VERMONT AGENCY OF TRANSPORTATION 2022 RESEARCH PEER EXCHANGE

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Final Report 2022-02

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The Vermont Agency of Transportation (Vermont AOT) hosted a virtual peer exchange on June 7, 14 and 21, 2022, to discuss topics related to transportation research with other state departments of transportation (DOTs). The meeting and the subsequent publication of this report fulfill the agency's obligation to conduct a periodic peer exchange as part of the federal State Planning & Research program. The event focused on three primary topics: research interactions with materials/pavement topics and staff, qualitative and quantitative research evaluation, and research engagement of leadership. Participants of the multi-day event included staff from Vermont AOT, seven other state transportation agencies (Alaska, Maine, New Hampshire, North Dakota, Rhode Island, Utah, and Wyoming), and the Federal Highway Administration. Based on presentations and small- and large-group discussions, participants shared what they saw as Vermont AOT's strengths and challenges, opportunities for Vermont AOT in the areas discussed, and takeaways for their home agencies. The event concluded with a fourth session on July 18 that included a report-out to Vermont AOT leadership and a summary of perspectives and opportunities for Vermont AOT from an executive viewpoint.

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The authors also thank all peer exchange participants and presenters from Vermont and across the United States, also named in Section 1.1 of this report, for lending their expertise and perspectives on the topics discussed during the peer exchange.

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PEER EXCHANGE AT-A-GLANCE

Host Agency: Vermont Agency of Transportation

Participating Agencies: Alaska DOT&PF, Maine DOT, New Hampshire DOT, North Dakota DOT, Rhode Island DOT, Utah DOT, Wyoming DOT, and the Federal Highway Administration.

PEER EXCHANGE TOPICS

Research Interactions with Materials/Pavement Topics and Staff: In this first session, attendees described their agencies' organizational structure and the relationship between the Research and Materials/Pavement teams.

Qualitative and Quantitative Research Evaluation: Attendees sought to learn more about how their peer agencies document and assess their research efforts.

Research Engagement of Leadership: Research staff members discussed their interactions with agency leadership, including frequency of communications and strategies for identifying and presenting information for the targeted audience.

TOP FINDINGS AND TAKEAWAYS

Research Interactions with Materials/Pavement Topics and Staff

- An internal working group that meets regularly, such as Vermont AOT's Pavement Working Group (PWG), can help an agency **identify its research priorities and increase the pool of passionate project champions**.
- Increase the capacity of research staff by **engaging eager young professionals** in the specification writing process.
- Working groups offer an opportunity for **relationship-building among** different groups, allowing others to become aware of the important work Research does.
- Help staff understand the roles of others in the agency to **increase knowledge retention**.
- **Leverage the resources** offered through FHWA's Experimental Features Program.
- **Set aside funds for small research initiatives** like testing new materials and equipment and trying new ideas.

Qualitative and Quantitative Research Evaluation

- **Stories can help to illustrate** the qualitative value of research.
- Consider **interviews with project stakeholders** instead of—or in addition to—post-project surveys and emails to gain feedback.
- **Every research project can offer valuable lessons,** even if it was not considered to be successful in a traditional sense.
- Look for ways to **lean on researchers and subject matter experts** to define goals and metrics for success during scoping and other pre-project activities.
- **Build implementation plans and evaluation metrics** into requests for proposals, contracts and interim reports.

Research Engagement of Leadership

- **Utilize dashboards** to offer visually attractive and customized information for different audiences.
- **Host events**—like Vermont AOT's annual Research and Innovation Symposium—to allow agency executives and project stakeholders to interact and see the impacts of research.
- Think of **research as stories** that are waiting to be told and look for ways to tell those narratives in interesting ways.
- **Build relationships and alliances** to help others when possible and acknowledge contributions through press releases and other avenues.
- **Maintain focus**. Staff may change, but research should remain value-driven.

CHAPTER 1: INTRODUCTION AND OVERVIEW

The Vermont Agency of Transportation (Vermont AOT) hosted a virtual peer exchange meeting over the course of three days, on June 7, 14, and 21, 2022, to discuss topics related to transportation research goals, strategies, and processes with other state DOTs and the Federal Highway Administration (FHWA). The meeting and the subsequent publication of this report fulfill the agency's obligation to conduct a periodic peer exchange as part of the federal State Planning & Research (SP&R) program (per Title 23, Part 420 of the Code of Federal Regulations).

Each session focused on a different topic:

- June 7: Research Interactions with Materials/Pavement Topics and Staff
- June 14: Qualitative and Quantitative Research Evaluation
- June 21: Research Engagement of Leadership

A fourth session, held on July 18, provided an opportunity for attendees to share insights and takeaways with Vermont AOT's executive leadership.

PEER EXCHANGE PARTICIPANTS

The peer exchange brought together representatives from Vermont AOT, seven state DOTs and FHWA. The following individuals participated in one or more of the sessions.

Vermont Agency of Transportation

Executive Team
- Joe Flynn, Secretary
- Michele Boomhower, Director of Policy, Planning, and Intermodal Development
- Trini Brassard, Deputy Director of Policy, Planning, and Intermodal Development
- Jayna Morse, Director of Finance and Administration
- Maureen Parker, Deputy Director, Finance and Administration
- Ann Gammell, Highway Division Director/Chief Engineer
- Wayne Gammell, District Maintenance and Fleet Director
- Erin Sisson, Deputy Highway/Deputy Chief Engineer
- Michael Smith, Deputy Commissioner, Department of Motor Vehicles

Finance and Administration Division
- Amanda Gilman-Bogie, Continuous Improvement Unit Manager
- Christine Hetzel, Director of Organizational Development
- Manuel Sainz, Chief of Performance
- Lori Valburn, Civil Rights and Labor Compliance Chief

Highway Division
- Ian Anderson, Bituminous Concrete Manager, Materials Testing and Certification
- Matt Bogaczyk, Project Manager, Pavement Design, Project Delivery Bureau

William Crowther, Engineer, Asset Management Bureau
Mladen Gagulic, Construction and Materials Bureau Director
Reid Kiniry, Pavement Management System Engineer, Asset Management Bureau
Brandon Kipp, Project Manager, Pavement Design, Project Delivery Bureau
Aaron Schwartz, Bituminous Concrete Engineer, Materials Testing and Certification

Policy, Planning and Intermodal Development Division
Amy Bell, Director, Policy, Planning and Research Bureau
Emily Parkany, Research Manager, Policy, Planning and Research Bureau
Tanya Miller, Research Engineer, Policy, Planning and Research Bureau
Amy Tatko, Director of Communications and Public Outreach

Guest State DOT Research Programs

Alaska Department of Transportation and Public Facilities
Anna Bosin, Research Program Manager and Tribal Liaison
Charlie Bohart, QA Review Engineer
Paulette Hoffman, Research Section
Andrew Pavey, Pavement Management Engineer
Steve Saboundjian, State Pavement Engineer

Maine Department of Transportation
Dale Peabody, Transportation Research Engineer

New Hampshire Department of Transportation
Ann Scholz, Research Engineer
Deirdre Nash, Assistant Research Engineer

North Dakota Department of Transportation
Andrew Ayash, Transportation Engineer
Amy Beise, Research Manager
TJ Murphy, Materials and Research Engineer
Aaron Perez, Transportation Engineer
Ben Pihl, Intern
Jon Stork, Research and Pavement Engineer

Rhode Island Department of Transportation
Colin Franco, Associate Chief Engineer
Christos Xenophontos, Assistant Director

Utah Department of Transportation
Austin Baysinger, State Pavement Management Engineer
Cameron Kergaye, Director of Research and Innovation
Bill Lawrence, Materials and Pavements Director
Kevin Nichol, Research Project Manager
Scott Nussbaum, State Engineer for Quality and Materials
David Stevens, Research Project Manager

Wyoming Department of Transportation

Ethan Crockett, Pavement Management and Research Engineer

Enid White, Research Manager

Northwestern University

Joe Schofer, Professor Emeritus

Federal Highway Administration

Dara Burke, Intern

Mary Huie, Innovation Management and Technology Transfer Project Manager

Chris Jolly, Planning and Program Engineer, Vermont Division

David Kuehn, Team Director/Program Manage, Turner-Fairbank Highway Research Center

Patricia Sergeson, Transportation Pooled Fund Manager

FORMAT

To accommodate participation from agencies across the country, Vermont AOT conducted the peer exchange virtually, on Tuesday afternoons for three consecutive weeks in June. The agency's fourth session with attendees and Vermont AOT executive leadership took place in July. Participants shared their cameras when possible (Figure 1) to support face-to-face discussion in the virtual setting.

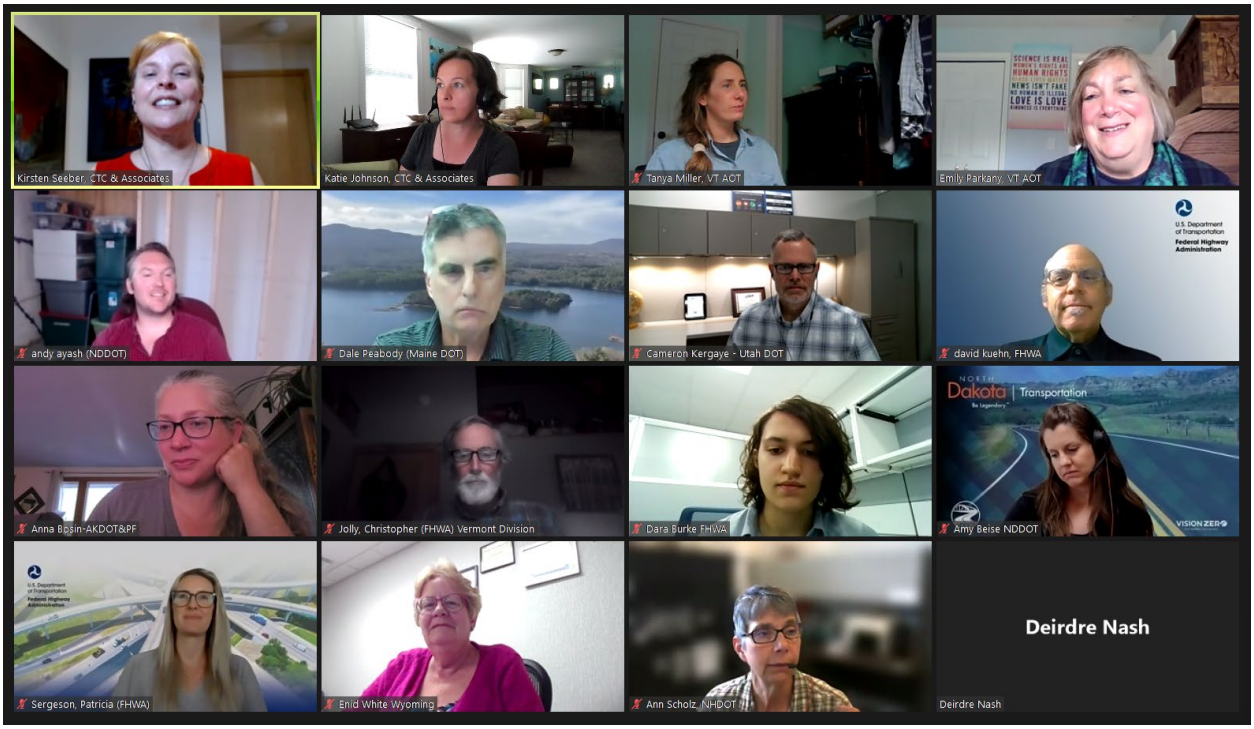

Figure 1. Meeting Participants

Each of the three sessions featured a research-related topic of specific interest to Vermont AOT and opportunities for all attendees to discuss and explore the issue in greater detail. Each session included a

prepared presentation from Vermont AOT, as well as additional presentations from participating states and invited guests.

The final morning was dedicated to an executive report-out session. The meeting agenda including all four sessions is included as Appendix A to this report.

June 7 Session – Research Interactions with Materials/Pavement Topics and Staff

For many state transportation agencies, the largest portion of research interest and investment is spent on pavements and the materials used to build and maintain them. However, as staff in research and in materials/pavement are often housed in separate departments, relationships and interactions can be limited. State DOT research staff were encouraged to invite their colleagues in pavement and materials to identify and discuss opportunities for collaboration and to maximize their collective investigative efforts.

June 14 Session - Qualitative and Quantitative Research Evaluation

Transportation research can lead to a variety of valuable outcomes. When results are not directly measurable, however, they can be difficult to analyze and share. Through discussions and an activity involving a hypothetical scenario, attendees explored a range of ideas and strategies for effectively evaluating research projects and highlighting the value of the work for different audiences.

June 21 Session – Research Engagement of Leadership

Leadership support is essential for a successful research program. Attendees discussed how they interact with their agencies' executive staff and ways to optimize these opportunities for maximum impact.

July 18 – Executive Report-Out

A fourth session of the peer exchange provided an opportunity for attendees and Vermont AOT staff to share with Vermont AOT's executive leadership the key findings from the Research Peer Exchange and the ideas that attendees plan to take back to their own agencies.

CHAPTER 2: PEER EXCHANGE TOPIC 1—RESEARCH INTERACTIONS WITH MATERIALS/PAVEMENT TOPICS AND STAFF

PRESENTATIONS

Ian Anderson, bituminous concrete manager at Vermont AOT, began by describing the size and organizational structure of the agency's materials and pavement team and its relationship with Research staff. Representatives from North Dakota and Rhode Island DOTs followed, providing insight into their agencies' programs, histories, and interactions between research and materials/pavement offices. Complete presentation materials are reproduced in the appendices to this report.

> Appendix B. Research Interactions with Materials/Pavement Staff, Ian Anderson, Vermont AOT
> Appendix C. Interactions with Materials & Pavement, Amy Beise, North Dakota DOT
> Appendix D. Transportation Research at DOTs: The Role of Materials and Pavement Sections, Colin Franco, Rhode Island DOT

FINDINGS

Attendees discussed the differences and similarities of their own programs and working relationships, as well as opportunities for improving relations. These comments were collected during discussions before and after small-group breakout sessions and in report-out forms that participants completed and submitted after the session.

Comments are grouped by topics discussed. Opportunities for Vermont AOT are described below, as well as additional best practices and ideas that attendees noted for potential use within their home agencies.

TOP IDEAS are those that were highlighted by several participants.

Research and Materials/Pavement Staff Collaborations

What are states doing to encourage interaction between research and materials/pavement staff?

- Vermont AOT has a Pavement Working Group (PWG), a collaborative panel of stakeholders that meets monthly to identify issues and opportunities for research.
- North Dakota DOT's Research staff is housed *within* the agency's pavement section.
- Utah DOT conducts an annual research workshop, which can help materials and pavement staff prioritize their research needs and focus funding requests.

TOP IDEAS:

- An internal working group that meets regularly, such as Vermont AOT's PWG, can help an agency **identify its research priorities and increase the pool of passionate project champions**.

Best practices and takeaways for increasing interactions between research and materials/pavement staff:

- Consider the role that specification writing can have as part of the research process.
- Relationships with external groups, such as other agencies, universities, and consultants/industry professionals, can be helpful for addressing timely issues and identifying passionate subject matter experts and project champions.

Potential Barriers to Effective Collaborations

What can make it difficult for Research and Materials/Pavement groups to work together?

- **Lack of awareness.** Without understanding what each group does, it can be difficult to find opportunities for collaboration.
- **Lack of resources.** Research tends to have fewer staff than other agency groups, making outreach difficult.

TOP IDEAS:

- Maine DOT **engages eager young professionals** in their research and innovation efforts. At times they draft material and construction specifications to deploy new initiatives.
- Working groups offer an opportunity for **relationship-building** among different groups, allowing others to become aware of the important work Research does.
- Help staff understand the roles of others in the agency to **increase knowledge retention**.

Additional Opportunities for Improving Interactions

What are states doing to encourage interaction between research and materials/pavement staff?

TOP IDEAS:

- **Leverage the resources** offered through FHWA's Experimental Features Program.
- Maine DOT **sets aside funds for small research initiatives** like testing new materials and equipment and trying new ideas.

CHAPTER 3: PEER EXCHANGE TOPIC 2—QUALITATIVE AND QUANTITATIVE RESEARCH EVALUATION

PRELIMINARY DISCUSSIONS

To facilitate discussions on June 14 and gauge attendees' initial perspectives, Vermont AOT posed three questions through the Mentimeter online polling tool. Attendees' responses revealed a number of insights and opportunities that prompted further discussion. (Note that open-ended responses are lightly edited for clarity.)

Question 1. When you think of the word "evaluation" what three words come to mind? (word cloud)

Results:

Figure 2. Attendees' Responses to a Word Association Exercise

Question 2. Which of these have you used? (multiple choice)

Quantitative evaluation – 12 respondents
Qualitative evaluation – 11 respondents
Performance measures – 9 respondents
Another way to show the value of research – 8 respondents

Question 3. Can you expand on what your agency does? (open-ended)

- Survey.
- Support FHWA and State DOTs in their Research programs.
- Promote value in newsletters.
- Develop logic models and narratives to explain the movement from research towards practice.
- Materials, technology, and methodology research.
- We quantify estimated benefits of research implementation.
- In VT we struggle with Q, Q, and PMs but we do a lot of Tech Transfer (Annual Symposium and Quarterly Newsletter) and we hope that those activities imply value.
- Use a principal investigator to evaluate our program and our projects every 4-5 years so that we can determine and change our protocols.
- Periodic questionnaire to research project champions on implementation success and cost savings.
- Move people and goods safely.
- Safely moving people and goods. Builds and maintains highway and bridge infrastructure.
- We research and publish a report of three to four years of projects, evaluated by the divisions that requested the research.
- Project by project basis, try to determine back of envelope benefits, presentations, communicate.
- Survey technical champions to determine value of research.

PRESENTATIONS

After this ice-breaking exercise, representatives from Northwestern University and the Federal Highway Administration each provided 20-minute presentations highlighting project- and program-specific approaches to evaluating research. The Northwestern professor was invited because of his experience with a related NCHRP project. Next, attendees from three state agencies presented information about their own strategies and experiences in this area. Leading off, Vermont AOT shared details of the agency's goals, methods, and challenges to measuring the value of its research efforts. Presentations from Utah and Wyoming DOTs followed, showcasing alternative ideas and perspectives for how an agency can assess and share its research outcomes. Complete presentation materials are reproduced in the appendices to this report.

Appendix E. Evaluate Research Impacts, Joseph Schofer, Northwestern University
Appendix F. Research and Technology (R&T) Evaluation Program, Mary Huie, FHWA
Appendix G. Qualitative and Quantitative Evaluation of Research Projects, Tanya Miller, Vermont AOT
Appendix H. Qualitative and Quantitative Research Evaluation, Cameron Kergaye, Utah DOT
Appendix I. WYDOT Research, Enid White, Wyoming DOT

DISCUSSION, BREAKOUT ACTIVITY AND ADDITIONAL FINDINGS

Following the presentations, attendees were invited to discuss their agencies' performance measures and how their own state's activities resemble and differ from the presenters'.

Next, in an effort to increase engagement and inspire creative thinking, Vermont AOT presented a hypothetical research project and asked attendees to consider how they would approach one of three project aspects: quantitative project evaluation, qualitative framework, and sharing the value of the research program. Attendees chose the issue that most interested them and broke into separate groups to discuss and explore the topic further.

Project details and instructions for participants included the following written guidance:

> *On Tuesday, June 14, we anticipate three breakout activities based on Generic State X as described here. You will get to choose which project you would like to work on. We hope that each group will have at least two participants and a facilitator. The non-facilitator in each group who has been in their current position the closest to five years will be the reporter.*
>
> ***Generic State X***
>
> *State X is a small program with about $1.3M in SPR-B funding a year. They have 10-12 "active" "internal" and "external" research projects; 3-5 projects finish in a year but some of the "internal" projects are long-term.*
>
> ***Quantitative Project Evaluation***
>
> *State X just completed an asphalt materials project where they researched the impact of additional RAP in their binder. The research results look promising.*
>
> *State X is getting ready to install 10 new traffic signal controllers because a recent research project suggests that the new controller will lead to fewer crashes.*
>
> *Determine what you will need to quantitatively evaluate both projects. Describe how and when (how often?) you will perform a quantitative analysis of these projects and how the results from the two projects will be used to evaluate the research program.*
>
> ***Qualitative Framework***
>
> *Potentially starting with the slide from Tanya Miller's presentation with potential qualitative assessments, how should State X qualitatively assess the projects in their program? Describe the variables used, whether there's a weighting system, when and how you will evaluate the program and how the results will be used to evaluate the research program.*

Sharing the Value of State X's Research Program

Develop a Communications Plan focused on Sharing the Value of State X's Research Program. What will you communicate, how and how often? Is "Sharing the Value" different from sharing results from individual projects?

This type of activity, which is not usually included in most peer exchanges, was a well-received exercise that allowed attendees to brainstorm together how to evaluate research. States may have individual approaches but this was a way to get all participants focused on one of the three topics and to work together to address quantitative and qualitative evaluation or sharing the value of State DOT research projects.

A number of themes emerged throughout the day, including the importance of defining commonly used terms and how these definitions can influence an agency's assessment of its research success. The ideas below represent the key findings and ideas.

Report-out forms, which participants completed and submitted at the end of the day, also contributed to the summaries below.

TOP IDEAS are those that were highlighted by several participants.

Evaluating Research

How can the value of research be measured and shared?

- **Quantitative measurements**
    - Consider quantifying the impacts of one project a year. Work towards a "story" of the project.
    - Wyoming DOT regularly evaluates its program as well as individual projects.
    - Utah DOT has developed a benefit/cost calculation model to show numeric value as well as an academic grading system that can be applied to each project.
- **Qualitative measurements**
    - FHWA uses an evaluation matrix and logic models to identify objectives, anticipate results, and measure successes.
    - Northwestern University considers a Research Impact Process Model to assess its outcomes.
    - Wyoming DOT includes information gathered from focus groups, while Maine DOT schedules post-project interviews with project managers and other stakeholders.

- **Sharing the value of research**
    - Vermont AOT produces individual project webpages, quarterly newsletters, emails, and hosts an annual Symposium to highlight its research efforts.
    - Utah DOT creates two-page fact sheets and powerful videos that focus on specific innovations and research results.
    - Maine DOT and FHWA advocate for choosing one or two projects a year to quantify and highlight, as opposed to trying to measure everything.

TOP IDEAS:

- **Stories can help to demonstrate** the qualitative and quantitative values of research.
- Consider **interviews with project stakeholders** instead of—or in addition to—traditional post-project surveys and emails to gain feedback.
- **Every research project can offer valuable lessons,** even if it was not considered to be successful in a traditional sense.

Additional best practices and takeaways

- Smaller research programs may be able to find ways to scale ideas down to suit their needs.
- Not all projects will fit into the same evaluation framework, and that's okay.

Potential Barriers to Effective Evaluation

What can make it difficult to measure and share the value of research?

- **Lack of resources.** Time constraints and available staff can limit an agency's ability to investigate and pursue hard-to-quantify research results.
- **Unshared terms**. Terminology and definitions vary among states and make it harder to compare similar ideas.

TOP IDEAS:

- **Rely on the experts.** Look for ways to lean on researchers and subject matter experts to define goals and metrics for success during scoping and other pre-project activities.
- **Streamline efforts.** Build implementation plans and evaluation metrics into requests for proposals, contracts and interim project reports.

Best practices and takeaways for overcoming evaluation-related challenges:

- Consider measuring benefits as projects are completed as opposed to only at designated intervals.
- Researchers have a vested interest in demonstrating value of research outcomes and products.

CHAPTER 4: PEER EXCHANGE TOPIC 3—RESEARCH ENGAGEMENT OF LEADERSHIP

PRELIMINARY DISCUSSIONS

To kick off group discussions and identify differences and similarities among attendees' agencies, Vermont AOT began the session on June 21 by posing a series of engaging questions through the Mentimeter online polling tool. Attendees' responses revealed a number of insights and opportunities that prompted further discussion. (Note that open-ended responses are lightly edited for clarity.)

Question 1. In your state, who does Research engage with? (multiple choice, select all that apply)

Results:

- Project Champions – 10 respondents
- Additional Subject Matter Experts – 8 respondents
- Bureau Directors – 8 respondents
- Middle Management – 8 respondents
- Executive Staff – 6 respondents
- Other – 3 respondents

Question 2. How does Research customize its information for different audiences? (open-ended)

Responses:

- Not much customization in VT.
- Custom messaging.
- Change the language used.
- Different formats. Leadership is looking for a prescribed briefing format.
- Executive and technical summaries. Research reports.
- Newsletter for internal distribution identifies champions by name; external news does not.
- Different styles of research. Pooled funds versus university research.
- Not a lot of customization in WY. We may tweak the message depending on the stakeholders.
- Hmmm. We don't do much of this. For front office it does need to be much more succinct.

In further response to this question, New Hampshire DOT noted that it publishes separate newsletters targeted to internal DOT staff and external audiences, with one major difference between the two publications being whether the names of project champions are included in information about the highlighted research projects.

This initiated a thoughtful discussion of whether and how much detail is helpful before becoming overwhelming and distracting to the audience. To demonstrate how Utah DOT customizes information

for different audiences, the agency shared several examples of dashboards that can be adjusted to offer a range of high-level and detailed information depending on the user's level of interest.

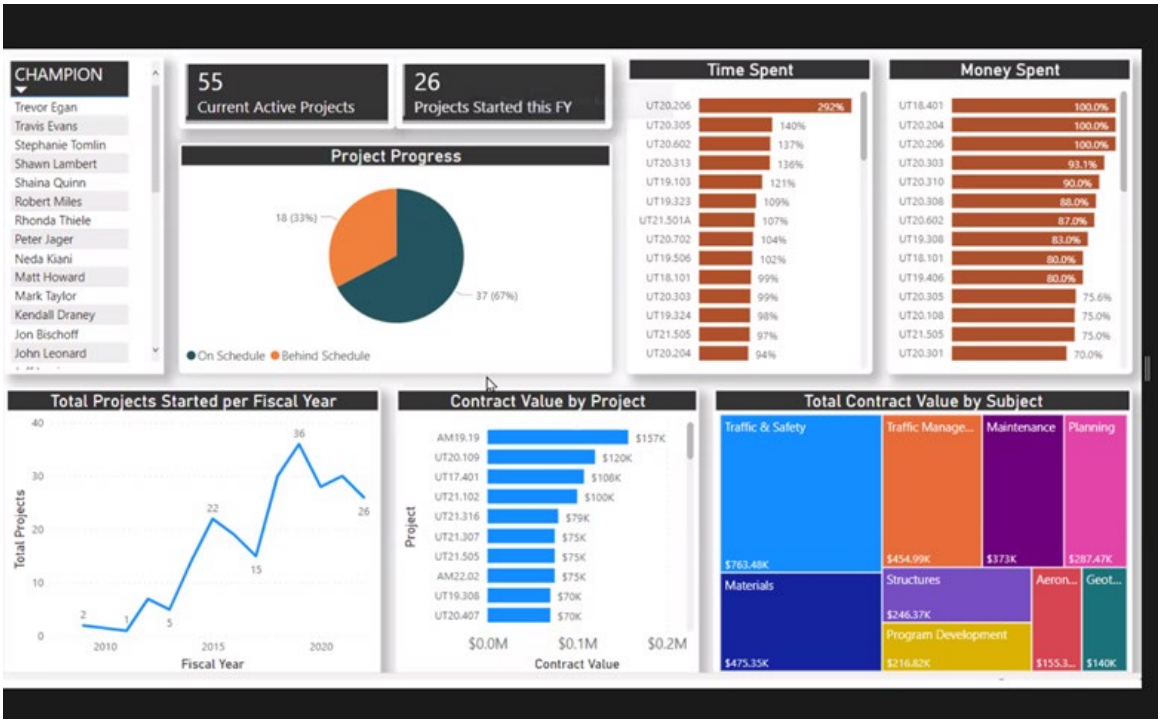

Figure 3. Utah DOT Research Dashboard

The dashboard example that Utah DOT shared with the group is public-facing and can include general program information or project-specific details to accommodate the audience's needs.

Question 3. What kinds of exposure does Research have with management or leadership? (multiple choice; select all that apply)

Results:

- Informal Communication —10 respondents
- State Research Advisory Committee / State Transportation Innovation Council — 9 respondents
- Formal Written Communication—6 respondents
- One-on-Ones — 3 respondents
- Other — 1 respondent

Question 4. What information do you regularly share with your agency leadership? (open-ended)

Responses:

- Work program.
- Symposiums, newsletters, weekly?
- Quarterly reports from principal investigators.
- Newsletters, symposiums.
- BEAUTIFUL photos! (Drones, technology, pilot studies).
- Cost of projects, years the project will be open, what department is the project champion from, completed projects in certain department areas.
- Overall program for the new fiscal year (annually).
- Awards. Project mid-point and technology readiness level meetings. Pilots and demonstrations.

This final question prompted further discussion about the purpose of sharing research-related information with agency leadership. Attendees noted the opportunity to increase engagement with other departments, and to advocate for the work a Research section does and could potentially offer.

PRESENTATIONS

Next, representatives from four states each gave 15-minute presentations highlighting how their Research section interacts and engages with their agency's leadership. Vermont AOT led this session, sharing details on the agency's structure, research activities, and opportunities for leadership engagement. Presentations from Alaska, Maine, and New Hampshire DOTs followed, giving attendees a comparative look at each agency's structure, operations, and perspectives. Complete presentation materials are reproduced in the appendices to this report.

Appendix J. Engagement of Leadership with Research, Emily Parkany, Vermont AOT
Appendix K. Research Program-Leadership Engagement, Anna Bosin, Alaska DOT&PF
Appendix L. Leadership Engagement in Research, Dale Peabody, Maine DOT
Appendix M. Research Engagement of Leadership, Dee Nash, New Hampshire DOT

DISCUSSION AND ADDITIONAL FINDINGS

Once the presentations concluded, all attendees were invited to discuss what they heard and share how their own state's activities contrast and compare.

Key issues that were addressed included the role of research in the broader agency, the effect of staffing changes and how much information should be shared with executives. Attendees generally agreed that disseminating information about an agency's research efforts provides valuable exposure and credibility, but the quantity, type, and frequency of the information that should be shared tends to vary. The ramifications of leadership turnover are also a common concern, as retirements and other updates affecting employees can influence an agency's overall strategic priorities and long-term goals.

This discussion prompted states to identify a variety of effective strategies for engaging leadership. In addition, attendees noted a number of challenges that influence their decisions and opportunities for enhancing their interactions with agency executives. Report-out forms, which participants completed and submitted after the session, also contributed to the findings below.

TOP IDEAS are those that were highlighted by several participants.

Strategies for Engaging Leadership

Where can an agency's Research section intersect with its leadership?

- **Publications**
    - Vermont AOT, New Hampshire DOT, and others highlight new and interesting research projects in regularly published newsletters.
    - Utah DOT compiles and distributes an annual listing of the agency's successful innovations.
- **Meetings**
    - Vermont AOT's Research team hosts an annual project selection meeting with Bureau Directors and Deputy Division Directors.
    - At Alaska DOT&PF, research staff strive to be a reliable resource by saying yes when asked to contribute to presentations or other activities.
- **Committees**
    - The National Cooperative Highway Research Program (NCHRP), the Transportation Research Board (TRB), and other panels provide an opportunity for Agency staff to gain technical expertise and exposure and then return to their states and engage with senior management.
    - At New Hampshire DOT, all research projects are sponsored by leadership.

TOP IDEAS:

- **Utilize dashboards** like Utah DOT does to offer visually attractive and customized information for different audiences.
- **Host events**—like Vermont AOT's annual Research and Innovation Symposium—to allow agency executives and project stakeholders to interact and see the impacts of research.
- Think of **research as stories** that are waiting to be told and look for ways to tell those narratives in interesting ways. Alaska DOT&PF's five-step engagement process is highlighted in Appendix K.

Additional best practices and takeaways:

- Make research interesting and tangible to raise the section's profile and get attention from those in leadership.
- Promote the benefits of research and innovation at every opportunity to help others appreciate the value research provides.
- Alaska DOT&PF reviews upcoming Legislative agendas to find opportunities to showcase relevant transportation research. The agency also prepares white papers that can be shared with legislators.
- Maine DOT invites staff who attend NCHRP or TRB meetings to report back on the group's activities. This helps leadership see the value of national participation as well as the DOT's financial investment.

Potential Barriers to Engagement

What can challenge Research's ability to effectively engage with leadership?

- **Time**. Executives are busy, so Utah DOT is selective with what it shares, and crafts specific information to target different audiences. This strategy can help leaders focus on what's most important.
- **Support**. Vermont AOT noted that as leaders come and go over time, research priorities and directives can shift.

TOP IDEAS:

- **Build relationships and alliances.** Alaska DOT&PF strives to help others when possible and acknowledge contributions through press releases and other avenues.
- **Maintain focus**. Staff may change, but research should remain value-driven.

Best practices and takeaways for overcoming engagement-related challenges:

- Work to increase awareness and support for research.
- Strive to help and find opportunities to showcase how research can solve problems.
- Involve leadership whenever possible – invite agency executives to ribbon cuttings and other events.

