Montana Department of Transportation
PO Box 201001
Helena, MT 59620-1001

Memorandum

To: RRC Members
Steve Albert/WTI
Mike Bousliman, Administrator/Information Services Division
Jeffery M. Ebert, P.E./District Administrator-Butte
Larry Flynn, Administrator/Administration Division
Dwane Kailey, Administrator/Highways and Engineering Division
Bob Seliskar/FHWA
Jon Swartz, Administrator/Maintenance Division
Mike Tooley/Director
Duane Williams, Administrator/Motor Carrier Services Division
Pat Wise/Deputy Director
Lynn Zanto, Administrator/Rail, Transit, and Planning Division

From: Susan C. Sillick, Manager
Research Programs

Date: December 4, 2018

Subject: May 30, 2018 RRC Meeting Agenda (9:00 a.m. – 12:00 p.m. MDT Commission Room)

Action items are in bolded red font.

RRC Members Present: Jeff Ebert, Dwane Kailey, Bob Seliskar, Jon Swartz, Sue Sillick, Duane Williams, and Lynn Zanto

Others Present: Marcee Allen, Danielle Bolan, Stephanie Brandenberger, Tricia Burke, Paul Bushnell, Jim Davies, Brandi Hamilton, David Hedstrom, Scott Helm, Jeff Jackson, Lenci Kappes, Doug McBroom, Oak Metcalfe, Shane Mintz, Matt Needham, Jeff Olsen, Mary Gayle Padmos, David Schroeder, Matt Ulberg, and Jim Wingerter

1. **2019 FFY Work Plan:** Attached

   The RRC and District Administrators were presented with a listing of all topic statements submitted and Stage 2: Topic Statement forms for all those with a champion and a Sponsor. They were also provided with Partnering Project Funding requests and/or Annual Evaluations. Each Champion presented on their topics. Stage 2: Topic Statements are attached in Appendix A. Partnering Project Funding Request and Annual Evaluation forms are attached in Appendix B. With the exception of the AASHTO Technical Services Programs and TPF-5(349), which are funded by default, unless an annual evaluation update indicates otherwise, the decision to be made after these presentations is which will move

forward to the Technical Panel Stage and, also, potential members of each MDT research project technical panel.

a. 19-001: Effectiveness of Highway Public Safety Educational Montana Motor Vehicle Division and Registration Stations by Using Safety Videos ($166,000)

   Tricia Burke and Marcee Allen were present to support this research topic.

   Duane Williams asked if this project would be eligible for HSIP funds; Marcee responded she didn't think so. Sue Sillick added that as of the Fast Act, HSIP funds can no longer be used for research. Dwane Kailey responded that they are trying to change this so that training and research are HSIP-eligible activities again.

   Dwane indicated he is looking at effectiveness.

   Jon Swartz asked for Brandi Hamilton and Lynn Zanto asked for Audrey Allums to be placed on this project panel if it is moved forward to the Technical Panel Stage.

b. 19-005: Developing a Systematic Approach for Safety Improvements on Low-Volume Roads in Montana ($55,000)

   Tricia was present to support this research topic.

   Dwane asked about serious injuries and fatalities on low-volume roads. Tricia responded that she thinks it is more than 50%.

   Lynn asked for Wayne Noem to be placed on this project technical panel if it moves forward to this stage.

c. 19-006: Use of Fluorescent Orange Delineators in Temporary Traffic Control Work Zones (100,000)

   Jim Wingerter was present to support this research topic.

   There were no questions or comments.

d. 19-011: Monitoring Streamflow Using Video Cameras ($96,000)

   David Hedstrom was present to support this topic.

   David stated this is a partnering project with funding by USGS committed to this project.

   There were no questions or comments.

e. 19-015: Concrete-Filled Steel Tube to Concrete Pile Cap Connections – Further Evaluation/Improvement of Analysis/Design Methodologies: Phase 2, Specimen Testing ($183,000)

Lenci Kappes was present to support this topic.

There were no questions or comments.

f. 19-017: Evaluation of Thin Polymer Overlays for Bridge Decks (83,000)

Jeff Olsen was present to support this topic.

There were no questions or comments.

g. 19-019: Bridge Deck Cracking Evaluation ($210,000)

Oak Metcalfe was present to support this topic.

Dwane asked if this project would investigate rebar – coated, high carbon, and stainless steel. He added that there is a massive price difference among these materials. Oak replied that in Phase 1 there were five significant recommendations which will be evaluated in this Phase as to their effectiveness.

h. 1474: Comprehensive Field Load Test and Geotechnical Investigation Program for the Development of LRFD Pooled Fund Study

Jeff Jackson and Scot Helm were present to support this new pooled fund study for funding.

There were no questions or comments.

i. AII AASHTO Technical Services Program

Sue was present to present to provide an annual evaluation update for this AASHTO Technical Services Program.

There were no questions or comments.

j. APEL AASHTO Technical Services Program

Oak was present to provide an annual evaluation update for this AASHTO Technical Services Program.

There were no questions or comments.

k. DAMS AASHTO Technical Services Program

Oak was present to provide an annual evaluation update for this AASHTO Technical Services Program. There was an increase in cost for this year.

There were no questions or comments.

l. LRFDSM AASHTO Technical Services Program

Stephanie Brandenberger was present to provide the annual evaluation update for this AASHTO Technical Services Program.

Dwane stated there is a notice for potential rulemaking, looking at adopting these manuals by edition; Dwane is not a fan. Every update requires a federal rule update. Stephane indicated these editions are published every year, with each one requiring a comment period, which is followed by an AASHTO ballot. This process takes 6-12 months before we can implement the updates. Finally, Dwane stated the software is another 3-4 years or a couple of versions behind, adding another year for rulemaking. Dwane will send Lynn Z. a comment for the upcoming reauthorization white papers.

m. MASH Pooled Fund (# is pending) ($250,000)

David Schroeder was present to support this pooled fund for funding. If funding is approved, this would be a joint Montana-Wyoming pooled fund study with Wyoming being the lead state. David stated that there were no other states expressing an interest in this pooled fund study.

Dwane asked about the deadline for crash testing for these devices. David responded January 2020.

Jeff Ebert asked why there were no other interested states and why we aren't following other states. David responded that we don't want to follow other states. He added no one has gotten to open rail testing yet, needed to help with our snow drifting, as the other states are focusing on crash testing for other features. Snow drifting is a big concern for our bridges. Also, the Thrie Beam approach section is an approved section; the approach is not tested, but everything else has been tested. Right now, we do not have a viable solution. Shane Mintz agreed.

Dwane added that when the whole MASH effort was initiated, the states asked if AASHTO or FHWA could take the lead. FHWA originally said yes, but, due to lawsuits, they backed down. It's been a very frustrating, convoluted., and inefficient process that needs a solution. Dwane also added that the deadlines are firm.

n. NTPEP AASHTO Technical Services Program

Oak was present to provide an annual evaluation update for this AASHTO Technical Services Program.

There were no questions or comments.

o. Re:Source AASHTO Technical Services Program

Oak was present to provide an annual evaluation update for this AASHTO Technical Services Program.

There were no questions or comments.

p. TSP2 AASHTO Technical Services Program

Jim Davies was present to present to provide an annual evaluation update for this AASHTO Technical Services Program.

There were no questions or comments.

q. TPF-5(299): Improving the Quality of Pavement Distress and Transverse Profile Data Collection and Analysis Pooled Fund Study

Jim D. was present to provide an annual evaluation update for this pooled fund study. Jim D. noted this long-term pooled fund will sunset in 2020 at which time Phase 2 will begin; this project is currently funded through 2020. Jim also noted that as a part of this pooled fund study a data management plan is being developed.

Lynn asked if we already submitted our data management plan to FHWA. Jim D. responded yes and added that if FHWA does not approve the plan, this project can help us move forward to develop a plan that FHWA will approve. Lynn is concerned with the level of signature required for the plan. Jim D. stated that Matt Strizich delegated this signature authority.

r. TPF-5(313): Technology Transfer Concrete Consortium

Matt Needham and Paul Bushnell were present to provide an annual evaluation update for this AASHTO Technical Services Program.

There were no questions or comments.

s. TPF-5(316): Traffic Control Device Consortium

Danielle Bolan was present to provide the annual evaluation update on this pooled fund, which is funded through FFY 2019. This pooled fund is a long-term program. She stated that this group meets annually, with most of the research topics being brought forward by the states to introduce new or review current traffic control devices, and incorporating results into the MUTCD, which is considered by a national committee. Some recent topics include: zipper merge, roundabouts, sign clutter, and symbols.

Dwane asked to clarify the funding.

Both Duane and Dwane stated that signs are becoming obsolete, especially for outdoor advertising. Dwane added we need to do better on education and we need to look at signs.

t. TPF-5(349): WAQTC

Oak was present to provide an annual evaluation update for this long-term pooled fund study, which is funded by default, unless an annual evaluation suggests otherwise.

There were no questions or comments.

u. TPF-5(353): Clear Roads – Phase 2 Pooled Fund Study

Doug McBroom was present to give an annual evaluation update. This project is funded through FFY 2019.

There were no questions or comments.

v. TPF-5(376): North/West Passage Pooled Fund Study

Brandi Hamilton was present to give an annual evaluation update and request additional funding for three more years (FFY 2019-2021).

There were no questions or comments.

Since these projects can be funded with the available budget, Jon made a motion, which was seconded by Duane to move all MDT research projects forward to the Technical Panel Stage and to fund all partnering projects. All RRC members voted in favor of the motion. Sue asked the RRC to let her know if they would like any specific individuals added to any of the technical panels.

Sue will initiate the technical panel process for all MDT research projects and will make the commitment for partnering project funding requests.

2. **Budget Report:** Attached

No discussion.

3. **Research Projects – current listing**

No discussion.

4. **Reports:** Available on Research website

a. Alkali-Silica Reactivity in the State of Montana – Kick-Off Meeting Notes
b. Effective Production Rate Estimation and Monitoring of Controlling Activities Using Daily Work Report Data – Quarterly Progress Report

c. Guidelines for Chemically Stabilizing Problematic Soils – Quarterly Progress Report
d. LTAP – Quarterly Progress Report
e. MDT Wildlife Accommodation Process – Monthly Progress Report
f. Traffic Safety Culture Pooled Fund: Understanding Law Enforcement Attitudes and Beliefs about Traffic Safety – Task 2 Report

No discussion.

5. **Proposed Research Projects (attached):**
   a. 2019 FY LTAP Proposal

   Matt Ulberg was present to request SFY 2019 funding for LTAP. He stated MDT's funding (SPR) has been $80,000. He added that in the 2017 legislative session state gas tax funding of LTAP was increased from $100,000 to $150,000. This increase resulted in a 15% increase in LTAP funding; however, with the changes made since Steve Jenkins left, the program has seen a 35% increase in cost. This cost increase is due to the change in director, hiring a technical trainer, and other changes made to the program. Matt stated he is not asking for an increase in SPR funding, but also stated the current funding is the lowest of all LTAP centers, but Matt added, we are in the top third of what we get out of LTAP. He discussed where LTAP is heading and what's changed. Also, Matt is increasing his outreach to eastern Montana and reaching out more to cities. He's also reactivated participation in regional and national LTAP and TTAP. Montana LTAP is also working more with ND LTAP to facilitate reaching out to eastern Montana. Finally, he is working more closely with MDT, and trying to be in MDT headquarters at least quarterly. He's also reinitiating the Work Zone Traffic Control Committee. Matt added he needs to put more work into staying in touch with Maintenance. In doing all of this, he is solidifying partnerships. Finally, Matt asked the RRC to provide comments on how they feel LTAP is doing.

   Lynn stated LTAP has worked some with Wayne Noem, but not enough.

