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2023 Research Peer Exchange: Transportation Pooled Funds, Data Curation, and Promoting Research Culture

APPLIED RESEARCH & INNOVATION BRANCH

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16. Abstract

Colorado Department of Transportation (CDOT) hosted a two-day Peer Exchange at the CDOT headquarters in Denver, Colorado on February 28 and March 1, 2023. Representatives from Colorado, Idaho, Missouri, Maryland, Vermont, Federal Highway Administration, and the National Transportation Library participated. This peer exchange focused on the discussion of three topics of particular benefit to the CDOT Research Branch: Leading Pooled Fund Projects, Research Data Curation, and Promoting a Culture of Research. Participating states each presented their experiences and lessons learned for each topic. Additionally, to begin the exchange, each state shared an overview of their Research & Innovation programs. Experts from FHWA and NTL-BTS presented and shared their expertise regarding pooled funds and data curation, respectively.

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Executive Summary

Colorado Department of Transportation (CDOT) hosted a two-day Peer Exchange at the CDOT headquarters in Denver, Colorado on February 28 and March 1, 2023. Representatives from Colorado Department of Transportation, Idaho Transportation Department (ITD), Maryland Department of Transportation (MDOT), Missouri Department of Transportation (MoDOT), Vermont Agency of Transportation (VTrans), Federal Highway Administration (FHWA), and the National Transportation Library's Bureau of Transportation Statistics (NTL-BTS) participated. Leading up to the exchange, CDOT Applied Research and Innovation Branch (ARIB) fielded questions and topics of interest from potential participants. Following the meeting, participants were invited to an optional site tour of CDOT's Central-70 Project, which includes a cut-and-cover tunnel.

Peer Exchange Topics

This peer exchange focused on the discussion of three topics of particular benefit to the CDOT ARIB:

1. **Leading Pooled Fund Projects**
2. **Research Data Curation**
3. **Promoting a Culture of Research**

Key Takeaways

At the end of the peer exchange, the full group of participants identified the following key takeaways:

Research & Innovation Program Overviews

- ★ Consider using agency value statements to drive research priorities
- ★ Increase familiarity among states' research programs through peer exchanges to enable Research Managers to better support one another

Leading Pooled Fund Projects

- ★ Allocate administrative work to the contractor/researcher's scope when leading pooled fund projects to reduce Research Manager workload
- ★ Simplify financial steps by taking advantage of automation now available through FHWA Financial Management Information System (FMIS)
- ★ Require frequent project briefs from contractors to ease Research Manager quarterly reporting responsibilities

Research Data Curation

- ★ Ensure data sets are recognized as standalone research products, equally valued as peer-reviewed publications
- ★ Leverage NTL-BTS resources to create Data Management Plans (DMPs)
- ★ Take advantage of existing boilerplate language from other states and University Transportation Centers (UTC) when developing DMPs
- ★ Consider including a DMP requirement in Requests For Proposals (RFPs) and research scopes of work

Promoting a Culture of Research

- ★ Consider a variety of approaches to encourage and support opportunities for staff outside of research branches to contribute to research (e.g., symposiums, webinars, in-person meetings, a research agenda item on existing department meetings)
- ★ Consider a *"Research Needs"* or a *"Research Ideas"* summit as an option to help Research Managers better understand potential Champions' interests

From the Host: CDOT ARIB

ARIB was appreciative of thoughtful presentations and discussion of all states and participants. We found many ideas that we learned from and processes we want to investigate more and possibly adapt for use in our program. A particular highlight for us was the focus on Data Curation. This is a new-to-us area, and we intend, over time, to develop and improve how we curate and get the best value from research project data sets. The following report summarizes presentations and discussion that took place throughout the exchange and details points of key learning and areas that ARIB will further explore.

Peer Exchange Report

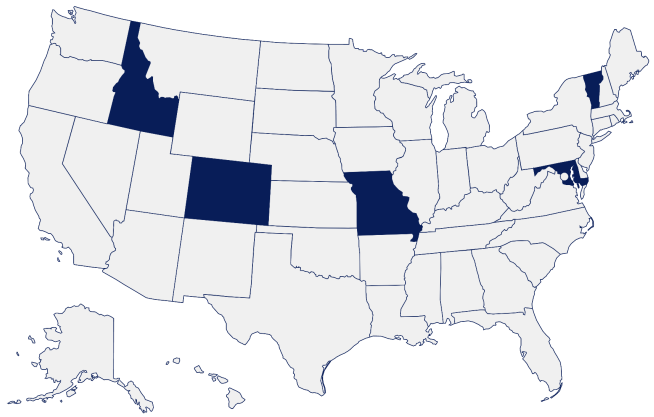
Exchange Overview

Colorado Department of Transportation (CDOT) hosted a two-day Peer Exchange at the CDOT headquarters in Denver, Colorado on February 28 and March 1, 2023. Leading up to the exchange, CDOT Applied Research and Innovation Branch (ARIB) fielded questions and topics of interest from potential participants.

Participating States

The State Transportation Research Branches in attendance at this peer exchange included:

- Colorado Department of Transportation (CDOT)
- Idaho Transportation Department (ITD)
- Maryland Department of Transportation (MDOT)
- Missouri Department of Transportation (MoDOT)
- Vermont Agency of Transportation (VTrans)



Attendees

- Steve Cohn, *CDOT Research Manager*
- Meteb Mejbel, *CDOT Air Quality Research Intern*
- David Reeves, *CDOT Research Engineer*
- Bryan Roeder, *CDOT Environmental and Planning Research Program Manager*
- Keith Stefanik, *CDOT Chief Engineer*
- Thien Tran, *CDOT Research Engineer*
- Sarah Zepeda, *CDOT Research Librarian*
- Emily Parkany, *VTrans Research Manager*
- Amanda Laib, *ITD Senior Research Analyst*
- Jen Harper, *MoDOT Research Director*
- Hua Xiang, *MDOT Deputy Director of Policy and Research*
- Aaron Bustow, *FHWA Colorado Division Transportation Planner*
- Tricia Sergeson, *FHWA Pooled Fund Program Manager*
- Leighton Christensen, *NTL-BTS Data Curator*
- Jeffrey Range, *CDR Associates (facilitator)*
- Laura Hickey, *CDR Associates (facilitator)*