CHAPTER 5: EXECUTIVE REPORT-OUT

During the final 60-minute session of the peer exchange event, the following Vermont AOT extended executive staff members joined the discussion:

- Joe Flynn, Secretary
- Amy Bell, Director, Policy, Planning and Research Bureau
- Michele Boomhower, Director of Policy, Planning and Intermodal Development
- Trini Brassard, Deputy Director of Policy, Planning, and Intermodal Development
- Ann Gammell, Highway Division Director/Chief Engineer
- Wayne Gammell, District Maintenance and Fleet Director
- Amanda Gilman-Bogie, Continuous Improvement Unit Manager
- Mladen Gagulic, Construction and Materials Bureau Director
- Christine Hetzel, Director of Organizational Development
- Jayna Morse, Director Finance and Administration
- Maureen Parker, Deputy Director, Finance and Administration
- Manuel Sainz, Chief of Performance
- Erin Sisson, Deputy Highway/Deputy Chief Engineer
- Michael Smith, Deputy Commissioner, Department of Motor Vehicles
- Amy Tatko, Director of Communications and Public Outreach
- Lori Valburn, Civil Rights and Labor Compliance Chief

MAJOR TAKEAWAYS AND EXECUTIVE REPORT OUT

Vermont AOT's Tanya Miller began by providing a high-level review of the previous three sessions, describing the format for each day and the agency's goals for the peer exchange.

Next, peer exchange participants shared what they perceived as Vermont AOT's strengths, opportunities for continued growth, and ideas they intend to apply to their own program. Details about these observations and perspectives appear in Chapters 2, 3 and 4 of this report.

Emily Parkany then presented on behalf of Vermont AOT, summarizing the insights the agency gained throughout the peer exchange and steps that had been taken in the time between the third session and executive report-out.

> Appendix N. Vermont Executive Report Out, Tanya Miller, Vermont AOT
> Appendix O. Vermont Takeaways, Emily Parkany, Vermont AOT

The peer exchange helped Vermont AOT recognize how its organizational structure and research priorities contribute to its success and how these features contrast with other agencies. The three sessions also served to highlight opportunities for enhancing Vermont AOT's existing research program. Specifically, the agency found that:

- The two-person team within Vermont AOT's research bureau is likely already investing **its staff and financial resources wisely**, and sharing the appropriate amount of information with agency leadership.
- Vermont AOT's **PWG is a unique and effective model** of inter-agency collaboration that other state DOTs can emulate and learn from.
- The FHWA's **Experimental Features Program is active**, and Vermont AOT is encouraged to leverage its resources.
- Vermont AOT's Research team may want to **encourage small, internal research projects**.
- **A single framework** for evaluating all projects may not be reasonable or realistic.
- **The Weekly Report is a great opportunity to strategically share details** with executives.

The peer exchange also helped Vermont AOT to identify actionable next steps, some of which have already been put into practice. Examples of these include:

- Discussing with the PWG which **projects, new techniques, and experimental features** may be appropriate for deployment.
- Identifying opportunities to **support the implementation of completed research projects.**
- **Observing field activities** to better understand procedures and potential research needs.
- **Hosting two successful external research project kickoff** meetings using a new Benefits and Implementation framework to increase implementation awareness and clarify project expectations.
- Emphasizing **research projects as stories**.
- Engaging leadership through **annual research project selection and meetings like the Peer Exchange's** executive report out.

OBSERVATIONS AND COMMENTS FROM VERMONT AOT LEADERSHIP

After listening to all participant comments, the Vermont AOT executives reflected on what they heard and highlighted possible opportunities and areas of investigation for Vermont AOT.

- Vermont's two-person team **has accomplished amazing things**, raising awareness of what research is and what it can do.
- Lack of executive input may be **evidence of good work and trust**.
- Executives need to be able to **link savings or better outcomes to research**.
- **Incorporating research into agency culture** will help streamline processes and make research an integral part of everyday work.
- **Networking opportunities** are important.
- The reach and impact that Research offers can help **to advance many areas of interest** within the agency, including workforce issues and equity.

APPENDIX A. VERMONT AOT 2022 PEER EXCHANGE AGENDA

Vermont AOT Research Peer Exchange

Meeting Agenda

Zoom Meeting ID: 841 8293 7043, **Passcode**: 746425

Direct Link: https://us02web.zoom.us/j/84182937043?pwd=ZjdvRi9kRklCK3JlZkViRHBFenZVUT09

For audio, use your computer headset and mic, or dial 929-205-6099 and use the passcode 746425

All times are Eastern – Breaks will be taken as needed/fit

Tuesday, June 7 - Research Interactions with Materials/Pavement Topics and Staff

12:00 p.m. **Welcome, Goals**
Emily Parkany, Vermont AOT
Chris Jolly, FHWA

12:10 p.m. **Meeting Format and Logistics**
Kirsten Seeber, CTC & Associates

Introductions
- Name
- Agency
- What about this topic brings you to the peer exchange?

1:00 p.m. **State Presentations**
- **Vermont**
- **North Dakota**
- **Rhode Island**

2:00 p.m. **General Discussion**
- Does any state want to provide 2-3 minutes about how your agency is similar or different to what was presented?
- Does any state want to contribute additional ideas for how you work together on this topic?
- Anything else?

2:45 p.m. **Break**

Vermont AOT Research Peer Exchange

Meeting Agenda

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For audio, use your computer headset and mic, or dial 929-205-6099 and use the passcode 746425

All times are Eastern – Breaks will be taken as needed/fit

2:50 p.m. **Breakout Groups**

- Based on presentations and discussions, what actions do VT AOT and guests envision taking next?

3:20 p.m. **Reconvene and Report Out**

- Each breakout group will report back to the large group.

3:50 p.m. **Final Closing** (Expect a survey and the Report Out Worksheet for Session 1. See you next week to talk about Q and Q Evaluation.)

Vermont AOT Research Peer Exchange

Meeting Agenda

Zoom Meeting ID: 841 8293 7043, **Passcode**: 746425

Direct Link: https://us02web.zoom.us/j/84182937043?pwd=ZjdvRi9kRklCK3JlZkViRHBFenZVUT09

For audio, use your computer headset and mic, or dial 929-205-6099 and use the passcode 746425

All times are Eastern – Breaks will be taken as needed/fit

Tuesday, June 14 - Qualitative and Quantitative Research Evaluation

12:00 p.m. **Welcome and Agenda Review**
Emily Parkany, Vermont AOT
Kirsten Seeber, CTC & Associates

12:10 p.m. **Introductions**
- Name
- Agency
- What interests you about this topic?
- Menti poll

12:40 p.m. **Invited Presentations** (40 minutes)
- **Joe Schofer, Northwestern University**
- **FHWA, Mary Huie**

1:20 p.m. **Break**

1:30 p.m. **State Presentations** (60 minutes)
- **Vermont, Tanya Miller**
- **Utah, Cameron Kergaye**
- **Wyoming, Enid White**

2:30 p.m. **General Discussion**
- Do other states want to share what they do with regards to evaluation for a couple of minutes?

Vermont AOT Research Peer Exchange

Meeting Agenda

Zoom Meeting ID: 841 8293 7043, **Passcode**: 746425

Direct Link: https://us02web.zoom.us/j/84182937043?pwd=ZjdvRi9kRklCK3JlZkViRHBFenZVUT09

For audio, use your computer headset and mic, or dial 929-205-6099 and use the passcode 746425

All times are Eastern – Breaks will be taken as needed/fit

- What have you heard that you are eager to apply in your state?

2:50 p.m. **Break**

2:55 p.m. **Breakout Groups** (40 minutes)

- Project: You are a generic state transportation agency (State X) and can build the program you want for a topic listed below. State X is a small program with about $1.3M in SPR-B funding a year. They have 10-12 "active" "internal" and "external" research projects; 3-5 projects finish in a year but some of the "internal" projects are long-term.
- Choose one of three breakout options: quantitative project evaluation, qualitative framework, sharing the value of the research program. Ideally, we will have similar numbers of participants in each group.

3:35 p.m. **Reconvene and Presentations** (30 minutes)

- Each breakout group will present to the large group the program their generic state transportation agency created. The presenter is the non-facilitator in each group that has been in their position closest to five years.

4:00 p.m. **Final Closing** (Expect a survey and the Report Out Worksheet for Session 2. See you next week to talk about Leadership Engagement.)

Vermont AOT Research Peer Exchange

Meeting Agenda

Zoom Meeting ID: 841 8293 7043, **Passcode**: 746425

Direct Link: https://us02web.zoom.us/j/84182937043?pwd=ZjdvRi9kRklCK3JlZkViRHBFenZVUT09

For audio, use your computer headset and mic, or dial 929-205-6099 and use the passcode 746425

All times are Eastern – Breaks will be taken as needed/fit

Tuesday, June 21 - Research Engagement of Leadership

12:00 p.m. **Welcome and Agenda Review**
Emily Parkany, Vermont AOT
Kirsten Seeber, CTC & Associates

12:05 p.m. **Introductions**
- Menti questions
- Name
- Agency
- What about this topic brings you to the peer exchange?

12:40 p.m. **State Presentations** (40 minutes)
- **Vermont, Emily Parkany**
- **Alaska, Anna Bosin**

1:20 p.m. **Break**

1:30 p.m. **State Presentations** (40 minutes)
- **Maine**, **Dale Peabody**
- **New Hampshire, Dee Nash**

2:10 p.m. **General Discussion**
- Would the other states share what you do in your state for a few minutes?
- What are some takeaway actions?
- What do you see as challenges in your state?

Vermont AOT Research Peer Exchange

Meeting Agenda

Zoom Meeting ID: 841 8293 7043, **Passcode**: 746425

Direct Link: https://us02web.zoom.us/j/84182937043?pwd=ZjdvRi9kRklCK3JlZkViRHBFenZVUT09

For audio, use your computer headset and mic, or dial 929-205-6099 and use the passcode 746425

All times are Eastern – Breaks will be taken as needed/fit

2:45 p.m. **Break**

2:55 p.m. **Complete Session 3 Report Out Worksheet**

3:05 p.m. **Peer Exchange Report Out**

- What is Vermont doing well?
- Takeaways/your actions
- Opportunities for Vermont
- Comments on the three topics and virtual format

4:00 p.m. **Final Closing** (Expect a survey and a reminder to send Kirsten your completed Report Out Worksheets. See you on July 18th at 11:00 a.m. ET for the Executive Report Out session.)

Vermont AOT Research Peer Exchange – Meeting Agenda

PLEASE NOTE: Today's session uses Teams instead of Zoom. We will be joining a VT AOT Extended Executive Staff Meeting

Teams Information:

Join on your computer or mobile app: Click here to join the meeting

Or call in (audio only): +1 802-828-7667,,12446630# (United States, Montpelier)

Phone Conference ID: 124 466 30# (Find a local number | Reset PIN)

Monday, July 18 – Executive Report Out

11:00 a.m. **Restatement of Goals and Sessions 1-3 Recap** – **Tanya Miller, VT AOT**

Session One – Research Interactions with Materials/Pavement Topics and Staff

Session Two – Qualitative and Quantitative Research Evaluation

Session Three – Research Engagement of Leadership

Overview of Three-Session Peer Exchange – Peer States and FHWA

Most important insights and takeaways from the peer exchange, across all topics.

- What stood out to you?
- Where does Vermont AOT excel?
- How can Vermont AOT grow?
- "Aha moments" and ideas to take home

Vermont AOT Research Section – Emily Parkany, VT AOT

- Takeaways, challenges and opportunities
- Key reflections
- Next steps (and steps we've already taken) based on what we learned during the peer exchange

Vermont AOT Extended Executive Staff

- What stood out to you?
- What are opportunities that might align with Vermont AOT's needs and executive priorities?
- Other reflections on what you have heard today

Vermont AOT Research Peer Exchange – Meeting Agenda

PLEASE NOTE: Today's session uses Teams instead of Zoom. We will be joining a VT AOT Extended Executive Staff Meeting

Teams Information:

Join on your computer or mobile app: Click here to join the meeting

Or call in (audio only): +1 802-828-7667,,12446630# (United States, Montpelier)

Phone Conference ID: 124 466 30# (Find a local number | Reset PIN)

12:00 p.m. **Adjourn meeting**

APPENDIX B. VERMONT – RESEARCH INTERACTIONS WITH MATERIALS/PAVEMENT STAFF

VT AOT PEER EXCHANGE

DAY 1
RESEARCH INTERACTIONS WITH MATERIALS/PAVEMENT STAFF

JUNE 7, 2022

DR. IAN ANDERSON, HMA MATERIALS MANAGER, VERMONT AGENCY OF TRANSPORTATION

Size and Materials/Pavement Participants

Research Staff

25% of AOT Budget spent on Materials/Pavement

- Research $1.6M with state match
- AOT Budget $829.9M
- Paving Program $159M, of which $152M is Construction

Research Staff (2): Research (Policy, Planning, and Research Bureau; Policy, Planning, and Intermodal Development Division)

- **Research Manager Emily Parkany**
- **Research Engineer Tanya Miller**

Materials and Pavement Staff

Materials/Pavement Staff Research regularly interacts with (Peer Exchange Participants in **bold)**

Materials (Construction and Materials, Highways)

- Materials Manager Nick Van Den Berg
- **HMA Materials Manager Ian Anderson**
- **HMA Materials Engineer Aaron Schwartz**
- Concrete Materials Manager Jim Wild
- Concrete Materials Engineer Logan Roth-Longe

Pavement Design (Project Development, Highways)

- **Pavement Design Engineer Matt Bogaczyk**
- **Pavement Design Engineer Brandon Kipp**

Pavement Management (Asset Management, Highways)

- **Pavement Management Engineer Reid Kiniry**

Pavement Construction (Construction and Materials, Highways)

- Pavement Construction Engineer Ryan Darling

Please describe how VTrans' research office and materials/pavements offices are related

How are they supposed to interact (both officially and in fact)?

- Materials/Pavements are within the Highways Division, while Research is in the Policy & Planning Division. Each Division Director reports directly to the Secretary of Transportation.
- Officially: Materials/Pavements are a "Customer" of Research's services, who serve the entire agency. We collaborate in a monthly "Pavement Working Group", and like all other groups, compete for Research funding annually.
- Actual: Materials/Pavements historically has been active in conducting research efforts to evaluate new treatments, and materials testing, both with Research and on our own. Materials/Pavements is very engaged in NCHRP/EDC/SHPR2/AASHTO COMP.
- Research manages the Research program, and manages the individual research projects, and the SME are expected to Champion the actual content of the project. Most projects rely on outside investigators to conduct the efforts to answer VTrans questions.

In what ways can these interactions be improved?

What have we considered or tried?

Path Forward

- Materials/Pavements are often focuses of current problems/projects. Having research support to initiate an investigation and then implement the research would be the highest benefit.
- Research solicits input for the various external efforts VTrans could benefit from (and pays for), NCHRP, UTC, NETC, etc.

What we have done

- Research used to conduct internal research projects, i.e. “Pavement Life Study” to determine treatment successes/failures. This proved unsuccessful, as it was outdated and did not deliver actionable conclusions.
- Experimental Feature for single new treatments, had been commonplace. Thus far it has worked well to help engage the numerous stakeholders, and keep the treatment front of mind. But FHWA is unlikely to continue to support them.

Please provide examples

- Where should research and material interact?
- Successful initiatives with both groups

- Monthly Pavement Working Group (Materials, Design, Asset Management, Construction, Research) has been a benefit.
- External Research Projects: Materials staff serve as project Champions for external research projects with universities. i.e. HMA and Concrete PWL specifications, RSB agent selection
- Pooled Fund Participation
- Test method development: Research helps Materials acquire necessary equipment and knowledge to incorporate a new materials test, to determine its applicability in Vermont. i.e. Superpave, Performance Testing, DCP.
- Internal Research Projects: The agency develops a project using a new treatment/material, and tracks its implementation to develop lessons learned and correct specs. i.e. SMA Experimental Feature, Porous Asphalt Experimental Feature.
- Recent in-person NHI courses (Geotech Aspects of Paving, Asphalt In-Place Recycling)

Staffing Issues

- Is materials/pavement staffing sufficient?
- Are there enough materials/pavement staff to foster enthusiasm and support for research projects?
- Is research staff familiar with materials/pavement topics? Have they spent time in materials lab or on paving projects?

- We are not over staffed. Project related activities take up most of our time, and time put toward work on “Non-Project” is kept to a minimum to conserve State dollars.
- Staffing for Materials/Pavements has not significantly limited our ability to engage in research, but follow through and implementation are a struggle.
- Research staff are learning, but focus their efforts on “management” of the research program, and not on “researching” anything in particular.
- Research learns through meetings, managing projects, presentations and interactions with Materials/Pavement staff. Not much time in the field.

Other Questions

- What percentage of VTrans' DOT budget is related to materials/pavement?
- How do you accommodate supplier requests to test new products or experimental features?

- Approximately 25% of VTrans budget goes toward paving projects.
- VT Division Office is no longer accepting Experimental Feature work plans
- Collaboration with the paving industry is done through the TechPave working group, with topics that include: specification development, performance and binder testing initiatives, new materials, treatments, and construction practices. Industry can supply draft specifications for the agency to consider in whole, or present evidence to support a spec change for existing materials.
- Contractors on active projects can present a value engineering proposal to incorporate a new product/feature not specified in the plans.

APPENDIX C. NORTH DAKOTA – INTERACTIONS WITH MATERIALS & PAVEMENT

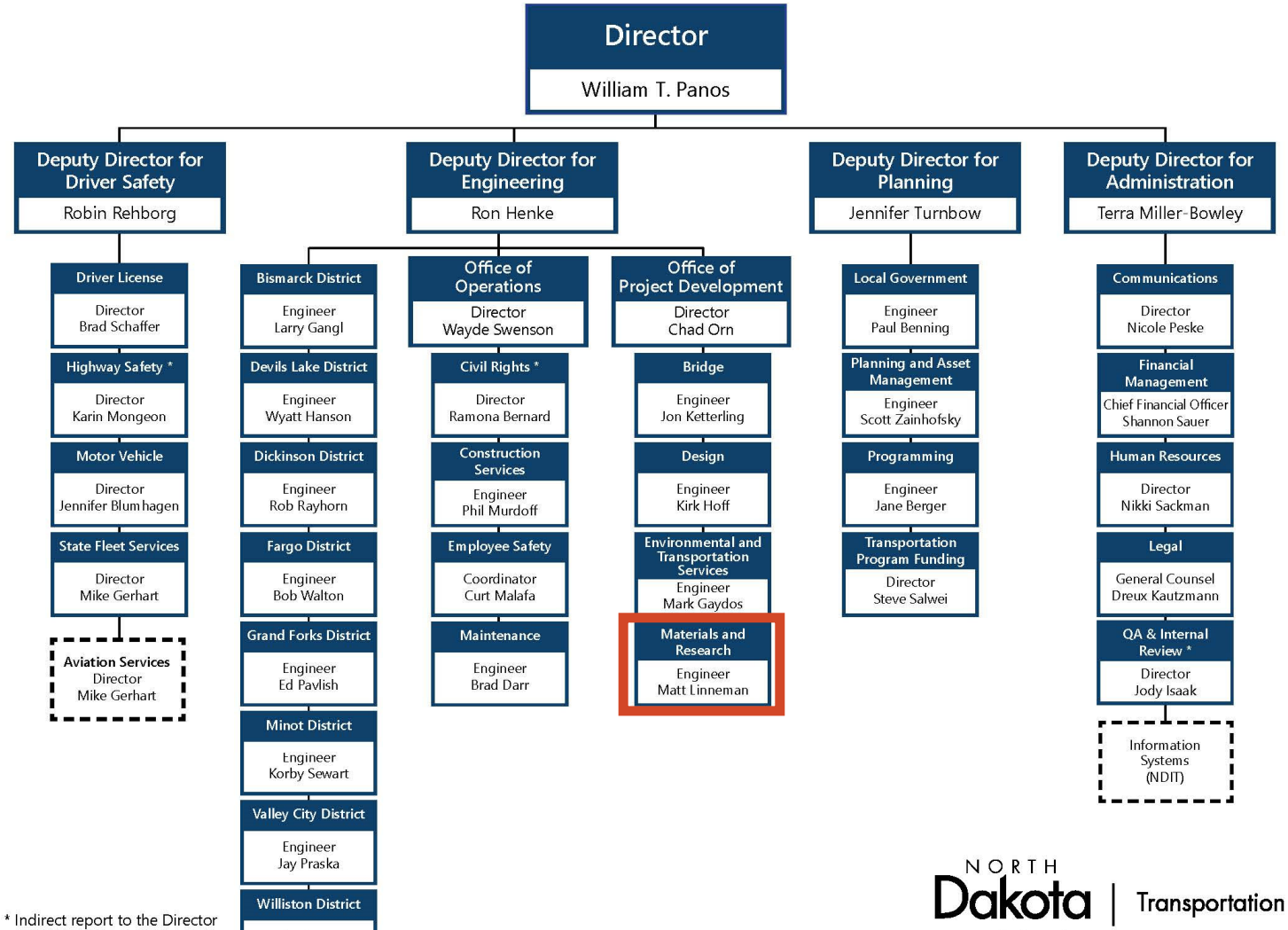
NDDOT Research

Interactions with Materials & Pavement

NORTH DAKOTA

BY THE NUMBERS

- **779,000** Population (47th/50)
- **$390,000,000** Federal Budget (44th/51)
- **7,415** Miles of Roadway +80,752 Local Networks
- **1,724** Bridges +3,139 Local Networks
- **1,159,000+** Registered Vehicles
- **350** Snowplows
- Average **39** events/year requiring snow/ice treatment



* Indirect report to the Director

March 2022

NORTH Dakota | Transportation

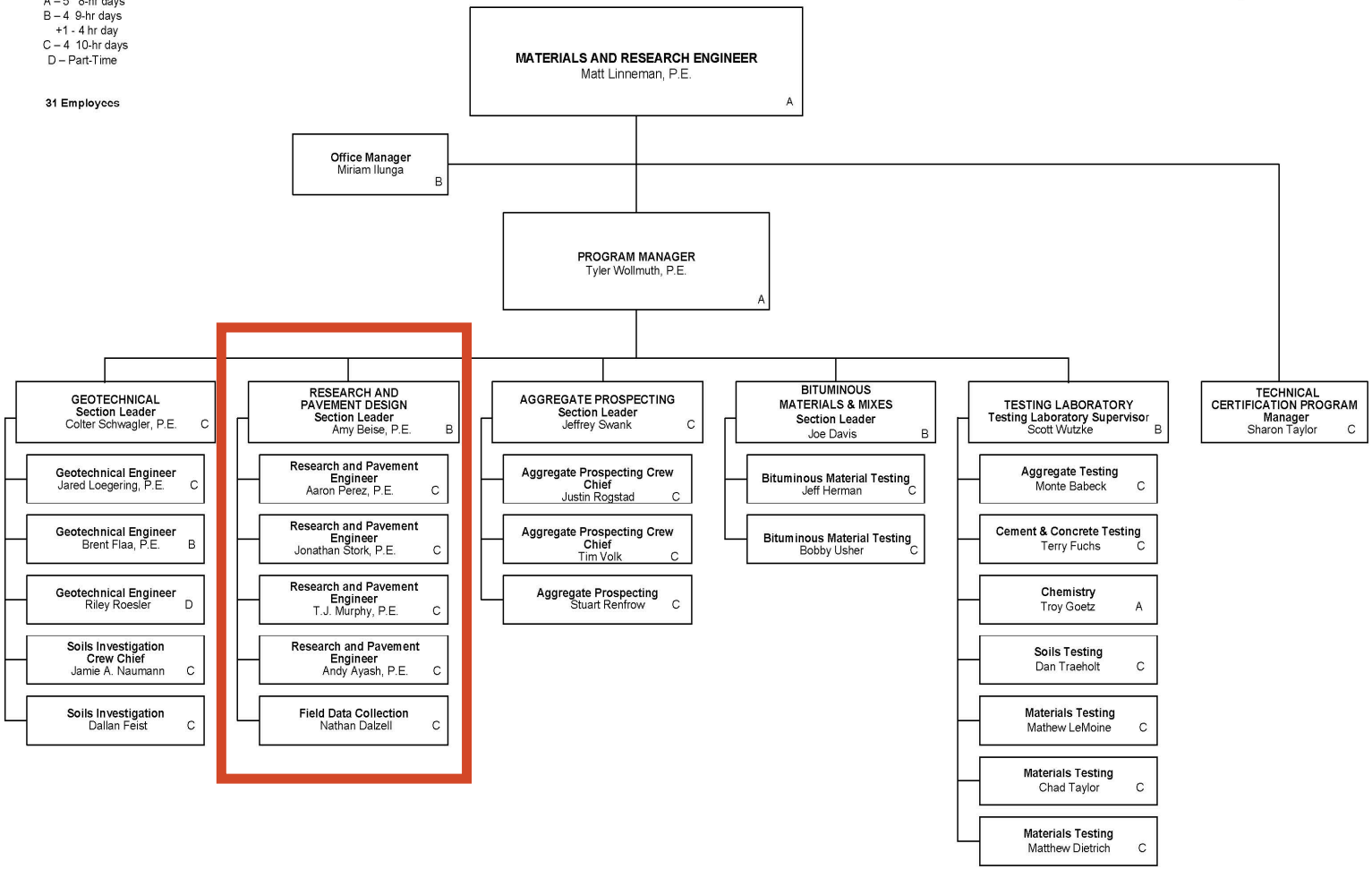
Be Legendary.

MATERIALS AND RESEARCH DIVISION
300 Airport Road, Bismarck, North Dakota 58504-6005
Organizational Chart – March 2022

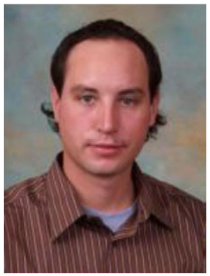
Mission Statement:
Assure the quality, economy, and reliability of highways and structures through the performance and innovative use of materials and technology.

Work Schedules
A – 5 8-hr days
B – 4 9-hr days
+1 - 4 hr day
C – 4 10-hr days
D – Part-Time

31 Employees



Amy Beise, PE
Section Leader



TJ Murphy, PE
Transportation Engineer

RESEARCH PROGRAM STAFF

- Research (25-35%)
- Pavement Design (25-35%)
- Spring Load Restrictions (10-15%)
- Project Profiling (10-15%)

Nathan Dalzell
Field Crew

Aaron Perez, PE

Transportation Engineer

Jon Stork, PE
Transportation Engineer

Andy Ayash, PE

Transportation Engineer

STRENGTHS AND WEAKNESSES

Strengths

- Multi functional staff
- Communication

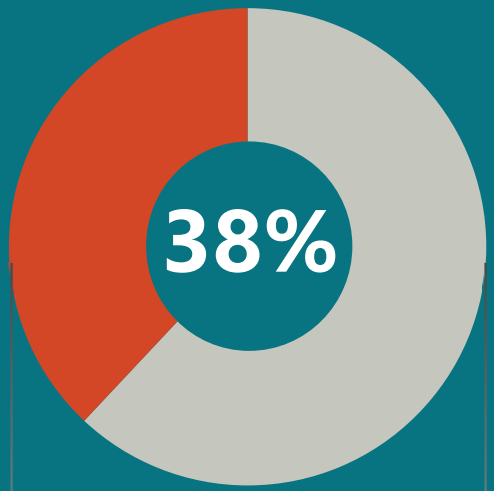
Weaknesses

- Productivity
- Lack of time dedicated to specific task
- Implementation

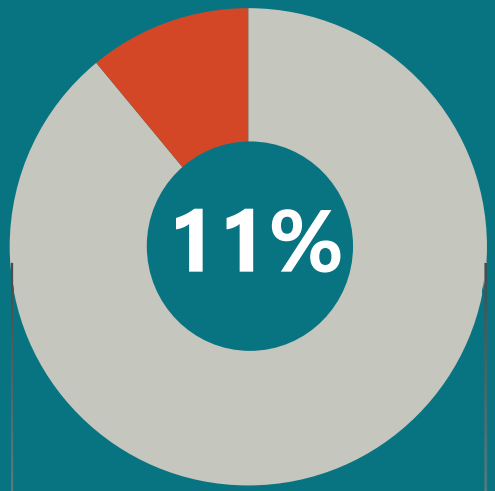
2022 Construction

$391.3 M*

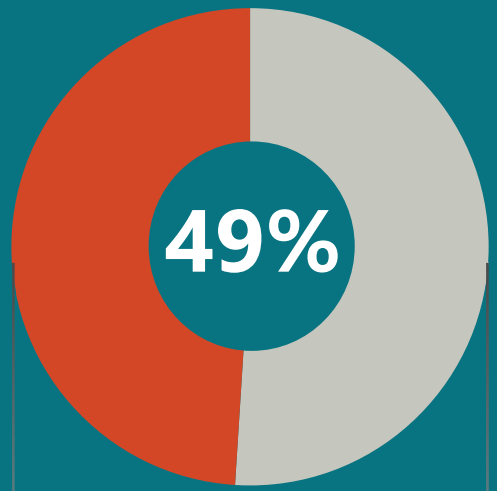
*Projects Bid Oct 2021- April 2022



Asphalt
$148.5 M
38% Total Bids



Concrete
$41.3 M
11% Total Bids



Total Pvmts.
$189.8 M
49% Total Bids

HOW WE CONDUCT RESEARCH…

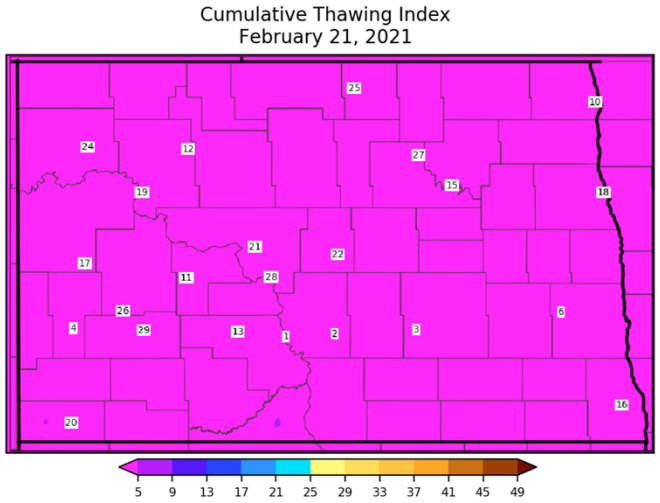
- FHWA Pooled Funds
- University
- Internal

TPF TRANSPORTATION POOLED FUND

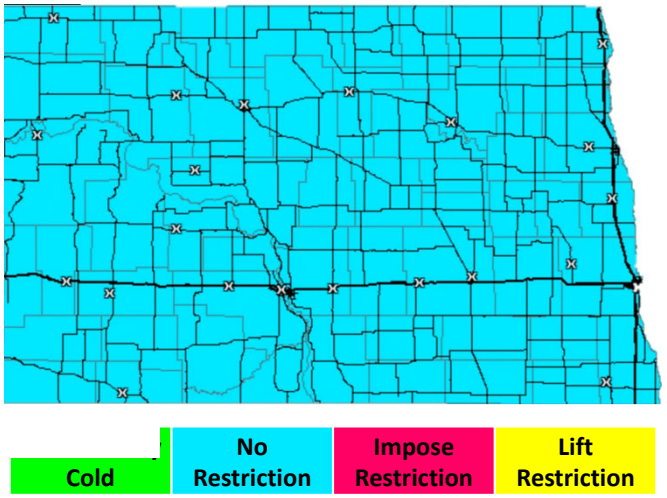
TPF No.	TITLE
TPF-5(354)	Improving the Quality of Pavement Profiler Measurement
TPF-5(439)	Technology Exchange on Managing Pavements
TPF-5(443)	Continuous Asphalt Mixture Compaction Assessment using Density Profiling System
TPF-5(448)	Integrating Construction Practices and Weather Into Freeze Thaw Specifications
TPF-5(399)	Improve pavement surface distress and transverse profile data collection and analysis, Phase II
TPF-5(471)	Real-time monitoring of concrete strength to determine optimal traffic opening time
TPF-5(437)	Technology Transfer Concrete Consortium
TPF-5(465)	Consortium for Asphalt Pavement Research and Implementation (CAPRI)
TPF-5(466)	National Road Research Alliance - NRRA (Phase-II)
TPF-5(478)	Demonstration to Advance New Pavement Technologies Pooled Fund