   Dwane made a motion to fund LTAP for SFY 2019. Jon Swartz seconded the motion. All RRC members voted in favor of the motion.

   Sue will initiate programming and contracting LTAP.

6. **Implementation/Performance Measures/Technology Transfer:** None

   No discussion.

7. **Department/Division Hot Topics – RRC Members Roundtable Discussion**

   Bob Seliskar informed the RRC that next week we will be hosting an individual from the Turner-Fairbanks Highway Research Center. This person will meet with bob and Sue and will also visit an experimental feature site.

Copies: Craig Abernathy/Research Section
Audrey Allums/Grants Bureau
Stephanie Brandenberger, P.E./Bridge Bureau
Kevin Christensen/Highways and Engineering Division
Ryan Dahlke, P.E./Consultant Design Bureau
Lisa Durbin/Construction Administration Bureau
Mike Dyrdahl/Engineering Operations Bureau
Ed Ereth/Data and Statistics Bureau
Jeff Jackson, P.E./Materials Bureau
Paul Jagoda, P.E./Construction Engineering Services Bureau
Tom Martin, P.E./Environmental Services Bureau
Kraig McLeod/Multimodal Planning Bureau
Shane Mintz/District Administrator-Glendive
Roy Peterson, P.E/Traffic & Safety Bureau
Jake Goettle, P.E./Contract Plans Bureau
Dustin Rouse, P.E./Highways and Engineering Division
Ed Toavs/District Administrator-Missoula
Lesly Tribelhorn, P.E./Highways Bureau
Jim Skinner/Planning and Policy Analysis Bureau
Rob Stapley/Right of Way Bureau
Jerry Stephens, P.E./WTI MSU
Stefan Streeter, P.E./District Administrator-Billings
Matt Ulberg, P.E./LTAP
Doug Wilmot/District Administrator-Great Falls
File

APPENDIX A: STAGE 2: RESEARCH TOPIC STATEMENTS

RESEARCH PROGRAMS USE ONLY
RESEARCH IDEA NO: 19-001
DATE OF RECEIPT: 4/27/18
TOTAL MDT COST W/ICAP: $166,000

RESEARCH PROGRAMS

STAGE 2: RESEARCH TOPIC STATEMENT[1]

Submit completed form to mdtresearch@mt.gov. All fields are required, except the last field: XVIII, Sponsor(s). Incomplete forms will not be accepted.

I. TITLE: Effectiveness of Highway Safety Public Education at Montana Motor Vehicle Division and Vehicle Registration Stations by streaming safety videos

II. TOPIC STATEMENT: *There is a need to educate Montanans about highway safety, the consequences of exhibiting risky behaviors while driving such as texting while driving, driving while impaired or distracted, driving unbuckled; and the benefits of proven innovative road safety countermeasures such as roundabouts and rumble strips installed by public transportation agencies. There is an opportunity to install video equipment at select Motor Vehicle Divisions licensing and vehicle registration stations around the state to continuously play highway safety video clips. At many of these locations, the public has waiting times of five minutes or longer. This is enough time for people to give their attention to a video screen playing safety messages.*

III. RELATED RESEARCH SUMMARY FROM STAGE 1: *TRID did not find results specific to safety videos related to showing them at Motor Vehicle Division or Vehicle Registration offices. However, there was two related research projects for using educational video to affect driver behavior and the better way to present educational videos:*
1) Impact of Education and Awareness Programs on the Usage and Attitude Towards Texting While Driving Among Young Drivers indicates that repeated consistent messaging about the danger of texting while driving may help in reducing texting while driving among young drivers. 2) Employing Humor and Celebrities to Manipulate Passengers' Attention to Pre-Flight Safety Briefing Videos in Commercial Aviation; this research indicates the most effective way for people to retain information was through using humorous videos versus using celebrities or standard safety video.

IV. RESEARCH PROPOSED: *This research would be the collection of data by giving short surveys to people as they conclude their business and prepare to leave. This data will be useful for identifying educational gaps, safety focus areas, educating legislators, etc. It would also provide important information about the safety culture, attitudes and beliefs of Montana drivers and provide insight into developing projects and programs to improve highway safety and reducing serious injuries and fatalities caused by vehicle crashes.*

V. **RESEARCH PERIOD (Time to complete research project.):** *1.5 to 2 years*

VI. IT COMPONENT: Identify if the project includes an IT component (purchasing of IT hardware, development of databases, acquisition of existing applications, etc.). If so, describe IT component in as much detail as possible.
The plan is to buy 24 televisions and have them installed at the Motor Vehicle Division and County Registration locations. This research will focus on at least the seven largest urban cities in Montana. These TVs will not need to be connected to any network as prerecorded material will be provided by flash-drives.

VII. FEASIBILITY, PROBABILITY OF SUCCESS, AND RISK: *The purchasing and installation of the TV's is expected to be straight forward and low risk (in communication with DOJ personnel). The data gathering by interviews and reporting out should also be straight forward for any public involvement firm that specializes in this type of work. The most challenging part of this research is to develop and maintain the video content so that it remains fresh and relevant for the viewers.*

[1] Note: All research topics submitted become public property and submitters are not guaranteed to receive a contract for any work that may result from this topic statement.

VIII. URGENCY, IMPORTANCE, AND EXPECTED BENEFITS/PAY-OFF: Address urgency, timeliness, and importance of the research. Identify if the research is required for any federal or state initiative or compliance. This section must include a description of how this research will help to meet MDT's mission (i.e., serve the public by providing a transportation system and services that emphasize quality, safety, cost effectiveness, economic vitality and/or sensitivity to the environment).

This research will clearly support MDT's Vision Zero goal of no fatalities or serious injuries are acceptable on Montana's highways. The educational component is shown as a strategy within Montana's Comprehensive Highway Safety Plan. These educational videos will also support the Department's current effort to educate the traveling public on various topics such as proper use of roundabouts, flashing yellow arrows and rumble strips to name a few.

IX. IMPLEMENTABILITY, IMPLEMENTATION PLAN, AND RESPONSIBILITY: Address the implementability of the expected results from the proposed project. Identify products that will enhance implementation. Identify any known implementation barriers and how these barriers might be eliminated or reduced. Identify MDT office or entity outside of MDT responsible for implementation. Describe initial implementation plan, include timeframe for implementation.

The results from this research data will be useful for identifying educational gaps, safety focus areas, educating legislators, etc. It would also provide important information about the safety culture, attitudes and beliefs of Montana drivers and provide insight into developing projects and programs to improve highway safety and reducing serious injuries and fatalities caused by vehicle crashes

X. **MDT PRIORITY FOCUS AREAS: MDT may, as often as annually, identify priority research focus areas. These focus areas will be listed on** http://www.mdt.mt.gov/research/unique/solicit.shtml**.** *The priority focus of this research is traffic safety education for the traveling public.*

XI. TOTAL COST ESTIMATE (If the project proposal comes in at a higher cost, it may require further approval and may be delayed.): *The cost estimate of this research is 150k. The scope is expected to be hiring a consultant firm that specializes in this type of work, buying and installing televisions, and the development of content to play on these TV monitors. The cost of this research can be dependent on if the panel members choose to use existing safety videos or choose to develop new ones***.**

XII. MDT FUNDING SOURCE (If MDT Research, enter SPR): *SPR*

XIII. FUNDING MATCH SOURCE AND AMOUNT: Click or tap here to enter any funding match and the source of the match.

XIV. FUNDING PARTNER(S): Click or tap here to enter any funding partners.

XV. POTENTIAL TECHNICAL PANEL MEMBERS (At this time, individuals do not necessarily need to be identified; rather, MDT offices and outside entities can be named. However, if known, individuals may be named): *Roy Peterson (MDT), Marcee Allen (FHWA), Sky Schaefer (DOJ), MDT Planning Division*

XVI. SUBMITTED BY:

NAME: Roy Peterson
TITLE: Traffic and Safety Engineer
AFFILIATION: Montana Department of Transportation
ADDRESS: 2701 Prospect Ave
PHONE NO.: 444-9252
E-MAIL: roypeterson@mt.gov

XVII. CHAMPION: Must be internal to MDT, feel strongly that the research will benefit the Department, and is willing to chair the technical panel. Note: If a champion is not identified by you or Research staff, this topic statement will not move forward.

NAME: Roy Peterson
TITLE: Traffic and Safety Engineer
AFFILIATION: Click or tap here to enter champion affiliation.
ADDRESS: Click or tap here to enter champion address.
PHONE NO.: Click or tap here to enter champion phone number.
E-MAIL: Click or tap here to enter champion e-mail.

XVIII. SPONSOR(S) (optional): Must be internal to MDT (Division Administrator or higher) and willing to ensure implementation occurs, as appropriate. If a sponsor is not identified, this topic statement will not move forward.

NAME: Dwane Kailey
TITLE: Highways and Engineering Division Administrator
AFFILIATION: Montana Department of Transportation
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RESEARCH PROGRAMS USE ONLY
RESEARCH IDEA NO: 19-005
DATE OF RECEIPT: 4/25/18
TOTAL MDT COST W/ICAP: $55,000

RESEARCH PROGRAMS

STAGE 2: RESEARCH TOPIC STATEMENT[1]

Submit completed form to mdtresearch@mt.gov. All fields are required, except the last field: XVIII, Sponsor(s). Incomplete forms will not be accepted.

I. TITLE: Developing a Systemic Approach for Implementing Safety Improvements on Low-Volume Roads in Montana

II. TOPIC STATEMENT: Maintaining safety on the highway system has been a top priority for most highway agencies in the US given the heavy toll in deaths and casualties associated with traffic crashes. The limited funds available to highway agencies for safety improvements require a careful consideration of sites that are more promising in improving safety at the network level. Therefore, highway agencies systemically screen the network to identify those sites that are expected to yield greater safety benefits, thus deserving more consideration for safety improvement funds. While this process has been successfully implemented by many agencies for urban and well-traveled major rural highways, it may prove difficult on rural low-volume roads including local county roads. The low traffic exposure on these roads and consequently the low number of crashes occurring may preclude the possibility of using crash data alone in identifying and ranking candidate sites for safety improvement projects. The proposed research attempts to address this issue by providing a much-needed guidance on how to systemically screen the network and rank sites on low-volume roads that are most deserving of safety improvements funds.

III. RELATED RESEARCH SUMMARY FROM STAGE 1: Two major aspects are critical to developing a systemic approach in implementing safety improvements on local roads: 1) A methodology for assessing risk which incorporates, besides crash history, other important factors contributing to the risk, and 2) A practical approach for network screening of high risk locations using information that is readily available to the highway agency. The literature review done by MDT staff in stage I research did not necessarily focus on the two aforementioned aspects. A fairly recent literature review done by the author on a different project revealed several proposed approaches which attempt to assess risks on low volume roads using other factors besides crash history. However, the majority of those approaches are of exploratory research nature and have not moved into practice. In regards to the application of network-level screening for safety improvement on low volume roads, the information published on these applications in the literature or on agency websites is limited at best.

IV. RESEARCH PROPOSED: The proposed research consists of the following tasks: 1) Review all published materials on the various approaches that have been proposed nationally or internationally in assessing risk and identifying sites for safety improvements on low-volume roads. This involves published materials in scientific databases, online research reports and information available on agency websites, 2) Synthesize information gathered in task 1 and develop a set of criteria that will be used in assessing the merits, or lack thereof, of any of the approaches currently used by highway agencies gathered in the following task, 3) Screen the different approaches for identifying sites for safety improvements on local roads that are currently adopted by different state DOT's in the US and Canada. This task will be performed using agency survey and phone interviews to follow up with participants as needed, 4) Analyze and assess the merits and limitations of the different approaches used by highway agencies using the criteria developed in task 2, and 5) Develop and recommend a methodology for use in the state of Montana which could incorporate certain elements of the various approaches analyzed in task 4 or a totally novel approach that best suits the MDT needs and the data structure used by the agency.