Discussion Topics

This peer exchange focused on the discussion of three topics of particular benefit to the CDOT Applied Research and Innovation Branch and participating states:

1. **Leading Pooled Fund Projects**
2. **Research Data Curation**
3. **Promoting a Culture of Research**

Exchange Format & Agenda

Participating states presented their experiences and lessons learned for each topic. To begin the exchange, each state shared an overview of their Research and Innovation programs. Experts from FHWA and NTL-BTS provided expertise and a federal perspective during the exchange, presenting on pooled funds and data curation, respectively. Facilitated discussion took place for each topic.

Day 1	Day 2
Welcome and Introductions (ft. Keith Stefanik, *CDOT Chief Engineer*)	Research Data Curation (ft. Leighton Christensen, *NTL-BTS Data Curator*)
Overview of State Research & Innovation Programs	Promoting a Culture of Research
Leading Transportation Pooled Fund Projects (ft. Tricia Sergeson, *FHWA Pooled Fund Program Manager*)	Roundtable Reflection of Takeaways

Welcome Statements

Steve Cohn, CDOT ARIB Manager, began the meeting. The group of participating states were chosen to have representation from diverse regions, including three of the four Research Advisory Committee (RAC) regions. The attending states also have important similarities, including state population and research spending, which added to the possibilities to apply lessons learned from each other.

Keith Stefanik, CDOT Chief Engineer, welcomed the group. He shared his belief that peer exchanges provide an opportunity to learn about other state's innovations. He highlighted that learning leads to improving and helps CDOT succeed.

Peer Exchange Success Story

Keith Stefanik attended a peer exchange hosted by Texas DOT focused on cut-and-cover tunnels, which informed the innovation of the Central-70 project in Colorado. This project reconnected Denver communities formerly divided by a highway. Following the 2-day peer exchange, some attendees took a tour of the recently completed project site. The excursion is briefly summarized in the Site Tour section of this report.

Overview of State Research & Innovation Programs

Each state provided an overview of their program and detailed their research project solicitation cycle. Topics of interest that emerged during discussion included challenges of procurement, best practices for survey deployment, the responsibilities of research champions, and communicating research invitations and opportunities. Full presentations for each state overview can be found in Appendix E.

State Overview Discussion Highlights

Research Solicitation Cycle

Gathering and selecting research needs and ideas is one of the primary responsibilities of each Research & Innovation Branch and this was a key topic of discussion. Ideas to strengthen the effectiveness of project solicitation include:

- Ensure diverse agency representation to establish research priorities (e.g., consider agency mission or values, participation of high-level representatives, and an active "Research Needs Assessment" across agency divisions)
- Assign a large role for Research Champions in the solicitation cycle (e.g., presenting elevator pitches) to maintain early Champion involvement and leadership

Procurement

Because many research projects are carried out with universities and consultants, the procurement process was frequently mentioned as a challenge for state research branches. One path to ease this process gained enthusiasm, although procurement rules greatly vary between states:

- Develop a Memorandum of Understanding (MOU) with Institutions of Higher Education (IHEs) to streamline the procurement process, lower overhead costs, and enhance workforce development opportunities

Benefits and Implementation

Another common challenge cited was how to most effectively track and communicate application of research outcomes, their benefits, and the degree to which they are implemented. Strategies discussed include:

- Planning regular surveys or check-in meetings throughout each project, focused on sharing research benefits and implementation
- Use a targeted survey and follow-up directly with those who are most interested or knowledgeable about benefits and implementation
- Require greater discussion of the benefits and paths for implementation within each project proposal

Colorado Department of Transportation (CDOT)

Presenter: Steve Cohn

About the Research Program:

- 5 full-time staff
- The Research Branch is within Division of Transportation Development (DTD) but Innovation activities are centered within the Office of Process Improvement
- 89 work program projects
- Budget: $3.5M for FY23

Research Solicitation Cycle

CDOT ARIB hosts two rounds of problem statement (PS) evaluation each year. Each PS requires a CDOT Project Champion who is responsible for research project leadership. To help select problems, an Oversight Team made up of Subject Matter Experts (SMEs) provides advice on the need, feasibility, and applicability of the PS to the Research Branch. Additionally, a Research Implementation Council (RIC) assesses the importance of the PS topic to CDOT from a leadership perspective. Final selection of research projects is made by the ARIB Manager, DTD Director, & CDOT Chief Engineer before submitting to FHWA for final approval.

CDOT Program Highlights

- Research Areas
  - Environmental & Water Quality Planning
  - Safety and Operations; Pooled Fund management
  - Pavement & Materials
  - Structures, Hydraulics, & Geotech
- Emerging Research Topics
  - Cybersecurity
  - Machine Learning
  - Greenhouse Gas and Air Quality
  - Mobility Modeling
  - Unmanned Systems
  - Alternative Fuels
- Areas of Emphasis
  - Mitigating Wildlife–Vehicle Collisions
  - Construction and Operations/Maintenance Impacts–Air Quality
  - Post-wildfire Effects–Hydrology and Debris Flow

Idaho Transportation Department (ITD)

Presenter: Amanda Laib

About the Research Program

- 2 full-time employees
- Located in the Planning and Development Services Division
- Projects overseen by sponsors, managers, and technical advisory teams
- Budget: $2.35M for FY23

Research Solicitation Cycle

ITD distributes an annual call for research ideas using a project request form (Appendix D). Ideas can only be submitted by internal staff (e.g., ITD program managers, SMEs, and past Project Managers (PMs)). Research Branch staff meet with the ITD strategic goals team and innovation stewards to discuss their ideas. The request forms must be signed by a PM and a sponsor. The sponsor doesn't manage the project but must be a manager at the program level or higher and is often the PM's direct supervisor. The sponsor commits to supporting implementation. After all ideas are submitted, an ITD Research Advisory Council reviews and invites PMs to present a project elevator pitch. Following presentations, the council is responsible for final project selection before submitting to FHWA for final approval.