SPRING THAW DAMAGE

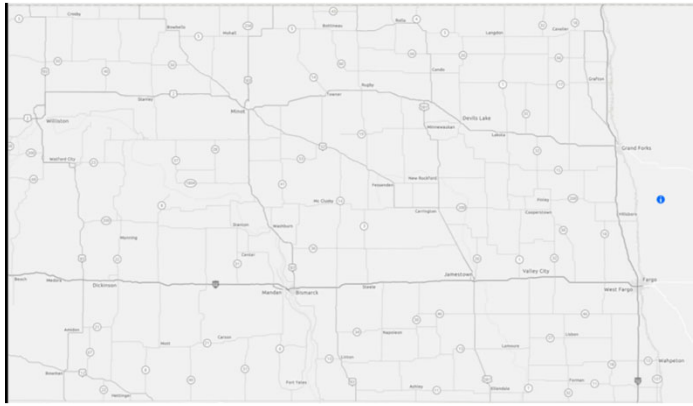
MnDOT



FrezTrax



NDDOT Restriction Orders



UNIVERSITY OF NORTH DAKOTA
COLLEGE OF ENGINEERING & MINES

UNIVERSITY

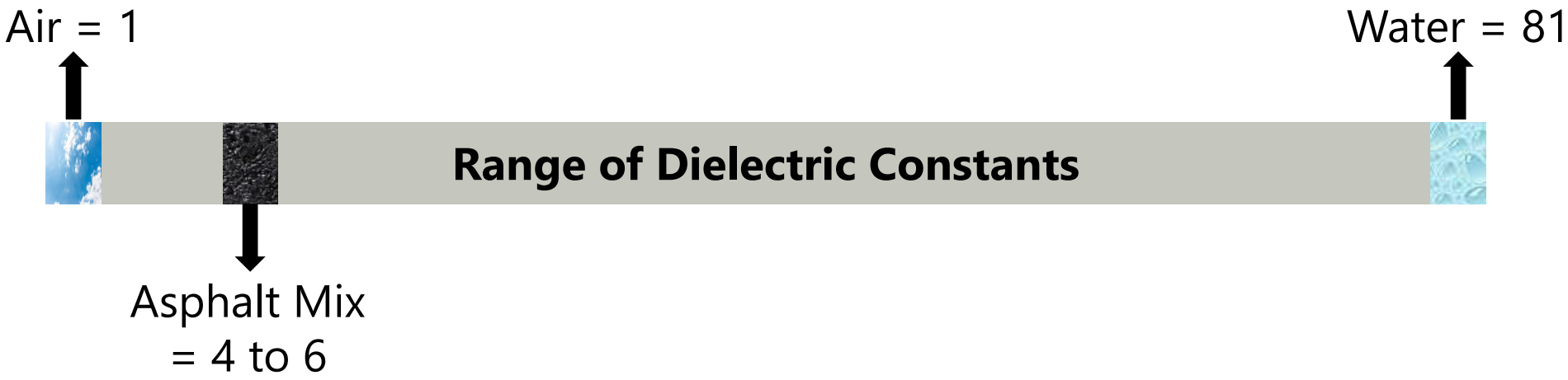
- Hydronic Snow-Melting Technique for Concrete Pavements
- Developing Balanced Mix Design Gyrations (Ndesign) for North Dakota's HMA Pavements
- Generating Binder and Mixture Inputs in Pavement ME (AMPT)

INTERNAL

- Density Profiling Systems
- Unbound Base Specifications
- Balanced Mix Designs

DENSITY PROFILING SYSTEMS

DIELECTRIC MEASUREMENT



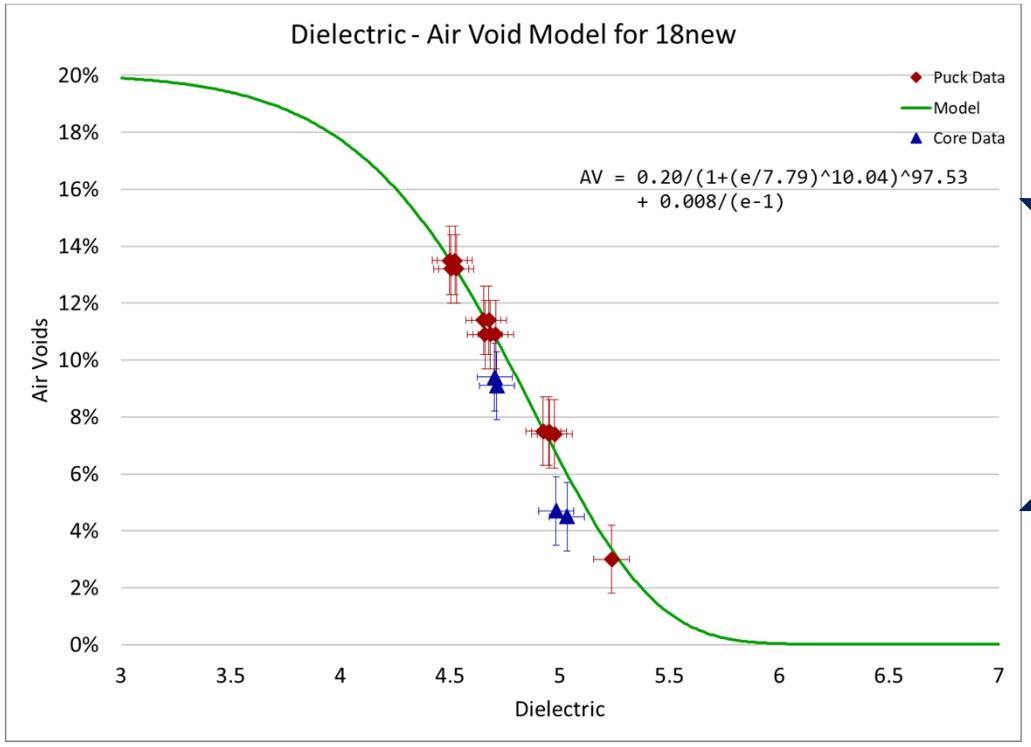
Variable

Constant

Constant

DIELECTRIC MEASUREMENT

Coreless Calibration Curve

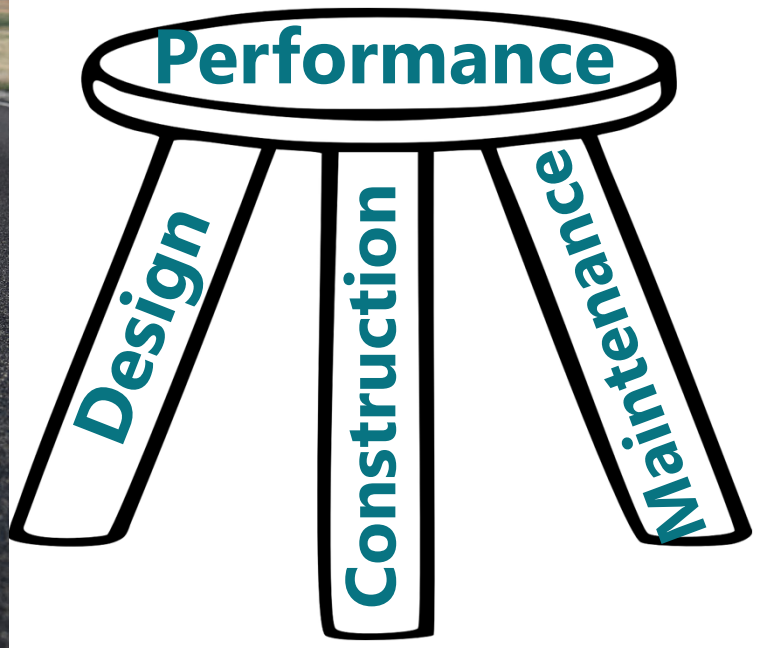


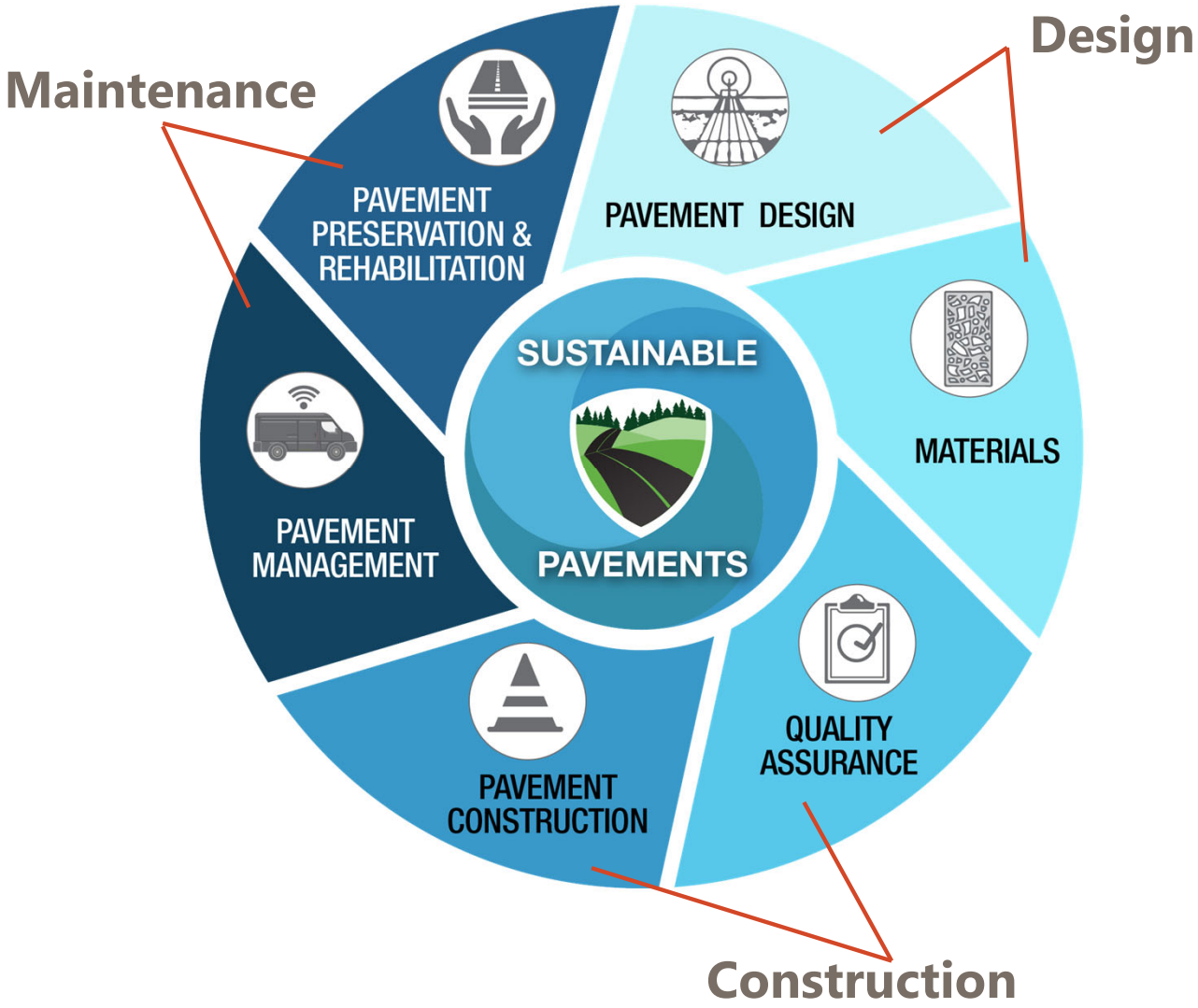
Dielectric Values = Densities

Dielectric Values = Densities

HOT MIX ASPHALT ADVANCEMENT GROUP

- Diverse Internal Team
- AGC – HMA User Producer Group
- Purpose – Discuss Advancements




Maintenance
Design
PAVEMENT PRESERVATION & REHABILITATION
PAVEMENT DESIGN
SUSTAINABLE
PAVEMENTS
MATERIALS
PAVEMENT MANAGEMENT
QUALITY ASSURANCE
PAVEMENT CONSTRUCTION
Construction


URGENT
NOT URGENT
IMPORTANT
NOT IMPORTANT
CRISIS
GOALS AND PLANNING
INTERRUPTIONS
DISTRACTIONS

NEW PRODUCT EVALUATION

- National Level – NTPEP

- Agency Level
  - NDDOT does not have an approved product list
  - Consideration form on website
  - Transportation Innovation Program (TRIP)
  - Research

NORTH Dakota | Transportation
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QUESTIONS?

Amy Beise, P.E.
NDDOT Research Manager abeise@nd.gov

APPENDIX D. RHODE ISLAND – TRANSPORTATION RESEARCH AT DOTS: THE ROLE OF MATERIALS AND PAVEMENT SECTIONS

Transportation Research at DOTs:
The Role of Materials and Pavement Sections

By: Colin A. Franco, P.E.

RIDOT Assoc. Chief Engineer

Vermont AOT Research Peer Exchange

June 7, 2022

Story of Transportation Research

1890's – Started with LAW (_____????_____)

- LAW convinced rural folk (farmers) that better roads would be good for all.

1900 – Office of Road Inquiries (ORI) –{pre BPR and FHWA }

- Repository for technical info on road construction
- Operated materials testing lab for pavement materials (soils, concrete, asphalt)

1914 – AASHTO formed

- Assisted with 1916 Federal Aid Road Act (initial national funding for roads).

1921 – AASHTO and NRC agree to cooperate

1962 – NCHRP created by AASHTO/TRB/FHWA

- Inspired by the AASHTO road test (1956)

Early Transportation Research Initiatives

1900 – Office of Public Road Inquiries (ORI) { later BPR FHWA}

- Materials lab in DC to test rock, soils, concrete, oil, asphalt

1920 – Call by AASHTO/Universities for BPR to launch large-scale long-term research in pavement ,materials & construction

1922 – TRB (Advisory Board) with FHWA/AASHTO/ASTM /others
(For runner of the NCHRP)

- Six areas of research
  1. Economic theory of highway improvement
  2. Structural design of roads
  3. Test and road materials
  4. Construction
  5. Maintenance
  6. Bridges and Culverts

Early Transportation Research Initiatives (Cont.)

1948 – AASHTO road test planning w/ TRB

1956-1960 – AASHTO road test -construction and data collection

1962 – NCHRP created by AASHTO/TBR/FHWA- as a result of the successful AASHTO Road test program.

- Currently it has 25+1 areas of study

NCHRP Research and Its Metamorphosis

- Initially Transportation Research by TRB (Advisory Board)
- Consisted of six areas (see slide 3) that to a large extent dealt with materials/pavements/bridges (m/p/b)
- A review of the first 50 NCHRP projects show 26 out of 50 (52%) were (m/p/b)
- The last round of NCHRP projects selected (FY 2023) show 6 out of 59 (10%) new projects are (m/p/b)

Keep this in mind!!

Regional Research NETC

1988 – 5 New England states and the MIT started the New England Transportation Consortium in the late 80's

- State representatives initially were from planning/research/materials

1996 – NETC invited Conn DOT to join and parted ways with MIT

- Representatives were from planning/research/materials
- However, the initial projects were overwhelmingly materials/pavements/structures

Peer State Research - ConnDOT

1980's – Research under Research Materials Offices at Rocky Hill

- In house research
- Partnered with UConn through MOU

The research unit had a pavement conditions (photo log) section that conducted conditions assessments

Transportation Research with UConn initially was largely M/P/ Structures

Peer State Research - Maine

- Maine research effort was initially housed at the DOT laboratories at Umaine
- It also began as a unit of Materials and Research
- Project data indicates the following:
  - (1980)Initial projects 20 out of 26 (77%) were M/P/B, which is similar to the latest recent (2018) project data.

RIDOT Research – Down Memory Lane

1980's – Conducted by Planning in the mid 1980's- RIDOT ADMIN DIV

1993 – Post ISTEA: under Research and Product Evaluation-RIDOT ENG DIV
- Worked closely with Materials & Bridge

2008 – Under Materials and Research -RIDOT ENG DIV
- The 2 sections were united

2018 – Shunted off to Planning -RIDOT ADMIN DIV

RIDOT Research – Down Memory Lane (Cont.)

Pre-1993 – Research conducted informally by co-op agreement between RIDOT Planning and URI.

1993 – Research Program formalized- RIDOT Research/URI Engineering(MOU)

2008 – RIDOT Materials and Research Partnered with URI School of Business

2019 – Planning takes over research effort.

2019 – Planning conducted an automated vehicle program with a private vendor($$$$)

- Limited Funding –resulted in smaller program with URI
- Process of Rebuilding Research Program w/ multi institutions

RIDOT Research – Project Data

1993 -The research Program consisted of mainly “basic” research projects in the areas of Materials /Pavements/ Bridge (M/P/B) with a few Environmental and miscellaneous topics.

Of the first 25 projects 17 (68%) were M/P/B

Of the last 25 projects (2019), 8 (32%) were M/P/B projects

NB> It is to be expected that with the expansion of transportation issues , research would expand to other ‘areas’.

Conclusion

Materials/Pavements units in Transportation Research

Research in the modern transportation era (circa 1900's) was necessitated by the urgent need for durable, hard surfaced all weather roads to be used by bicycles, cars, trucks etc.

a) Building Good roads, required the use of sound Engineering knowledge based in Science, for the selection of good paving Materials, Pavement designs, Construction processes and Quality Assurance. As such, it was natural that Materials and Pavement/Bridge practitioners take the reins of research- right up to the time the Interstate system was built(Mid 1980's)

b) 1991 Hwy Act – ISTEA saw the institutionalization of transportation research in every DOT. This coincided with the expansion, complexities and diversification of Transportation which created issues that 21-century transportation had to face-e.g. Intermodal, environmental, congestion, security, diversity, policy, UAVs , auto-connect vehicles etc.- which brought about the obvious need for DOT researchers to include and work with stakeholders from these diverse disciplines from within, and external to-the DOT's.

Conclusion (Cont.)

Role of Matls., Pavts., Bridge.

- Implementation of New materials, designs, construction processes etc., into a Project are accomplished through the Five PART AASHTO construction specification i.e.
- Introduction
- Materials
- Construction,
- Method of Measurement
- Method of Payment.

The drafting of these specs suggests a critical role for M/P/B folks who would/should be well versed in the technology being implemented.

APPENDIX E. NORTHWESTERN UNIVERSITY – EVALUATE RESEARCH IMPACTS!

Evaluate Research Impacts!

Vermont AOT Research Peer Exchange
Qualitative and Quantitative Research Evaluation

Joseph L. Schofer
Professor Emeritus – Northwestern University
June 14, 2022

Informed by work on NCHRP 20-44(09)

- **Quantitative and Qualitative Methods for Capturing the Impacts and Value of NCHRP Research**
- **Texas Transportation Institute:**
  - **Johanna Zmud, Tina Geiselbrecht, Nicole Katsikides, Chris Simek, Paul Anderson**
- **EBP US:**
  - **Peter Plumeau, Glen Weisbrod, Scott Middleton**
- **Northwestern University**
  - **Joseph Schofer**

Evaluating the Impacts & Outcomes of (Transportation) Research

- **Why do it?**
  - **Manage research program**
    - **Set, revise program directions**
    - **If we do not know impact, we cannot know value**
    - **Knowing value grows, sustains support for program**
    - **Accountability**
- **Who cares?**
  - **Program managers**
  - **Investors – money could be used in other ways**
    - **DOT leadership**
    - **General leadership – governors, legislators**
    - **(Some investors require *ex post* evaluation as basis for future funding)**

What Aspects of the Research Program Do People Care About?

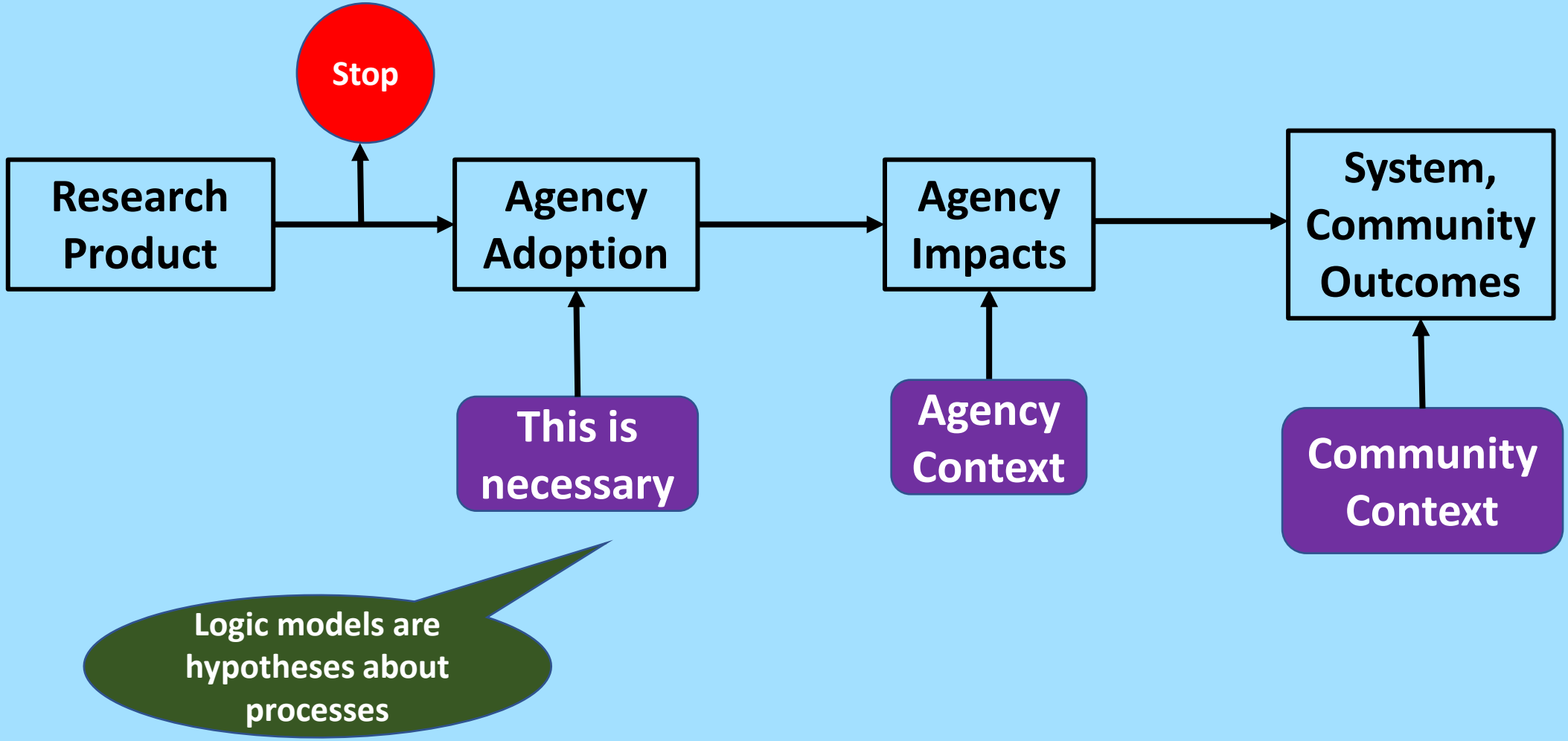
- Program management issues - internal
  - Level of activity
  - Scope of activity – subjects covered
  - Productivity
    - On time, on budget
    - Products produced
- Program impacts, value produced - external
  - Problems solved, costs reduced
  - Changes implemented
  - Who, what is affected

How Does Research have Impact?

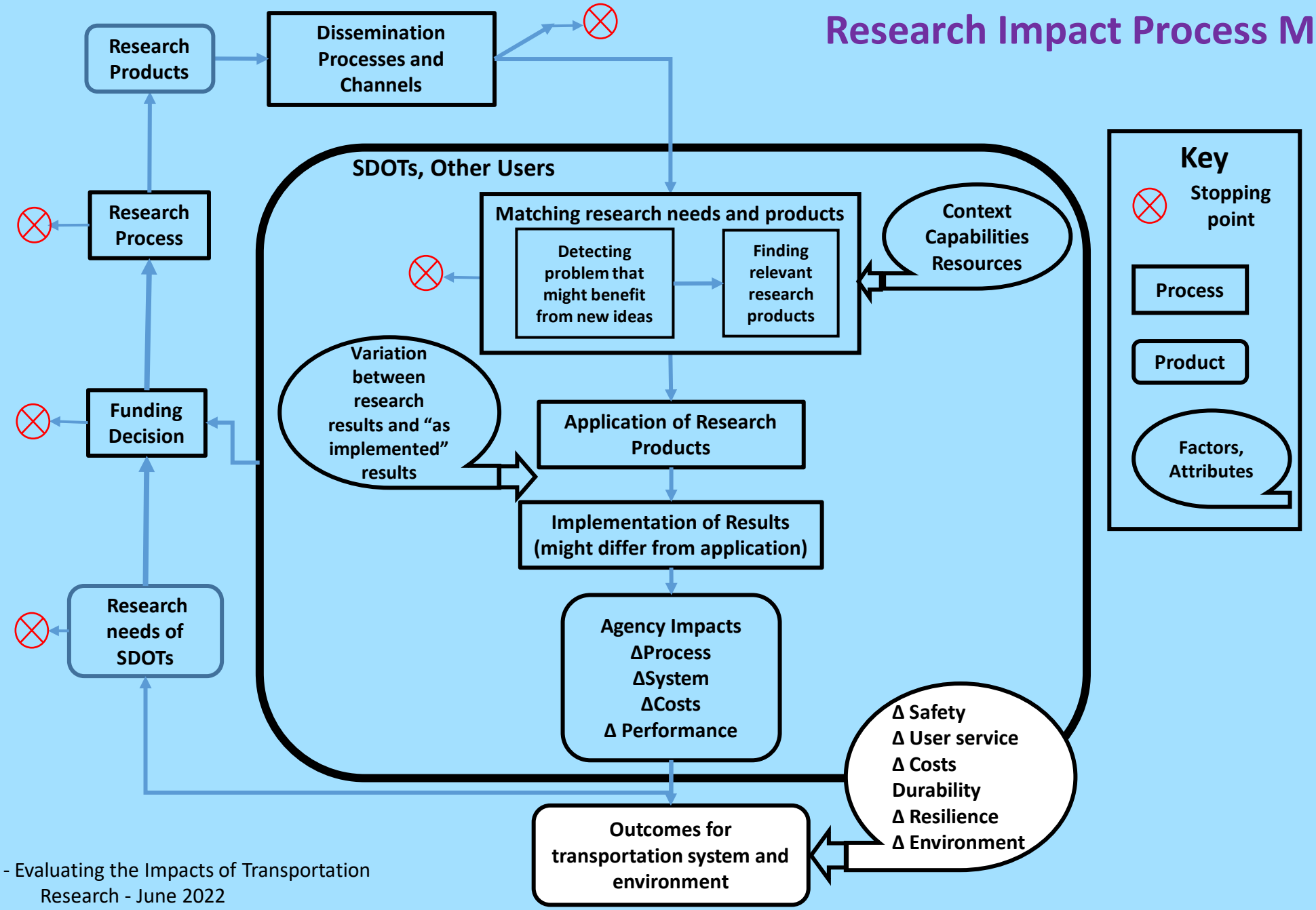
- Change methods, tools, materials – internal
  - Introduce new methods, tools, materials
  - Eliminate inefficient, ineffective methods…
  - Change organizational structure
  - Change personnel skill mix
  - …
- System changes from changed methods, tools, materials change - external
  - Better performance, increased safety, satisfaction

To produce impact, something has to happen as a result of the research – beyond producing a report

Logic or Process Models Help Explain, Guide Search for Research Impact, Value

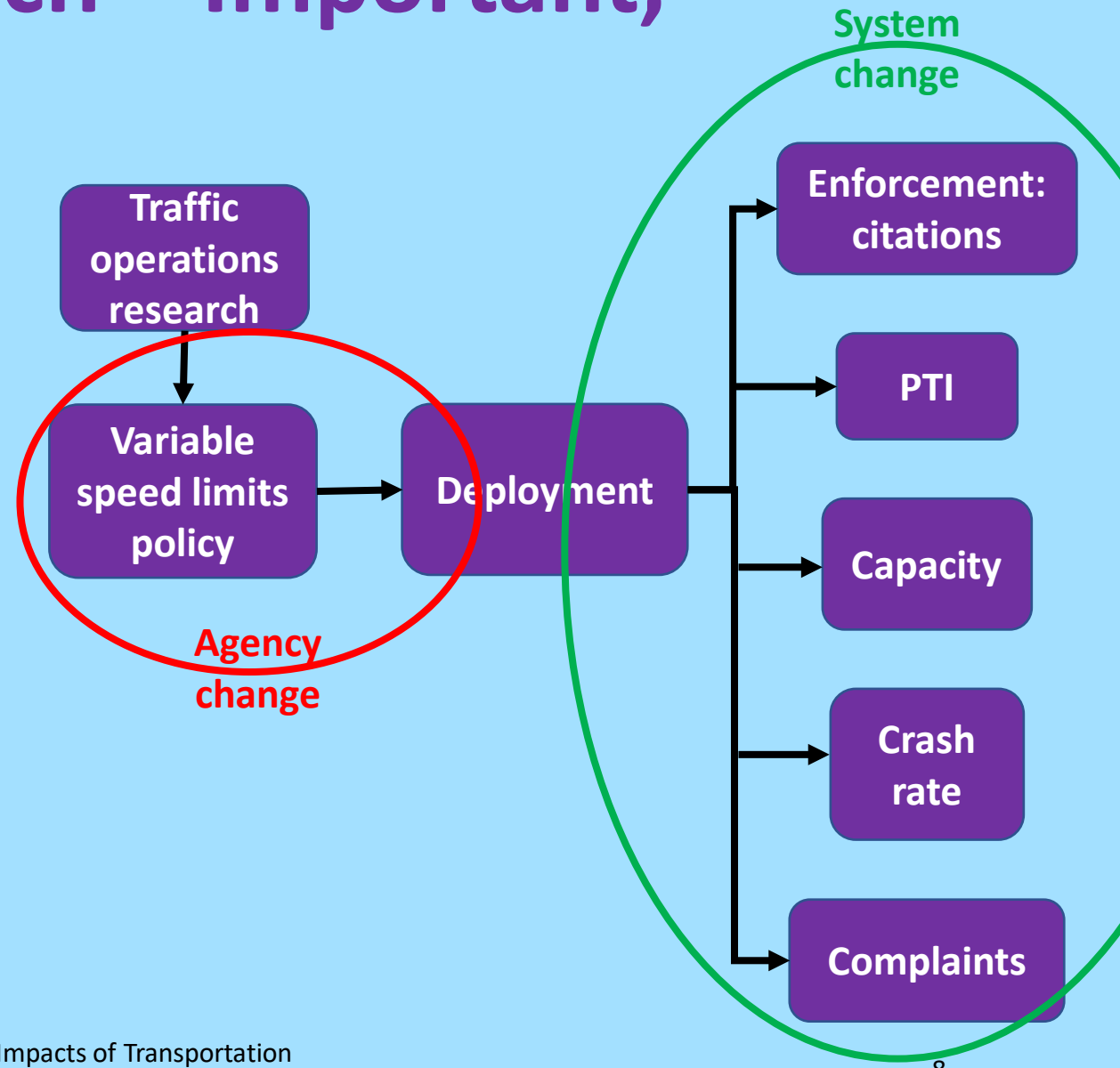


Research Impact Process Model



Outcomes from Research – Important, challenging

- Some research targets only/mainly agency operations
  - Relatively easy to detect, measure, value changes
- Much research aims to change the transportation system, user experience, community outcomes
  - Customers care about this
  - So do their elected officials
  - These outcomes are harder to measure, value



Finding the Impacts and Outcomes of Research

- The search for impacts and outcomes is an informed search
- Guides include
  - Hypotheses, expectations, objectives of the research
  - Logic models
  - Experience

Agency Impacts and Metrics - Examples

Agency (Internal) Impact	Type of Measure	Potential Metric
Knowledge increase	Qualitative	Benefit of new knowledge gained
Engineering/administration savings (planning/design costs, paperwork)	Quantitative / qualitative	Described or quantified cost/time savings from process/practice improvement; product quality improvement
New design technical standard	Quantitative	Extension in life cycle or decreased life-cycle costs
Construction savings	Quantitative	Δ $ agency savings (labor, equipment, and time)
Agency operation/maintenance savings	Quantitative	Δ $ agency savings (per worker or per week/month or per assignment, task, or project)
Better decision support	Qualitative	Improvement in decision efficiency; effectiveness of data and analytical tools for supporting agency decisions
+ Worker safety	Quantitative	Δ rate of agency worker injury (per worker or per week/month), number of workers affected
+ Worker productivity	Quantitative	Δ agency performance (above) per worker; number of workers affected
+Workforce development	Qualitative	Extent to which agency staff perceive improvements attributable to training/education
+Workforce diversity	Quantitative	Δ ratio of participation by minority or disadvantaged population groups; number affected

Logic model helps define these benefit *bins* in advance

Community/System Outcomes and Metrics - Examples

External Impact	Type of Measure	How Measured
System performance	Quantitative	Δ in transport level of service, reliability, speed, delay, number served, and connectivity
System cost	Quantitative	Δ $ user savings (per capita, trip, vehicle-mile, or passenger-mile)
System revenue	Quantitative	Δ $ revenue generated (per capita, trip, vehicle-mile, or passenger-mile)
System safety	Quantitative	Δ rate of crashes, injury, or fatalities (per vehicle-mile or passenger-mile)
System productivity	Quantitative	Δ $ outcome/$ invested (cost-effectiveness)
Environment	Quantitative	Δ emissions rate (for air or water), noise, or regional quality index
Quality of life	Quantitative/ qualitative	Δ index or rating for traveler comfort or broader quality of life; assessment by community leaders and stakeholders
Equity	Qualitative/ quantitative	Δ availability and quality of service for under-served groups (relative to well-served groups)
User satisfaction	Quantitative	Δ satisfaction rate from surveys

Logic model helps define these benefit *bins* in advance

Measuring Outcomes – Metrics

- Monetary
  - Market values
  - Willingness to pay
  - Behavioral indicators
  - Stated preference surveys
  - Policy-based e.g., statistical life, VOT
- Quantitative
  - Counts, measurements
    - Quantities (materials, injuries…)
  - Quantities saved and the counterfactual
    - If no research, no implementation

- Communicating qualitative outcomes
  - Written descriptions
  - Pictures
  - Opinions
    - Stakeholder quotes
  - Triangulation – multiple observers, reporters
    - To manage bias
  - Case studies – in-depth

Measuring Outcomes – Data Sources

- Outcomes may be far off in distance and time
  - The “not my problem” problem
- Data sources
  - Streaming (automatic, continuous data)
  - Administrative records
  - Special data collection efforts
    - E.g., traffic surveys, field inspections
  - User, community surveys
- Surrogates and early warnings
  - Indicators, precursors
    - Citations for crashes
- Don’t be distracted by low hanging fruit
  - Opt-in surveys vs sample surveys

Complications

- Verification – what was the actual intervention?
  - Did agency processes really change
  - Was the change what the research recommended?
    - Need to monitor, e.g., as-built plans: what was done
- Attribution – did the research implementation cause the impact, outcome?
  - Confounding factors (e.g., shifts in traffic patterns, natural hazards, pandemic)
  - Detecting patterns (e.g., crash rates)
- Latency – how long does it take for impacts, outcomes to occur, to be detectable
  - How fast can processes change?
  - Confounding factors
    - History, maturation
    - Persistence of the change
  - Patience, persistence, early answers, indicators
    - Tracking

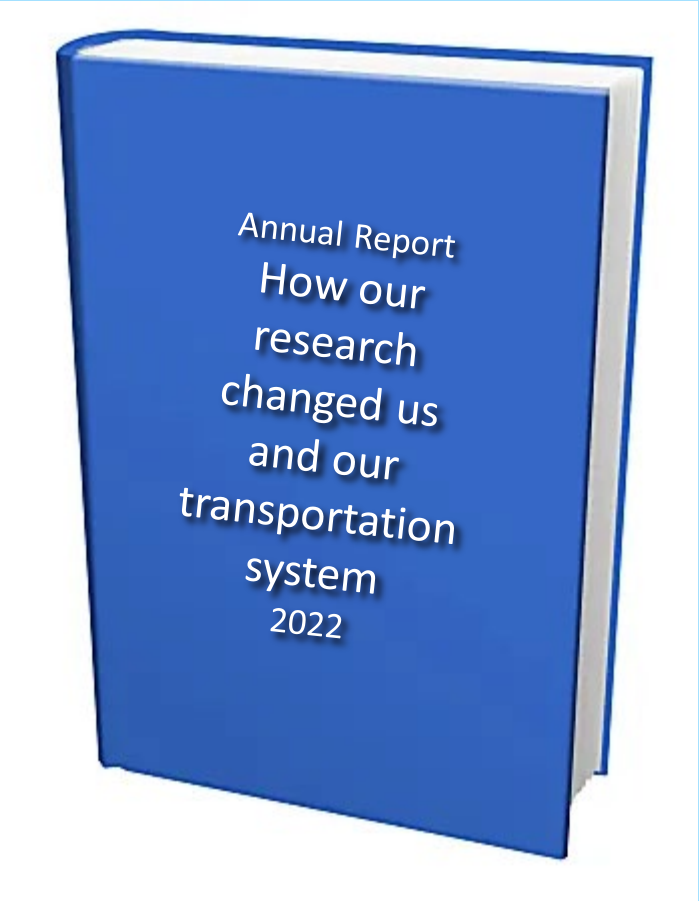
Aggregation of Impacts, Outcomes

- Everyone wants single score, grade
  - E.g., BCA
- Requirements
  - Identify all outcomes
  - Common metric - $$
- Disadvantage
  - Partial picture
  - What is excluded might be important
- Decision makers usually broader
  - Few major decisions are based on scalar metrics

- Multi-dimensional products
  - Monetary/quantitative/qualitative
    - Narrative – stories, anecdotes, testimonials
      - Good for customers, voters, governors
    - Stories as wrappers
      - What does the boss care about?