[1] Note: All research topics submitted become public property and submitters are not guaranteed to receive a contract for any work that may result from this topic statement.

V. RESEARCH PERIOD (Time to complete research project.): The project duration is 15 months including one month for MDT review of the final project report.

VI. IT COMPONENT: Identify if the project includes an IT component (purchasing of IT hardware, development of databases, acquisition of existing applications, etc.). If so, describe IT component in as much detail as possible.
Not Applicable

VII. FEASIBILITY, PROBABILITY OF SUCCESS, AND RISK: Lack of guidance and information is the biggest hurdle in attaining an optimum use of agency resources. The guidance developed through this project is essential in managing safety improvement projects on local and low volume roads. Considering the nature of research tasks involved, the probability of success is fairly high with minimal foreseen risks (if any).

VIII. URGENCY, IMPORTANCE, AND EXPECTED BENEFITS/PAY-OFF: Address urgency, timeliness, and importance of the research. Identify if the research is required for any federal or state initiative or compliance. This section must include a description of how this research will help to meet MDT's mission (i.e., serve the public by providing a transportation system and services that emphasize quality, safety, cost effectiveness, economic vitality and/or sensitivity to the environment).
Maintaining safety on the highway system has been an utmost priority for MDT, and critical for progress towards Vision Zero initiative embraced by the agency. The proposed research is expected to help MDT move towards this goal on low-volume and local roads which constitute the majority of highways by length in Montana. The research will help the agency achieve a better use of the highway traffic safety grants program. The expected return on investment (ROI) for this project is expected to be very high given that fact that findings will be used on a regular basis in the long term.

IX. IMPLEMENTABILITY, IMPLEMENTATION PLAN, AND RESPONSIBILITY: Address the implementability of the expected results from the proposed project. Identify products that will enhance implementation. Identify any known implementation barriers and how these barriers might be eliminated or reduced. Identify MDT office or entity outside of MDT responsible for implementation. Describe initial implementation plan, include timeframe for implementation.
The main implementable product of this research will be the final report, particularly the chapter related to the recommended guidelines for screening high risk sites on local and low-volume roads in Montana. The Traffic and Safety Bureau at MDT will be responsible for implementation of the main products of this research. The proposer is not aware of any legal or practical implementation barriers at this time.

X. MDT PRIORITY FOCUS AREAS: MDT may, as often as annually, identify priority research focus areas. These focus areas will be listed on http://www.mdt.mt.gov/research/unique/solicit.shtml**.** No priority areas are listed by MDT at this time.

XI. TOTAL COST ESTIMATE (If the project proposal comes in at a higher cost, it may require further approval and may be delayed.): The total project cost is $98,000.

XII. MDT FUNDING SOURCE (If MDT Research, enter SPR): SPR

XIII. **FUNDING MATCH SOURCE AND AMOUNT:** Small Urban, Rural and Tribal Center on Mobility (SURTCOM) - $49,000 (50% match funding)

XIV. FUNDING PARTNER(S): Small Urban, Rural and Tribal Center on Mobility (SURTCOM) – UTC - USDOT

XV. POTENTIAL TECHNICAL PANEL MEMBERS (At this time, individuals do not necessarily need to be identified; rather, MDT offices and outside entities can be named. However, if known, individuals may be named): Click or tap here to enter potential technical panel members.

XVI. SUBMITTED BY:

NAME: Ahmed Al-Kaisy
TITLE: Professor
AFFILIATION: Montana State University
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XVII. CHAMPION: Must be internal to MDT, feel strongly that the research will benefit the Department, and is willing to chair the technical panel. Note: If a champion is not identified by you or Research staff, this topic statement will not move forward.

NAME: Roy Peterson
TITLE: Bureau Chief, Traffic and Safety
AFFILIATION: MDT
ADDRESS: MDT Headquarters, Helena, Montana
PHONE NO.: 406-444-9252
E-MAIL: roypeterson@mt.gov

XVIII. SPONSOR(S) (optional): Must be internal to MDT (Division Administrator or higher) and willing to ensure implementation occurs, as appropriate. If a sponsor is not identified, this topic statement will not move forward.

NAME: Roy Peterson
TITLE: Bureau Chief, Traffic and Safety
AFFILIATION: MDT
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RESEARCH PROGRAMS USE ONLY
RESEARCH IDEA NO: 19-006
DATE OF RECEIPT: 4/25/18
TOTAL MDT COST W/ICAP: $100,000

RESEARCH PROGRAMS

STAGE 2: RESEARCH TOPIC STATEMENT[1]

Submit completed form to mdtresearch@mt.gov. All fields are required, except the last field: XVIII, Sponsor(s). Incomplete forms will not be accepted.

I. TITLE: Use of Fluorescent Orange Delineators in Temporary Traffic Control Work Zones

II. TOPIC STATEMENT: Road maintenance and reconstruction often present serious safety challenges to highway agencies due to the dynamic and variable work environment which may well be inconsistent with drivers' expectations. As such, proper delineation of travel path through work zones is critical for safe and efficient work zone operations. Currently the Manual on Uniform Traffic Control Devices (MUTCD) only allows white and yellow delineators within temporary traffic control (TTC) work zones (section 6F.80, MUTCD 2009). Field observations suggest that using the conventional white and yellow delineation may not be adequate to effectively delineate traffic through work zones. The proposed research aims to evaluate a new alternative fluorescent orange delineation devices for their effectiveness in guiding traffic through work zones. The Montana Department of Transportation (MDT) used the new proposed devices (larger, 6" x 12", retro reflective fluorescent orange delineators) in lieu of the MUTCD approved white delineators in two rural reconstruction projects during summers 2015 and 2016. Pictures and observations were taken and recorded for the original and proposed delineation devices. MDT project inspectors report the new devices to offer better visibility even when the delineators become dusty and dirty. Traffic control contractors also prefer the larger delineators as they offer an even bigger target value. The fluorescent orange delineators are much more visible during nighttime, adverse weather conditions, and construction activities. Further, road users are familiar with the fluorescent orange color within wok zones which may aid in identifying travelled ways that are not self-explaining. The MUTCD allows the use of devices not described in Chapter 6 of the Manual but this must be based on an engineering study, which is the main impetus for the proposed effectiveness evaluation project. Click or tap here to describe the issue, including any background information.

III. RELATED RESEARCH SUMMARY FROM STAGE 1: The literature search from stage I showed that the proposed fluorescent orange delineators have not been used in practice nor evaluated in any previous study.

IV. RESEARCH PROPOSED: The proposed research project consists of five primary tasks: 1) State-of-the-art review on work zone delineation devices and the different approaches for assessing their effectiveness, 2) Selection of study sites to include a limited number of work zones with different work activity and site conditions, 3) Data collection: traffic surveillance cameras and traffic recorders (on mobile trailers) will be used to collect data from study sites using the regular and the proposed delineation devices, 4) Data processing and compilation which involves extraction of information from video records and traffic sensors in a format appropriate for analysis, 5) Data analysis where major study variables (e.g. lateral clearance between vehicle and delineation devices, roadside encroachments, speeds, etc.) will be analyzed to examine the effectiveness of the proposed delineation devices, and 6) Final report to include a description of the investigations performed along with a summary of major findings and recommendations.

[1] Note: All research topics submitted become public property and submitters are not guaranteed to receive a contract for any work that may result from this topic statement.

V. RESEARCH PERIOD (Time to complete research project.): Total project duration is 24 months including one month period for the MDT panel to review the final project report. The project duration reflects the fact that field experiments will have to take place in summer 2019 construction season.

VI. IT COMPONENT: Identify if the project includes an IT component (purchasing of IT hardware, development of databases, acquisition of existing applications, etc.). If so, describe IT component in as much detail as possible.
Not Applicable

VII. FEASIBILITY, PROBABILITY OF SUCCESS, AND RISK: Safe traffic operations through work zone is a top priority for most highway agencies and contributes to Vision Zero initiative. The proposed research will test a very promising work zone delineation device expected to better guide traffic through work zones, thus contributing to safer driving environment at temporary traffic control areas. The research team has the expertise in conducting similar observational studies where safety effectiveness was assessed using surrogate measures. In this research, chances for success are relatively high with minimal foreseen risks.

VIII. URGENCY, IMPORTANCE, AND EXPECTED BENEFITS/PAY-OFF: Address urgency, timeliness, and importance of the research. Identify if the research is required for any federal or state initiative or compliance. This section must include a description of how this research will help to meet MDT's mission (i.e., serve the public by providing a transportation system and services that emphasize quality, safety, cost effectiveness, economic vitality and/or sensitivity to the environment).
The MDT Work Zone Safety and Mobility Goals and Objectives report published in 2015 outlines Goal 1 as "reduce the number and severity of crashes, injuries and fatalities in construction zones." Effective channelizing devices including delineators are critical in guiding traffic safely through work zones, thus contributing to this important goal. The proposed study is required by MUTCD before application of the new delineation devices is allowed at maintenance and construction sites. Further, the proposed research is expected to have a very high pay-off for MDT given the extensive highway network and associated maintenance and reconstruction operations in the state.

IX. IMPLEMENTABILITY, IMPLEMENTATION PLAN, AND RESPONSIBILITY: Address the implementability of the expected results from the proposed project. Identify products that will enhance implementation. Identify any known implementation barriers and how these barriers might be eliminated or reduced. Identify MDT office or entity outside of MDT responsible for implementation. Describe initial implementation plan, include timeframe for implementation.
The engineering study proposed in this research will facilitate the use of the new work zone delineation devices which could much improve the mobility and safety at highway maintenance and reconstruction sites. The MDT construction program will be responsible for the implementation of study findings.

X. **MDT PRIORITY FOCUS AREAS: MDT may, as often as annually, identify priority research focus areas. These focus areas will be listed on** http://www.mdt.mt.gov/research/unique/solicit.shtml**.** No priority areas are listed by MDT at this time.

XI. TOTAL COST ESTIMATE (If the project proposal comes in at a higher cost, it may require further approval and may be delayed.): $180,000

XII. MDT FUNDING SOURCE (If MDT Research, enter SPR): SPR

XIII. FUNDING MATCH SOURCE AND AMOUNT: Small Urban, Rural and Tribal Center on Mobility (SURTCOM) - $90,000 – 50% matching fund

XIV. FUNDING PARTNER(S): Small Urban, Rural and Tribal Center on Mobility (SURTCOM) – UTC - USDOT

XV. POTENTIAL TECHNICAL PANEL MEMBERS (At this time, individuals do not necessarily need to be identified; rather, MDT offices and outside entities can be named. However, if known, individuals may be named): Click or tap here to enter potential technical panel members.

XVI. SUBMITTED BY:

NAME: Ahmed Al-Kaisy
TITLE: Professor
AFFILIATION: Montana State University

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XVII. CHAMPION: Must be internal to MDT, feel strongly that the research will benefit the Department, and is willing to chair the technical panel. Note: If a champion is not identified by you or Research staff, this topic statement will not move forward.

NAME: Jim Wingerter
TITLE: Construction Traffic Control Engineer
AFFILIATION: MDT
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PHONE NO.: (406) 454-5897
E-MAIL: jwingerter@mt.gov

XVIII. SPONSOR(S) (optional): Must be internal to MDT (Division Administrator or higher) and willing to ensure implementation occurs, as appropriate. If a sponsor is not identified, this topic statement will not move forward.

NAME: Click or tap here to enter sponsor name.
TITLE: Click or tap here to enter sponsor title.
AFFILIATION: Click or tap here to enter sponsor affiliation.
ADDRESS: Click or tap here to enter sponsor address.
PHONE NO.: Click or tap here to enter sponsor phone number.
E-MAIL: Click or tap here to enter sponsor e-mail.