ITD Program Highlights: Innovation

- In 2016 ITD formed the Continuous Improvement Office
- The program uses a SharePoint site to capture ideas and implemented innovations
- The Volunteer Innovation Stewards program assists staff in their work area with idea generation and implementation support
- Employee recognition awards encourage staff participation across the Department

Maryland Department of Transportation (MDOT)

Presenter: Hua Xiang

About the Research Program

- Located at State Highway Administration within division of office of policy and research
- 5-person Research team and 3-person Knowledge Management team
- Budget: $4.4M for FY23

Research Solicitation Cycle

MDOT circulates an annual call for Problem Statements internally using a research needs form. The form requires Champions to detail a PS, research benefits, level of problem urgency, and expected project deliverables. MDOT leadership determines which projects will be funded and selected projects go through an RFP process with state universities. Once proposals are awarded, the work program is submitted to FHWA for approval.

MDOT Program Highlights: Project Oversight

- The program developed and maintains 25+ knowledge management documents (Appendix D)
- There are two leads for every research project, one Technical Lead and one Administrative Lead
- The program provides report guidelines for proposals, quarterly progress reports, and final reports
- It is requested that all researchers utilize technical editors to review reports before submission

Vermont Agency of Transportation (VTrans)

Presenter: Emily Parkany

About the Research Program

- 2 full-time employees
- All research is performed externally and led by VTrans
- Each project includes a TAC that may consist of the VTrans Champion, research staff, VTrans staff, technical staff, and Regional Planning Commission staff
- Budget: $1.3M for FY23

Research Solicitation Cycle

VTrans requests ideas from anyone on an annual basis. An internal VTrans Project Champion with appropriate technical expertise must be matched to an idea to go forward as a Problem Statement. PSs are shared with a Qualified Researcher list—currently including five universities and seven consultants selected by RFQ every two years—to solicit letters of interest. Project Champions evaluate these letters of interest to select a research team and the selected Qualified Researchers submit full proposals to VTrans. Lastly, Project Champions present an elevator pitch to Bureau Directors and Deputy Division Directors who decide on projects to fund before submitting to FHWA for final approval.

VTrans Program Highlights: Engagement Duties

- Research staff coordinate and host an annual Research & Innovation Symposium every September
- The program conducts a benefits and implementation survey three times throughout a project

Missouri Department of Transportation (MoDOT)

Presenter: Jen Harper

About the Research Program

- 4 full-time staff and a Contract Librarian
- Located in the Construction and Materials Division
- Budget: $6M for FY23
- Average of 45 contracts at a time
- Research is performed by universities, consultants, or a partnership of the two

Research Solicitation Cycle

The MoDOT Research Director meets with Division heads, SMEs, or District Engineers annually to brainstorm project ideas. Additionally, they circulate a call for ideas with external research partners. Then they host a "Research Needs Day" where technical staff and researchers present and refine ideas and begin developing proposals. Proposals are sent out for competitive bids to universities and contractors, and then submitted to FHWA for final approval

MoDOT Program Highlights: Innovation Challenge

- An annual competition hosted by the program to reward best practices for tools and equipment, productivity, and operations
- Awards given at two levels—District/Central Office and Statewide
- The State provides $1M to implement winning applied innovations
- After the Innovation Challenge, the MoDOT Maintenance Division hosts a "store" of winning innovations for Districts to purchase, supporting implementation of research

Topic 1: Leading Transportation Pooled Funds

Discussion of Transportation Pooled Funds (PF) began with an overview presentation by Tricia Sergeson, FHWA. Each state then presented their active PF projects, challenges in leading PF projects, and lessons learned. Attendees exchanged ideas to improve PF project partnerships and ease some of the burdens faced by lead states. Presentations from FHWA and each state can be found in Appendix E.

Topic 1 Discussion Highlights

Challenges of Leading PF

The primary challenges PF-leading states cited involved the administrative burden. These include:

- Entraining the best Principal Investigators and SMEs
- Difficult sole-source procurement requirements in some states
- Limited capacity for added responsibilities in small research branches and financial offices
- Large time commitment for agency Champions/PMs
- Maintaining project momentum through employee turnover
- Limited budget options to fulfill match requirements in smaller states

Relieving Administrative Burdens

Since the challenges of leading PF projects are largely administrative, discussion focused on brainstorming how states can delegate administrative tasks, and on best practices for PF partners to proactively support the lead state. Suggestions include:

- Solicit PF project requests together with general problem statement solicitation to increase efficiency
- Within TACs, consider designating topic-specific leaders to share responsibilities
- Seek administrative support through universities, for example as part of existing MOUs
- Include administrative duties within the scope of work done by contractors and consultants

Fund Transfers

PF partnerships rely on timely and accurate transfers of funds. Ideas discussed to improve the fund transfer process include:

- Complete transfers as early as possible, particularly at project initiation, since procurement cannot begin until there are sufficient funds available
- Allow extra time for non-State Planning and Research (SPR) fund transfers that may require extra steps
- For efficiency, consider submitting all transfers annually with as-needed transfers when necessary
- Review status with the finance office to verify that all transfers are processed before project closeout

FHWA Overview and Accumulated Learning

Presented by Tricia Sergeson

PF Program Qualifications

- Majority are SPR-B funded projects, SPR-A eligible at times
- Five-funding-year project limit
- FHWA seeks flexibility; for example, grouping and funding multiple projects

PF Project Participants

- Lead Agency: a State DOT, FHWA program office, or FHWA resource center
- Partners: organizations, private industry, approved foreign governments, local and regional agencies, or other federal or state agencies

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International Partnerships

- Currently partner with organizations in Canada, the Netherlands, UK, New Zealand, and Turkey