Mainstreaming research impact evaluation

- Make research outcome evaluation routine, integral
- Consider: who is the audience?
  - Who do you want to be the audience?
- Track projects as they move into practice
  - Keep records of implementations
  - Invite implementors to record, report
- Sample for detailed analysis
  - The important stuff, not just the easy stuff
- Every implementation is a learning opportunity



Thank you!

Joseph Schofer

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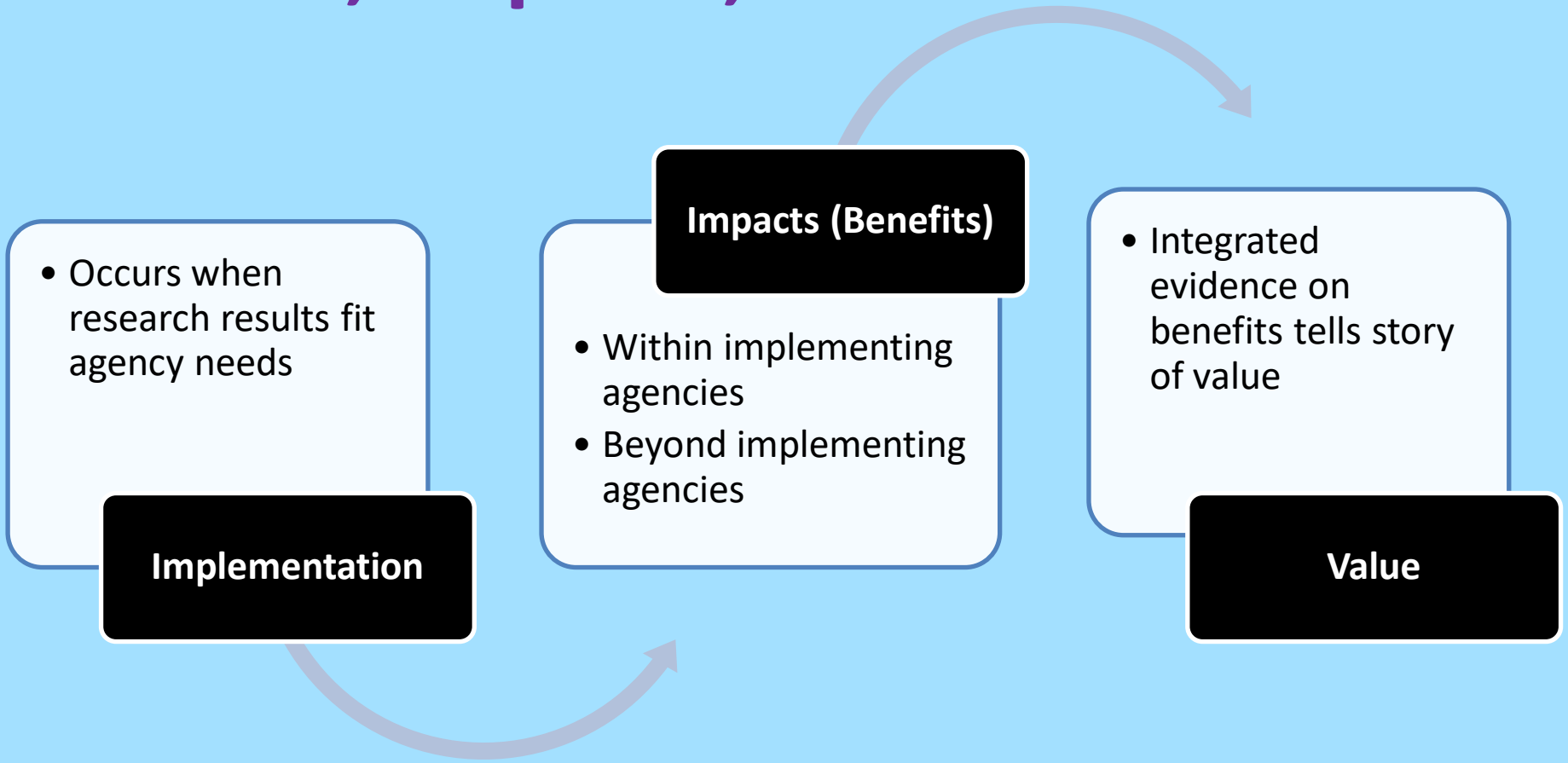
Extra Slides Follow

5-step Research Evaluation Process

1. Select studies. Every two years, select sample of research products for assessment.
2. Find implementations of selected studies. Conduct evaluability assessment to determine if it is feasible and worthwhile to pursue impact assessments.
3. Identify expected impacts and outcomes. Use logic model, experience to identify expected internal and external impacts to look for.
4. Collect and analyze data on impacts, outcomes. Apply a quantitative (mostly economic) and qualitative data gathering and analysis as appropriate. Limit primary data collection and rely on information from existing data sources.
5. Communicate value. The multidimensional nature of contributions of research makes quantifiable valuations difficult. The findings of internal and external research benefits may best be communicated through narrative stories. Well-written stories can effectively communicate the experiences and observations of those involved in implementations and what resulted from them, providing insight and understanding beyond quantification and giving context to implementation activities and impacts.

Implementation, Impacts, Value



Evaluability Assessment

Screener Question	Answer	Recommended Action
1. **Is there an agency representative who is knowledgeable about the implementation and willing to support the impact assessment?**	If NO, then…	Drop from sample
1. **Are there factors outside of the implementation setting that could prevent the implementation from generating internal or external benefits?**	If YES, then…	Consider what these factors are and the extent to which they negatively impact the assessment; if extremely problematic, drop from sample
1. **Has the implementation reached a sufficient level of maturity to generate expected internal benefits?**	If NO, then…	Consider when timing could be right; if too long, drop from sample or set aside for future consideration
1. **Has sufficient time passed so that data on external impacts for an implementation can be obtained? Do these data exist?**	If NO, then…	Consider assessing internal impacts only
1. **Are there other operational difficulties that would make impact assessment for this implementation particularly difficult and/or costly?**	If YES, then…	Drop from sample

APPENDIX F. FHWA – RESEARCH AND TECHNOLOGY (R&T) EVALUATION PROGRAM

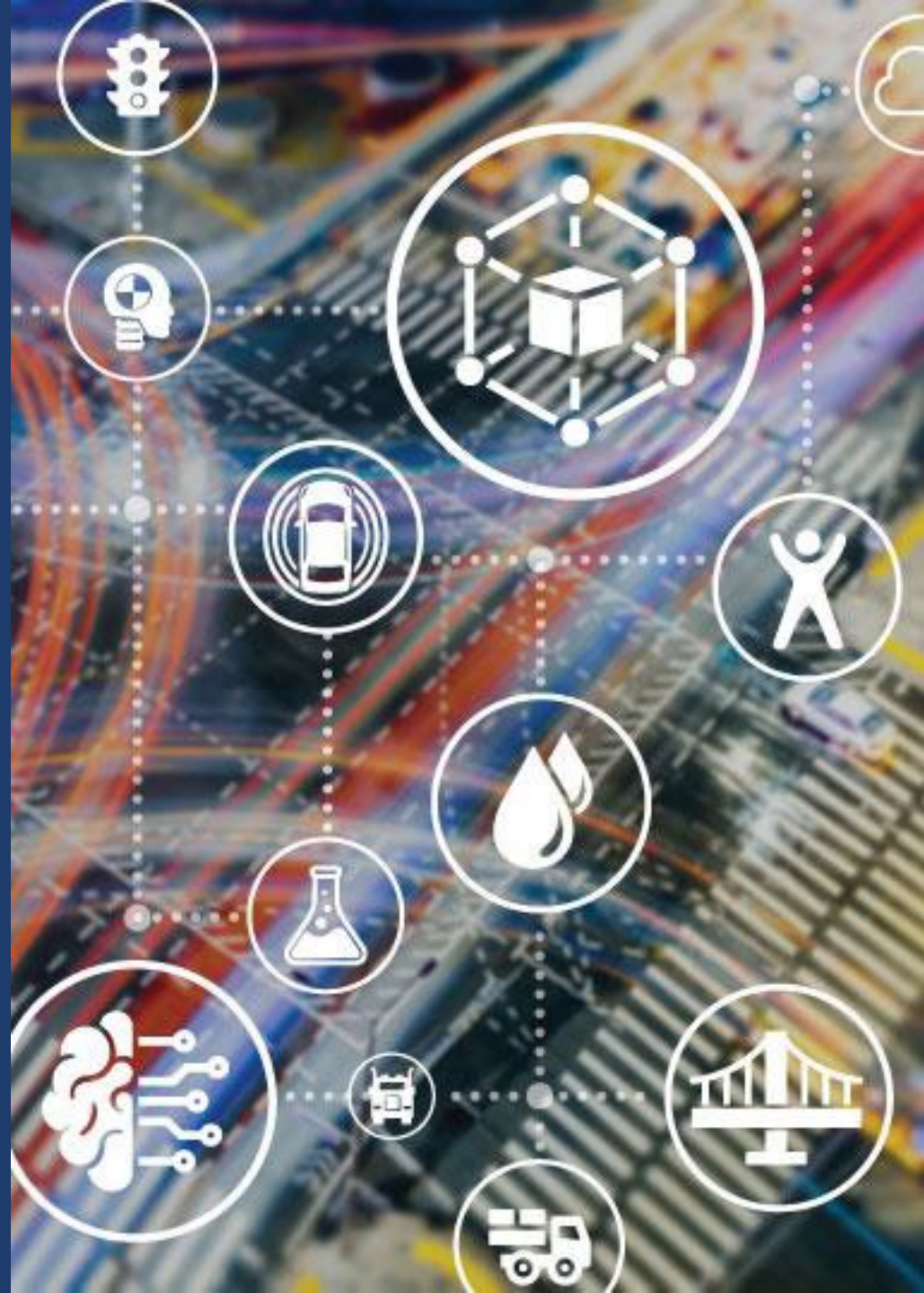
U.S. Department of Transportation
Federal Highway Administration

Turner-Fairbank
Highway Research Center

Research and Technology (R&T) Evaluation Program

Mary Huie
Tech Transfer and Innovation Management Program Manager,
Office of Corporate Research, Technology, and Innovation Management
Federal Highway Administration

June 14, 2022



Agenda

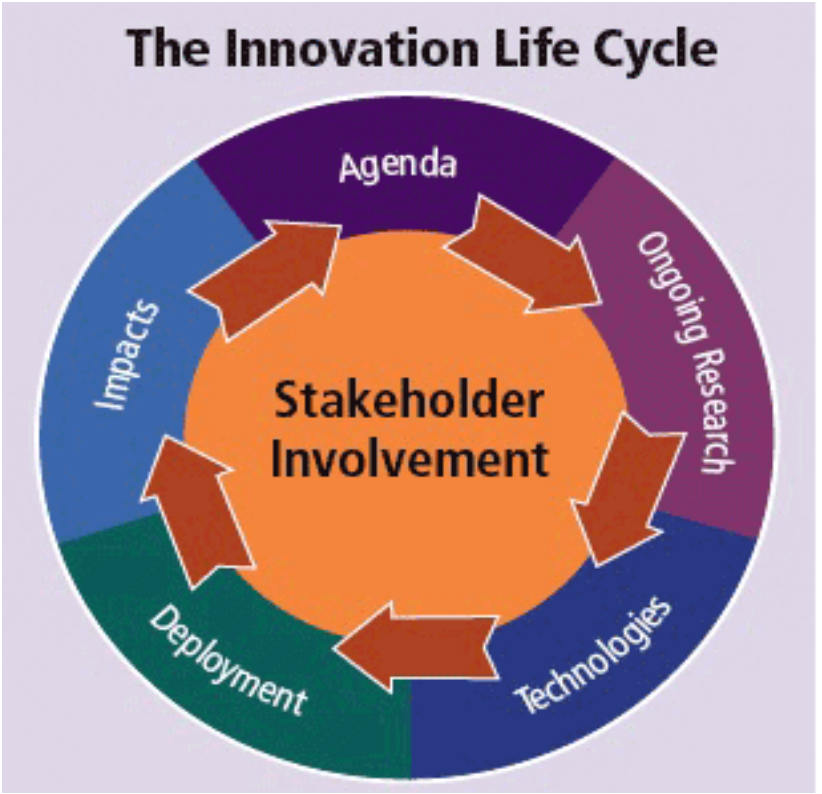
- Program Overview
- Evaluation Process
- Select Projects and Findings
- Cross-Cutting Recommendations

Program Overview

U.S. Department of Transportation
Federal Highway Administration
Turner-Fairbank
Highway Research Center

R&T Program Evaluation Purpose

- Document the impact of the project.
- Demonstrate accountability to funders and policymakers.
- Identify lessons learned and best practices that can be applied to future projects/programs to complete the innovation lifecycle.



Source: FHWA.

Sample Topics Covered

- Adaptive signal control technologies (2016).
- Gusset plates (2016).
- National household travel survey (2016).
- Roadside revegetation (2016).
- Roundabouts (2016).
- Public-private partnership capacity building (2017).
- Innovative intersection design (IID) (2020).
- Truck platooning (2020).
- Exploratory advanced research (2022).*

*Final report is pending publication.

Evaluation Process

U.S. Department of Transportation
Federal Highway Administration
Turner-Fairbank
Highway Research Center

Evaluation Planning – Evaluation Matrix

Researchable/Evaluation Question(s)	Information Required and Sources	Scope and Methodology	Limitations	What This Analysis Will Likely Allow Evaluators to Say
What questions is the team trying to answer? (Specific questions, measurable objective, neutral)	*What information does the team need to address each EQ? Where will they get it* (Documents/types of information, databases, studies, SMEs, models)	*How will the team answer each evaluation question?* (Strategies for collecting information or data, planned scope of each strategy, analytical techniques to be used — e.g., regression/ BCA/modeling/descriptive analysis, etc.)	*What are the design's limitations and how will it affect the product?* (e.g., questionable data and/or reliability, inability to access certain types of data, difficulty showing direct causation)	*What are the expected results of this work?* (What will the evaluation will be able to say? Does the answer match column one?)

Source: FHWA.

BCA = benefit cost analysis; EQ = evaluation question; SMEs = subject matter experts.

Evaluation Process Overview

- Researchable/evaluation questions:

  The questions the evaluation team is trying to answer.

- Information required and sources:
  - The information the team needs to answer the evaluation questions.
  - Where to get the information.

- Scope and methodology:

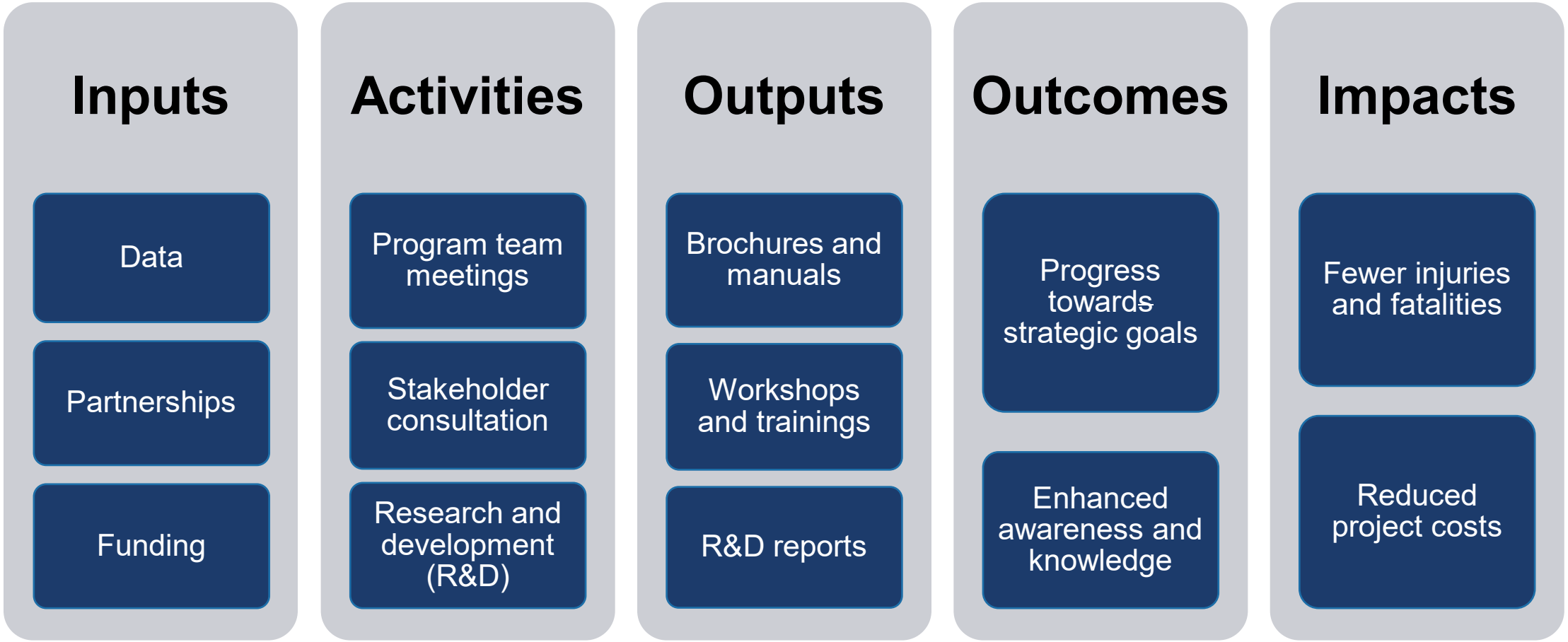
  How the team will answer the evaluation questions.

Evaluation Process Overview (Continued)

- Limitations:
  - The design's limitations.
  - How the design will affect the product.
- What the analysis will allow the evaluators to say:

  The expected results of this work.

Evaluation Planning – Example Logic Model



Select Projects and Findings

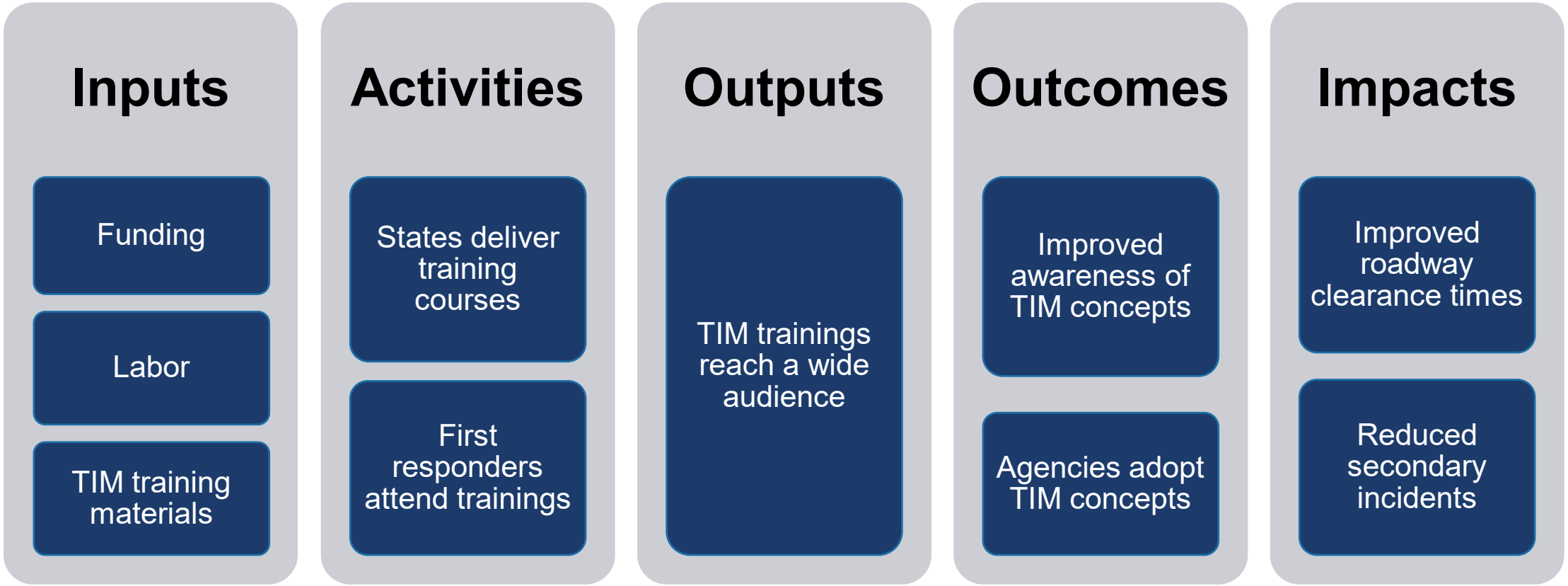
U.S. Department of Transportation
Federal Highway Administration
Turner-Fairbank
Highway Research Center

Traffic Incident Management (TIM)

Summary: To assess the effectiveness of Federal Highway Administration's (FHWA) TIM training program on spreading concepts to a wide incident-responder community, enhancing responder-agency practices, and improving safety.

Oregon Department of Transportation. 2016. "Outside Demonstration." Flickr. Available online: https://www.flickr.com/photos/oregondot/29234930144/in/photolist, last accessed May 17, 2022.

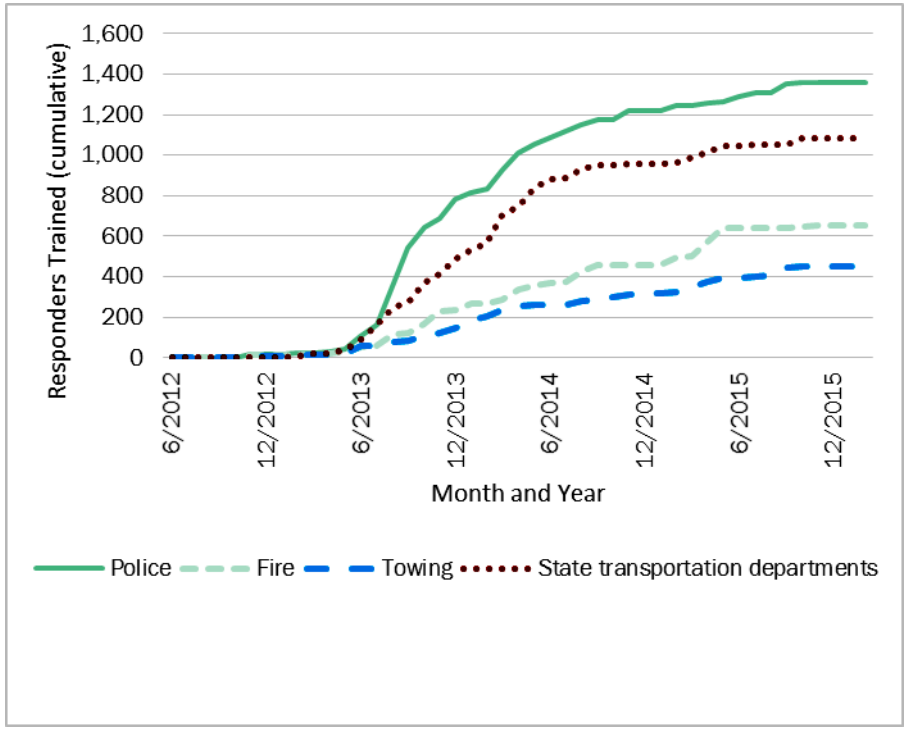
TIM Logic Model



Einstein, N., and J. Luna, 2018. *SHRP2 Traffic Incident Management Responder Training Program Final Report*. Report No. FHWA-HRT-18-038. Washington, DC: Federal Highway Administration. https://www. https://www.fhwa.dot.gov/publications/research/randt/evaluations/18038/18038.pdf, last accessed May 12, 2022.

TIM Select Findings

In Arizona, more than 3,000 responders attended TIM trainings over the course of the program.

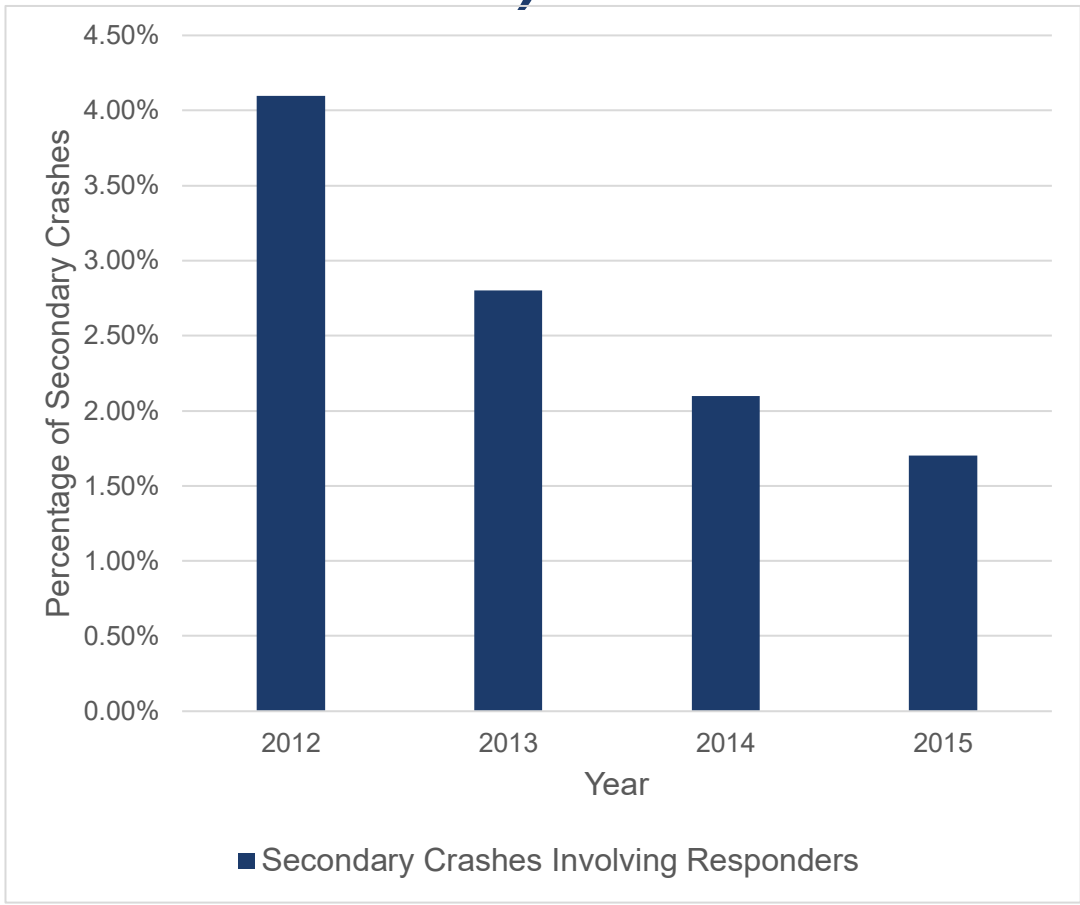


Source: FHWA.

Einstein, N., and J. Luna, 2018. *SHRP2 Traffic Incident Management Responder Training Program Final Report*. Report No. FHWA-HRT-18-038. Washington, DC: Federal Highway Administration. https://www. https://www.fhwa.dot.gov/publications/research/randt/evaluations/18038/18038.pdf, last accessed May 12, 2022.

TIM Select Findings (continued)

FHWA TIM trainings in Arizona were associated with a reduction in secondary crashes that affected responders despite increasing vehicle miles traveled.



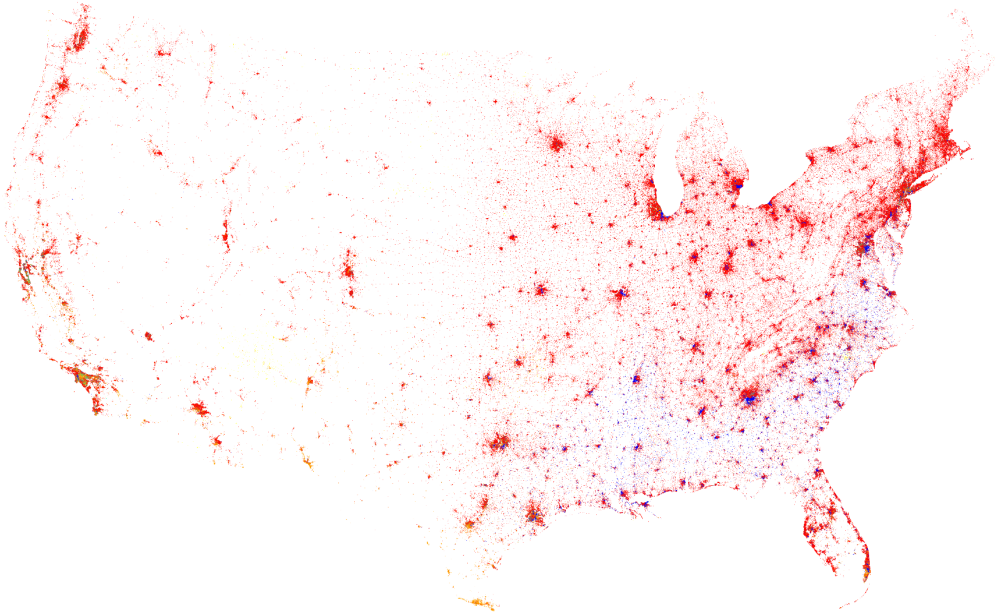
Source: FHWA.