RESEARCH PROGRAMS USE ONLY
RESEARCH IDEA NO: 19-011
DATE OF RECEIPT: 4/30/18
TOTAL MDT COST W/ICAP: $96,000

RESEARCH PROGRAMS

STAGE 2: RESEARCH TOPIC STATEMENT[1]

Submit completed form to mdtresearch@mt.gov. All fields are required, except the last field: XVIII, Sponsor(s). Incomplete forms will not be accepted.

I. TITLE: Monitoring Streamflow by using Video Cameras

II. TOPIC STATEMENT: The United States Geological Survey (USGS) is exploring the use of large-scale particle image velocimetry (LSPIV) to obtain measurements of surface velocities in rivers. For LSPIV, a video camera records images of particles traveling along the stream surface; surface velocities are calculated from those images. LSPIV could be a valuable tool for measuring discharge when traditional measurement techniques are not possible, for verification of theoretical measurements, or as a "backup" to direct measurements of discharge. For example, this method might be especially suited to streams that experience very rapid changes in stage (and discharge), such as those that experience flash flooding. LSPIV may also be used to measure magnitudes and angles of surface velocities for bridge scour calculations, for model calibration, or for other hydraulic studies.

III. **RELATED RESEARCH SUMMARY FROM STAGE 1:** The USGS has installed and is testing LSPIV devices across the United States. The USGS WY-MT Water Science Center has installed one LSPIV on the Little Blackfoot River in Montana.

IV. RESEARCH PROPOSED: LSPIV equipment will be installed at approximately 10 sites (Crest-stage gage sites or other streamgage or bridge sites) in different stream settings in Montana.

V. RESEARCH PERIOD (Time to complete research project.): October 1, 2018 – September 30, 2020.

VI. IT COMPONENT: Identify if the project includes an IT component (purchasing of IT hardware, development of databases, acquisition of existing applications, etc.). If so, describe IT component in as much detail as possible.
The LSPIV setup includes a video camera and a small computer. LSPIV videos are processed using open-source software such as PIVlab and RIVeR 2.2.

VII. FEASIBILITY, PROBABILITY OF SUCCESS, AND RISK: LSPIV technology is being tested by the USGS as well as other agencies such as Environment and Climate Change Canada. Guidelines have been developed and likely will evolve based on field testing. As with any new technology, risks include finding that LSPIV is unsuitable for some situations, and unknown periods of time to troubleshoot and finalize guidelines for ultimate deployment.

VIII. URGENCY, IMPORTANCE, AND EXPECTED BENEFITS/PAY-OFF: Address urgency, timeliness, and importance of the research. Identify if the research is required for any federal or state initiative or compliance. This section must include a description of how this research will help to meet MDT's mission (i.e., serve the public by providing a transportation system and services that emphasize quality, safety, cost effectiveness, economic vitality and/or sensitivity to the environment).
LSPIV could greatly improve MDT/USGS Crest-stage gage (CSG) data collection efforts, by supplying velocity measurements during flash floods when personnel cannot reach the sites. Those measurements can be used to calculate stream discharges and be used to verify rating curves, thus improving discharge measurements for CSG's, and ultimately improving peak-flow frequency estimates.

[1] Note: All research topics submitted become public property and submitters are not guaranteed to receive a contract for any work that may result from this topic statement.

LSPIV also can be used to measure velocity magnitude and angle of attack at bridge piers for various discharges, and can help improve pier scour estimates. Therefore, this project will help to meet MDT's emphases for safety, cost effectiveness, and sensitivity to the environment.

IX. IMPLEMENTABILITY, IMPLEMENTATION PLAN, AND RESPONSIBILITY: Address the implementability of the expected results from the proposed project. Identify products that will enhance implementation. Identify any known implementation barriers and how these barriers might be eliminated or reduced. Identify MDT office or entity outside of MDT responsible for implementation. Describe initial implementation plan, include timeframe for implementation.
CSG peak-flow data are used by MDT Hydraulics to estimate peak-flow frequencies for structure design. Velocity magnitude and angle measurements can be used for pier scour calculations by MDT Hydraulics.

X. MDT PRIORITY FOCUS AREAS: MDT may, as often as annually, identify priority research focus areas. These focus areas will be listed on http://www.mdt.mt.gov/research/unique/solicit.shtml**.** None listed at this time.

XI. TOTAL COST ESTIMATE (If the project proposal comes in at a higher cost, it may require further approval and may be delayed.): $144,000

XII. MDT FUNDING SOURCE (If MDT Research, enter SPR): MDT Research

XIII. FUNDING MATCH SOURCE AND AMOUNT: USGS Cooperative Matching Funds (40%) $57,600

XIV. FUNDING PARTNER(S): Click or tap here to enter any funding partners.

XV. **POTENTIAL TECHNICAL PANEL MEMBERS (At this time, individuals do not necessarily need to be identified; rather, MDT offices and outside entities can be named. However, if known, individuals may be named):** David Hedstrom, Annette Compton, MDT Hydraulics

XVI. SUBMITTED BY:

NAME: Katherine J. Chase
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XVII. CHAMPION: Must be internal to MDT, feel strongly that the research will benefit the Department, and is willing to chair the technical panel. Note: If a champion is not identified by you or Research staff, this topic statement will not move forward.

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XVIII. SPONSOR(S) (optional): Must be internal to MDT (Division Administrator or higher) and willing to ensure implementation occurs, as appropriate. If a sponsor is not identified, this topic statement will not move forward.

NAME: Dwane Kailey
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RESEARCH PROGRAMS USE ONLY
RESEARCH IDEA NO: **19-015**
DATE OF RECEIPT: **4/30/18**
TOTAL MDT COST W/ICAP: **$183,000**

RESEARCH PROGRAMS

STAGE 2: RESEARCH TOPIC STATEMENT[1]

Submit completed form to mdtresearch@mt.gov. All fields are required, except the last field: XVIII, Sponsor(s). Incomplete forms will not be accepted.

I. TITLE: Concrete-Filled Steel Tube to Concrete Pile Cap Connections – Further Evaluation/Improvement of Analysis/Design Methodologies: Phase II Specimen Testing

II. TOPIC STATEMENT: The Montana Department of Transportation has found concrete-filled steel tube (CFT) piles connected at the top by a concrete pile cap to be a very cost-effective support system for short and medium span bridges. This type of system offers low initial cost, short construction time, low maintenance requirements, and a long service life. While the gravity load performance of these systems is well understood, their strength and ductility under extreme lateral loads (e.g., seismic events) is more difficult to reliably predict using conventional design procedures. The proposed research aims to further develop newly established design and analysis methodologies, and to ultimately ensure the desired bridge performance.

III. RELATED RESEARCH SUMMARY FROM STAGE 1: MDT has sponsored previous research at Montana State University (MSU) to investigate the performance of these systems under extreme lateral loads and to develop appropriate analysis/design procedures. As part of these investigations, MSU conducted physical tests on various ½-size models of the CFT to pile cap connections under pseudo-static and cyclic loading. Although this research provided useful information regarding the behavior and design of CFT to concrete pile-cap connections, further research is required to more fully characterize this behavior and further develop the analysis/design methodologies. For example, several aspects of these methodologies rely on empirical assumptions that may not be valid for all possible cap configurations. That is, the tests carried out in this research did not vary cap dimensions, CFT diameter, or number of embedded piles in the test section, and therefore some of the empirical assumptions used in the proposed methodologies may not be valid for all conditions. Thus, further testing and/or further analytical modeling should be conducted to validate/modify these assumptions and to ultimately ensure the desired system performance.

IV. RESEARCH PROPOSED: The primary objective of this project is to further validate/improve MDT's CFT to concrete pile cap connection design/analysis methodologies, and to ensure the efficacy of these methodologies for a wide variety of potential design configurations. This research will include physical tests of scaled specimens, which may include specimens with variations in cap dimensions, CFT diameter, or number of embedded piles. Additionally, the use of battered piles or precast concrete pile caps in this system may be explored experimentally. This project will consist of two phases. The first phase of research will focus on identifying potential gaps in the existing design/modeling strategies, and then designing future tests to help close these gaps. This phase of research was proposed last year and is currently in the proposal stage. The second phase of research (proposed herein) will involve the testing of the specimens designed in the first phase of research. The exact scope of this project will be further developed through collaboration with the technical panel at the next stage of the proposal.

V. **RESEARCH PERIOD (Time to complete research project.):** 2 Years

VI. IT COMPONENT: Identify if the project includes an IT component (purchasing of IT hardware, development of databases, acquisition of existing applications, etc.). If so, describe IT component in as much detail as possible.
The work proposed herein does not require IT hardware, software or support.

VII. FEASIBILITY, PROBABILITY OF SUCCESS, AND RISK: The proposed research is low risk, and has a high probability of success.

[1] Note: All research topics submitted become public property and submitters are not guaranteed to receive a contract for any work that may result from this topic statement.

VIII. URGENCY, IMPORTANCE, AND EXPECTED BENEFITS/PAY-OFF: Address urgency, timeliness, and importance of the research. Identify if the research is required for any federal or state initiative or compliance. This section must include a description of how this research will help to meet MDT's mission (i.e., serve the public by providing a transportation system and services that emphasize quality, safety, cost effectiveness, economic vitality and/or sensitivity to the environment).

Bridges have been found to be a particularly vulnerable element of critical infrastructure systems during earthquakes. While CFT pile to concrete pile cap bridge support systems designed following the current methodology offer significantly better performance in seismic events than those designed using older methodologies, this design procedure has not been fully validated by physical testing and analytical modeling. The results of this project will provide such validation, and the data necessary to revise this procedure so that the required connection performance during seismic events is realized under various conditions.

IX. IMPLEMENTABILITY, IMPLEMENTATION PLAN, AND RESPONSIBILITY: Address the implementability of the expected results from the proposed project. Identify products that will enhance implementation. Identify any known implementation barriers and how these barriers might be eliminated or reduced. Identify MDT office or entity outside of MDT responsible for implementation. Describe initial implementation plan, include timeframe for implementation.

Depending on the outcomes of this test program, MDT may elect to modify their CFT to concrete pile cap design methodology.

X. MDT PRIORITY FOCUS AREAS: MDT may, as often as annually, identify priority research focus areas. These focus areas will be listed on http://www.mdt.mt.gov/research/unique/solicit.shtml**.** There currently are no focus areas.

XI. TOTAL COST ESTIMATE (If the project proposal comes in at a higher cost, it may require further approval and may be delayed.): The preliminary cost estimate is $165,000

XII. MDT FUNDING SOURCE (If MDT Research, enter SPR): SPR

XIII. FUNDING MATCH SOURCE AND AMOUNT: N/A

XIV. FUNDING PARTNER(S): N/A

XV. POTENTIAL TECHNICAL PANEL MEMBERS (At this time, individuals do not necessarily need to be identified; rather, MDT offices and outside entities can be named. However, if known, individuals may be named): Lenci Kappes, Steffan tyler, Drew Sielbach, and Jim Scoles

XVI. SUBMITTED BY: NAME: Michael Berry, PhD
TITLE: Associate Professor
AFFILIATION: Montana State University/Western Transportation Institute
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XVII. CHAMPION: Must be internal to MDT, feel strongly that the research will benefit the Department, and is willing to chair the technical panel. Note: If a champion is not identified by you or Research staff, this topic statement will not move forward.
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AFFILIATION: Montana Department of Transportation
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PHONE NO.: (406) 444-6932
E-MAIL: lkappes@mt.gov

XVIII. SPONSOR(S) (optional): Must be internal to MDT (Division Administrator or higher) and willing to ensure implementation occurs, as appropriate. If a sponsor is not identified, this topic statement will not move forward.