PF Process Flow Charts and PF Checklist are available on the TPF website

Best Practices of Leading Pooled Funds

- Fact sheet available here
- Invite Tricia to TAC kick-off meeting

The Pooled Fund Transfer Process is now fully automated through FMIS

- For questions about the automated funds transfer process in FMIS, contact the Office of Budget, Budget Execution Team at budgetexecutionteam[at]dot.gov
- 1575 Form is no longer needed; can enter project number, program code, acceptance letter into FMIS
- To request access to the automation tool in the FMIS Fund Control Module, contact the Office of Financial Data and Technology, Systems Team at HCFB_SystemsTeam[at]dot.gov

FAQ for State Planning and Research Match Waivers

- States can send any type of funds to a PF project
- If you use federal (non-SPR) funds, use the 1575-C form
- Non-SPR funds require a non-federal match (typically 80/20)
- The 100% match waiver only applies to SPR funds

Website features

- To see the studies an agency is participating in go to pooledfund.org/Report
- Log in to update email preferences and check fund transfer updates

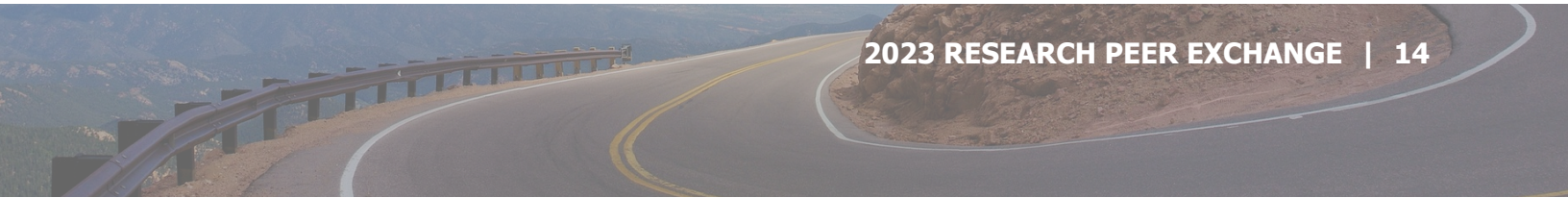
Excellence Awards

- Biannual call for nominations, the next opens in September 2023

How FHWA Can Help States Lead PF Projects

FHWA inquired about specific ways to improve the experience of State-led PF projects. Ideas for this type of support include:

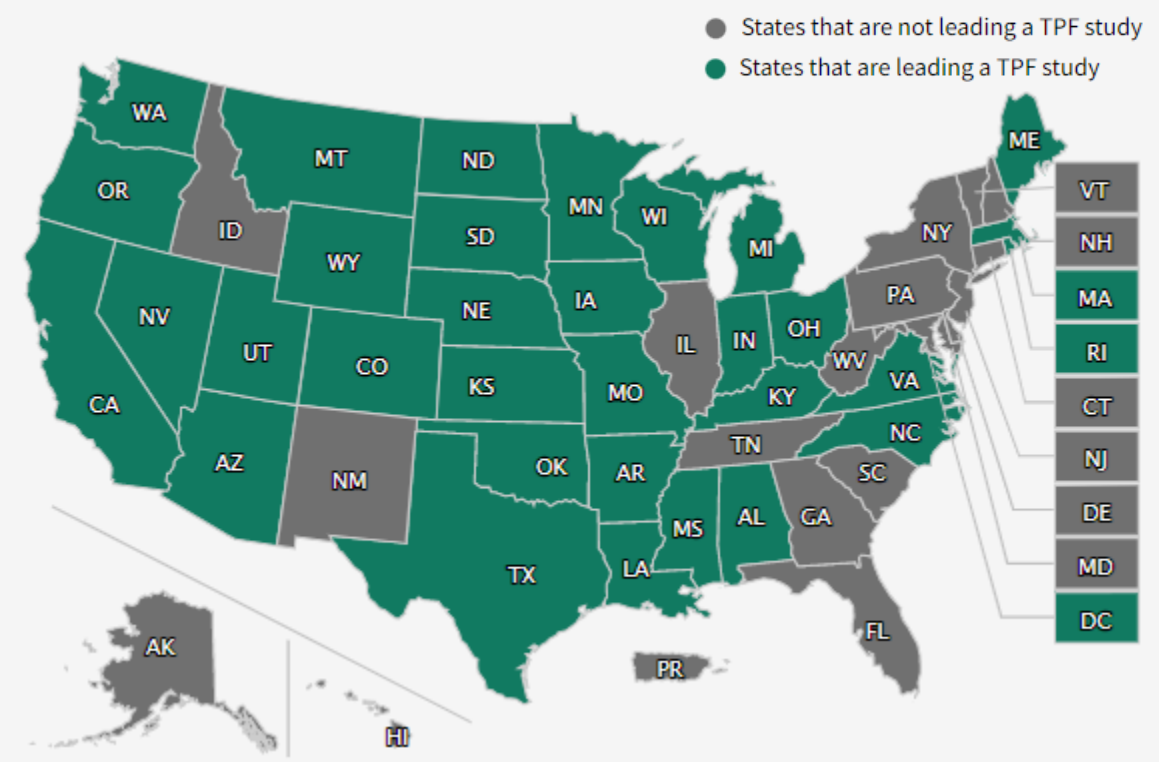
- *Share how other states have addressed the administrative burden of leading PF projects*
- *Continue encouraging strong closeout and reporting practices*
- *Require PF-leading states to clearly describe expected contributions (e.g. include one-time project costs in addition to annual contributions upfront where applicable)*



State Lessons Learned

State presentations included their lessons learned, including:

- Ask researchers to include detailed cost per state in their proposals
- Start with the PF website to address initial questions
- Include links to regularly updated websites in quarterly reports
- Invite researchers to lead project update meetings
- Frame decision requests to the TAC as, "If I don't hear from you by [deadline], I will assume you are in agreement"
- Plan for clear and regular communication with the TAC and financial team early in the project
- Holding a peer exchange focused on a specific PF project supports sustained engagement
- Consider Department priorities and directives when assessing whether or not to participate in a PF project



Topic 2: Research Data Curation

The Data Curation discussion began with states presenting their experiences and questions about data curation and data management. This was followed by a presentation from Leighton Christiansen, NTL-BTS. Discussion focused on building a better understanding of the resources available to support long-term data storage practices, stay updated on data sharing standards, and write Data Management Plans (DMPs). Presentations by NTL-BTS and each state can be found in Appendix E.