Einstein, N., and J. Luna, 2018. *SHRP2 Traffic Incident Management Responder Training Program Final Report*. Report No. FHWA-HRT-18-038. Washington, DC: Federal Highway Administration. https://www. https://www.fhwa.dot.gov/publications/research/randt/evaluations/18038/18038.pdf, last accessed May 12, 2022.

National Household Travel Survey (NHTS)

Summary:

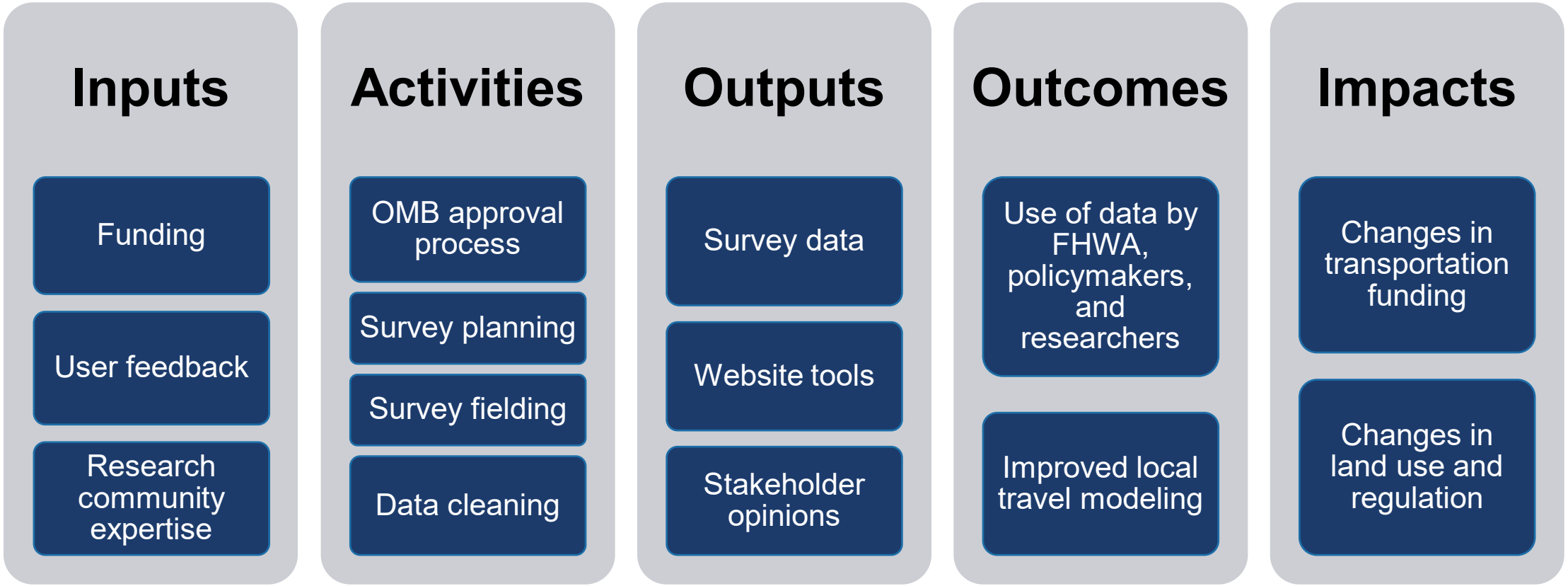
- Measure the breadth and depth of NHTS use.
- Assess the impacts of the NHTS on policymaking.
- Describe NHTS' responsiveness to its user community.
- Compile challenges and lessons learned.



Source: © 2011 Erica Fischer.

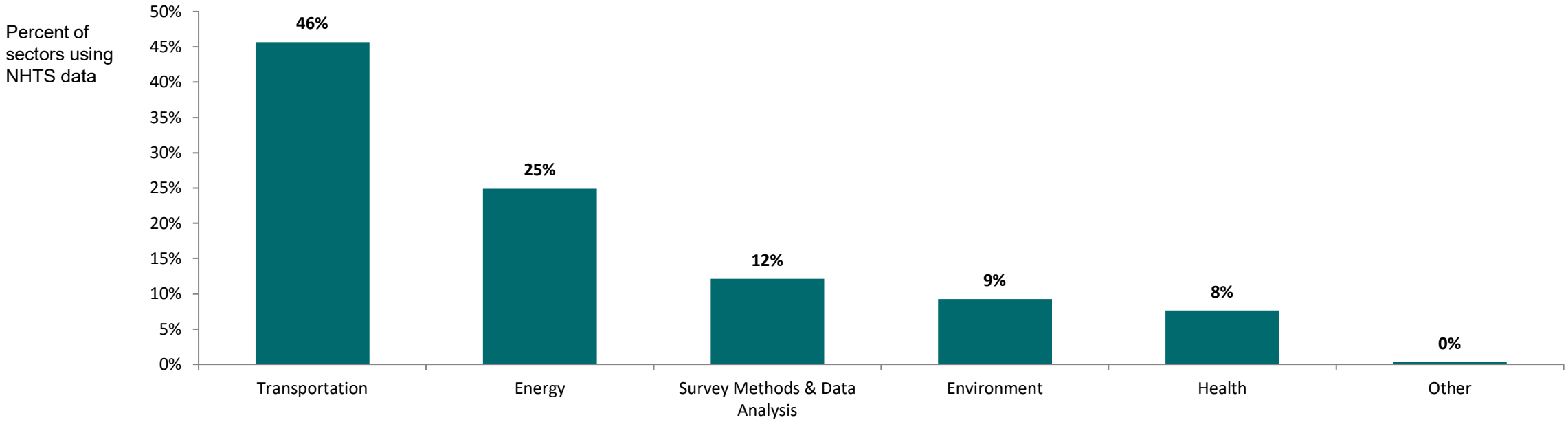
Fisher, E. 2011. "Contiguous United States, Census 2000."Flickr. Available online: https://www.flickr.com/photos/walkingsf/5557821250/in/photolist-9t8hCj, last accessed on May 17, 2022.

NHTS Survey Logic Model



Chajka-Cadin, L.,. M. Petrella, C. Timmel, E. Futcher, and J. Mittleman, 2017. *Federal Highway Administration Research and Technology Evaluation: National Household Travel Survey Program Final Report*. Report No. FHWA-HRT-16-082. Washington, DC: Federal Highway Administration. https://www.fhwa.dot.gov/publications/research/randt/evaluations/16082/16082.pdf, last accessed May 12, 2022.
OMB = Office of Management and Budget.

NHTS Survey Select Findings



Source: FHWA.

Chajka-Cadin, L.,. M. Petrella, C. Timmel, E. Futcher, and J. Mittleman, 2017. *Federal Highway Administration Research and Technology Evaluation: National Household Travel Survey Program Final Report*. Report No. FHWA-HRT-16-082. Washington, DC: Federal Highway Administration. https://www.fhwa.dot.gov/publications/research/randt/evaluations/16082/16082.pdf, last accessed May 12, 2022.

Ultra-High Performance Concrete – Connections (UHPC-C)

Summary:

- Assess effectiveness of UHPC-C technology transfer efforts of FHWA.
- Assess efforts in addressing the barriers for adoption.
- Estimate the benefits and costs of UHPC-C.

Source: FHWA.

Graybeal, B. 2019. *Design and Construction of Field-Cast UHPC Connections*. TechNote. FHWA-HRT-19-011. Washington, DC: Federal Highway Administration. https://www.fhwa.dot.gov/publications/research/infrastructure/structures/bridge/uhpc/19011/19011.pdf, last accessed May 18, 2022.

UHPC-C Cost Benefits

One-time net UHPC-C benefit of 8-18 dollars per square foot.

+

Annual UHPC-C performance benefit of 1-4 dollars per square foot.

×

Aggregate square footage of 181 bridges in National Bridge Inventory database using UHPC-C for PBE deck slabs from 2011–2018.

=

Present value (PV) of benefits for United States. UHPC-C bridges built from 2011–2018.

Category	Low	High
PV Benefits (2021 Dollars)	22,348,000	55,332,000

UHPC-C Return of Investment

PV of UHPC-C Benefits from 2011–2028 Attributable to TFHRC

PV Benefits (2021 Dollars)	Low (60 Percent Attribution)	High (75 Percent Attribution)
Realized (2011–2018)	13,409,000	41,499,000
Potential (2019–2028)	33,888,000	106,726,000
Total	47,927,000	148,225,000

(- or ÷) 3.1 million dollars PV of TFHRC UHPC-C Research Costs from 2009–2017

= NPV and BCR of TFHRC UHPC-C Research

Realized benefits (2011-2018) versus TFHRC costs (2009-2017)	Low	High
NPV (2021 Dollars)	10,302,000	38,392,000
BCR	4.3	13.4

Realized and potential benefits (2011-2018) versus TFHRC costs (2009-2017)	Low	High
NPV (2021 Dollars)	44,189,000	145,118,000
BCR	15.2	47.7

BCR = benefit cost ratio; NPV = net present value.

Cross-Cutting Recommendations

U.S. Department of Transportation
Federal Highway Administration
Turner-Fairbank
Highway Research Center

Cross-Cutting Recommendations Overview

- Incorporate market research into projects involving the development of new technologies or processes to understand conditions that might affect technology transfer.
- Incorporate outreach efforts into research planning to improve future technology transfer.
- Improve internal protocols for research communication.
- Identify key performance measures and potential data during research planning process.

Cross-Cutting Recommendations Overview (Continued)

- Collect baseline data.
- Track how research is being disseminated (document postings, webinars, trainings) and used (views, downloads, attendance).

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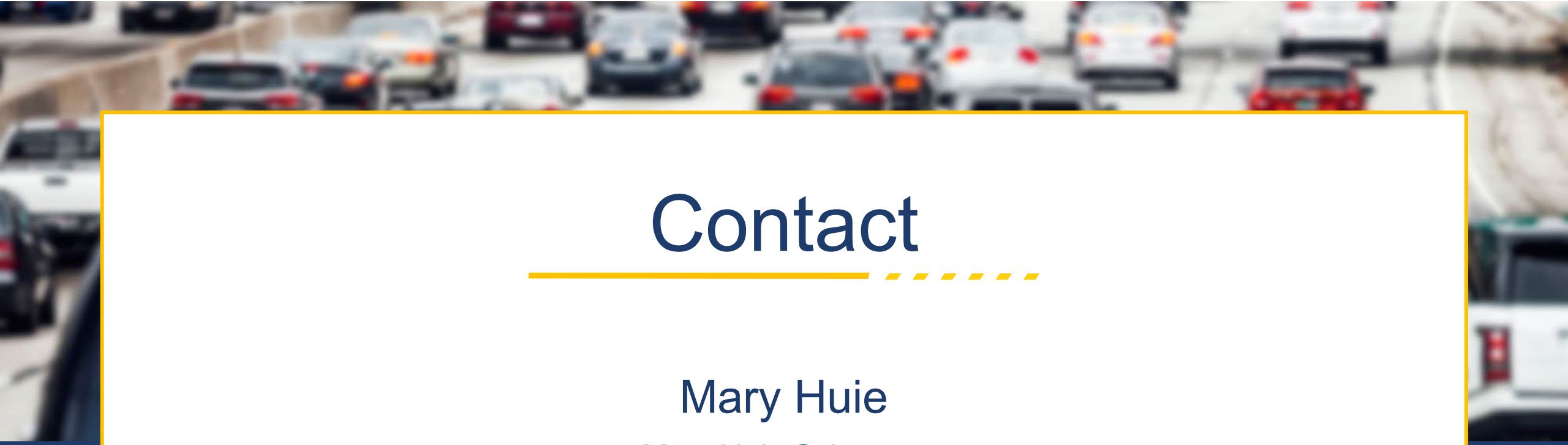


Contact

Mary Huie

Mary.Huie@dot.gov

202-493-3460

U.S. Department of Transportation
Federal Highway Administration

Turner-Fairbank
Highway Research Center

APPENDIX G. VERMONT – QUALITATIVE AND QUANTITATIVE EVALUATION OF RESEARCH PROJECTS

VT AOT PEER EXCHANGE

DAY 2
QUALITATIVE AND QUANTITATIVE EVALUATION OF RESEARCH PROJECTS

JUNE 14, 2022

TANYA MILLER, RESEARCH ENGINEER, VERMONT AGENCY OF TRANSPORTATION

What are our project evaluation goals?

- What have we started?
- What do we plan to do?
- What are the end goals?

- Complete VTRC 21-0 Research Evaluation project which started in October 2021
  - Will hopefully lead to a framework for how to evaluate projects going forward

- Implementation and Benefits measuring program
  - Will send Project Champions and Technical Advisory Committee (TAC) members surveys every quarter after project completion for a year
  - Survey will aim to measure how projects are implemented and if the project is delivering the anticipated benefits as identified by the Project Champions

- Measure projects one at a time as they are completed instead of having to look back on several years worth of projects
  - Give more up to date data

How successful have your evaluation efforts been?

- VTRC 21-0 setbacks

- VTRC 21-0 Research Evaluation project sent out benefits survey to finished projects
  - Initial survey sent to Project Champions did not return helpful results
  - Not many responses to the survey
  - Struggling to figure out how to salvage anything from this project

- Difficult to get folks to spend their time on evaluations of completed projects
  - May have been too long ago for them to remember many project specifics
  - Hoping to get more proactive approach with new and ongoing projects

What strategies have we tried?

- Surveys
- Project Final Reports and Presentations
- Speak with Project Champions

- All External Research projects require specific project benefits to be identified during the proposal stage of the project
- Project Final Reports should report out on expected benefits, but do not always do this
- Project Final Presentations usually mention expected benefits, but no information on how to continue to measure them after the researchers are completed
- For projects we have received questions about we speak directly to the Project Champion to ask for specific responses
- Plan to require project researchers to identify how to measure benefits once the project is completed
  - This will allow information to be reported during our quarterly implementation and benefits post project surveys

When Do We Call Out Benefits?

Project Idea Submission

Project Problem Statement

Project Proposal

...

Final Project Presentation

Final Project Report

We hold Quarterly TAC meetings, but we need to do a better job of following up on whether or not we are achieving the benefits we called out at the beginning of the projects

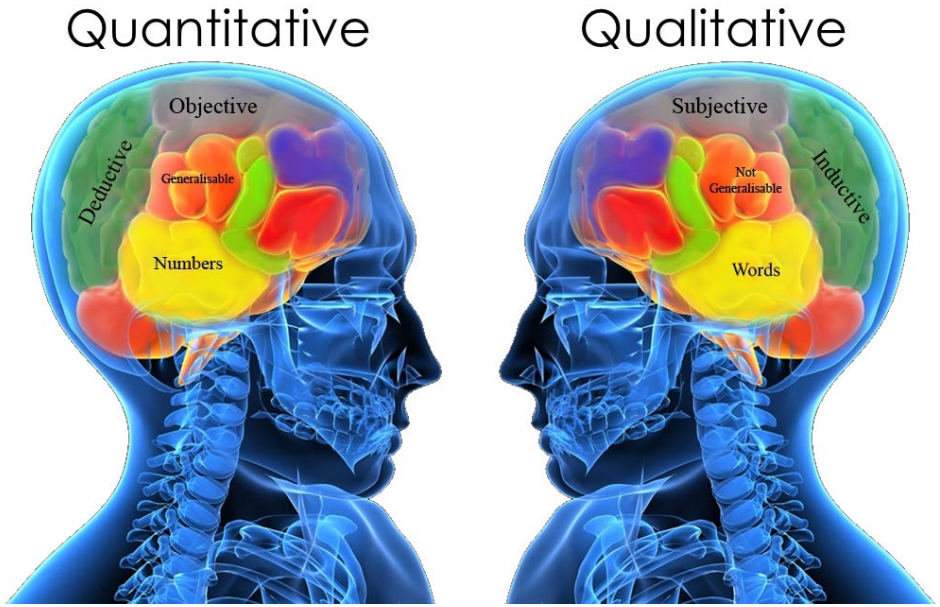
What are our biggest challenges in this area?

- Volunteer participation
- Time
- No permanent framework

- Getting responses
- The amount of time it takes for people to respond to us with specific information seems to be a deterrent
- Finding an effective way to get information
  - Surveys do not seem to be the best avenue
  - Working with our Researchers to find a better source of information
- No permanent framework yet
  - Working on it!
  - Plan to have in place before end of FY22
  - Will be piloting with our new Dynamic Cone Penetration Analysis project as it has very straightforward benefits

Qualitative vs. Quantitative

- Can a research project be valuable without quantitative assessment?
- Are all research project evaluations either quantitative or qualitative?



- Yes, qualitative measures are still important without quantitative counterparts
- Projects can have qualitative benefits instead of quantitative measures
  - Improved process
  - Updated or new specifications
  - Ease of work
  - New accepted material
- Projects can have both qualitative and quantitative measures
  - Increased Productivity = Time Savings
  - New Accepted Material = Different Costs

Qualitative Framework (so far)

Meeting Project Objectives	Implementation	Improvement	Ease of Using	Number of Stakeholders	Tech Transfer
10 pts	10 pts	10 pts	5 pts	5 pts	5 pts
	Fully Implemented Process Changed New Material Partially Implemented	Process Improved Additional Tool Change in Process Increased Knowledge	Lower Cost Less Staff Time Easier Procedure	Within AOT External Inquiries	Symposium Final Report Distribution Webinar Media Mentions HVR Recognition

What is measured?

- What methods and measures are used to evaluate research? Do you measure return on investment?
- How do small states evaluate research and show value?
- Should individual projects be evaluated or is it better to do a regular program evaluations?

- Plan to measure on a project by project basis
  - Do not have regular program evaluations, need to work up to that. Need to determine pros/cons.
  - Working to determine what framework we would like to use to evaluate qualitative and quantitative benefits
    - Could it be applied to a program and not individual projects?
- Return on Investment not worked into out system
  - Will possibly consider once we get our program up and running

Communicating Value

- How do you communicate to agency leadership and other research stakeholders?
- How important is evaluation in communicating project results?
- Do you pre-define expectations?
- How does the research program use Q&Q evaluations?
- How do you communicate non-quantitative value?

- Communication
  - Research Webpages
  - Annual September Symposium
  - Quarterly Newsletter
  - Email
- Expectations
  - Every project must define the benefits they expect from the project
  - Need to do a better job checking in with Project Champions that they are getting what they want during the project instead of after
- Sharing Q&Q Evaluations
  - Plan to include implementation and benefits information on project webpages

Questions?

EMILY PARKANY, RESEARCH MANAGER, EMILY.PARKANY@VERMONT.GOV

TANYA MILLER, RESEARCH ENGINEER, TANYA.MILLER@VERMONT.GOV

APPENDIX H. UTAH - QUALITATIVE AND QUANTITATIVE RESEARCH EVALUATION

VERMONT
AGENCY OF TRANSPORTATION

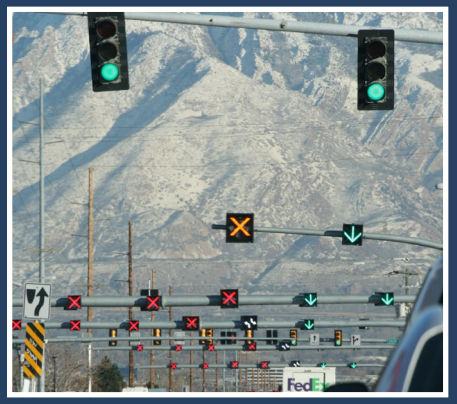
UDOT
Keeping Utah Moving

Vermont AOT Research Peer Exchange
June 2022

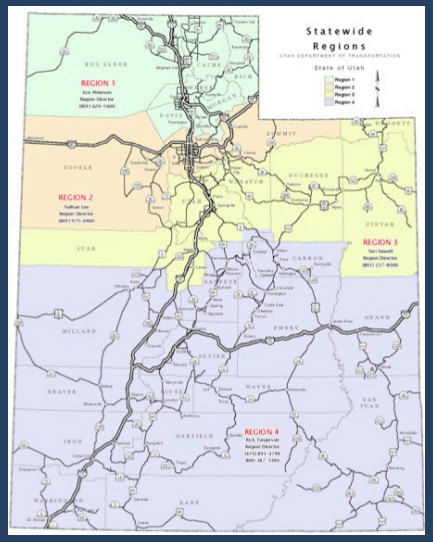
Qualitative and Quantitative Research Evaluation

Cameron Kergaye, PhD, PE, PMP
Director of Research & Innovation
Utah Department of Transportation

Utah Department of Transportation



1,237 Signals

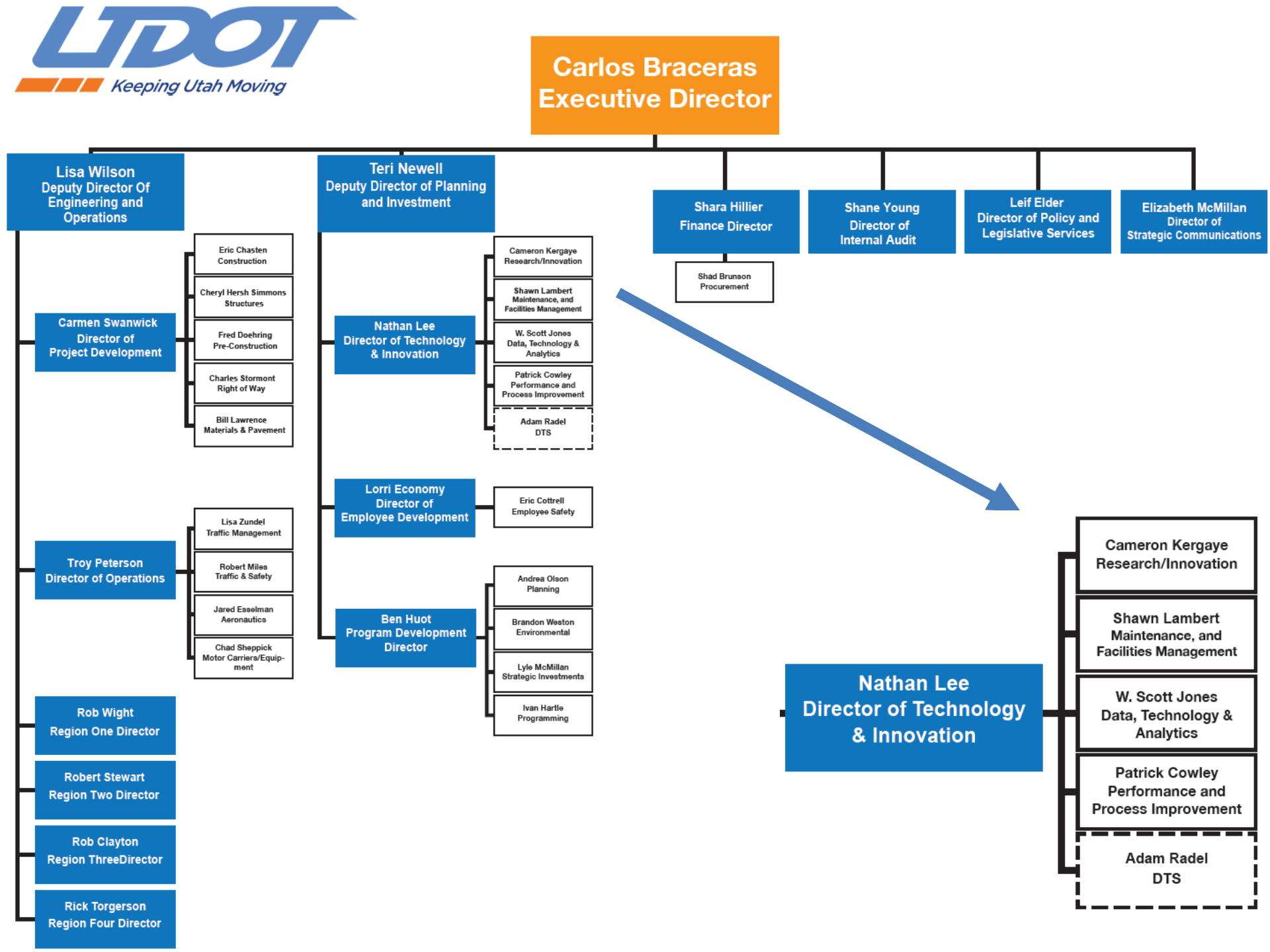


518 Snow Plows

1,973 Bridges

48,608 Lane Miles

102,493 Signs


UDOT
Keeping Utah Moving
Carlos Braceras
Executive Director
Lisa Wilson
Deputy Director Of Engineering and Operations
Teri Newell
Deputy Director of Planning and Investment
Shara Hillier
Finance Director
Shane Young
Director of Internal Audit
Leif Elder
Director of Policy and Legislative Services
Elizabeth McMillan
Director of Strategic Communications
Shad Brunson
Procurement
Carmen Swanwick
Director of Project Development
Eric Chasten
Construction
Cheryl Hersh Simmons
Structures
Fred Doehring
Pre-Construction
Charles Stormont
Right of Way
Bill Lawrence
Materials & Pavement
Troy Peterson
Director of Operations
Lisa Zundel
Traffic Management
Robert Miles
Traffic & Safety
Jared Esselman
Aeronautics
Chad Sheppick
Motor Carriers/Equip-ment
Rob Wight
Region One Director
Robert Stewart
Region Two Director
Rob Clayton
Region ThreeDirector
Rick Torgerson
Region Four Director
Nathan Lee
Director of Technology & Innovation
Cameron Kergaye
Research/Innovation
Shawn Lambert
Maintenance, and Facilities Management
W. Scott Jones
Data, Technology & Analytics
Patrick Cowley
Performance and Process Improvement
Adam Radel
DTS
Lorri Economy
Director of Employee Development
Eric Cottrell
Employee Safety
Ben Huot
Program Development Director
Andrea Olson
Planning
Brandon Weston
Environmental
Lyle McMillan
Strategic Investments
Ivan Hartle
Programming
Nathan Lee
Director of Technology & Innovation
Cameron Kergaye
Research/Innovation
Shawn Lambert
Maintenance, and Facilities Management
W. Scott Jones
Data, Technology & Analytics
Patrick Cowley
Performance and Process Improvement
Adam Radel
DTS

Research & Innovation NETWORK

RESEARCH & INNOVATION

Promote, conduct, and implement research and innovation initiatives to aid UDOT in achieving its mission.

AASHTO RAC Vice Chair

FHWA Innovation Partnering

Cost-Savings Calculations

Collaborate with UDOT Regions & Groups

Innovation Council

Annual Report

National Coordination

TRB Transportation Research Board

Federal Highway Administration

AASHTO

Innovation & Implementation

Winston

Facilitate the collection and sharing of innovation ideas and implementation activities throughout UDOT.

(vacant)

CONSULTANTS

Research Project Management

Kevin

David

Vincent

Identify, fund, and manage implementable research projects to ensure high-quality research products for UDOT champions.

CONSULTANTS

RESEARCH WORKSHOP

UTRAC

Technical Advisory Committees

SPR Budget

Information Sharing

Publish research and implementation outcomes within UDOT and in national databases via reports, news articles, literature searches and surveys. Manage digital library.

Joni

Interlibrary Loan

R&I Communications

Literature Searches

Digital Library

Nat'l Committee Membership Tracking

UDOT Research – video (3:48)

See shared video at https://youtu.be/J93GAKcVKNY

Research

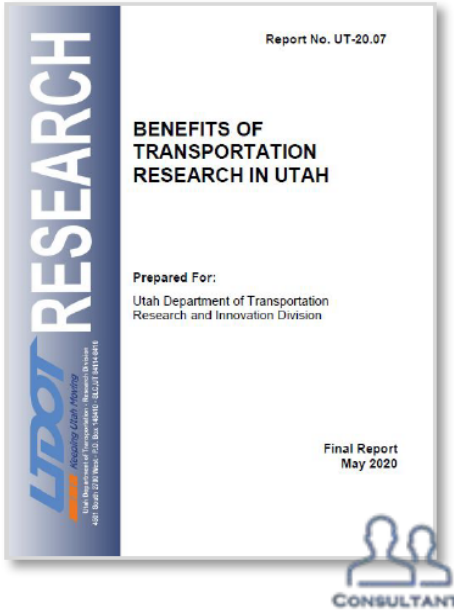
Project Management

We partner with UDOT experts, Utah universities and consultants to identify & prioritize transportation research that meets UDOT's most important needs. We manage research projects, promote implementation, share research results, coordinate with national research organizations, and field-evaluate products.


Kevin


David


Vincent



Annual Workshop (UTRAC): The Research and Innovation Division hosts an annual workshop to allocate state planning and research (SPR) funds. Participants represent UDOT, government agencies, universities and the private sector. Selected projects support the Department's Vision and Strategic Goals and pursue implementable products and outcomes.

Project Management:

- 28 new research projects *(mostly SPR $)*
- 61 ongoing research projects *(mostly SPR $)*
- 8 pooled fund studies led by UDOT *(mostly SPR $)*
- 31 pooled fund studies participating in *(some SPR $)*
- 38 PIs from universities & consulting firms

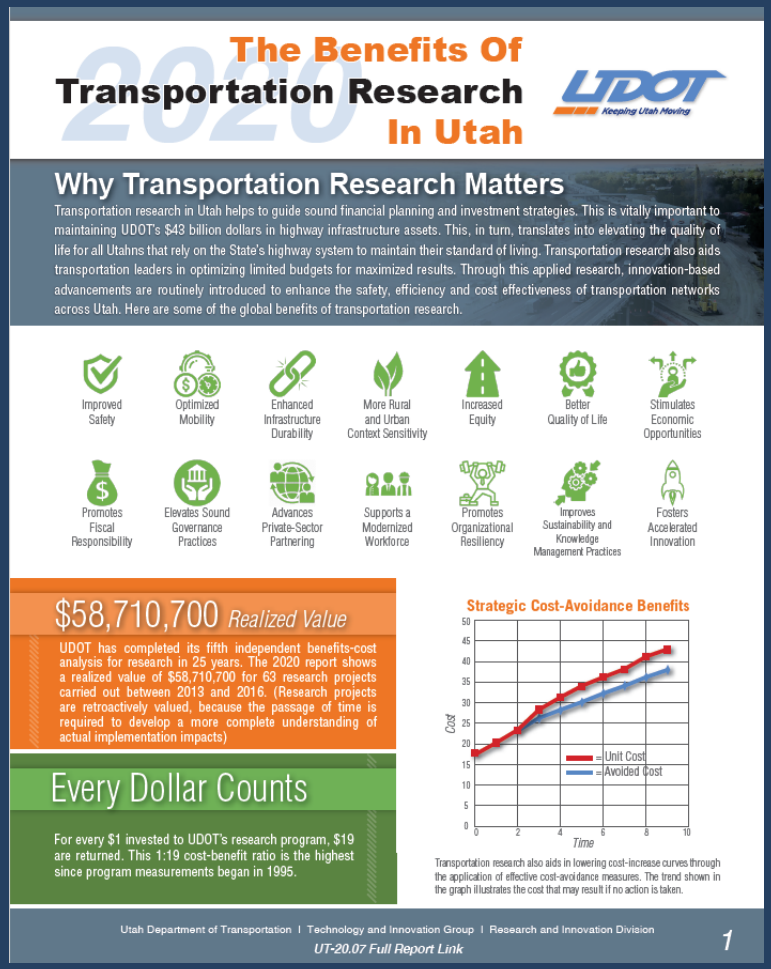
TACs: Technical Advisory Committees including UDOT subject-matter experts and academics help Research PMs ensure project and implementation objectives are met.

National Coordination: We promote UDOT participation in national transportation committees, panels and studies to influence transportation policy and advance UDOT's strategic goals.

Cold Weather-Related Research

- Completed research:
  - Time and Cost Benefits for Traffic Through Snowplow Operations
  - Balanced Asphalt Concrete Mix Performance in Utah for Intermediate and Low-Temperature Cracking
- Active research:
  - Assessing and Improving Efficiency of Snowplowing Operations via Data and Analytics
  - Freeze-Thaw Durability of Rapid-Setting Concrete
  - Differential Emissivity Imaging Distrometer (DEID) for Data Visualization and Avalanche Forecasting

Available Publications



Agency Use of Benefits

- Appreciate research contributions
- Implement specific research findings
- Utilize research capabilities as needed
- Share interesting technologies with the public and state legislature

Division Uses of Benefits

- Assess value of research program
- Balance resources with agency priorities
- Identify successful research that needs implementation support
- Improve research project management
- Create a B/C library

Approaches to Measure Benefits

- **Support implementation until benefits are realized**
  - Adoption may take a few years
- **Survey and interview project champions and end-users**
  - Obtain cost savings, project grade, other benefits
- **Compile research and field costs**
  - Refine estimates, maintain conservative values

Benefit Calculation

- **Number of items increased, saved, avoided**
  - Crashes/severity prevented
  - Person-hours saved
  - Facility or equipment life
- **Value of item**
  - Annual cost of facility, crash costs, wages
- **Percent attributed to research project**
  - Portion of initiative enhanced by research

Cost Calculation

- **Contract amount**
- **Advisory committee investment**
  - Number of members x TAC meetings x loaded hourly rate
- **PM costs**
  - 10% to 15% of project contract

Applied Calculation Method

$$\text{Benefit/Cost} = \frac{\text{Number x Value x Percentage}}{\text{Contract + TAC + PM costs}}$$

Note: Total program B/C includes projects where benefits could not be identified.