NAME: Click or tap here to enter sponsor name.
TITLE: Click or tap here to enter sponsor title.
AFFILIATION: Click or tap here to enter sponsor affiliation.
ADDRESS: Click or tap here to enter sponsor address.
PHONE NO.: Click or tap here to enter sponsor phone number.
E-MAIL: Click or tap here to enter sponsor e-mail.

RESEARCH PROGRAMS USE ONLY
RESEARCH IDEA NO: **19-017**
DATE OF RECEIPT: **4/30/18**
TOTAL MDT COST W/ICAP: **$83,000**

RESEARCH PROGRAMS

STAGE 2: RESEARCH TOPIC STATEMENT[1]

Submit completed form to mdtresearch@mt.gov. All fields are required, except the last field: XVIII, Sponsor(s). Incomplete forms will not be accepted.

I. TITLE: Evaluation of Thin Polymer Overlays for Bridge Decks

II. TOPIC STATEMENT: Thin composite polymer overlays are a cost-effective method for extending the service life and serviceability of concrete bridge decks by filling concrete cracks and increasing skid resistance. The overlays are a thin (1/4 - 1/2 in.) layer polymer that seals existing cracks and is embedded with aggregate for wear and skid resistance. Based on a survey of all state transportation agencies, thin polymer overlays can provide a service life up to 25 years when constructed on a sound concrete deck (Fowler and Whitney 2011). The Montana Department of Transportation has recently observed varying performance of two different polymer overlay systems applied to three different bridge decks across the state. The two poorest performing bridge decks were located in Kalispell where below-standard skid resistance was measured after only two years.

RELATED RESEARCH SUMMARY FROM STAGE 1: Published field studies by state departments of transportation on the performance of thin polymer overlays have begun to identify specific products and contributing factors related to poor durability and skid resistance. The Oregon Department of Transportation (Soltesz 2009) evaluated eight different overlay systems and found three products wore through to the concrete surface after 1.3 million vehicles, and one product much sooner. For the five products that did not wear through, empirical equations predicted the skid resistance would match that of plane concrete after five months with an average daily traffic volume of 10,000 vehicles per day. The Wisconsin Department of Transportation completed a laboratory and field experimental program to compare the performance of nine different overlay systems (Tabatabai et al. 2016). From three types of aggregate considered, flint rock used with epoxy resin had the highest friction and best overall performance. The lowest friction values were obtained from calcined bauxite aggregate. In a synthesis of recently completed research, CTC and Associates (2012) reported six different states (MO, CA, IL, MI, UT, WY) have stopped using specific types of polymer overlay products where poor performance may have been influenced by traffic volumes, bridge type, and installation procedures. The Washington State Department of Transportation stopped using thin polymer overlays in certain locations after poor skid resistance was observed after only five years of heavy studded tire use.

CTC and Associates, L. (2012). "Ultra-Thin Concrete Polymer Concrete Overlays for Bridge Decks.", 17.

Fowler, D. W., and Whitney, D. P. (2011). *Long-term performance of polymer concrete for bridge decks*, Transportation Research Board.

Soltesz, S. (2009). "Evaluation of thin overlays for bridge decks." Oregon. Dept. of Transportation. Research Section.

Tabatabai, H., Sobolev, K., Ghorbanpoor, A., Nabizadeh, A., Lee, C.-W., and Lind, M. (2016). *Evaluation of Thin Polymer Overlays for Bridge Decks*, Wisconsin Highway Research Program.

RESEARCH PROPOSED: The proposed research is divided into four tasks that will be used to assess the performance of thin polymer overlays on concrete bridge decks in Montana. Task 1 is a literature review investigating the performance of different overlay systems reported by other state departments of transportation. A review of the four polymer systems on MDT's qualified product list and recent skid resistance data for two of these materials will be included. Based on this information, Task 2 will implement an expanded and focused field investigation to measure skid resistance and durability of selected polymer systems. Bridge decks included in the field investigation will represent geographic locations, traffic volumes, and deck conditions that have been reported in the literature to be most closely related to the performance of polymer overlay systems. The application of the polymer overlay systems selected for the field sites will be observed and documented to identify if construction factors are contributing to overlay performance. Task 3 will monitor the selected bridge sites for a minimum of 2 years through site observations, skid resistance and traffic volume data, and weather information (temperature, moisture/snow events). Task 4 will document the polymer overlay performance and contributing factors identified through the collected data

[1] Note: All research topics submitted become public property and submitters are not guaranteed to receive a contract for any work that may result from this topic statement.

for each bridge site during the two-year period. Results of the study will produce recommendations for polymer systems and locations appropriate for their use. Alternative concrete bridge deck maintenance procedures will be recommended for locations and traffic characteristics that are not well-suited for thin polymer overlays.

III. RESEARCH PERIOD (Time to complete research project.): Six months of literature review + 3 months of product installation + 2 years of monitoring = 2.5 years.

IV. IT COMPONENT: Identify if the project includes an IT component (purchasing of IT hardware, development of databases, acquisition of existing applications, etc.). If so, describe IT component in as much detail as possible.
N/A

V. FEASIBILITY, PROBABILITY OF SUCCESS, AND RISK: The feasibility of successfully completing the proposed research is high. Success will be realized by reduced bridge deck maintenance operations through selection of effective polymer overlay systems for geographic-specific bridge locations in Montana.

VI. URGENCY, IMPORTANCE, AND EXPECTED BENEFITS/PAY-OFF: Address urgency, timeliness, and importance of the research. Identify if the research is required for any federal or state initiative or compliance. This section must include a description of how this research will help to meet MDT's mission (i.e., serve the public by providing a transportation system and services that emphasize quality, safety, cost effectiveness, economic vitality and/or sensitivity to the environment).
This research meets MDT's mission by increasing the service life and quality of bridge decks through cost effective thin polymer overlay systems which require less maintenance and improved skid resistance for the travelling public.

VII. IMPLEMENTABILITY, IMPLEMENTATION PLAN, AND RESPONSIBILITY: Address the implementability of the expected results from the proposed project. Identify products that will enhance implementation. Identify any known implementation barriers and how these barriers might be eliminated or reduced. Identify MDT office or entity outside of MDT responsible for implementation. Describe initial implementation plan, include timeframe for implementation.
The anticipated product of this research will be an updated process for selecting and utilizing thin polymer overlays to increase the service life of bridge decks in Montana by sealing cracks and improving skid resistance. This effort will include recommendations to be used internally by MDT personnel to update its polymer overlay operations for specific geographic locations and bridge types. The implementation timeframe may be contingent on the process of adding new polymer overlay systems to the qualified product list.

VIII. MDT PRIORITY FOCUS AREAS: MDT may, as often as annually, identify priority research focus areas. These focus areas will be listed on http://www.mdt.mt.gov/research/unique/solicit.shtml**.** Curre tly, there are no priority focus areas.

IX. TOTAL COST ESTIMATE (If the project proposal comes in at a higher cost, it may require further approval and may be delayed.): $75,000

X. MDT FUNDING SOURCE (If MDT Research, enter SPR): SPR

XI. FUNDING MATCH SOURCE AND AMOUNT: N/A

XII. FUNDING PARTNER(S): N/A

XIII. POTENTIAL TECHNICAL PANEL MEMBERS (At this time, individuals do not necessarily need to be identified; rather, MDT offices and outside entities can be named. However, if known, individuals may be named): Bridge and FHWA

XIV. SUBMITTED BY:

NAME: Damon Fick
TITLE: Assistant Professor
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XV. CHAMPION: Must be internal to MDT, feel strongly that the research will benefit the Department, and is willing to chair the technical panel. Note: If a champion is not identified by you or Research staff, this topic statement will not move forward.

NAME: Jeff Olsen
TITLE: Bridge Area Engineer
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PHONE NO.: 406-444-7610
E-MAIL: jolsen@mt.gov

XVI. SPONSOR(S) (optional): Must be internal to MDT (Division Administrator or higher) and willing to ensure implementation occurs, as appropriate. If a sponsor is not identified, this topic statement will not move forward.

NAME: Click or tap here to enter sponsor name.
TITLE: Click or tap here to enter sponsor title.
AFFILIATION: Click or tap here to enter sponsor affiliation.
ADDRESS: Click or tap here to enter sponsor address.
PHONE NO.: Click or tap here to enter sponsor phone number.
E-MAIL: Click or tap here to enter sponsor e-mail.

RESEARCH PROGRAMS USE ONLY
RESEARCH IDEA NO: 19-019
DATE OF RECEIPT: 4/27/18
TOTAL MDT COST W/ICAP: $210,000

RESEARCH PROGRAMS

STAGE 2: RESEARCH TOPIC STATEMENT[1]

Submit completed form to mdtresearch@mt.gov. All fields are required, except the last field: XVIII, Sponsor(s). Incomplete forms will not be accepted.

I. TITLE: Bridge Deck Cracking Evaluation

II. TOPIC STATEMENT: In the spring of 2016, MDT noted severe cracking on two bridge decks in the Missoula District which led to holes in these decks after small sections of concrete fell through. MDT hired Wiss, Janney, Esltner and Associates (WJE) to investigate the cause of these cracks and provide recommendations. The report by WJE was published in April of 2017 and some, but not all the recommendations were implemented and proved successful in reducing early age cracking in new bridge decks. Although MDT had success with implementation, documentation of actual in-field procedures was not sufficient and there was not a clear understanding of what recommendations implemented were causing the success. It was determined a better way to document in-field procedures and specification enforcement is needed as well as a way to better determine which recommendations are the main cause of the success and which ones may not be proving beneficial.

III. RELATED RESEARCH SUMMARY FROM STAGE 1: N/A

IV. RESEARCH PROPOSED: It is proposed that we hire a consultant to gather data and summarize information from the previous deck pours that have used the recommendations from the WJE report, collect data and document procedures on new deck pours, monitor temperature and stress gradients with modified deck curing, perform modeling to demonstrate the benefit of modified curing on deck stresses and cracking risk, and provide a report and recommendations from this investigation.

V. RESEARCH PERIOD (Time to complete research project.): It is anticipated this research project will take approximately 6 months to complete.

VI. IT COMPONENT: Identify if the project includes an IT component (purchasing of IT hardware, development of databases, acquisition of existing applications, etc.). If so, describe IT component in as much detail as possible. N/A

VII. FEASIBILITY, PROBABILITY OF SUCCESS, AND RISK: The feasibility of completing the project is strong since the information that will be gathered will come from construction projects that are already active and are using the recommendations from WJE report. The successful project will provide MDT with a report detailing what recommendations were used on each project, how well specifications were followed in the field, any construction issues, and what recommendations that we have implemented have proven to be the most successful.

VIII. URGENCY, IMPORTANCE, AND EXPECTED BENEFITS/PAY-OFF: Address urgency, timeliness, and importance of the research. Identify if the research is required for any federal or state initiative or compliance. This section must include a description of how this research will help to meet MDT's mission (i.e., serve the public by providing a transportation system and services that emphasize quality, safety, cost effectiveness, economic vitality and/or sensitivity to the environment).
With bridge deck projects currently active and the need to gather existing information before it is lost the urgency is great to complete this project. The faster we can get the project going the more information we will

[1] Note: All research topics submitted become public property and submitters are not guaranteed to receive a contract for any work that may result from this topic statement.

have to provide more comprehensive and accurate recommendations. This project will help meet MDT's mission by improving the quality and lifespan of bridge decks throughout the state.