Topic 2 Discussion Highlights

Data Storage

Conversations around data storage covered who should be responsible for hosting data, where data might be stored long-term, and what kind of data to store. Advice for data storage includes:

- Consider establishing an online Data Repository - a shared storage space for researchers to upload and access data sets associated with their research (e.g., GitHub)
- Host data within the DOT in addition to researcher's institution to prevent data loss
- Consider sharing and storing code in repositories, especially as it becomes a more regular part of data analysis

Data Sharing

The discussion around data sharing clarified what states are required to share with NTL and identified strategies to overcome common challenges. Challenges, requirements, and suggestions to promote data sharing include:

- SPR and Small Business Innovation Research (SBIR) are exempt from requirements of data management plans unless they are used as a match for federal funding (e.g. UTC)
- Some states do not make a distinction between DMP requirements for SPR and for other federally funded research–everything follows the same standard
- One challenge of data management is that significant amounts of historical data are inaccessible (e.g., data stored on outdated technology), a DMP can help prevent this
- The most prevalent risk of poor data management is data loss

Data Management Plans

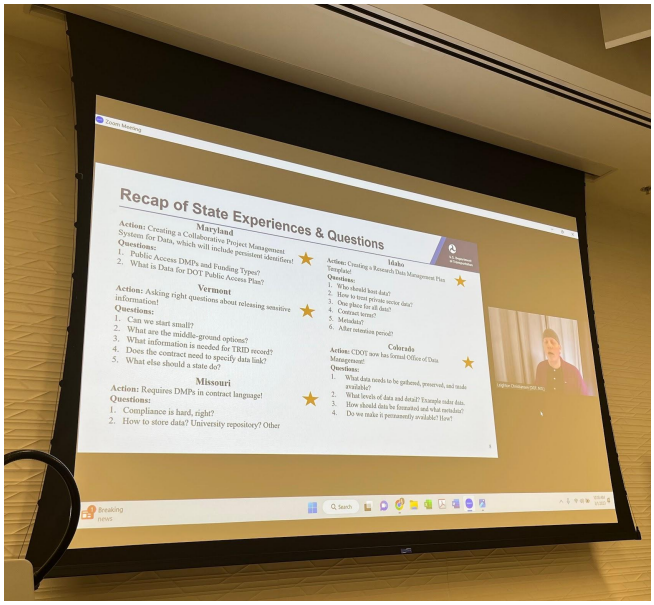
DMPs describe what data will be collected, how data will be used, and where data will be stored and accessed during a project and after it ends. The discussion focused on the requirement for agencies to create DMPs and the risks and challenges associated with poor data management habits. Important clarifications include:

- Data embargoes—publisher-imposed limits on sharing and accessing data associated with a publication—present a data sharing challenge
- The Office of Science and Technology Policy (OSTP) released a memo explaining that data embargoes by publishers will be fully phased out over the next 2 years
- If photos include license plates, faces, or other identifying information, that information must be pixelated prior to sharing them; typically researchers can perform this pixelation
- At a minimum, research metadata must be in the NTL repository and be assigned a Transport Research International Documentation (TRID) index
- Consider encouraging researchers to apply a license to their data
- Data ownership can be protected through Data Sharing Agreements between researchers and agencies

Summary and Advice from National Transportation Library

Presented by Leighton Christiansen

Strong Data Curation has many benefits, such as: Improved data search and retrieval, data reuse, and meta-analysis



Resources to Get Started

- NCHRP Research Report 936: Chapters 7 and 8 contain the basics of Data Management
- NTL LibGuide
- USDOT Public Access Guidance Website
- NTL trusted data repositories list and guidelines

Defining Data Curation Terms

- Data Management: The practice of collecting, keeping, and using data securely and efficiently
- Data Curation: A lifecycle approach and a series of actions taken to help create, organize, and maintain data
- Data Science: Analysis actions to garner meaningful insight from data
- Data Stewards: Data-minded individuals who connect with and support researchers
- Data Governance: High-level rules and policies that are implemented by curators, stewards, etc.
- Data Lifecycle: The phases of data's existence from planning all the way to possible destruction

The goal is making data FAIR: Findable, Accessible, Interoperable, Reusable

Research is moving towards Open Science: The principle and practice of making research products and processes available to all, while respecting diverse cultures, maintaining security and privacy, and fostering collaborations, reproducibility, and equity.

Aim for Proactive Curation Actions

Reactive Actions occur where data management is considered late in the collection process. A proactive example is:

- Preservation & mitigation of loss in "cold storage" paired with living data repositories updated regularly

Proactive Actions occur before, throughout, and following data collection. Some examples include:

- DMPs & Training
- Robust Documentation: including readme documents & code
- Persistent IDs (e.g. Digital Object Identifier (DOI), ORCID, Research Organization Registry (ROR))
- Preservation Planning: Repository and backup

Tips to Promote Data Curation Skills in State DOT Research Programs

- *Hire a professional Data Curator, or contract data curation activities through a university library or digital repository*
- *Contracts could include a requirement for a participating data manager*
- *Create or join a data curation network*
- *Learn from other in-house departments and divisions that may have already prepared DMPs*
- *Attend courses to grow expertise*

State Lessons Learned

Data curation lessons distilled from the presentations and discussion include:

- 4 of 5 attending states already include a data deliverable or a data management plan in their RFPs and scopes of work
- Data management is important. On average, 17% of data collected is lost each successive year after a project concludes
- Data Management implementation is challenging. Taking the time to create a DMP before data collection begins is the first step to making it easier
- Data management resources are available to help research managers get started
- DMPs can be required as part of the research contract
- The person who collects a dataset is the most likely person to share or reuse the data, and therefore the most likely person to benefit from good data management; DMPs are a service to the future self
- Other in-house departments and divisions may have knowledge and experience with DMPs to help get started.