Benefits Outcome

- Enhanced infrastructure
  - better designs, reduced construction costs, lower maintenance requirements, reduced materials costs
- Savings to operations
  - reduced manpower, lower bids, lower operational costs, more efficient equipment
- Benefits to the public
  - reduced congestion, improved safety, enhanced environment
- Also understanding what doesn't work.

Final B/C per Project Type

Project Type	Benefits x 1,000	Total Cost x 1,000	Benefit/Cost
Infrastructure	$37,310	$1,500	25
Operations	$19,964	$1,227	16
Policy Research	$982	$212	5
Administration	$455	$123	4
Totals	**$58,711**	**$3,062**	**19**

Recent B/C Evaluations

Years Evaluated	Number of Projects	Percent of Surveys Returned	Benefit/Cost Estimates
1991-1993	18	--	13-15
1995-1997	22	77%	12
2006-2008	41	78%	17
2009-2012	66	37%	14
2013-2016	63	67%	19

Quantitative and Qualitative Benefits

- Pavement & bridge life extension
- Improved rehab & maintenance methods
- Highway design advancements
- Traffic control enhancements
- More efficient & trained staff
- Reduced materials costs
- More efficient equipment
- Better utilize existing equipment
- Improved management
- Congestion mitigation for commuters
- Crash avoidance
- Crash severity reduction
- Construction zone enhancements
- Noise reduction
- Avoid inefficient highway expenditures
- Modify standards to eliminate poor designs
- Replace specs that are unsuccessful
- Reassign staff where not productive
- Find alternatives to inferior technologies
- Informed staff & stakeholders
- Understanding industry advancements
- Knowledge of future trends & challenges

Research Program Balance

Functional Area	Number of Projects	Percent of Projects	Percent of Funding
ITS/Traffic/Safety	16	25	23%
Materials/Pavements	13	21	21%
Planning/Asset Mgt	8	13	18%
Maintenance	7	11	3%
Administration/Policy	6	10	5%
Geotechnical	5	8	16%
Structures	4	6	8%
Construction	2	3	3%
Hydraulics	2	3	3%

Project Grades

Grade	Definitions
A	Major impact: New or revised specification, policy, method, etc.
B	Significant impact: Improved operations, procedure or policy
C	Contributed to state-of-the-practice or institutional knowledge
D	Unclear or contradicting findings: More study needed
E	Major tasks not completed: Objectives not met

Summary of Project Grades

Functional Area	A	B	C	D	E	GPA
Structures	2	-	-	-	1	2.7
Geotechnical	3	-	1	-	-	3.5
Construction	-	-	2	-	-	2.0
Maintenance	-	4	2	-	-	2.7
Materials/Pavement	-	5	3	-	-	2.6
Safety/Traffic/ITS	9	-	3	-	-	3.5
Planning/Asset Mgt	2	-	-	-	-	4.0
Administration	1	2	1	-	-	3.0
Policy Research	1	-	-	-	-	4.0
Average	**18**	**11**	**12**	**0**	**1**	**3.1**

Recommended Products and Deliverables

Ranking	Product/Deliverable	Champions Recommended
1	Training Sessions & Materials	13%
2	Manual of Instruction	12%
3	Report	12%
4	New Product Evaluation	11%
5	Policy & Procedure	10%
6	Specification	9%
7	Peer Exchange	7%
8	State-of-the-Practice Summary	7%
9	Experimental Feature	6%
10	Design Method	4%
11	Scanning Tours & Workshops	3%
12	Laboratory Test	3%
13	Executive Summary	3%

2023 Evaluation Enhancements

- Conduct evaluations every two years
- Establish oversight board of subject leaders
- Maintain transparent implementation dashboard
- Have board represent implementation progress
- Align B/C ratios to future research support

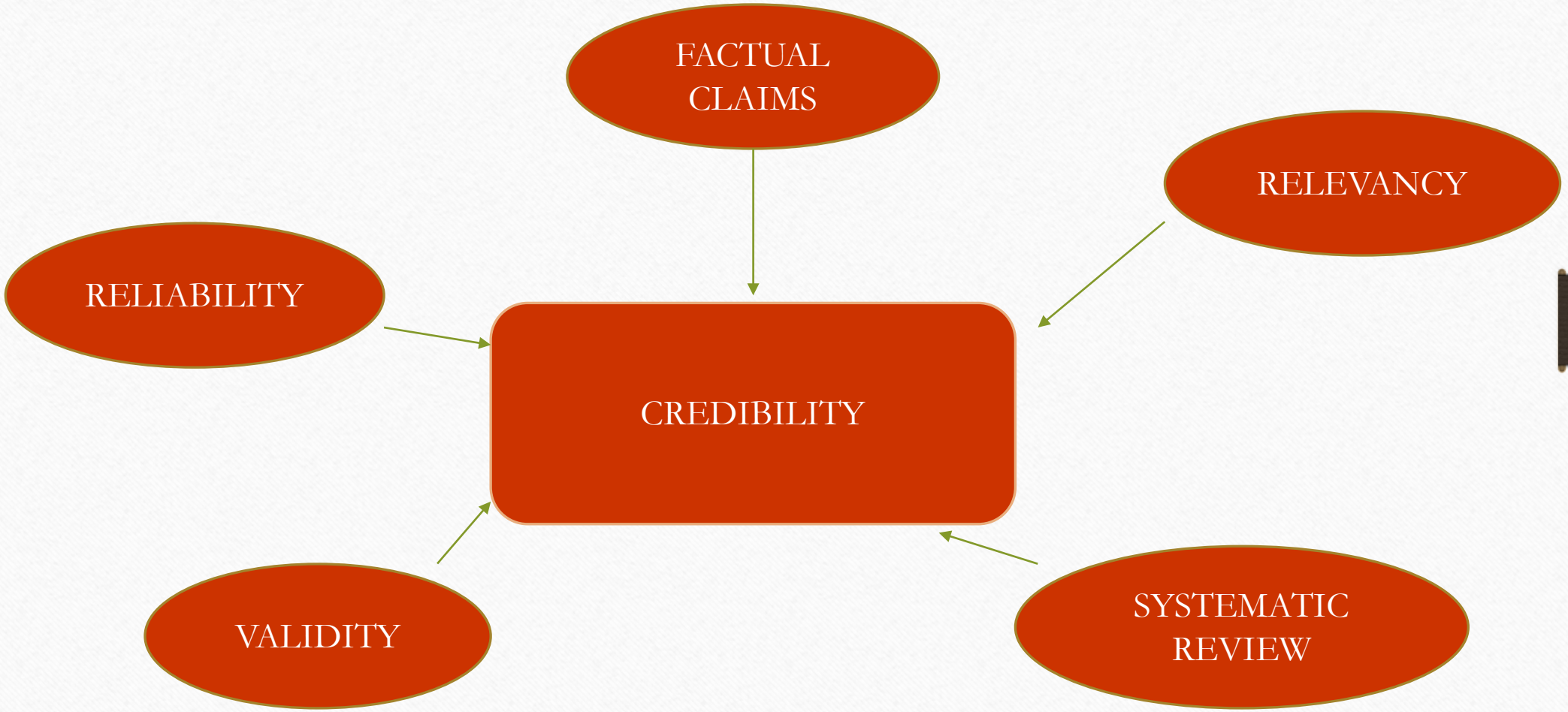
APPENDIX I. WYOMING PRESENTATION

ENID WHITE

RESEARCH MANAGER

EVALUATION BLUEPRINT

- How can we enhance research management strategies and performance measures
- How can we identify potential research needs, and long and/or short term goals for research
- How can we improve the research program and projects
- How do we determine if technology transfer is occurring
- How to ensure future success
- How can we identify gaps in our research program and research projects
- How can we maintain our valuable assets
- How can we develop strategies for monitoring out research projects
- How can we implement our research
- How can we improve our proposals, research projects, final reports, and implementation
- How we should measure efficiency of the program
- How can we improve the performance of our program


FACTUAL CLAIMS
RELEVANCY
RELIABILITY
CREDIBILITY
VALIDITY
SYSTEMATIC REVIEW

METHODS OF EVALUATION

- QUALITATIVE
- QUANTITATIVE

QUALITATIVE

- measure quality rather than quantity
- look for the answer to why and how

QUANTITATIVE

- looking for numerical indices gathered from formal methods
- looking for the answer to what and how many

WHAT WYDOT MEASURED

- Projects completed within budget and on time.
- Project implemented.
- Level of increased knowledge.
- Technology transfer activities.
- Quality of final research reports.
- Return on investment or benefit-cost ratio.
- Cost savings.
- Reduction in crashes/lives saved.
- Reduction in system delays.
- Contribution to the overall mission of the department.
- Management & policy improvement.

- Number of projects and amount of funding per project by strategic intent.
- Number of proposals responding to the Research Center solicitations.
- Number of needs statements submitted by the agency's programs.
- Outcomes of the research projects
- Number of research reports completed each year
- Benefit-to-cost analysis for individual projects.
- Percentage of administrative costs to overall program funding.
- Funds requested by research community versus funds available.
- Percentage of projects completed on-time and within budget.

Project Type 2008

- engineering standards and data and new knowledge
- systems engineering and engineering analysis
- technology transfer
- public affairs.

Project Categories

- **Contract**
- **Pooled funds**
- **In-house**

Strategic Intent

- Safety
- Preservation
- Infrastructure
- shared knowledge
- public affairs.

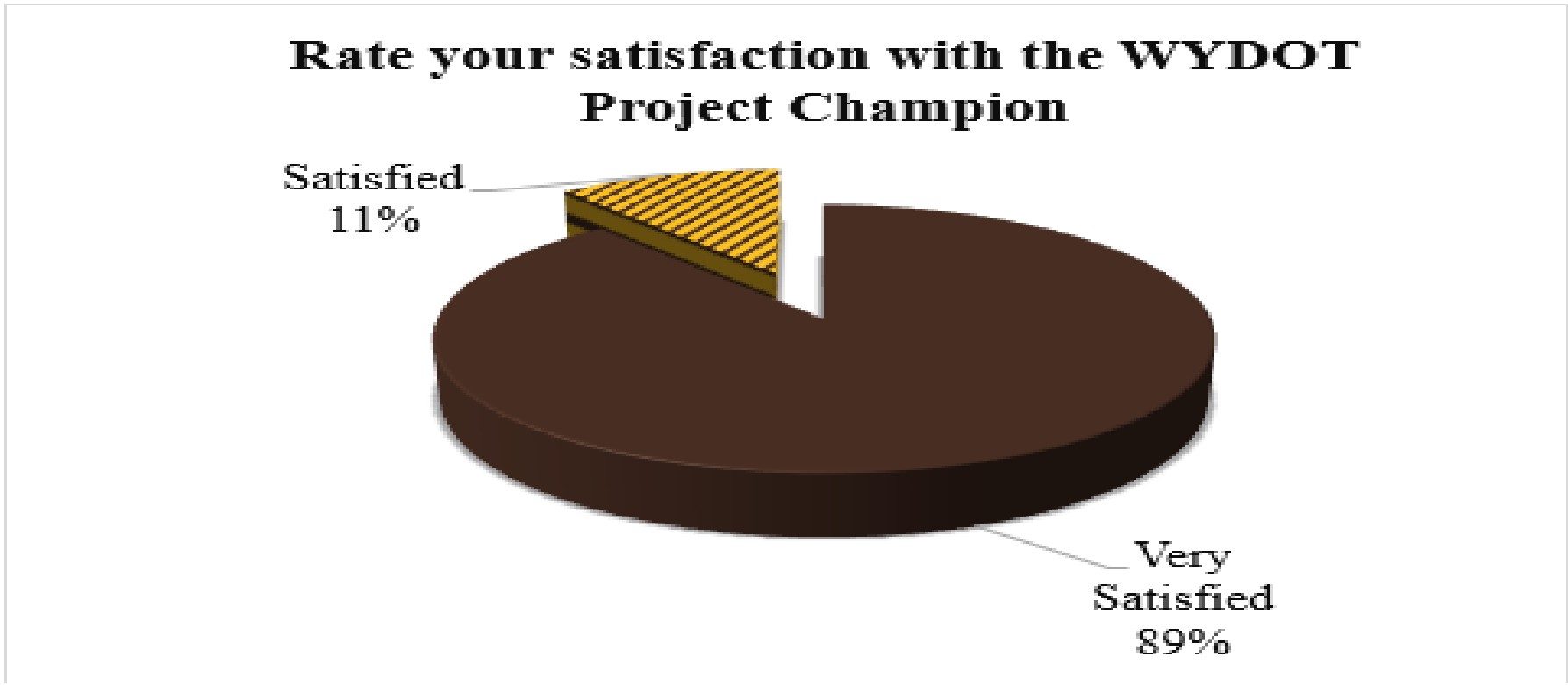
RECOMMENDATIONS FROM EVALUATIONS

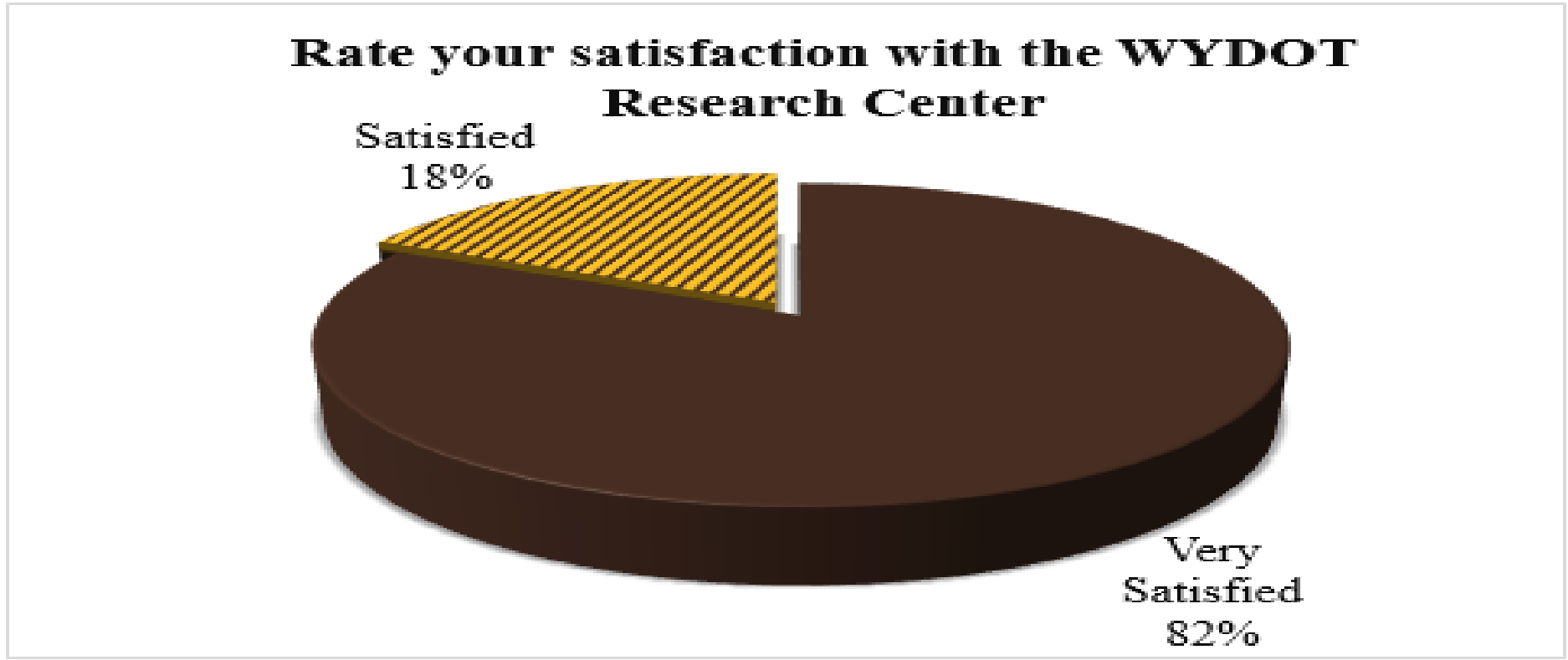
- Set out guidelines which should include all requirements for proposals.
- Draft a Proposal Checklist
- Work with Programs to solicit research opportunities
- Maintain administrative efficiency.
- Research feedback from Principle Investigators and Project Champions.

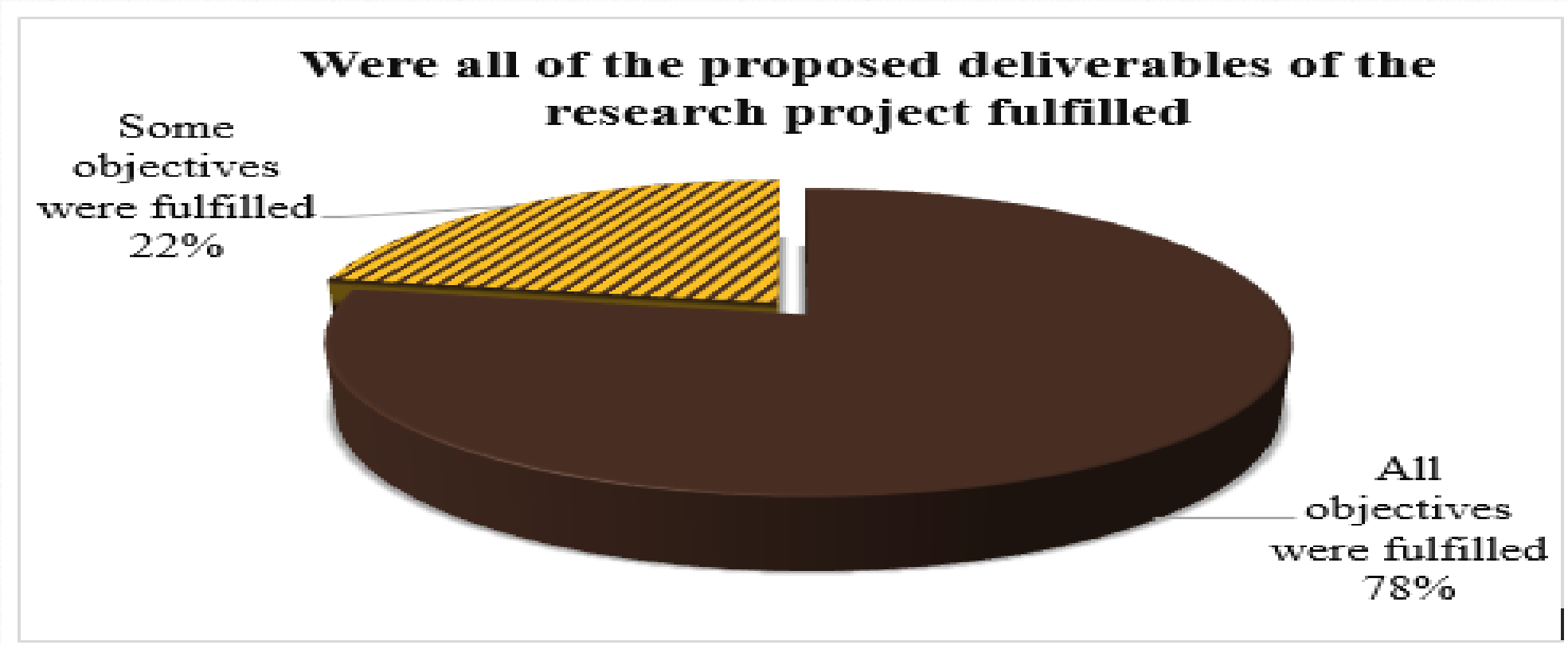
- Continue funding research projects that advance the overall goals of the WYDOT mission statement.
- Investigate why more wildlife research studies are not being conducted.
- Formal presentations on Pooled Fund studies should be brought to the RAC.
- The Principle Investigator, Project Champion and Research Manager should work more closely on issues with research projects.
- Implementation process should be reviewed on all research projects.
- More research projects should come directly from the District Engineers.
- Performance Evaluations for each research project should be implemented.
- Standardized budgets should be used in all proposals.

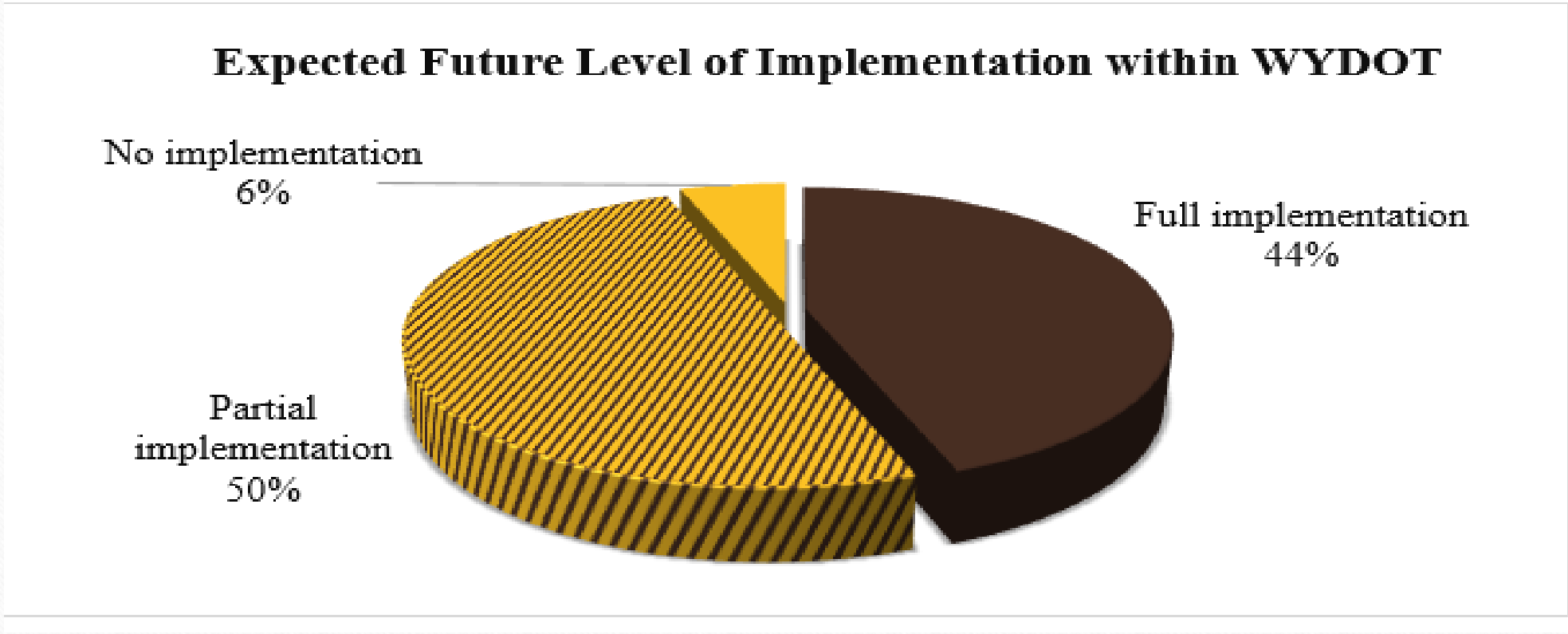
- Continue funding research projects that advance the overall goals of the WYDOT mission statement.
- The Research Center should evaluate the research projects on a regular basis to better understand which are most effective.
- Funded projects should be those with the highest potential to produce significant benefits to WYDOT.
- The Research Center should implement a benefit to cost analysis methodology.
- A formal process should be implemented to monitor implementation of research projects.
- Identify areas where research is needed in the short and long term
- Develop strategies for monitoring research projects
- Determine way to implement the research especially in cities, towns, counties and local government

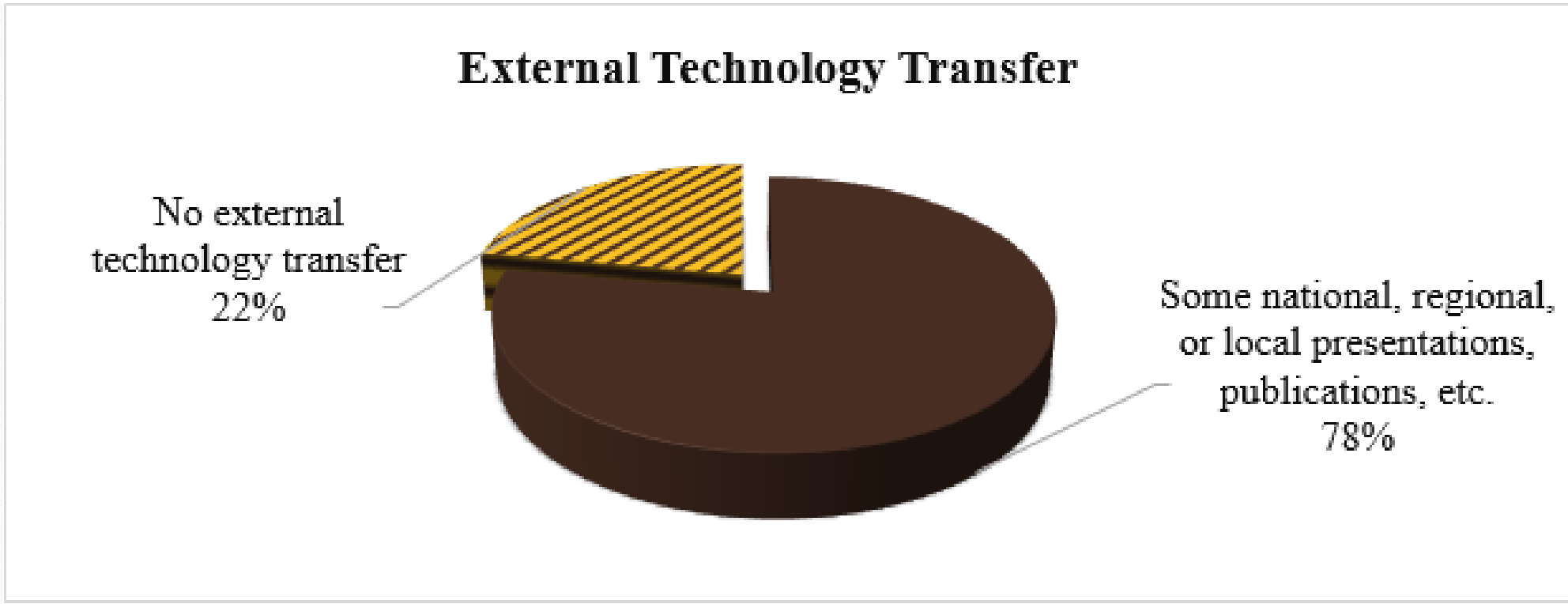
Program success from Principle Investigators


Rate your satisfaction with the WYDOT Project Champion
Satisfied 11%
Very Satisfied 89%

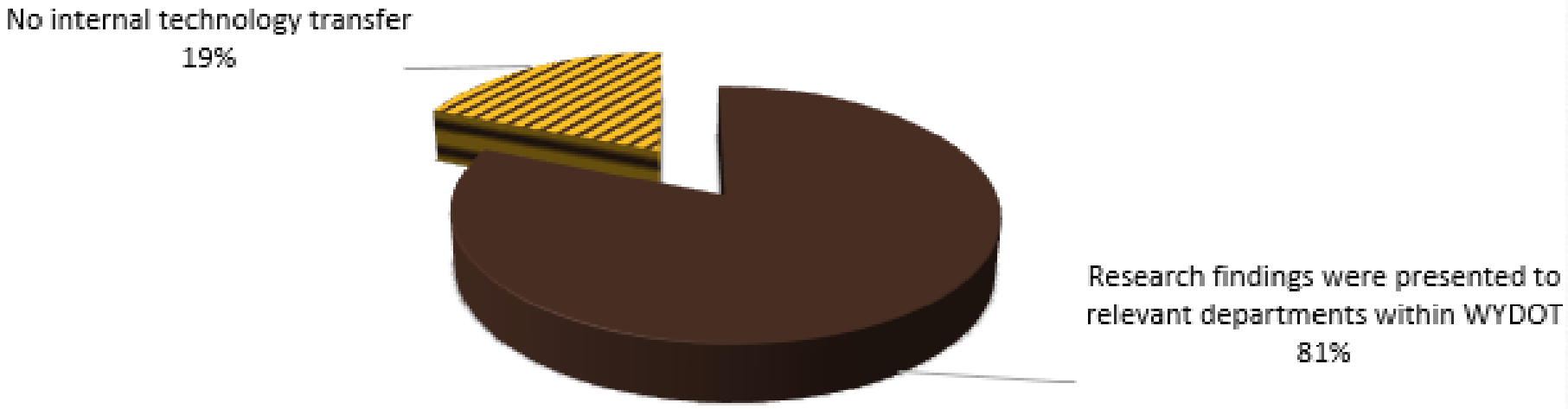

Rate your satisfaction with the WYDOT Research Center
Satisfied 18%
Very Satisfied 82%

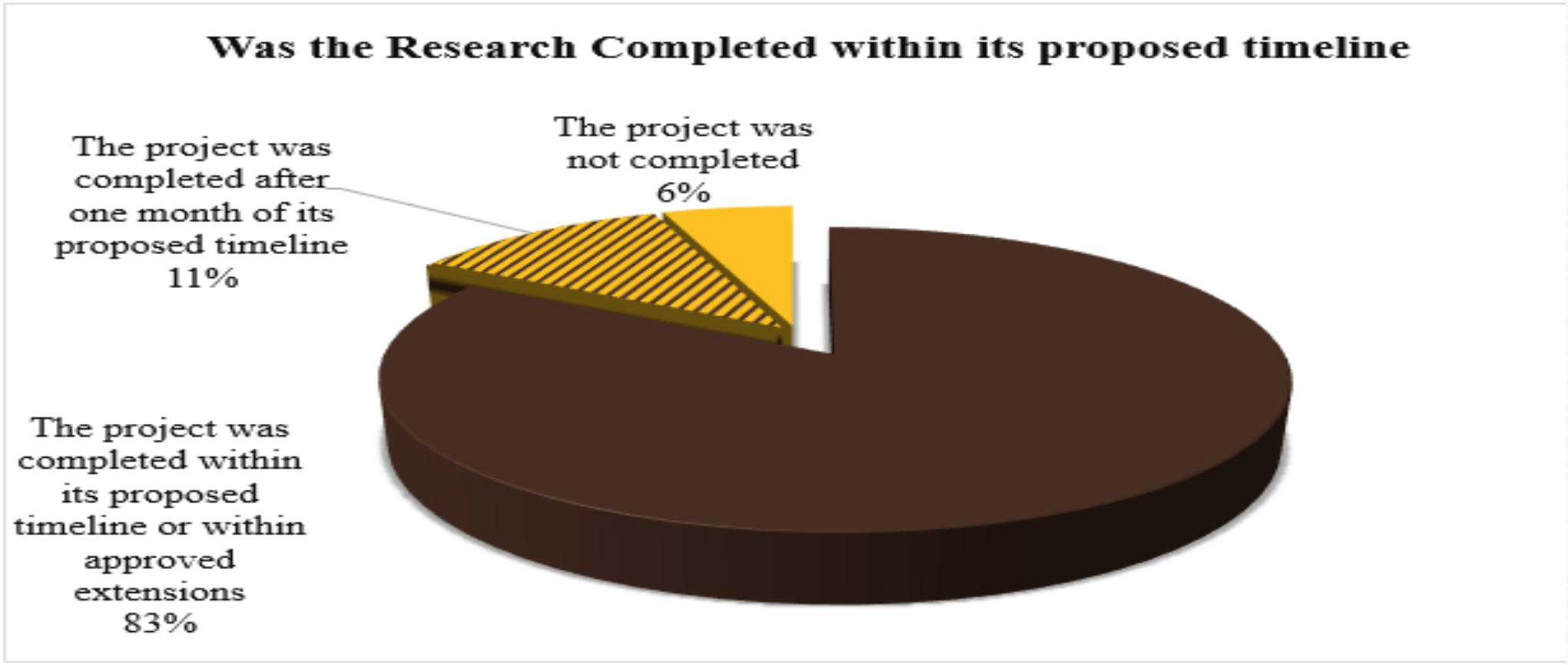

Were all of the proposed deliverables of the research project fulfilled
Some objectives were fulfilled 22%
All objectives were fulfilled 78%


Expected Future Level of Implementation within WYDOT
No implementation
6%
Full implementation
44%
Partial
implementation
50%


External Technology Transfer
No external technology transfer 22%
Some national, regional, or local presentations, publications, etc. 78%

Internal Technology Transfer




Was the Research Completed within its proposed timeline
The project was not completed 6%
The project was completed after one month of its proposed timeline 11%
The project was completed within its proposed timeline or within approved extensions 83%

APPENDIX J. VERMONT – ENGAGEMENT OF LEADERSHIP WITH RESEARCH

VT AOT PEER EXCHANGE

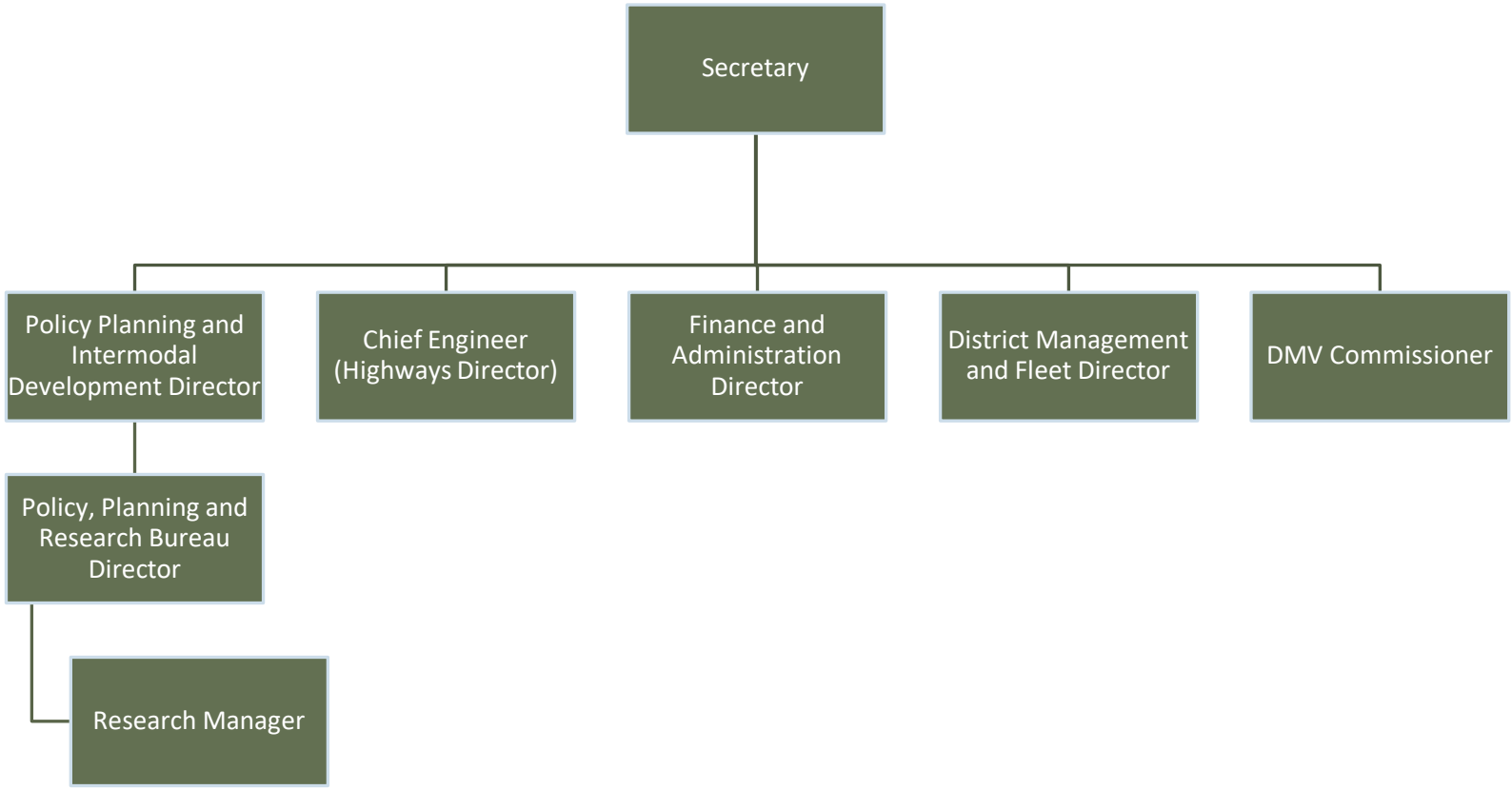
DAY 3
ENGAGEMENT OF LEADERSHIP WITH RESEARCH

JUNE 21, 2022

EMILY PARKANY, RESEARCH MANAGER, VERMONT AGENCY OF TRANSPORTATION

Where is the research organization within the Agency?