IX. IMPLEMENTABILITY, IMPLEMENTATION PLAN, AND RESPONSIBILITY: Address the implementability of the expected results from the proposed project. Identify products that will enhance implementation. Identify any known implementation barriers and how these barriers might be eliminated or reduced. Identify MDT office or entity outside of MDT responsible for implementation. Describe initial implementation plan, include timeframe for implementation.
The recommendations that will come from this report will be able to be implemented immediately on future projects. Existing specifications, mix designs, and construction practices can be quickly modified to reflect the recommendations. There are no identifiable implementation barriers and the MDT Materials and Bridge Bureaus will be responsible for implementation. Once the recommendations are received implementation will begin by modifying specifications, mix designs, and construction practices on projects that are currently under development. Projects that are currently under construction will have these changes made through the change order process as practical.

X. MDT PRIORITY FOCUS AREAS: MDT may, as often as annually, identify priority research focus areas. These focus areas will be listed on http://www.mdt.mt.gov/research/unique/solicit.shtml. There are currently no Priority Focus Research Areas listed on the web site.

XI. TOTAL COST ESTIMATE (If the project proposal comes in at a higher cost, it may require further approval and may be delayed.): The total project cost is estimated at $190,000.

XII. MDT FUNDING SOURCE (If MDT Research, enter SPR): SPR

XIII. FUNDING MATCH SOURCE AND AMOUNT: N/A

XIV. FUNDING PARTNER(S): N/A

XV. POTENTIAL TECHNICAL PANEL MEMBERS (At this time, individuals do not necessarily need to be identified; rather, MDT offices and outside entities can be named. However, if known, individuals may be named): Staff from the MDT Materials, Construction and Bridge Bureau will be selected for the technical panel. I representative from the Federal Highway Administration will also be selected.

XVI. SUBMITTED BY:

NAME: Chris Hardan
TITLE: Bridge Area Engineer-Missoula District
AFFILIATION: Submitter
ADDRESS: 2701 Prospect Ave, Helena, MT 59620
PHONE NO.: 406-444-9221
E-MAIL: chardan@mt.gov

XVII. CHAMPION: Must be internal to MDT, feel strongly that the research will benefit the Department, and is willing to chair the technical panel. Note: If a champion is not identified by you or Research staff, this topic statement will not move forward.

NAME: Oak Metcalfe
TITLE: Click or tap here to enter champion title.
AFFILIATION: MDT
ADDRESS: Click or tap here to enter champion address.
PHONE NO.: Click or tap here to enter champion phone number.
E-MAIL: Click or tap here to enter champion e-mail.

XVIII. SPONSOR(S) (optional): Must be internal to MDT (Division Administrator or higher) and willing to ensure implementation occurs, as appropriate. If a sponsor is not identified, this topic statement will not move forward.

NAME: Dwane Kailey
TITLE: Chief Engineer, Highways and Engineering Division Administrator
AFFILIATION: Sponsor
ADDRESS: 2701 Prospect Ave, Helena, MT 59620
PHONE NO.: 406-444-6414
E-MAIL: dkailey@mt.gov

APPENDIX B: PARTNERING PROJECTS FUNDING REQUESTS AND ANNUAL EVALUATION UPDATES

Research Partnering Project Funding Request Form

RESEARCH PROGRAMS

INSTRUCTIONS

Complete this form to request funding for research projects and programs where MDT will not be the lead and will not contribute all funds for the project/program, such as AASHTO pooled fund programs/projects (TPF) and Technical Service Programs (TSP). Send completed form to the Research Programs Manager.

Part A: General Project/Program Information		
Date: 5/1/2018	**Solicitation or Project Number: 1474**	**Lead Entity: Wyoming Department of Transportation**
Title: Comprehensive Field Load Test and Geotechnical Investigation Program for Development of LRFD Recommendations of Driven Piles on Intermediate GeoMaterials		
Project/Program URL: http://www.pooledfund.org/Details/Solicitation/1474		
Project/Program Duration: 5 years	**Project/Program Begin Date: TBD**	
Total Cost: $739,462	**Total Cost to MDT: $45,000 for 3-year commitment.** ($75,000 for full 5-year project term.)	**Annual Cost to MDT: $15,000**

Part B: For Bureau Chief		
Scott Helm will be the Technical Representative for this project/program.		
☒ **Yes**	☐ **No**	This employee will be encouraged to request travel approval to attend panel meetings in-person, as funded by the project/program.
☒ **Yes**	☐ **No**	If the employee is not granted travel approval, employee will be allowed to attend via conference call or web meeting, as provided through the project/program.
☒ **Yes**	☐ **No**	I will annually review MDT's participation in this project/program to determine value to MDT.
☒ **Yes**	☐ **No**	If this project/program is funded, but becomes no longer of significant value to MDT, I will alert the Research Programs Manager.

Part C: For Technical Representative		
☒ **Yes**	☐ **No**	I will attend project/program meetings, as funded by the project/program.
☒ **Yes**	☐ **No**	If I cannot attend in-person, I will attend via conference call or web meeting, as provided
☒ **Yes**	☐ **No**	I will review documents and deliverables, determining their value to MDT.
☒ **Yes**	☐ **No**	I will complete an annual evaluation form, for this project/program, and provide comprehensive feedback on its value to MDT.
☒ **Yes**	☐ **No**	If this project/program is no longer of value to MDT, I will alert my Bureau Chief and the Research Programs Manager.

Part D: MDT Benefits

Please explain the benefits MDT is expected to achieve through participation in this project/program.

Analytical methods for modeling pile capacity and pile driving characteristics for cohesive soil, cohesionless soil, and rock are well understood. These methods have **not** proven to be reliable for piles driven into Intermediate GeoMaterials (IGMs - material found within the property range bracketed by soil and rock). Methods to determine the axial capacity, driving resistance, and long-term resistance of piles driven into IGMs are not well established. These materials are predominant in the eastern half of the state, and located intermittently in the western half as well.

The main thrust of this research is to establish geotechnical investigation best practices, calibrations for resistance factors and design methods, and to ascertain improvements to current construction methods. Less uncertainty in material property correlations and design methods lead to less design conservatism (direct material cost savings), better construction control (indirect efficiency savings) and above all, confidence in the long-term durability of the final product.

Part E: Approval (Technical Representative and Bureau Chief Sections are to be completed prior to submitting form)			
Scott Helm	☒ Yes	☐ No	5/1/2018
Technical Representative Name	Technical Representative Approval		Date
Jeff Jackson	☒ Yes	☐ No	5/2/2018
Bureau Chief Name	Bureau Chief Approval		Date
RRC Approval	☐ Yes	☐ No	Date: Click or tap to enter a date.

MONTANA MDT DEPARTMENT OF TRANSPORTATION

RESEARCH PROGRAMS

Research Partnering Project Annual Evaluation Form

INSTRUCTIONS

Complete this form to request funding for research projects and programs where MDT will not be the lead and will not contribute all funds for the project/program, such as AASHTO pooled fund programs/projects (TPF) and Technical Service Programs (TSP). Send completed form to the Research Programs Manager.

Part A: General Project/Program Information			
Date: 5/17/2018	**Solicitation or Project Number:** N/A	**Lead Entity:** AASHTO	
		Technical Representative: Sue Sillick	
Title: AASHTO Innovation Initiative (AII)			
Project/Program URL: http://aii.transportation.org/Pages/default.aspx			
Project/Program Begin Date: Ongoing		**Project/Program End Date:** Ongoing	
Annual MDT Contribution: $6,000	**Number of Years for Annual Contribution:** N/A, program is ongoing	**Total Contributed:** N/A, ongoing	**Total Yet to Contribute:** N/A, ongoing

Part B: Evaluation – Technical Representative		
Evaluation		
Is this project/program making progress toward stated goals?	☒ **Yes**	☐ **No**
If yes, please describe. New focus technologies are identified and pushed out each year.		
If no, please explain why. N/A		
What knowledge and/or deliverables has MDT received to date from participation in this project/program? See below list		
Do you anticipate that any results of this project/program will be implemented/used at MDT?	☒ **Yes**	☐ **No**
If yes, please describe. The AII program used to be under the AASHTO Standing Committee on Highways (SCOH); however, with the AASHTO committee reorganization, it is now under the Special Committee for Research and Innovation (SCRI). In the past, there was no one person responsible for tracking AII innovations implemented at MDT. This is changing. It is anticipated technology transfer will be improved in the future to identify innovations to implement. SCRI still has some decisions on how to incorporate AII into its processes; however, a Community of Practice (COP) has been organized and a first meetring held. Both Sue Sillick and Dwane Kailey belong to this COP. Iniitial internal discussions identified a goal of not only improving information delivery on new technologies, but also, qualifying and quantifying the value obtained by MDT's implementation of innovations.		
If no, please explain why. N/A		
Communications		
How often are meetings held? TBD		

Are you able to attend? TBD	☐ **Yes**	☐ **No**
Do you at least receive quarterly progress reports? TBD	☐ **Yes**	☐ **No**
If no, please explain. N/A		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. Many new and emerging technologies, offering improved performance/effectiveness, are continually becoming ready for operational implementation. Some of these technologies have been developed through rigorous research and may have been demonstrated in "real world" applications. Some may have been gleaned from international technology scanning tours. Others evolved within practice but are not shared. These innovations need to be identified and shared with MDT staff as MDT has much to gain by the implementation on innovations.		
If no, please explain. N/A		

Part C: Evaluation – Bureau Chief		
What benefits has participation had on your bureau, staff, and/or on MDT? This effort has value Department-wide. MDT has been active in implementing the innovations of others as it has the potential to decrease costs, increase quality, improve safety, improve environmental sensitivty, and improve economic vitality.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. See above.		
If no, please explain. N/A		

Part D: Approval			
Sue Sillick	☒ Yes	☐ No	5/17/2018
Technical Representative Name	Technical Representative Approval		Date
Mike Dyrdahl	☒ Yes	☐ No	5/17/2018
Bureau Chief Name	Bureau Chief Approval		Date

Active Lead States Teams Focus Technologies

- Project PS&E C-Rev
- Interactive Visualization
- Carbon Fiber Reinforced Polymer Strands

Access earlier Lead States Team Focus Technologies

Additionally Selected Technologies (ASTs)

- Bridge Expansion Joint System
- Prep-ME Software
- Sandwich Plate System Bridge Decks
- Double Crossover Diamond Interchange

Access earlier ASTs.

MONTANA MDT DEPARTMENT OF TRANSPORTATION

RESEARCH PROGRAMS

Research Partnering Project Annual Evaluation Form

INSTRUCTIONS

Complete this form to request funding for research projects and programs where MDT will not be the lead and will not contribute all funds for the project/program, such as AASHTO pooled fund programs/projects (TPF) and Technical Service Programs (TSP). Send completed form to the Research Programs Manager.

Part A: General Project/Program Information			
Date: 3/22/2018	**Solicitation or Project Number:** AASHTO TSP	**Lead Entity:** AASHTO	
		Technical Representative: Oak Metcalfe	
Title: AASHTO Product Evaluation List (APEL)			
Project/Program URL: http://APEL.transportation.org			
Project/Program Begin Date: Ongoing		**Project/Program End Date: Ongoing**	
Annual MDT Contribution: $2,500	**Number of Years for Annual Contribution:** Ongoing	**Total Contributed: N/A**	**Total Yet to Contribute: N/A**

Part B: Evaluation – Technical Representative		
Evaluation		
Is this project/program making progress toward stated goals?	☒ **Yes**	☐ **No**
If yes, please describe. This program provides for an independent evaluation of proprietary products as well as a Clearing house for other DOT evaluated products and PIF's for proprietary products.		
If no, please explain why. Click or tap here to enter text.		
What knowledge and/or deliverables has MDT received to date from participation in this project/program? The ability to research proprietary products from many sources in one location. It also serves as an avenue for research That MDT can't perform otherwise.		
Do you anticipate that any results of this project/program will be implemented/used at MDT?	☒ **Yes**	☐ **No**
If yes, please describe. There are at least two proprietary products that have been evaluated by APEL that MDT has used Then used or is going to use on MDT projects.		
If no, please explain why. Click or tap here to enter text.		
Communications		
How often are meetings held? Monthly		
Are you able to attend?	☒ **Yes**	☐ **No**
Do you at least receive quarterly progress reports?	☒ **Yes**	☐ **No**
If no, please explain. Click or tap here to enter text.		

Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. This is an extremely inexpensive research alternative for proprietary products.		
If no, please explain. Click or tap here to enter text.		

Part C: Evaluation – Bureau Chief		
What benefits has participation had on your bureau, staff, and/or on MDT? See above.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. Agree this is a inexpensive option to evaluate a product MDT might not have time or funding for.		
If no, please explain. Click or tap here to enter text.		

Part D: Approval			
Oak Metcalfe	☒ Yes	☐ No	4/18/2018
Technical Representative Name	Technical Representative Approval		Date
Jeff Jackson (Acting)	☒ Yes	☐ No	4/18/2018
Bureau Chief Name	Bureau Chief Approval		Date

MONTANA MDT DEPARTMENT OF TRANSPORTATION

RESEARCH PROGRAMS

Research Partnering Project Annual Evaluation Form

INSTRUCTIONS

Complete this form to request funding for research projects and programs where MDT will not be the lead and will not contribute all funds for the project/program, such as AASHTO pooled fund programs/projects (TPF) and Technical Service Programs (TSP). Send completed form to the Research Programs Manager.

Part A: General Project/Program Information			
Date: 3/22/2018	**Solicitation or Project Number:** AASHTO TSP	**Lead Entity:** AASHTO	
		Technical Representative: Oak Metcalfe	
Title: Development of AASHTO Materials Standards (DAMS)			
Project/Program URL: www.aashto.org			
Project/Program Begin Date: Ongoing		**Project/Program End Date: Ongoing**	
Annual MDT Contribution: $10,000	**Number of Years for Annual Contribution:** Ongoing	**Total Contributed: N/A**	**Total Yet to Contribute: N/A**

Part B: Evaluation – Technical Representative		
Evaluation		
Is this project/program making progress toward stated goals?	☒ **Yes**	☐ **No**
If yes, please describe. These funds provide for AASHTO to develop, edit, and publish the AASHTO Materials Book		
If no, please explain why. Click or tap here to enter text.		
What knowledge and/or deliverables has MDT received to date from participation in this project/program? MDT specifies numerous AASHTO standards and test methods and this program supports the continual updating of those standards as well as providing MDT with the means to participate in the discussion and suggest and make changes.		
Do you anticipate that any results of this project/program will be implemented/used at MDT?	☒ **Yes**	☐ **No**
If yes, please describe. We continue to specify these AASHTO standards and are active in their development and Refinement.		
If no, please explain why. Click or tap here to enter text.		
Communications		
How often are meetings held? Twice Yearly		
Are you able to attend?	☒ **Yes**	☐ **No**
Do you at least receive quarterly progress reports?	☒ **Yes**	☐ **No**
If no, please explain. Click or tap here to enter text.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**

If yes, please explain. This allows us to not only contribute to the larger standard development process as a whole thereby reducing the internal effort to develop and maintain what would amount to duplicate standards, but also provides scholarships for two attendees to the annual meeting where we have a seat at the decision table.
If no, please explain. Click or tap here to enter text.

Part C: Evaluation – Bureau Chief		
What benefits has participation had on your bureau, staff, and/or on MDT? See above.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. MDT lives and dies by Standards – specifications, test methods, & practices. This program helps Ensure those standards are maintained.		
If no, please explain. Click or tap here to enter text.		

Part D: Approval			
Oak Metcalfe	☒ Yes	☐ No	4/18/2018
Technical Representative Name	Technical Representative Approval		Date
Jeff Jackson (Acting)	☒ Yes	☐ No	4/18/2018
Bureau Chief Name	Bureau Chief Approval		Date

Research Partnering Project Annual Evaluation Form

RESEARCH PROGRAMS

INSTRUCTIONS

Complete this form to request funding for research projects and programs where MDT will not be the lead and will not contribute all funds for the project/program, such as AASHTO pooled fund programs/projects (TPF) and Technical Service Programs (TSP). Send completed form to the Research Programs Manager.

Part A: General Project/Program Information			
Date: 4/5/2018	**Solicitation or Project Number: EMTSP /Equipment Management Technical Services Program**	**Lead Entity: AASHTO**	
		Technical Representative: Click or tap to en name. Tony F. Strainer	
Title: EMTSP /Equipment Management Technical Services Program			
Project/Program URL: https://www.emtsp.org/			
Project/Program Begin Date: 10/1/2017		**Project/Program End Date: 9/30/2018**	
Annual MDT Contribution: $3,000.00	**Number of Years for Annual Contribution: 7**	**Total Contributed: $21,000**	**Total Yet to Contribute: There is no reason to think we would not continue to be a part of EMTSP**

Part B: Evaluation – Technical Representative		
Evaluation		
Is this project/program making progress toward stated goals?	☒ **Yes**	☐ **No**
If yes, please describe. The program continues to explore best fleet management practices and give up to date and comprehensive information concerning equipment specifications. It is a terrific forum for sharing with other states our practices and receiving vital information on new fleet and equipment practices.		
If no, please explain why. Click or tap here to enter text.		
What knowledge and/or deliverables has MDT received to date from participation in this project/program? We have pursued the use of AVL in our fleet of snow plows along with safety practices that are currently in use just to name a couple.		
Do you anticipate that any results of this project/program will be implemented/used at MDT?	☒ **Yes**	☐ **No**
If yes, please describe. We are currently exploring updating our entire motor pool system. From reservations to pick up and drop offs. We are also sharing ideas with other states concerning the purchase of mechanics tools vs. them supplying their own tools as well as keeping up on the latest in shop safety and efficient maintenance and repair.		
If no, please explain why. Click or tap here to enter text.		
Communications		
How often are meetings held? We have bi-monthly skype meetings to discuss any ideas for new projects and to discuss the status of existing projects. We also have a bi-yearly regional conference which alternates with a bi-yearly national		

conference.		
Are you able to attend?	☒ **Yes**	☐ **No**
Do you at least receive quarterly progress reports?	☒ **Yes**	☐ **No**
If no, please explain. Click or tap here to enter text.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. It is always productive to be able to discuss ideas or projects with states that deal with the same issues we have. We do not need to reinvent the wheel if it has already been done somewhere else. Also, it is just as important for other states to see what we have in the cooker so they can ask questions or want to jump on board.		
If no, please explain. Click or tap here to enter text.		

Part C: Evaluation – Bureau Chief		
What benefits has participation had on your bureau, staff, and/or on MDT? It definitely gives us a global view of what other states battle. It makes us think outside the box and exposes our processes to them so if they see something that interest them they can pick our brains and possible adopt it for their own use.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. We need to continue to put ourselves out there and find ways to be as efficient and safe as we can. Brainstorming with our constiguants from other states and building those relationshiops is a vital piece in meeting those goals.		
If no, please explain. Click or tap here to enter text.		

Part D: Approval			
Tony F. Strainer	☒ Yes	☐ No	4/5/2018
Technical Representative Name	Technical Representative Approval		Date
Tony F. Strainer	☒ Yes	☐ No	4/5/2018
Bureau Chief Name	Bureau Chief Approval		Date

MONTANA MDT DEPARTMENT OF TRANSPORTATION

RESEARCH PROGRAMS

Research Partnering Project Annual Evaluation Form

INSTRUCTIONS

Complete this form to request funding for research projects and programs where MDT will not be the lead and will not contribute all funds for the project/program, such as AASHTO pooled fund programs/projects (TPF) and Technical Service Programs (TSP). Send completed form to the Research Programs Manager.

Part A: General Project/Program Information			
Date: 4/30/2018	**Solicitation or Project Number: N/A**	**Lead Entity:** AASHTO	
		Technical Representative: Stephanie Brandenberger	
Title: AASHTO LRFD Bridges and Structures Specifications Maintenance TSP			
Project/Program URL: https://bridges.transportation.org/			
Project/Program Begin Date: N/A		**Project/Program End Date: N/A**	
Annual MDT Contribution: $15,000	**Number of Years for Annual Contribution: Ongoing**	**Total Contributed: Ongoing**	**Total Yet to Contribute: Ongoing**

Part B: Evaluation – Technical Representative		
Evaluation		
Is this project/program making progress toward stated goals?	☒ **Yes**	☐ **No**
If yes, please describe. Program goal is to maintain and update LRFD bridge design specifications.		
If no, please explain why. N/A		
What knowledge and/or deliverables has MDT received to date from participation in this project/program? MDT receives regular updates, corrections, and proposals for improvements to the design specifications.		
Do you anticipate that any results of this project/program will be implemented/used at MDT?	☒ **Yes**	☐ **No**
If yes, please describe. Results are regularly incorporated into bridge designs.		
If no, please explain why. N/A		
Communications		
How often are meetings held? Yearly at a minimum.		
Are you able to attend? A representative from MDT regularly attends meetings.	☒ **Yes**	☐ **No**
Do you at least receive quarterly progress reports?	☒ **Yes**	☐ **No**
If no, please explain. N/A		

Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. Bridge design continues to evolve and incorporate new techniques and technology.		
If no, please explain. N/A		

Part C: Evaluation – Bureau Chief		
What benefits has participation had on your bureau, staff, and/or on MDT? Results support better bridge design and construction.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. Bridge design continues to evolve and incorporate new techniques and technology.		
If no, please explain. N/A		

Part D: Approval			
Stephanie Brandenberger	☒ Yes	☐ No	4/30/2018
Technical Representative Name	Technical Representative Approval		Date
Stephanie Brandenberger	☒ Yes	☐ No	4/30/2018
Bureau Chief Name	Bureau Chief Approval		Date

Research Partnering Project Funding Request Form

RESEARCH PROGRAMS

INSTRUCTIONS

Complete this form to request funding for research projects and programs where MDT will not be the lead and will not contribute all funds for the project/program, such as AASHTO pooled fund programs/projects (TPF) and Technical Service Programs (TSP). Send completed form to the Research Programs Manager.

Part A: General Project/Program Information		
Date: 5/4/2018	**Solicitation or Project Number: TBD**	**Lead Entity:** Wyoming DOT
Title: MASH Crash-Testing Bridge Approach Transitions		
Project/Program URL: N/A		
Project/Program Duration: 2 years	**Project/Program Begin Date: FFY 2019**	
Total Cost: $500,000	**Total Cost to MDT: $250,000**	**Annual Cost to MDT: N/A**

Part B: For Bureau Chief		
David Schroeder will be the Technical Representative for this project/program.		
☒ **Yes**	☐ **No**	This employee will be encouraged to request travel approval to attend panel meetings in-person, as funded by the project/program.
☒ **Yes**	☐ **No**	If the employee is not granted travel approval, employee will be allowed to attend via conference call or web meeting, as provided through the project/program.
☒ **Yes**	☐ **No**	I will annually review MDT's participation in this project/program to determine value to MDT.
☒ **Yes**	☐ **No**	If this project/program is funded, but becomes no longer of significant value to MDT, I will alert the Research Programs Manager.

Part C: For Technical Representative		
☒ **Yes**	☐ **No**	I will attend project/program meetings, as funded by the project/program.
☒ **Yes**	☐ **No**	If I cannot attend in-person, I will attend via conference call or web meeting, as provided
☒ **Yes**	☐ **No**	I will review documents and deliverables, determining their value to MDT.
☒ **Yes**	☐ **No**	I will complete an annual evaluation form, for this project/program, and provide comprehensive feedback on its value to MDT.
☒ **Yes**	☐ **No**	If this project/program is no longer of value to MDT, I will alert my Bureau Chief and the Research Programs Manager.