CDOT Research Library Visit

Sarah Zepeda (CDOT Research Librarian) shows guests around the research library located next to the Research Branch offices at CDOT. This library is operated by the Research Branch and assists with literature searches and reviews.

Topic 3: Promoting a Culture of Research

Each state provided an overview of efforts to cultivate knowledge, appreciation, and participation in research and innovation throughout their Department. Presentations described engagement activities and communication tools used to connect with Department leadership, divisions and departments. Discussion included experience with maintaining and growing interest in research outside of Research Branches and ideas to improve science communication. Topics that emerged included virtual engagement, soliciting ideas and interests broadly, and creating project briefs. Presentations can be found in Appendix E.

Topic 3 Discussion Highlights

Soliciting Ideas and Interests

The group discussed how to best learn and understand varied audiences research-related interests, and ways to customize engagement and communication approaches. Tools and tactics discussed include:

- At CDOT, the RIC sponsor could be involved in selecting research champions
- Holding a "Research Ideas Summit" to inform and identify both ideas and champions
- Surveying groups for their interests can result in greater Research exposure as well as bring forth ideas
- Meeting with division leadership can clarify topics of most value to parts of the organization
- Getting on the agenda as various teams and groups meet can be a lower-effort approach to share research opportunities.

Engagement Format: Virtual meetings

Attendees discussed the increased prevalence and norms of virtual meetings and shared thoughts on the respective benefits of virtual and in-person formats. Considerations that arose include:

- Virtual engagement eliminates some geographical barriers and associated time constraints, and can helps involve Champions from around a state
- In-person meetings during project formation support foundational relationship-building
- In situations where hybrid meetings are the best approach, training, tools, and practice for virtual interaction can be beneficial (e.g., breakout rooms, polls, etc.)
- Hosting or attending webinars are opportunities both for champion and researcher recognition and for greater engagement with SMEs

Project Briefs

During discussion, it was agreed that Project Briefs summarizing the highlights of a research project's purpose, benefits, and progress can be a highly valuable communication tool. Ideas shared to increase the number, quality, and usefulness of Project Briefs include:

- Project Briefs can be added to the scope of work of research contracts
- Champions can be asked to review Project Briefs and ensure there is clear communication of the projects benefits and paths to implementation
- Project Briefs and summaries can be submitted for NTL cataloging along with project final reports, which will increase the project exposure

State Presentations

State presentations included an overview and highlights from current engagement approaches and activities including:

Vermont Agency of Transportation

Presenter: Emily Parkany

Research Engagement

- Host an annual Research symposium
- Create and widely share a quarterly research newsletter
- Engage with multiple divisions when evaluating and rating NCHRP problem statements
- Encourage broad agency attendance of the Transportation Research Board (TRB) annual meeting and transportation webinars, distribute TRB reports, host a TRB Annual Meeting information exchange after the TRBAM

Communication Tools

- A Benefits/implementation survey (Appendix D) is distributed to project teams at least three times throughout a project lifecycle - before kickoff, mid-project, and at the end of the project
- Survey results are used to facilitate meeting discussions on benefits and implementation

Idaho Transportation Department

Presenter: Amanda Laib

Research Engagement

- Attend annual ITD conferences for planning, data, leadership, Engineers-In-Training
- Forward all Pooled Fund solicitations
- Involve ITD Research Advisory Council to review and select project requests
- Meet with new section leaders to get the top-down directive
- Convene the Innovation Strategic Team where ITD staff members from cross-functional business create innovation strategies together

Communication Tools

- Regular meetings with people throughout the department a few times a year
- Annual program update to the Idaho Transportation Board
- ITD Internal Newsletter
- Occasional workshops and trainings to share project results and outcomes

Maryland Department of Transportation

Presenter: Hua Xiang

Research Engagement

- Develop and circulate an engagement survey to inform employees about TRB and help form a continued understanding of what the most and least popular subject areas are among colleagues

Communication Tools

- A SharePoint to share current projects, highlight research awards, and research of interest
- SharePoint system for targeted email outreach based on interests

Colorado Department of Transportation
Presenter: Bryan Roeder

Research Engagement
- Ongoing Research Branch activities and efforts are also opportunities to promote a culture of research
- Convene interdisciplinarity Study Panels and Oversight Teams involving staff throughout CDOT
- Involve subject matter experts, research branch staff, upper-level management, and Department leadership in project selection
- Host and attend peer exchanges
- Attend meetings (for example, the periodic Traffic Engineering meetings) and present research branch activities and research opportunities
- Organize internal "Research Engineering Idea Summit" with varied parts of the Department
- Serve on committees, both related and unrelated to research
- Meet face-to-face with unit leaders to build relationships

Communication Tools
- The Research Librarian supports knowledge transfer and management
- Share one-page research Project Briefs
- Emphasize research depth and quality over project quantity, and ensure results are tied to implementation

Missouri Department of Transportation
Presenter: Jen Harper

Research Engagement
- Librarian attends new employee orientation to share about services and access
- Assign champions at the leadership-level (i.e., division head or an engineer) to remain involved throughout, and appoint an SME for the majority effort
- Facilitate the Missouri Center for Transportation Innovation; a collaboration between MoDOT, IHEs, and consultants

Roundtable and Closing Thoughts

At the conclusion of the Exchange, participants reflected on the past two days, considering what resonated most and what concepts may be valuable to their Departments. Key takeaways were:

Research & Innovation Program Overviews

- ★ Consider using agency value statements to drive research priorities
- ★ Increase familiarity among states' research programs through peer exchanges to enable Research Managers to better support one another

