Highway Expenditures (RP 12-19, Betty Mason) [Developmental]

This study provided a detailed estimate of impacts of GDOT's capital expenditures from 1271 transportation infrastructure projects (2009–2013) on statewide economic activity, income, employment, tax revenues and workforce development (also called *categories of impacts*). GDOT's Office of Equal Employment Opportunity (EEO) currently has a Disadvantaged Business Enterprise (DBE) disparity study pending, which establishes support for GDOT's overall DBE goal. The job creation data reported may be useful in identifying where new businesses may have either come into existence or expanded potentially in the categories above. The identification of the businesses will be used in recognizing ready and able vendors beyond the existing DBE program directory and the Prequalified/Registered vendors list.

Review of GDOT's Organization Evaluation Process by Examining Current Survey and other State DOT Methods (RP 13-07, Alma Mujkanovic) [Developmental]

This project assessed GDOT's current employee survey practices; compared them to those of other state DOTs, and proposed a new, more relevant survey instrument. The study was conducted using a literature review, survey data from 38 other state DOT's, and an internal review of GDOT's current survey process. The project's primary goal was to examine GDOT's current survey instrument; its relevancy and applicability to the current workforce, and the intended use of survey results by the GDOT Leadership Team. As a result, the new survey instrument, with new focus areas and a new set of questions, was created and used in GDOT'S 2014 Employee Survey. The new survey focuses on questions helpful in identifying initiatives and resources that would assist employees in becoming more successful in their jobs.

SAFETY

Centerline Rumble Strips Safety Impact Evaluation (RP 12-12, Phase 1, David Adams) [Feasibility]

GDOT Office of Traffic Operations (OTO) is actively pursuing the implementation of this study, which is being conducted in two phases. Phase 1 yielded critical information concerning the



design and construction of centerline rumble strips (CLRS). In Phase 1, researchers found that the pavement degradation issue in one CLRS site in Georgia was potentially related to a construction problem involving lack of tack coat near the centerline. Joint OTO and OM, evaluation of design and construction standards are recommended, and Phase 2 of the study

will focus on detailed crash analysis. Implementation steps include: (1) obtain finalized criteria for identifying applicable locations based on OTO statistical analysis of GDOT's crash data; (2) integrate data from GIS sources, including crash-, pavement-, and road characteristics data; (3) develop a search and reporting function; and (4) incorporation of CLRS safety improvements into the pavement resurfacing program.

Next-Generation Wireless Bridge Weigh-in-Motion (BWIM) System Integrated with Nondestructive Evaluation (NDE) Capability (RP 12-21, Kevin Schwartz) [Feasibility]

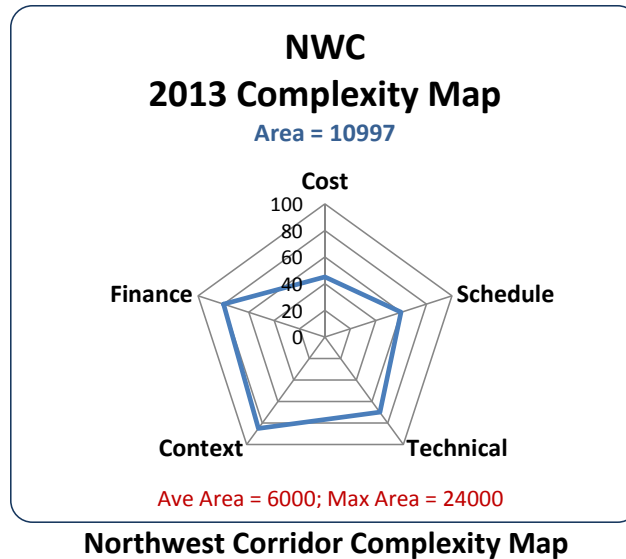
GDOT's Office of Bridge Design, in partnership with Georgia Tech, studied a wireless BWIM+NDE system to assist in monitoring transportation infrastructure safety in a two-fold approach: (1) control of overloaded trucks; and (2) safety assessment/monitoring of transportation infrastructure. The goals of the project were to deliver a rapidly deployable, low-cost, wireless system for WIM and NDE on bridges. The system contains individual wireless sensing nodes that integrate state-of-the-art ultrasonic NDE devices suitable for crack growth monitoring as well as wireless strain sensors for BWIM analysis. GDOT currently contracts the work that these sensors would be utilized for. The wireless feature, the flexibility of the NDE sensors, and the ability to remotely view the results of the NDE are attractive features to GDOT. These technological advances may assist vendors in providing better service to GDOT hereafter.

Strategic Highway Research Program 2

Besides ongoing research program in direct alignment with GDOT strategic goals, OR has been involved in strategic highway research at the federal level. The current program, Strategic Highway Research Program 2 (SHRP-2) includes four research focus areas: Safety, Renewal, Reliability, and Capacity. GDOT participated in Round 1 of the program and was awarded four SHRP-2 projects: R09 (Risk Management), R10 (Managing Complex Projects), L01/L06 (Organizing for Reliability), and R26 (Pavement Preservation).