How many levels away from the front office?



How valuable is engagement with your leadership aside from any required approvals? (EP Q)

- We want Leadership to know what we're doing
  - Good stewards of limited resources
  - Getting a variety of SMEs and topic areas involved
  - Trying to share what we're doing (to them and others)

Core Q: How is Agency Leadership engaged with Research?

Are these interactions formal or informal?

How important is this interaction?

- Formal
  - Report to a Bureau Director
  - Annual External Research Project Selection meeting with Bureau Directors and Deputy Division Directors
  - Division Director signs annual Work Program narrative
  - Executive Staff approve NCHRP Project and Synthesis panel applications
- Informal
  - Bureau Directors and Supervisors support External Research Champions
  - Leadership “Welcome” to annual Symposium; managers will be encouraged to attend this year’s Symposium
  - Leadership arranging food at this year’s Symposium
  - Can read our newsletters, learn about our projects

Core Q: How does this engagement translate to forwarding research projects or the research program as a whole?

- Research exposure seems important
  - Don't want Research to happen "in a vacuum"
  - Important that alerting/involving others is part of our mission
  - Starts with "the top" and the next levels
- Non-Leadership is important also!
  - Need the Champions and TAC members (other SMEs) to help with implementation
  - Leadership Institute folks often interested; great Champions and NCHRP panel members
  - We want Research to be of interest to a wide variety of folks—continually updating list of "research –friendly" staff

Is it enough to get leadership involved in external research project decisions? (EP Q)

- Good start
- Looking for additional suggestions/ideas on how to engage

Does research staff promote and raise the priority of research with leadership?

- Yes. Research has expanded its reach and is more obvious to the Agency than when I started
- Increased attention throughout Agency
  - Expanded research topics
  - More folks included as Project Champions and Technical Advisory Committee members
  - More folks as NCHRP panelists, project reviewers
- Technical Transfer (Symposium and Newsletter) helps with this

Core Q: What are the barriers to further engagement?

What are your agency's biggest challenges in this area?

- How much "squeak" is the right amount? (Next slide)
- My boss is retiring!
  - Will the next person be as supportive or interested?
- Time
- Are we showing enough implementation and value?
  - Materials Manager ranted during PWG
- What are the best ways to disseminate?

What info should we regularly share with leadership?

- Lists of potential projects
- Projects in Annual Research and Innovation Symposium
- Projects featured in Quarterly Newsletter

2020 VIRTUAL RESEARCH & INNOVATION **Poster Symposium**

AOT RESEARCH & INNOVATION

VERMONT AGENCY OF TRANSPORTATION

2021 VTrans **External Research Projects**

External Research Project Selection

This year the Research Section received 15 project idea submissions, seven of which Vermont Agency of Transportation (VTrans) staff have decided to Champion and move forward with. Nineteen letters of Interest were received February 10th from entities on the new Qualified Researcher List. VTrans Project Champions have chosen research teams from four different organizations. The researchers will consult the Project Champions as they produce a 7–10-page proposal due March 11th. The VTrans Champions will then present the proposals to Bureau Directors during the late March Project Selection Meeting.

The 7 potential research projects include:

- Traffic Safety Toolbox – Addressing Speeds
- Development of a Predictive Methodology to Apply the Systemic Safety Approach to Highway Safety in Vermont
- Development of Cost-Effective Rapid-Setting Concrete for Improved Bridge Joint

How much is leadership paying attention to newsletters, annual symposiums, and other efforts to describe and disseminate research? (EP Q)

- Symposium has Executive Staff attention
  - Linked with STIC
- Secretary emailed me once about interest in a potential research project as listed in a newsletter

How is research included in Agency strategic planning?

- My (retiring) boss has been heavily involved in Agency strategic planning
  - He cares that our research is related to Agency goals
  - He has led our Division to think about strategic planning
    - June Division retreat
- Agency of Digital Services (IT) wants all research projects with IT components to be related to Governor's Goals

APPENDIX K. ALASKA – RESEARCH PROGRAM – LEADERSHIP ENGAGEMENT

Alaska Department of Transportation & Public Facilities

Research Program-Leadership Engagement

Anna Bosin, P.E.

DOT&PF Fun Facts!

The Alaska Department of Transportation and Public Facilities has jurisdiction over:

- 5,635 center line miles / 11,894 lane miles of roads / highways
- 74 DOT&PF staffed Maintenance Stations
- 235 State Airports
- 2 International Airports
- 12 Ferries
- 35 Ports of Call
- 17 Harbors
- 835 DOT&PF owned bridges
- 2 DOT&PF owned tunnels
- 7,371 pieces of state equipment & vehicles distributed throughout all executive branch departments, Legislative Affairs, and the Court System
- 837 Public Facilities maintained, inclusive of 731 DOT&PF Owned Facilities
- 9 Weigh Stations
- 2.5 mile Anton Anderson Memorial Tunnel – the longest highway tunnel in North America
- Approximately $11.8B in transportation asset infrastructure

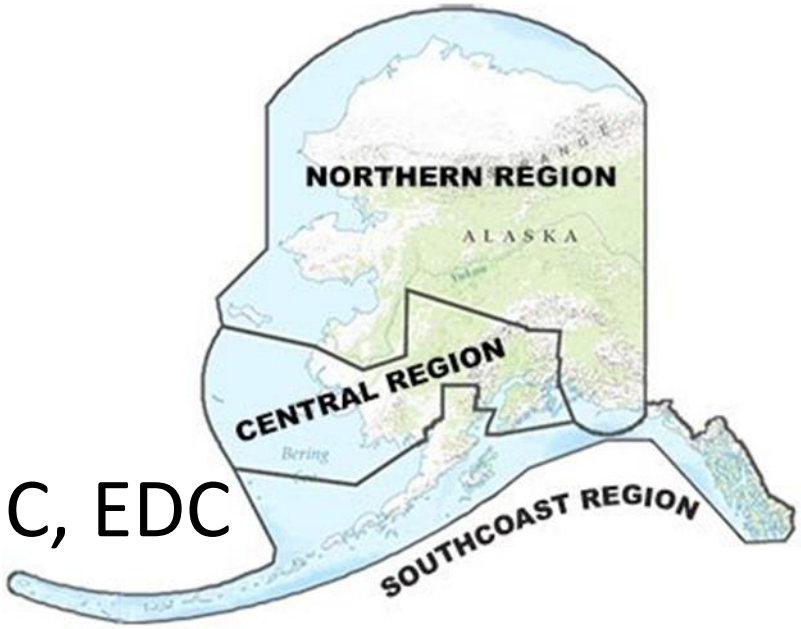
Nelchina workers make haste of cleaning up the Glenn Highway.
By Christina Weimer, Alaska DOT&PF

DOT&PF is one of the largest departments, consisting of approximately **3,338** permanent full-time, part-time and non-permanent employees in 8 labor unions in **83** locations throughout the state.

RD&T2 at a Glance

Mission – Implement projects that continuously improve our infrastructure

- Research (Universities, consultants, in-house)
- T2 Training
- Manage Innovation-STIC, EDC
- TRB/AASHTO

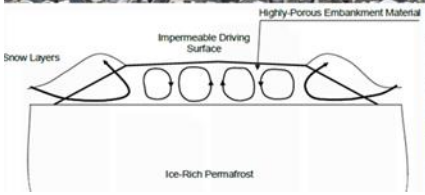


Goals: Support DOT&PF through research, training & technical assistance. Facilitate Implementation of research

Alaska's Research Program

- Money STIP line annually (~$2.6M)
- Individual Projects
  - Bigger, multi-year projects.
  - Rapid Research
  - Lit review, lab testing, field testing, etc.
- Experimental Features
  - Tied to a construction project. Pays for monitoring.
- Deployment
  - outreach, trainings, peer-exchange, webinar, bringing experts/national research, implementation

In Winter, Cold Air Circulation "Supercools" Ground, Stays Frozen Thru Summer



Step 1: Middle Management Engagement

- Pick engaging technical advisors for every project's champion list.
  - They will report up to management because they have a vested interest in continuing promising research for their sections.
- Projects are really good PR opportunities
  - Sometimes it is a great win for a department and a time to toot our own horns so if you can incorporate a good press release for the department, that is keeping your program as the "problem solver" section of the organization
  - Make sure to quote the technical advisor!
- Fill your committees
  - AASHTO, TRB, advisory boards, special projects/initiatives

Step 2: Make it REAL

- If you can get some real testing and trials going, you can get more buy-in that your program is worthwhile and not all “conferences, labs, and reports on shelves.”
- It’s good for our Federal Partners too, which continues to support that important relationship.

Experimental Feature: Incorporating a previously proven product/procedure/method/innovation for Alaska conditions into a larger scale field installation and evaluating/monitoring results

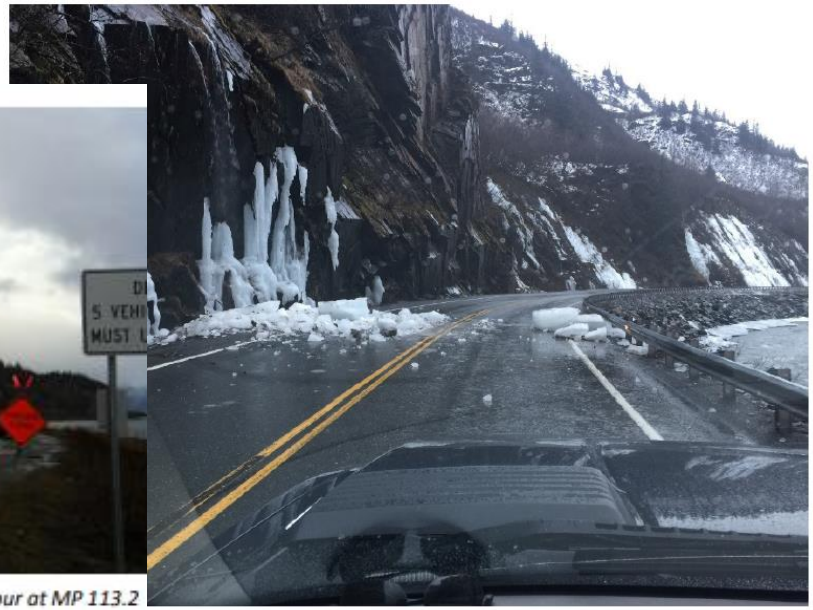
Photo 4: Dynamic Friction Tester with Case and Water Source

STEP 3: Make it SEEN

Customized Field Guides: Creating field guides for best practices following successful research evaluations. Maintenance guides, tech transfer tools, field training

- Deliverables that solve technical concerns
- Maintain some rapid research funds that can jump in if an opportunity to pilot a solution arises

***Figure 18** – Traffic pattern modification and detour at MP 113.2 area (Photo by Alaska DOT&PF)*

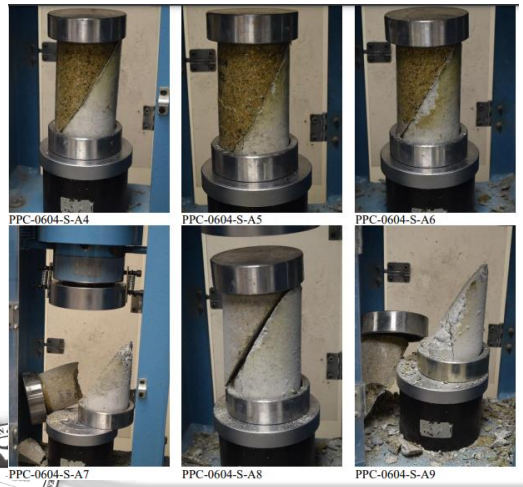


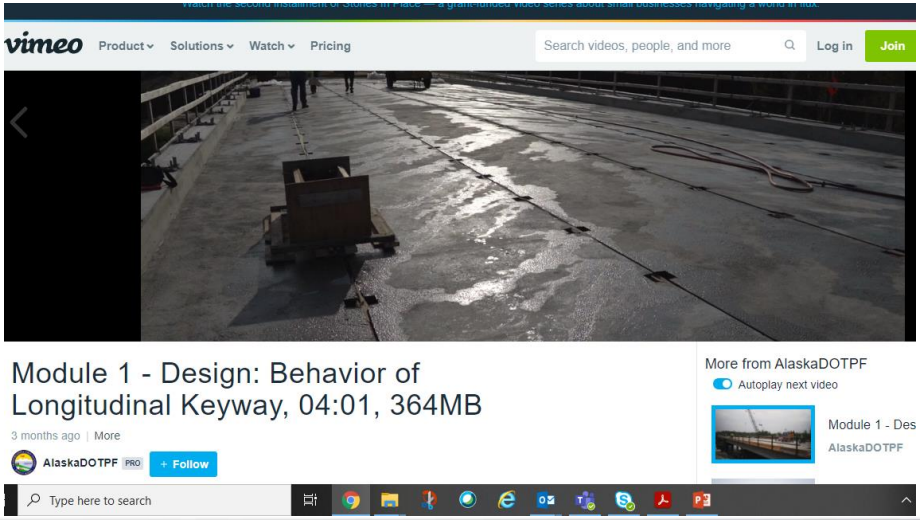
· Direct icefall impact & shatter at MP 13.9 Richardson Highway. Slab partially rotated outward during fall from overhung slope on 13 December 2017. Photo courtesy of AKDOT&PF.

STEP 4: Make it LAST

Technology Transfer: Trainings, webinars, newsletters, etc.

- Say yes to every engagement opportunity
  - I know we are all busy but the more you tell your section's story and value, the easier it gets and then you have lots of content to share
  - Includes peer exchanges!
  - I interject myself into every section in some capacity, and always offer to present to the executive team in their standing meetings if they are looking for content





STEP 5: Executive Engagement

Engagement means to me…

Part of the project selection process: RAB

- Chief Engineer-Carolyn Morehouse (Chair, *exec*.) (AASHTO R&I Member!)
- Regional M&O-Jason Sakalaskas Senior Manager (NR)
- FHWA AK Division Rep- Pete Forsling
- Preconstruction Engineer –Kirk Miller, Senior Manager (SCR)
- Construction Engineer –Joel St. Aubin, Senior Manager (CR)

Part of the PR

Present/open/ribbon cut at RD program events.

Includes cabinet members as technical advisors

Shares unique opportunities with executive team members

Co-Chairs the STIC with FHWA Division Administrator


QUESTIONS?

APPENDIX L. MAINE – LEADERSHIP ENGAGEMENT IN RESEARCH



LEADERSHIP ENGAGEMENT IN RESEARCH

Dale Peabody, Director
Research & Innovation

MaineDOT

MAINE DOT AT A GLANCE

- 8,812 Miles of State Highway – 38% miles, 76% traffic
- 2,974 – State Bridges and Minor Spans
- Seaports – Portland, Searsport, Eastport, etc.
- 492 State-owned railroad track
- 35 general aviation airports, 6 commercial
- State Ferry Service – 6 Islands served,
  - 3 Mainland Terminals
- 22 Transit Providers / 425 Transit buses and vans
- Active Transportation (Bike / pedestrian)

MaineDOT

MAINE DOT AT A GLANCE

- 1800 Employees
- Bridges: 47 projects, $183.3M
- Highway Construction/Rehabilitation: 13 miles, $128.4M
- Highway Safety and Spot Improvements: 29 projects, $19.5M
- Highway Preservation Paving: 256 miles, $90.6M
- Highway Light Capital Paving:
  - 725 miles, $36M
- Multimodal –
  - 21 projects, $31.7M

MaineDOT

MAINE DOT RESEARCH PROGRAM

Four FTE's (Director, Transportation Engineer, Senior Technician, Innovation Coord.)

Two-year cycle

Roughly $2.3 M in Federal SP&R

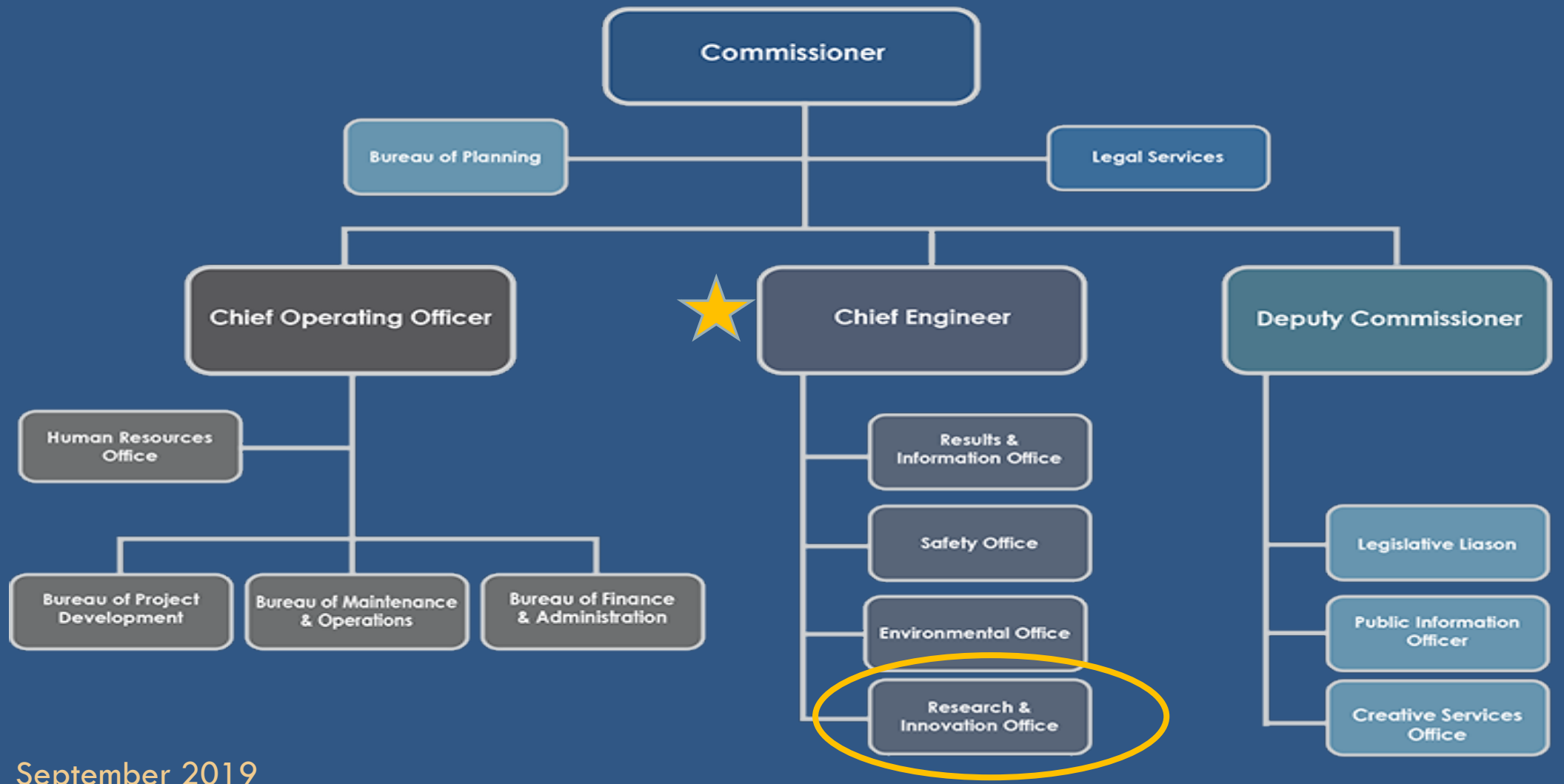
$900k for TPF's (including NCHRP, TRB and others)

$1.4 M towards admin, studies, problem solving, experimental construction and new products

- New studies = $420k (contract research)
- Problem solving/exp construction = $200k (staff)
- AASHTO TSP's = $230k
- New Products = $220k (staff)
- Innovation = $300k (staff and non-SP&R)

MaineDOT

MaineDOT Organizational Structure



September 2019

MaineDOT

LEADERSHIP ENGAGEMENT

Report directly to the Chief Engineer – HUGE, but be ready to roll

Engineering Council – Set engineering research agenda

Policy type studies examples

- Electric Vehicle, Hybrids & Highly Fuel-Efficient ICE's
- **Construction Costs**
- Interstate Rutting
- Diversity, Equity & Inclusion
- **Strategic Initiatives in a Telework Environment**
- **Bridge Suicide Study**

LEADERSHIP ENGAGEMENT

Building off the 7 keys – trust, accountability, policy research = top management support

What to Promote? A lot of opportunities for marketing and promoting the research program.

MaineDOT

LEADERSHIP ENGAGEMENT

Dale Peabody, Director
Research & Innovation

MaineDOT

APPENDIX M. NEW HAMPSHIRE – RESEARCH ENGAGEMENT OF LEADERSHIP

New Hampshire DOT

Department of Transportation

Bureau of Materials and Research

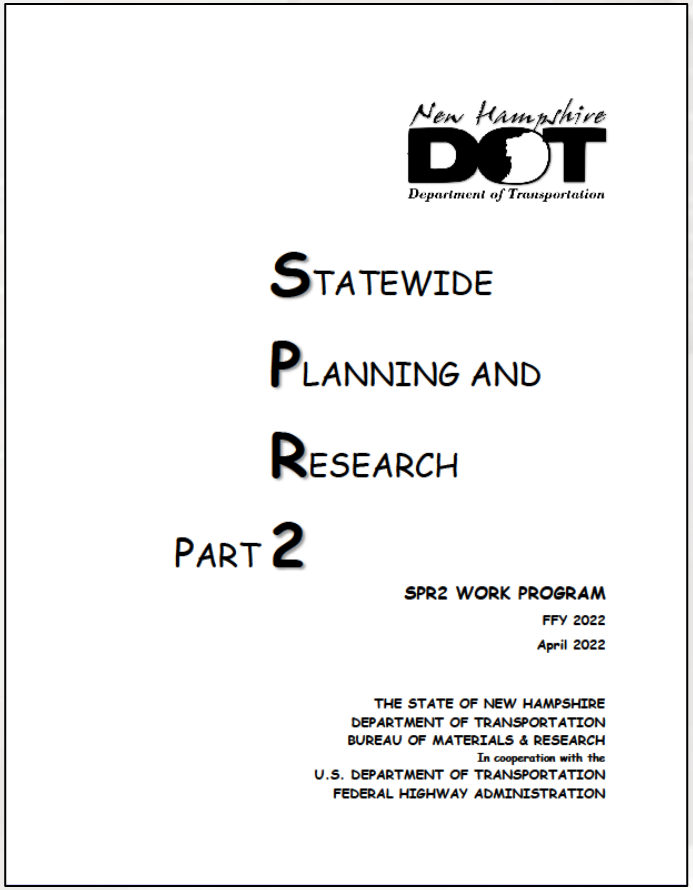
Topic #3 Research Engagement of Leadership
June 21, 2022

NHDOT Research Program

Deirdre Nash, P.E., Assistant Research Engineer
Deirdre.T.Nash@dot.nh.gov

New Hampshire DOT Department of Transportation

NHDOT SPR2 Work Program


New Hampshire DOT
Department of Transportation

STATEWIDE

PLANNING AND

RESEARCH

PART 2

SPR2 WORK PROGRAM

FFY 2022

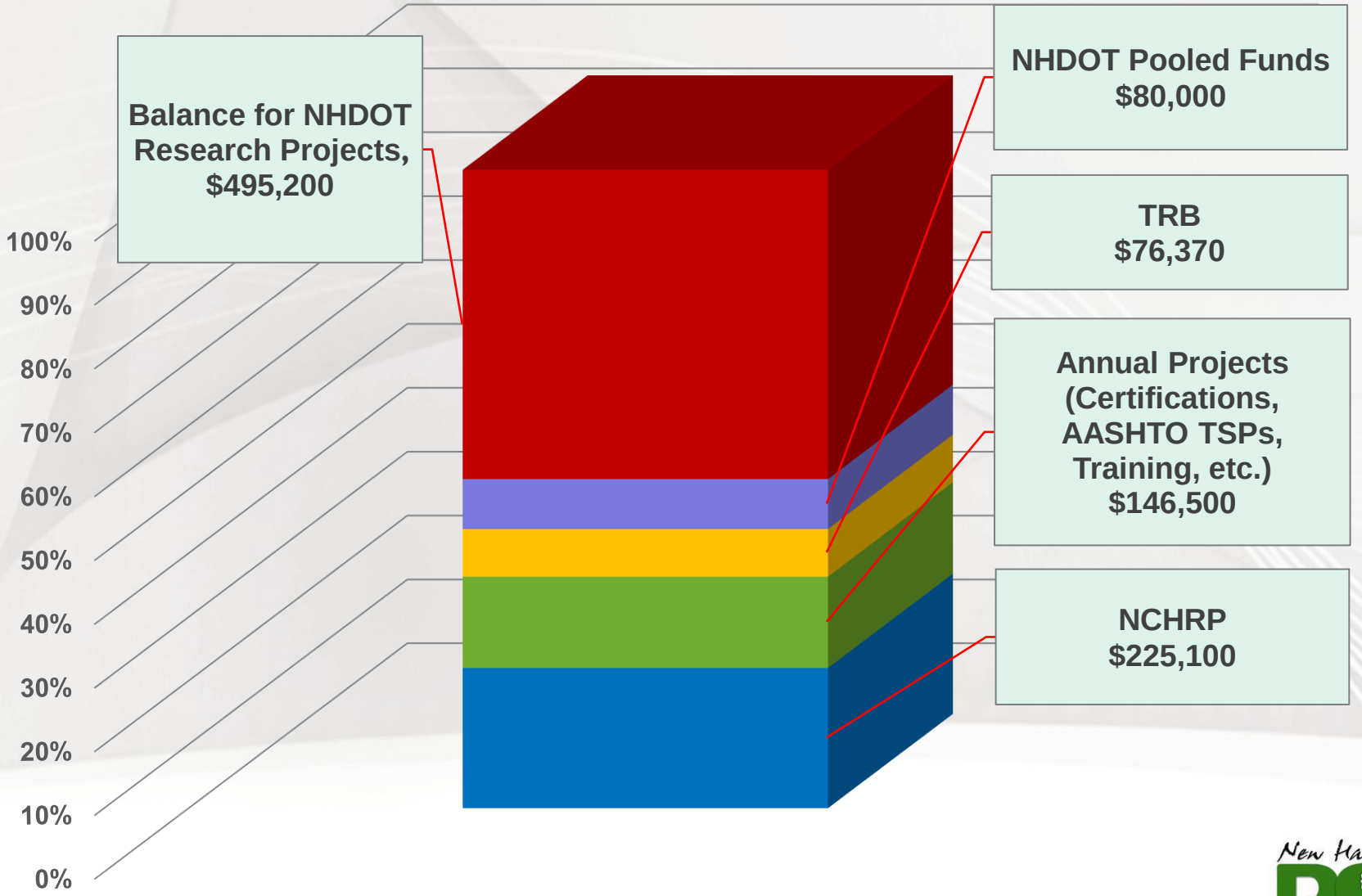
April 2022

THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION
BUREAU OF MATERIALS & RESEARCH
In cooperation with the
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

- NHDOT Research Projects
- Transportation Pooled Funds (TPF)
- NCHRP
- Transportation Research Board (TRB)
- AASHTO Technical Service Programs (TSPs)
- Certifications
- Training