Leading Pooled Fund Projects

- ★ Allocate administrative work to the contractor/researcher's scope when leading pooled fund projects to reduce Research Manager workload
- ★ Simplify financial steps by taking advantage of automation now available through FHWA Financial Management Information System (FMIS)
- ★ Require frequent project briefs from contractors to ease Research Manager quarterly reporting responsibilities

Research Data Curation

- ★ Ensure data sets are recognized as standalone research products, equally valued as peer-reviewed publications
- ★ Leverage NTL-BTS resources to create Data Management Plans (DMPs)
- ★ Take advantage of existing boilerplate language from other states and University Transportation Centers (UTC) when developing DMPs
- ★ Consider including a DMP requirement in Requests For Proposals (RFPs) and research scopes of work

Promoting a Culture of Research

- ★ Consider a variety of approaches to advance and support opportunities for staff outside of research branches to contribute to research (e.g., symposiums, webinars, in-person meetings, a research agenda item on existing department meetings)
- ★ Consider a *"Research Needs"* or a *"Research Ideas"* summit as an option to help Research Managers better understand potential Champions' interests

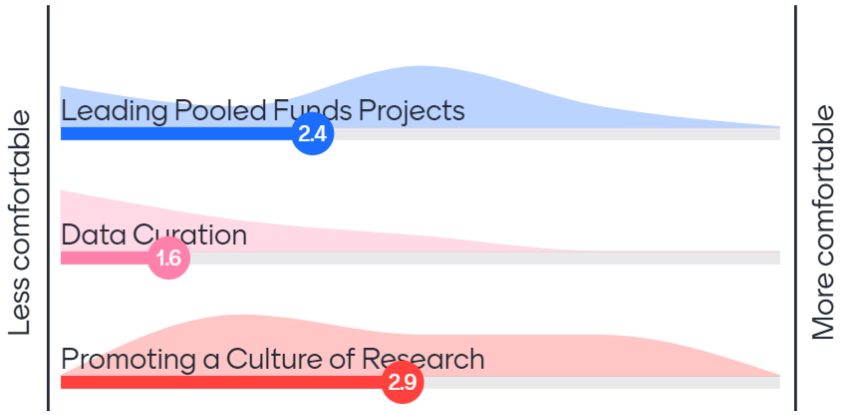
Action Items

During the course of the Exchange there were many requests for participants to share additional examples and information. To facilitate continued conversation and idea exchange, an Action Item list was created and shared in the week following the exchange. The list is available in Appendix C.

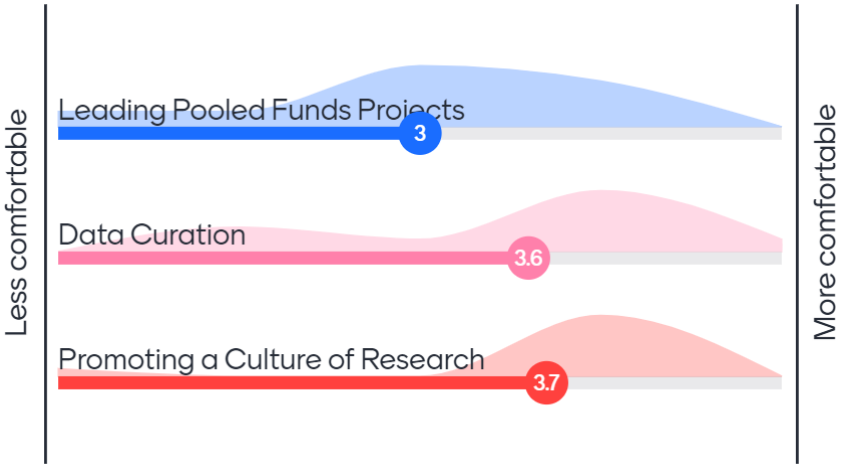
Participant Knowledge & Experience Survey

To establish a baseline of understanding and to measure the value of the peer exchange, CDOT conducted a survey of the participants' familiarity and comfort with each topic at the beginning and end of the exchange.

At the beginning of the exchange on Day 1, participants rated their familiarity with each topic of the peer exchange from 1-5.



At the end of Day 2, participants were asked the same question. Ratings of familiarity improved for all topics, especially Data Curation.



Finally, participants were asked to share final thoughts on all topics:

- Really great to learn from our peers! Lots to "swipe and adapt" based on two days of discussions!
- Doing and implementing quality research is also promotion of a good research culture
- Feel much more comfortable with some of the topics we discussed and am excited to go back with actions.
- Data curation is very doable with moderate additional workload
- Data curation
- Similarities and differences between State DOT R&I programs. Celebrate both.
- DMPs are the beginning of a whole cycle and the person most likely to benefit from good data management is you or your agency.
- Role of Champion to make a project successful

Site Tour: Central-70

Peer exchange participants were invited (optionally) to visit a CDOT project. The Central 70 Project reconstructed a 10-mile stretch of I-70, added one new Express Lane in each direction, removed an aging 57-year-old viaduct, lowered the interstate, and placed a 4-acre park over a portion of the lowered interstate. The peer exchange participants visited the recently completed project site.

CDOT Peer Exchange Outcomes

From CDOT ARIB Staff

ARIB was appreciative of thoughtful presentations and discussion of all states and participants. We found many ideas that we learned from, and processes we want to investigate more and possibly adapt for use in our program. A particular highlight for us was the focus on Data Curation. This is a new-to-us area, and we intend, over time, to develop and improve how we curate and get the best value from research project data sets. Below we list some points of key learning and areas that we will further explore.

Research Overview of Management Practices

Research Management: Elevate the role of the Champion in ways that provide them with greater ownership and responsibility. For example, when possible, the Champion should take the lead in drafting the RFP/SoW, selecting the study panel, and coordinating meetings.

- *Action: Check and possibly strengthen responsibilities in the next revision of our Research Manual.*

STIC management: Consider following the discussed idea of tapping EDC Champions as STIC members for the duration of their EDC project. Rotating new people through STIC can bring fresh ideas.