Project R09 has been completed. Under R09, GDOT and federal partners held a workshop in October 2013 on "Simplified Risk Management Planning." The workshop was attended by subject matter experts from GDOT, FHWA, TRB, AASHTO, Georgia Tech, and private industry. The workshop resulted in a final report detailing its conclusions and a scalable process for risk management implementation by GDOT Offices of Program Delivery, Innovative Delivery, and Utilities. GDOT's Risk Manager was able to review the spreadsheets and techniques used in the R09 workshop to assist in developing a risk register and process for risk management. This development is in conjunction with the ongoing GDOT research project, "Streamlining Project Delivery through Risk Analysis" (RP 13-05).

GDOT saw the implementation of R10 products as a natural progression for its trend of incorporating Design-Build flexibility in future GDOT projects. GDOT completed a workshop on the Northwest Corridor study, and implementation of lessons learned from the workshop is progressing. The next workshops are planned for the "Revive 285" and I-285/Georgia 400 interchange projects.



On Project R26, GDOT completed the first of three proposed preservation projects (ultra-thin overlay; cold-in-place recycling; fog seal), and the second project letting is pending. The third project is proposed for October 2014. The ultrathin asphalt overlay (4.75 mm) was placed in Dahlonga in May 2014. Based on the results of this project and other research, OMAT has recommended that the use of this type of thin overlay be expanded.

TRB Implementation Report Updates

Before the TRB Annual Meeting in January 2014, GDOT attendees were asked to identify things learned at the meeting that could be implemented by GDOT. GDOT attendees brought back nearly 50 implementation ideas aligned with all four of GDOT's strategic goals, as shown hereafter. A separate report of these ideas was presented to GDOT executive management in March 2014. The following paragraphs provide updates on several of the implementation ideas.

Session 378: "Advances in Traffic Survey Methods" (Jane H. Smith, OTD)

- *Proposed Initiative:* Develop an improved methodology for determining the Annual Average Daily Traffic (AADT) using seasonal factors computed from continuous counts within the same year.
- *Implementation Plan and Update.* Schedule a meeting to present the methodology to traffic statistics staff. Review the methodology with current and previous count years. Determine whether this methodology can be implemented by GDOT. It could reduce GDOT labor, make traffic available sooner, and improve HPMS reporting. A new process has been developed and implemented together with new Traffic Server software. A new, immediate AADT calculation is being reported during the count year cycle.

Session 508: "The Boss Is Looking: Support from Transportation CEO's on the Role of Data and Information for Better Decisions" (Jane H. Smith, OTD)

- *Proposed Initiative:* Use publication FHWA-SA-11-40, "Market Analysis of Collecting Fundamental Roadway Data Elements to Support the Highway Safety Improvement

Program (HSIP)” to show the true cost of road data collection to support the mandates of both the HPMS and HSIP. While federal transportation bills continue to add transportation data requirements, funding for transportation data programs has been declining. MAP-21 and FHWA have recently mandated that 38 data items be collected for all public roads.

- *Implementation Plan and Update.* Determined estimated costs to collect traffic and road data using the methodology in FHWA-SA-11-40 and presented cost analyses to GDOT executive management during the FY 2015 Transportation Planning Work Program budget meetings. As a result of the meeting, OTD’s program budget was restored to adequate funding levels for the current responsibilities. Additionally, the funding chart was reused as a part of the state’s response for AASHTO’s letter of concern to FHWA about the cost of unfunded mandates in MAP-21.

Session 674: “Women in Transportation: Support for Research, Professional Development, and Training” (Genetha Rice-Singleton, P3; Supriya Kamatkar, Research)

- *Proposed Initiative:* A support group for GDOT female employees has been initiated to (1) provide support for them as they balance family, work and community service; and (2) introduce young ladies to the transportation field.
- *Implementation Plan and Update.* Partner with Atlanta Women’s Transportation Seminar (WTS) Chapter and support efforts with Transportation YOU and STEM programs. A workshop on robotics demonstration has been organized for K-12 students from several schools in the Atlanta area. Currently, Ms. Rice-Singleton is the Technical/Implementation Manager for RP 14-08, “STEM and Our Future Transportation Leaders.” She is also gathering information from Michigan DOT concerning their implementation of the AASHTO–TRAC program, of which GDOT is currently a member, and encouraging women at GDOT to attend WTS meetings.

Project Delivery Methods Committee (Darryl VanMeter, OID)

- *Proposed Initiative:* Consider research on “Best Practices in Administrative Procedures for Alternative Delivery.”
- *Implementation Plan and Update.* Draft a research needs statement on “Best Practices in Administrative Procedures for Alternative Delivery.” Follow through on its potential advancement from actual research product to implementation. As a product of participating in this research in this manner, this can add value to forecasting resource needs and broadening the source of the knowledge, so as to have a healthy and unbiased viewpoint for decision makers.

Sessions 765: Pavement Preservation Treatments and Strategies (Stacy Aultman, District 4)

- *Proposed Initiative:* Consider to implement the tools from “Pavement Preservation Treatments and Strategies.”
- *Implementation Plan and Update.* Propose the use of chip seals for pavement preservation to reduce the resurfacing costs. This year, District 4 has submitted a list of 62 proposed routes to be chip sealed rather than resurfaced with hot mix to Office of Maintenance for consideration of letting. This will result in an estimated cost savings of \$57 million for GDOT. However, there is no funding currently available for any resurfacing projects in District 4 until March 2015.