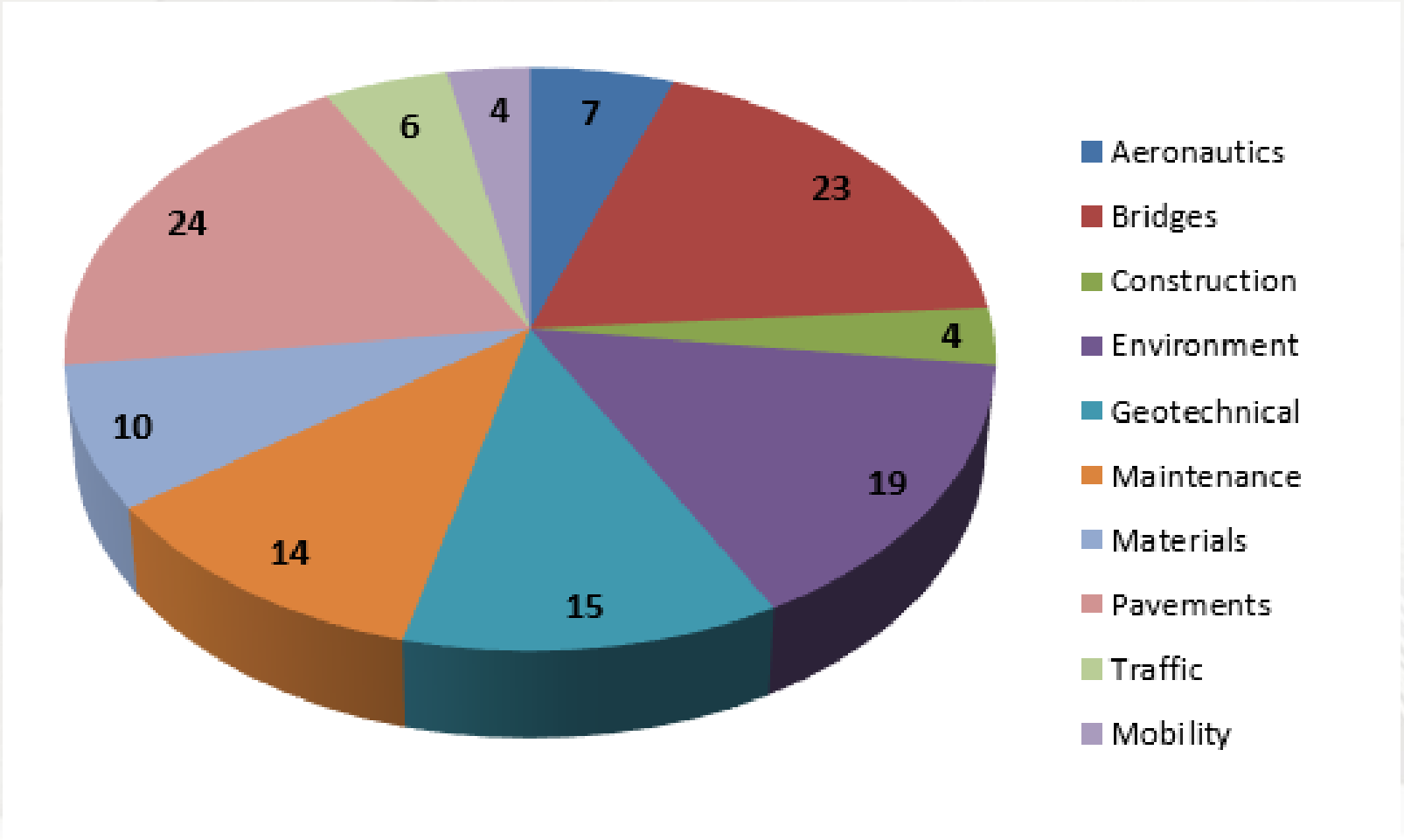
New Hampshire DOT
Department of Transportation

NHDOT FFY 2022 SPR2 Funds



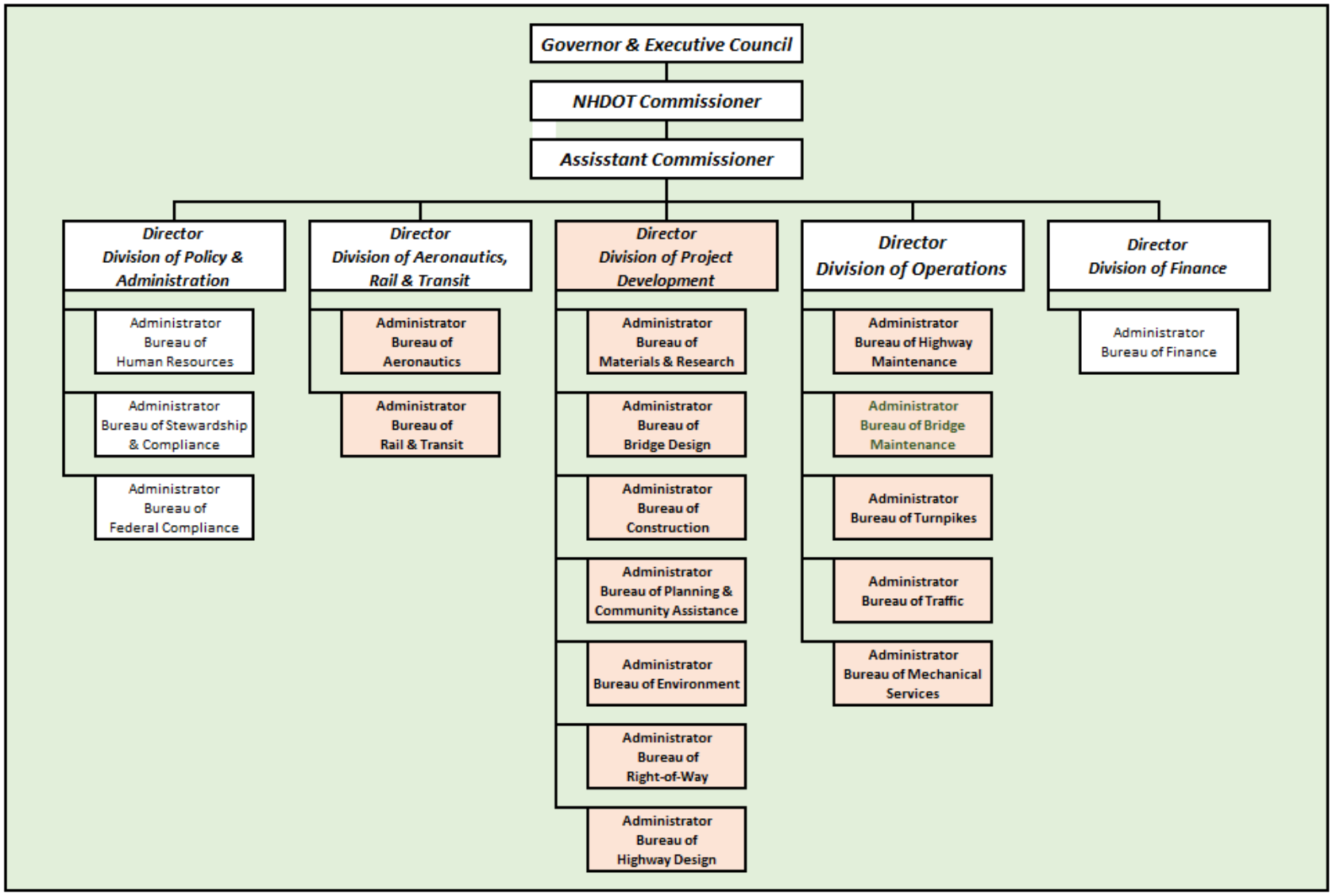
New Hampshire DOT Department of Transportation

NHDOT Research Program Overview



New Hampshire DOT Department of Transportation

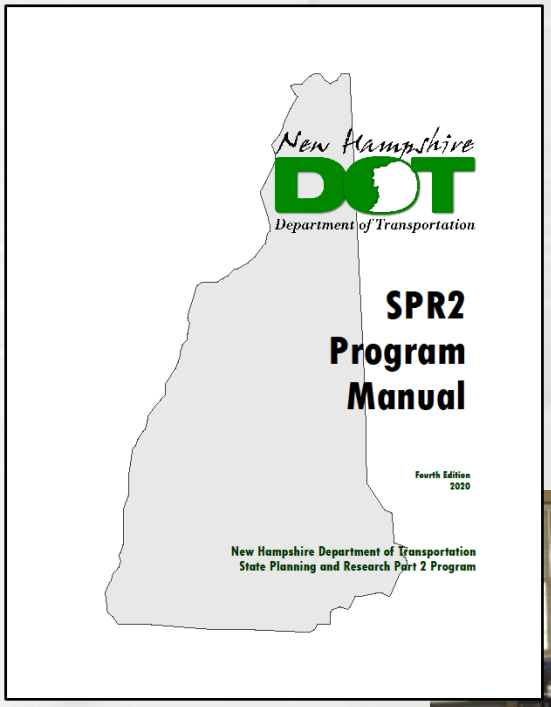
NHDOT Organizational Chart



New Hampshire DOT Department of Transportation

NH Research Advisory Council (NH-RAC)

- Established in 1993
- Primary engagement with leadership is through the NH-RAC
- Roles & responsibilities outlined in the NHDOT SPR2 Program Manual



New Hampshire DOT Department of Transportation

NH Research Advisory Council (RAC)

Voting Members:

- *Materials & Research Administrator*
- *Assistant Director of Project Development*

Bureau Administrators:

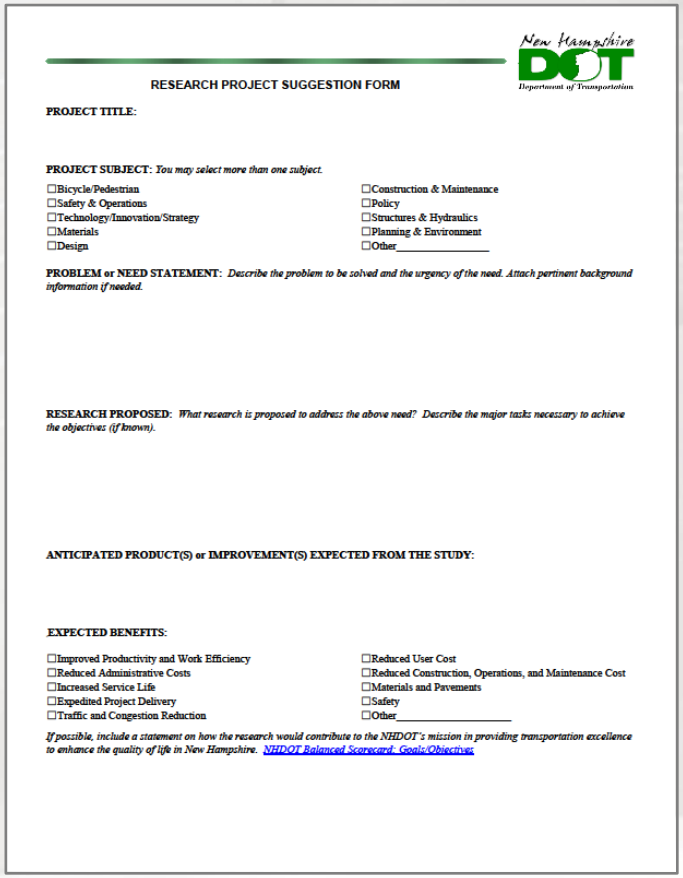
- *Aeronautics*
- *Highway Maintenance*
- *Planning & Community Asst.*
- *Right-of-Way*
- *Environment*
- *Rail & Transit*
- *Mechanical Services*
- *Bridge Design*
- *Construction*
- *Highway Design*
- *Bridge Maintenance*
- *Turnpikes*
- *Traffic*
- *Transportation System Management & Operations (TSMO)*
- *Asset Management Performance Strategy (AMPS)*

Associate (non-voting) members:

- *FHWA, NH Division*
- *NHDOT Research Engineer*

New Hampshire DOT Department of Transportation

Research Project Selection Process



RESEARCH PROJECT SUGGESTION FORM

PROJECT TITLE:

PROJECT SUBJECT: *You may select more than one subject.*

- ☐Bicycle/Pedestrian
- ☐Safety & Operations
- ☐Technology/Innovation/Strategy
- ☐Materials
- ☐Design
- ☐Construction & Maintenance
- ☐Policy
- ☐Structures & Hydraulics
- ☐Planning & Environment
- ☐Other_____

PROBLEM or NEED STATEMENT: *Describe the problem to be solved and the urgency of the need. Attach pertinent background information if needed.*

RESEARCH PROPOSED: *What research is proposed to address the above need? Describe the major tasks necessary to achieve the objectives (if known).*

ANTICIPATED PRODUCT(S) or IMPROVEMENT(S) EXPECTED FROM THE STUDY:

EXPECTED BENEFITS:

- ☐Improved Productivity and Work Efficiency
- ☐Reduced Administrative Costs
- ☐Increased Service Life
- ☐Expedited Project Delivery
- ☐Traffic and Congestion Reduction
- ☐Reduced User Cost
- ☐Reduced Construction, Operations, and Maintenance Cost
- ☐Materials and Pavements
- ☐Safety
- ☐Other_____

If possible, include a statement on how the research would contribute to the NHDOT's mission in providing transportation excellence to enhance the quality of life in New Hampshire. NHDOT Balanced Scorecard: Goals/Objectives

- Problem Statements supported by Leadership
- Presentations and discussion on proposals
- Leadership rates the proposals
- Work program established based on available funding

NH-RAC Selection Process

Strengths:

- Geared towards practical, applied research
- Meetings are well attended, and members appreciate involvement
- Director and Administrator representation brings credibility to the SPR2 Work Program

Challenges:

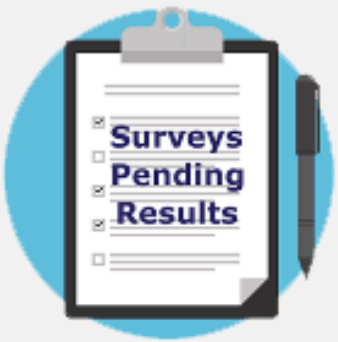
- Does not always produce policy or Commissioner-level ideas
- Tendency towards focus on traditional topics
- Problem Statement volume is relatively low

New Hampshire DOT Department of Transportation

Leadership Participation Beyond NH-RAC

Formal Engagement

- Support participation on Technical Advisory Groups, NCHRP panels, or conference attendance
- Annual review of proposed research outside of NHDOT
- RAC survey responses
- Funding through on-call contracts
- TRB state visit



Leadership Participation Beyond NH-RAC

Informal Engagement

- Receipt and distribution of Research marketing materials
- Display of research project posters
- Opportunities for research to attend and present at staff meetings and trainings

New Hampshire DOT
Department of Transportation

Snowplow Lights - LED vs. Halogen

Technical Brief — October 2020

Report Title
LED Snowplow Lights Evaluation Report

NHDOT Highway Maintenance
Dan Fogg
daniel.j.fogg@dot.nh.gov

Principal Investigator
Dan Fogg
New Hampshire Department of Transportation

Report Link
https://www.nh.gov/dot/org/projectdevelopment/materials/research/projects/26962x.htm

NHDOT Research Unit
Bureau of Materials and Research
3 Hazen Drive
Concord, NH 03302
(603) 271-3151

Why was it studied?
The NHDOT snowplow fleet currently uses halogen lights mounted on the push frame for nighttime and low-light snowplowing operations. Light-emitting diode (LED) bulbs are less susceptible to failure from vibrations and could reduce long-term maintenance cost. Plow drivers have suggested that LED lighting improves their visibility while operating as well as reducing the fatigue experienced during extended hours of plowing. As NHDOT did not have a firm policy on the use of LED headlamps, this research determined if the fleet would experience benefits by using LED bulbs.

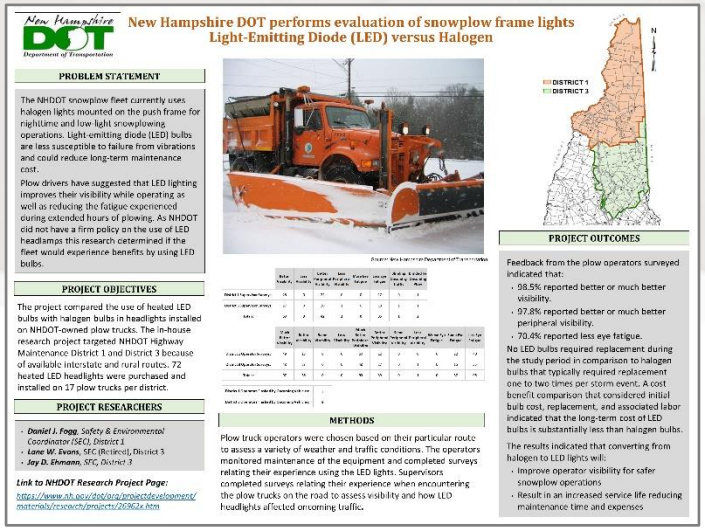
What was done?
The project compared the use of heated LED bulbs with halogen bulbs in headlights installed on NHDOT-owned plow trucks. 72 heated LED headlights were purchased and installed on 34 plow trucks. Plow truck operators were chosen based on their particular route to assess a variety of weather and traffic conditions. The operators monitored maintenance of the equipment and completed surveys relating their experience using the LED lights. Supervisors completed surveys relating their experience when encountering the plow trucks on the road to assess visibility and how LED headlights affected oncoming traffic.

What did we learn?
Feedback from the plow operators surveyed indicated that:
- 98.5% reported better or much better visibility.
- 97.8% reported better or much better peripheral visibility.
- 70.4% reported less eye fatigue.

No LED bulbs required replacement during the study period in comparison to halogen bulbs that typically require replacement one to two times per storm event. A cost benefit comparison that considered initial bulb price, replacement, and associated labor indicated that the long-term cost of LED bulbs is substantially less than halogen.

The results indicated that converting from halogen to LED lights will:
- Improve operator visibility for safer snowplow operations.
- Result in an increased service life reducing maintenance requirements.

How can we use it?
As the study has shown that the LED bulbs reduce maintenance costs and are preferred by the operators due to improved visibility and reduced fatigue, NHDOT will use the results when considering transitioning from halogen to LED snowplow lights.



New Hampshire DOT
Department of Transportation

New Hampshire DOT performs evaluation of snowplow frame lights Light-Emitting Diode (LED) versus Halogen

PROBLEM STATEMENT
The NHDOT snowplow fleet currently uses halogen lights mounted on the push frame for nighttime and low-light snowplowing operations. Light-emitting diode (LED) bulbs are less susceptible to failure from vibrations and could reduce long-term maintenance cost.
Plow drivers have suggested that LED lighting improves their visibility while operating as well as reducing the fatigue experienced during extended hours of plowing. As NHDOT did not have a firm policy on the use of LED headlamps this research determined if the fleet would experience benefits by using LED bulbs.

PROJECT OBJECTIVES
The project compared the use of heated LED bulbs with halogen bulbs in headlights installed on NHDOT-owned plow trucks. The in-house research project targeted NHDOT Highway Maintenance District 1 and District 3 because of available interstate and rural routes. 72 heated LED headlights were purchased and installed on 17 plow trucks per district.

PROJECT RESEARCHERS
- *Daniel J. Fogg, Safety & Environmental Coordinator (SEC), District 1*
- *Lane W. Evans, SFC (Retired), District 3*
- *Jay D. Ehmann, SFC, District 3*

Link to NHDOT Research Project Page:
https://www.nh.gov/dot/org/projectdevelopment/materials/research/projects/26962x.htm

METHODS
Plow truck operators were chosen based on their particular route to assess a variety of weather and traffic conditions. The operators monitored maintenance of the equipment and completed surveys relating their experience using the LED lights. Supervisors completed surveys relating their experience when encountering the plow trucks on the road to assess visibility and how LED headlights affected oncoming traffic.

PROJECT OUTCOMES
Feedback from the plow operators surveyed indicated that:
- 98.5% reported better or much better visibility.
- 97.8% reported better or much better peripheral visibility.
- 70.4% reported less eye fatigue.

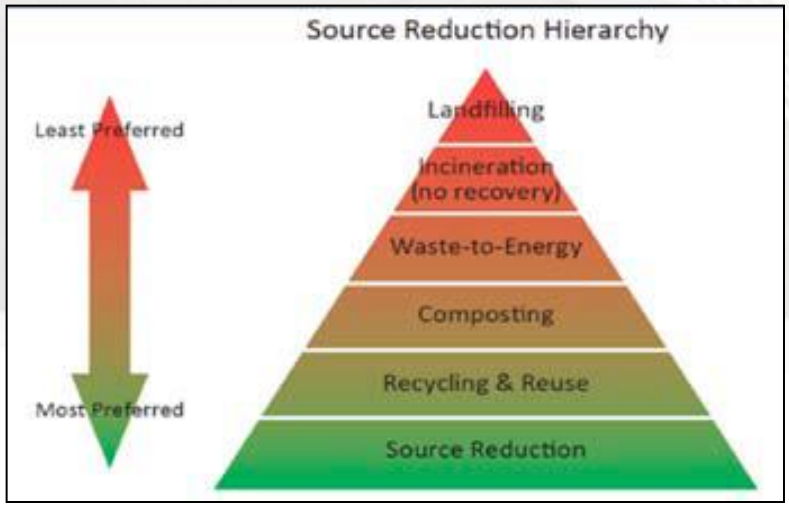
No LED bulbs required replacement during the study period in comparison to halogen bulbs that typically required replacement one to two times per storm event. A cost benefit comparison that considered initial bulb cost, replacement, and associated labor indicated that the long-term cost of LED bulbs is substantially less than halogen bulbs.

The results indicated that converting from halogen to LED lights will:
- Improve operator visibility for safer snowplow operations
- Result in an increased service life reducing maintenance time and expenses

New Hampshire DOT
Department of Transportation

Completed Project Prompted by Leadership

- Mildly Contaminated Soil (MCS) Distribution Assessment
- Initiated by Leadership
- Cooperation between NHDOT & NH Dept. of Environmental Services (DES)

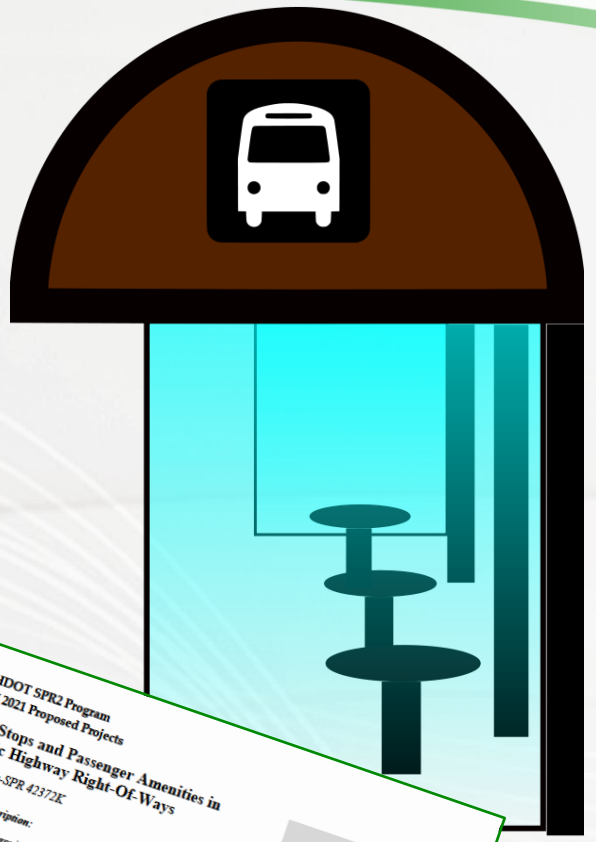


Researcher: Sanborn, Head & Associates, Inc.

Image source: NHDES Solid Waste

New Hampshire DOT Department of Transportation

Current Project Leadership Engagement



- Bus Stops & Passenger Amenities in Public Highway Right-of-Ways
- Championed by a Bureau Administrator
- The Technical Advisory Group includes Front Office Leadership
- Funded through on-call contract with the Front Office Asset Management group

NHDOT SPR2 Program
FFY 2021 Proposed Projects

Bus Stops and Passenger Amenities in Public Highway Right-Of-Ways

Statewide-SPR 42372K

Project Description:

Public transit providers within NH have bus stops, transit amenities, and way finding signage within public highway ROWs, including state-maintained ROWs. There is no clear policy or process by which a transit provider seeks and gains approval to implement stops, etc. There are safety and maintenance considerations that need to be balanced with the mobility/accessibility issues. The installation of bus stops, etc. has been going on for decades and will likely continue to occur haphazardly, but consideration should be given to the benefit of researching and formalizing the process.

The tasks associated with this project will include research of best practices throughout the country, consultation with affected NHDOT Divisions/Bureaus, consultation with NH public transit providers or NH Transit Association, and review of associated Federal or State laws, if applicable.

The Bureau of Rail and Transit presented the problem statement that was selected by the NHDOT Research Advisory Council in December 2020. The principle investigator for this project has not been determined.

Funding Notes:
Includes 10% indirect.

Project Details

Title:
Bus Stops and Passenger Amenities in Public Highway Right-Of-Ways

Project #:
Statewide-SPR 42372K

Start Date:
11/1/2020

End Date:
12/31/2022

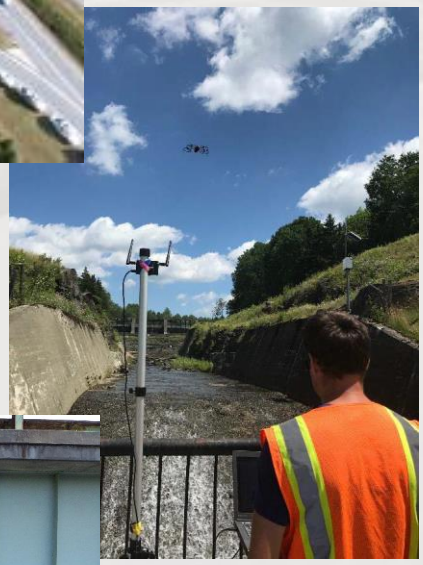
Estimated Obligated Funds:
$110,000.00

Estimated Project Budget:
$100,000.00

Researcher: Cambridge Systematics, Inc.

New Hampshire DOT Department of Transportation

Upcoming Project Leadership Takes Notice



- Development of an Unmanned Aircraft Systems (UAS) Program
- Leadership interest in how the UAS plan will fit into the NHDOT organization
- Leadership representation on the Technical Advisory Group

Researcher: WSP USA, Inc.

New Hampshire DOT Department of Transportation

Thank you
&
Looking forward to the
2022 RAC Meeting in Newton, MA

New Hampshire DOT
Department of Transportation

APPENDIX N. VERMONT EXECUTIVE REPORT OUT

VERMONT
AGENCY OF TRANSPORTATION

Vermont AOT Research Peer Exchange Executive Report Out

July 18, 2022

11:00am – 12:00pm ET

Session 4 Agenda

VERMONT
AGENCY OF TRANSPORTATION

11:00 a.m. **Restatement of Goals and Days 1-3 Recap**
Tanya Miller, Vermont AOT

Overview of Three-Session Peer Exchange
Peer States and FHWA

Vermont AOT Research Section
Emily Parkany, Vermont AOT

Vermont AOT Extended Executive Staff

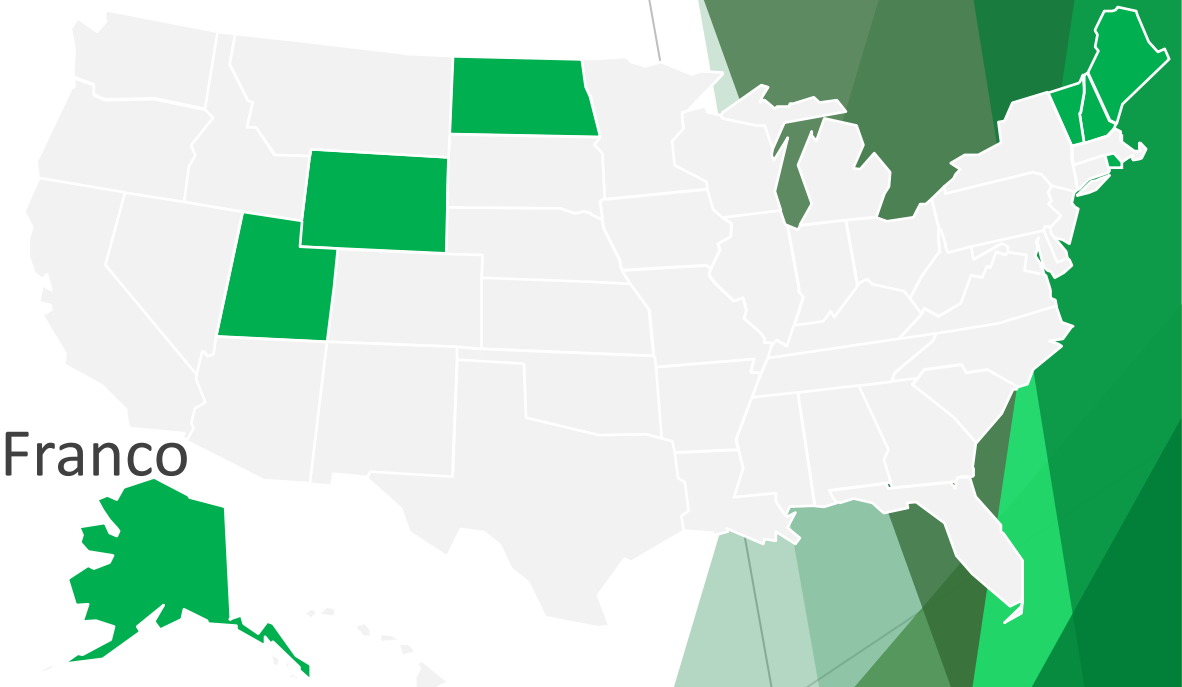
12:00 p.m. **Adjourn**

FHWA Requirement

- This peer exchange and the forthcoming final report fulfill Vermont AOT's obligation to conduct a periodic peer exchange as part of the federal State Planning & Research program.

Core Peer Exchange Participants

- Alaska – Anna Bosin
- Maine – Dale Peabody
- New Hampshire – Ann Scholz, Dee Nash
- North Dakota – Amy Beise
- Rhode Island – Christos Xenophontos, Colin Franco
- Utah – Cameron Kergaye
- Wyoming – Enid White
- Vermont – Emily Parkany, Tanya Miller
- FHWA – Chris Jolly



Peer Exchange Sessions

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- June 7th - Session 1. Research Interactions with Materials/Pavements Topics and Staff
- June 14th - Session 2. Quantitative and Qualitative Research Evaluation
- June 21st - Session 3. Research Engagement of Leadership
- July 18th - Session 4. Executive Report-Out

Differences between Sessions

- Each session included presentations from three or four states. VT presented during all three sessions.
- Differences between the sessions include:
  - Session 1. – Materials and Pavements staff from all states were invited to attend and participate in the session.

Differences between Sessions

- Session 2. – Additional presentations from FHWA and Northwestern University. Also, participants self-selected a breakout group to work on a project. As a generic state transportation agency, they developed a quantitative project evaluation, developed a qualitative framework, or shared the value of the research program.
- Session 3. – Participants took time at the end of the day to provide feedback on all three sessions.

APPENDIX O. VERMONT TAKEAWAYS

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Vermont AOT Research Peer Exchange Executive Report Out: VT Takeaways

July 18, 2022

11:00am – 12:00pm ET

This presentation

- Will share Major Takeaways, Details, Actions Already Taken and Next Steps for all three Peer Exchange Topics/Sessions
  - Research Interactions with Materials/Pavement Staff
  - Qualitative and Quantitative Evaluation
  - Engagement of Leadership
- Additional Takeaways/Conclusion
- Discussion Questions

Materials/Pavement Major Takeaways

- We’re probably doing what we can/the right things
- Pavement Working Group!
- FHWA Division Office is encouraging Experimental Features
- ND Research is embedded in Pavement Design

Materials/Pavement Details

- Potential research role with specification writing
- Encourage small internal research projects

Materials/Pavement
Actions Already Taken and Next Steps

- Discussion with PWG to identify appropriate projects and new techniques to deploy (Experimental Features)
- Support Materials and others to implement completed research projects
- Continue our learning by observing field activities

Qualitative and Quantitative Evaluation Major Takeaways

- This is hard; overlaps with Value of Research, Implementation, Tech Transfer
- Determine what is needed to tell a story about the project
- Maybe try to quantify only one project a year
- One framework that applies to all projects may be too hard—especially for a small program
- FHWA spends a lot of resources on qualitative evaluation

Q and Q Details

- We developed a small project and chose UVM to help us but there have been a lot of delays and the results were not as expected
- VT presented our ideas for Q&Q as of June 14, but we had so much feedback that we have made many changes and our Evaluation process will likely keep changing
- Consider interviewing project managers to assist them with post-project evaluation instead of a survey
- Consider putting together one-page fact sheet or short video for researchers and TAC members to explain what we mean by project Evaluation

Q&Q Actions Already Taken and Next Steps

- Positive experience with 7/13 SmartGrowth kickoff meeting! 11 responses to short pre-meeting survey and great discussion during meeting to clarify project expectations
- We will likely continue to tweak/develop
- Try to emphasize project “stories”

Engagement of Leadership Major Takeaways

- The "right amount" of executive and additional leader engagement varies
- We’re probably doing what we can/the right things
- How much should we share?
- Be more strategic with the Weekly Report in sharing specifics that we want to alert leadership about

Engagement of Leadership Details

- Encourage NCHRP panelists to share project results (and VT impact). Show how panel participation aligns with VT activities
- Create fact sheets or “white papers” prepared ahead of legislation season for hot topics we think will get attention (AK)
- Share unique opportunities with exec staff members (like drone field visits or experimental feature construction)

Engagement of Leadership
Actions Already Taken and Next Steps

- This meeting
- Bureau Directors and Deputy Division Directors are included in annual research project selection
- Executive support of NCHRP panel members

- Eager to learn **next steps** from today's discussion

Other Takeaways/Conclusion

- FHWA requirement fulfilled—Check!
- Advantages to virtual format including spread over three weeks and summary session

Questions for Leadership

- What stood out to you?
- What are opportunities that might align with Vermont AOT's needs and executive priorities?
- Other reflections on what you have heard today