- *Action: Discuss this with the STIC and consider revision of the STIC charter.*

Formalize the practice of holding annual meetings with CDOT area leads and teams to develop and prioritize needs and ideas. This helps define needs, shape future problem statements to meet those needs, and make clear what submitted ideas are and are not priorities.

- *Actions: Create a list of area leads and teams appropriate for annual meetings. Consider if this practice should be included in the next revision of our Research Manual.*

Consistently focus on the Benefits/Implementation argument of Problem Statements. If submitted arguments are not clear and strong, have the Champion revise these sections. While this is a current practice, it can be compromised in situations where the Champion is inexperienced or has marginal buy-in.

- *Action: Guard against compromising our best practices.*

The Exchange participants showcased examples of Problem Statement intake forms that had well-phrased plain language questions.

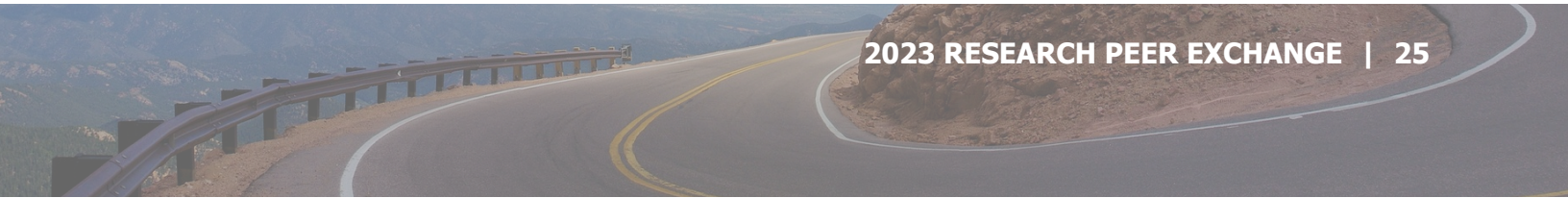
- *Action: Examine our forms considering these examples to see where they may be improved.*

We were impressed with the idea to create standalone Knowledge Management documents targeted at different roles in the research process. Examples are "Top 10: What a PI Should Know" and "Best Practices for Research PMs". While similar information is in our Research Manual, a separate document can be more easily digested by its audience.

- *Action: Draft and test a couple of documents to see how well they adapt to our stakeholder communication.*

We are intrigued by States' examples of additional outreach products as research project deliverables. We currently use a Research Brief. Other states had examples of a poster (even an annual poster symposium), a fact sheet, a web page, and a short video. These are ideas we can consider as we balance the value of this outreach and the effort needed.

- *Action: ARIB will discuss and explore these ideas further.*



Leading Transportation Pooled Funds

We were happy to learn that funds transfers can soon go through FMIS. This does not change our processes but will streamline activity of the CDOT budget staff that organize funds transfers.

- *Action: Stay informed and ensure our business office knows of this change.*

We were also glad to be reminded of the many FHWA Transportation Pooled Fund management resources and checklists available on their website (Tricia Sergeson). We will refer to these as needed.

- *Action: Consider if these resources should be added in the next revision of our Research Manual.*

We also were reminded to reemphasize some best practices we already use but have sometimes compromised. These include ensuring the Champion is fully committed and willing to diligently organize and lead the TAC; having a strong reliance on the university or consultant leading the TPF ("don't do their job for them"); and pushing states to transfer committed funds as early as possible so the funds can be spent, and the work completed within the 5-year maximum duration.

- *Action: Periodically revisit and review best practices and available resources.*

Data Curation

Data curation is a new topic for us. It was extremely helpful to hear introductory information from NTL (Leighton Christiansen) and to see what other states are doing or considering doing. For example, we learned where to find FHWA requirements and NCHRP reports that contain guidance and roadmaps toward implementation of data curation; we learned what a Data Management Plan (DMP) includes and where to find information about how to create one; and we learned about the existence of many online resources to help create good data curation practices. Our intent is to take steps to learn, get started, and over time integrate more data curation into our processes and research requirements.

Actions we will consider, in addition to continued learning from these resources, include:

- *Where appropriate, integrate the requirement for a Data Management Plan into Statements of Work for contracting.*
- *Determine current capabilities of the CDOT Data Management Office and how they can help with research data curation.*
- *Investigate public access and open-source requirements, and if there are conflicting requirements among Federal, State, and University rules.*
- *Learn how to acquire and assign persistent identifiers to data, reports, and researchers (e.g., with DOI and ORCID numbers).*

Building a Culture of Research

We will seek ways to strengthen our focus on communication and advocacy with all stakeholders—with CDOT practitioners, with CDOT management and leadership, and with university researchers and consultants. A note: These efforts have a "cost" in time, effort, and travel expense to be balanced against the expected benefit.

Actions we will consider, in addition to continued learning from these resources, include:

- *Develop ways for project Champions to be visible and broader advocates for the value of CDOT research. One action is to highlight Champions and wins in the new CDOT ARIB Newsletter.*
- *Consider internal mechanisms such as webinars on research results involving both the research and Champion; periodic direct meetings with leadership teams and with CDOT stakeholder groups throughout the state; and consider the benefits vs. effort of a Research Symposium. Such activities would build on our Research-Engineering Idea Summit series and the regular meetings we now hold with a small number of CDOT areas.*
- *Consider external mechanisms such as business development visits to university departments and relevant industry partners. This would build on the "Research Needs Day(s)" we host each year so that university and consultant groups can learn more about us.*
- *Leverage the new ARIB Quarterly Newsletter to promote the outcomes and benefits of specific research projects and highlight the people contributing their time and knowledge.*

Appendices

Due to file size, appendices are available in a separate document. These Include:

APPENDIX A: Full Agenda
APPENDIX B: Participant Contacts
APPENDIX C: Action Items
APPENDIX D: Shared Documents
APPENDIX E: Presentations