Part D: MDT Benefits

On all federally funded projects let after December 31, 2019, bridge rail and bridge approach transitions must be tested to MASH 2016 criteria (per Roadside Safety Hardware Upgrades Policy 5.03.002). The AASHTO MASH is a testing criterion for roadside hardware which updated and supersedes the previous standard called NCHRP 350. NCHRP 350 will sunset when the new MASH criteria mandate goes into effect. Test criteria is updated to better represent typically heavier and taller vehicles being produced and driven today. Impact conditions were modified to more correctly represent actual conditions and test speeds were increased as well. The MASH 2016 document provides uniform guidance for testing of highway safety elements and to assess their safety performance.

Implementing MASH tested guardrail in cold weather regions poses a unique challenge: "open" guardrail systems are required in areas with high snow drifting potential. Drift accumulation on bridges and at bridge ends poses a significant safety concern for road users. The currently available MASH-tested bridge approach transitions, which include the MGS W-beam and MGS thrie beam approach transitions, are not considered "open rail" and are expected to cause snow accumulation in drift-prone terrain.

The solution in such hazard areas is a box beam guardrail system. MDT and Wyoming DOT currently use box beam roadside guardrail, box beam bridge rail, and box beam bridge approach transitions in drift prone areas. The current box beam bridge rail does not meet the MASH height requirements. To achieve MASH compliance, MDT along with Wyoming DOT have selected the already MASH-tested Texas C2P open bridge rail to use on our structures. In addition, the Wyoming box beam roadside rail is expected to be MASH compliant in its current configuration. Thus, with both a compliant bridge rail and roadside rail, a MASH tested bridge approach transition is the missing element to connect the two. With this proposed pooled fund study, we plan to crash test a Wyoming Box Beam bridge approach transition directly connected to the Texas C2P bridge rail.

Snow drifting is a huge safety concern for northern states like Wyoming and Montana. With no crash testing completed or planned by other agencies or research efforts for an "open rail" system and the MASH deadline soon approaching, a pooled fund study is the solution. Working with other states such as Wyoming in this pooled fund study would provide MDT with a system that not only increases public safety, but also reduces road closures, road user costs and MDT snow plowing efforts. In addition, the width of the Texas C2P bridge rail is less than current bridge rail types MDT uses which means bridge width will be reduced. The rail is also lighter in weight and will likely require a less robust bridge system. These two items alone will provide a significant cost savings on future bridge designs.

Part E: Approval (Technical Representative and Bureau Chief Sections are to be completed prior to submitting form)			
David Schroeder	☒ Yes	☐ No	5/3/2018
Technical Representative Name	Technical Representative Approval		Date
Stephanie Brandenberger	☒ Yes	☐ No	5/3/2018
Bureau Chief Name	Bureau Chief Approval		Date
RRC Approval	☐ Yes	☐ No	Date: Click or tap to enter a date.

MONTANA DEPARTMENT OF TRANSPORTATION

RESEARCH PROGRAMS

Research Partnering Project Annual Evaluation Form

INSTRUCTIONS

Complete this form to request funding for research projects and programs where MDT will not be the lead and will not contribute all funds for the project/program, such as AASHTO pooled fund programs/projects (TPF) and Technical Service Programs (TSP). Send completed form to the Research Programs Manager.

Part A: General Project/Program Information			
Date: 3/22/2018	**Solicitation or Project Number:** AASHTO TSP	**Lead Entity:** NTPEP (AASHTO)	
		Technical Representative: Oak Metcalfe	
Title: National Transportation Product Evaluation Program			
Project/Program URL: www.ntpep.org			
Project/Program Begin Date: Ongoing		**Project/Program End Date:** Ongoing	
Annual MDT Contribution: $20,000	**Number of Years for Annual Contribution:** Ongoing	**Total Contributed:** N/A	**Total Yet to Contribute:** N/A

Part B: Evaluation – Technical Representative		
Evaluation		
Is this project/program making progress toward stated goals?	☒ **Yes**	☐ **No**
If yes, please describe. Yes, this program provides MDT with independent test data for many materials that MDT would not be able to test otherwise.		
If no, please explain why. Click or tap here to enter text.		
What knowledge and/or deliverables has MDT received to date from participation in this project/program? MDT has access to millions of dollars worth of test results to use as we see fit. Currently we use this data to list certain Items on our Qualified Products List which greatly streamlines our acceptance process.		
Do you anticipate that any results of this project/program will be implemented/used at MDT?	☒ **Yes**	☐ **No**
If yes, please describe. Yes, we currently require pavement markings, concrete curing compounds and admixtures, and reinforcing steel to go through the NTPEP process and are working on implementing the same for geotextiles, geogrids, elastomeric bridge bearing pads, and many others.		
If no, please explain why. Click or tap here to enter text.		
Communications		
How often are meetings held? Twice Yearly		
Are you able to attend?	☒ **Yes**	☐ **No**
Do you at least receive quarterly progress reports?	☒ **Yes**	☐ **No**

If no, please explain. Click or tap here to enter text.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. Currently NTPEP is required in many places by our Standard Specifications and if we stopped Contributing we would lose access to the required data.		
If no, please explain. Click or tap here to enter text.		

Part C: Evaluation – Bureau Chief		
What benefits has participation had on your bureau, staff, and/or on MDT? See above.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. Contibuting allows us to continue to access the independent data and to provide input on changes To the program.		
If no, please explain. Click or tap here to enter text.		

Part D: Approval			
Oak Metcalfe	☒ Yes	☐ No	4/18/2018
Technical Representative Name	Technical Representative Approval		Date
Jeff Jackson (Acting)	☒ Yes	☐ No	4/18/2018
Bureau Chief Name	Bureau Chief Approval		Date

MONTANA DEPARTMENT OF TRANSPORTATION

RESEARCH PROGRAMS

Research Partnering Project Annual Evaluation Form

INSTRUCTIONS

Complete this form to request funding for research projects and programs where MDT will not be the lead and will not contribute all funds for the project/program, such as AASHTO pooled fund programs/projects (TPF) and Technical Service Programs (TSP). Send completed form to the Research Programs Manager.

Part A: General Project/Program Information			
Date: 3/22/2018	**Solicitation or Project Number:** AASHTO TSP	**Lead Entity:** AASHTO	
		Technical Representative: Oak Metcalfe	
Title: AASHTO Re:source (Formerly AMRL)			
Project/Program URL: www.aashtoresource.org			
Project/Program Begin Date: Ongoing		**Project/Program End Date:** Ongoing	
Annual MDT Contribution: $20,000	**Number of Years for Annual Contribution:** Ongoing	**Total Contributed: N/A**	**Total Yet to Contribute: N/A**

Part B: Evaluation – Technical Representative		
Evaluation		
Is this project/program making progress toward stated goals?	☒ **Yes**	☐ **No**
If yes, please describe. It provides the means to maintain our Federally required Central Laboratory Accreditation – 23CFR637.209(a)		
If no, please explain why. Click or tap here to enter text.		
What knowledge and/or deliverables has MDT received to date from participation in this project/program? We have successfully maintained our Federally required Central Laboratory Accreditation.		
Do you anticipate that any results of this project/program will be implemented/used at MDT?	☒ **Yes**	☐ **No**
If yes, please describe. We continue to meet the requirements of 23 CFR 637.209(a)		
If no, please explain why. Click or tap here to enter text.		
Communications		
How often are meetings held? Twice Yearly		
Are you able to attend?	☒ **Yes**	☐ **No**
Do you at least receive quarterly progress reports?	☒ **Yes**	☐ **No**
If no, please explain. Click or tap here to enter text.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**

If yes, please explain. This is how we maintain our 23 CFR 637.209(a) responsibilities
If no, please explain. Click or tap here to enter text.

Part C: Evaluation – Bureau Chief		
What benefits has participation had on your bureau, staff, and/or on MDT? See above.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. This is how we maintain our 23 CFR 637.209(a) responsibilities		
If no, please explain. Click or tap here to enter text.		

Part D: Approval			
Oak Metcalfe	☒ Yes	☐ No	4/18/2018
Technical Representative Name	Technical Representative Approval		Date
Jeff Jackson (Acting)	☒ Yes	☐ No	4/18/2018
Bureau Chief Name	Bureau Chief Approval		Date

MONTANA MDT DEPARTMENT OF TRANSPORTATION

RESEARCH PROGRAMS

Research Partnering Project Annual Evaluation Form

INSTRUCTIONS

Complete this form to request funding for research projects and programs where MDT will not be the lead and will not contribute all funds for the project/program, such as AASHTO pooled fund programs/projects (TPF) and Technical Service Programs (TSP). Send completed form to the Research Programs Manager.

<table>
<tr><th colspan="4">Part A: General Project/Program Information</th></tr>
<tr><td colspan="2">Date: 4/24/2018</td><td>Solicitation or Project Number:
TSP2</td><td>Lead Entity: AASHTO

Technical Representative:
Mary Gayle Padmos</td></tr>
<tr><td colspan="4">Title: TSP2</td></tr>
<tr><td colspan="4">Project/Program URL: https://www.tsp2.org/</td></tr>
<tr><td colspan="2">Project/Program Begin Date: ongoing</td><td colspan="2">Project/Program End Date: ongoing</td></tr>
<tr><td>Annual MDT Contribution: $20,000</td><td>Number of Years for Annual Contribution: ongoing</td><td>Total Contributed: $ongoing</td><td>Total Yet to Contribute: $ongoing</td></tr>
</table>

<table>
<tr><th colspan="3">Part B: Evaluation – Technical Representative</th></tr>
<tr><td colspan="3">Evaluation</td></tr>
<tr><td>Is this project/program making progress toward stated goals?</td><td>☒ Yes</td><td>☐ No</td></tr>
<tr><td colspan="3">If yes, please describe. Participation in the Rocky Mountain West Partnership provides contacts and networking opportunities with 12 other state agencies as well as some local areas regarding pavement preservation. Attendance to the annual meeting offers training and updates on the latest research and practical application of materials and processes in pavement preservation.</td></tr>
<tr><td colspan="3">If no, please explain why. Click or tap here to enter text.</td></tr>
<tr><td colspan="3">What knowledge and/or deliverables has MDT received to date from participation in this project/program? More aware to the improvements and changing requirements going on in the pavement preservation industry.</td></tr>
<tr><td>Do you anticipate that any results of this project/program will be implemented/used at MDT?</td><td>☒ Yes</td><td>☐ No</td></tr>
<tr><td colspan="3">If yes, please describe. Not only do we anticipate the Engineering Division will benefit and use results from this program we also anticipate the Maintenance Division should also benefit by staying cutting edge on the latest technological advances in the pavement preservation industry.</td></tr>
<tr><td colspan="3">If no, please explain why. Click or tap here to enter text.</td></tr>
<tr><td colspan="3">Communications</td></tr>
</table>

How often are meetings held? Annual in person meetings are attended by one Pavement Analysis employee and one Maintenance employee. A few telephone meetings are held each year.		
Are you able to attend?	☒ **Yes**	☐ **No**
Do you at least receive quarterly progress reports?	☐ **Yes**	☒ **No**
If no, please explain. There's no such thing as quarterly progress reports from this one.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. As the field of pavement preservation continues to evolve, it is imperative that MDT stays in tune with the latest advances in the industry.		
If no, please explain. Click or tap here to enter text.		

Part C: Evaluation – Bureau Chief		
What benefits has participation had on your bureau, staff, and/or on MDT? It has kept staff cutting edge on technology		
Advancements in the field of pavement preservation as well as informed on B the data future of the industry. Should MDT continue to contribute? Yes	☒ **Yes**	☐ **No**
If yes, please explain. It keeps MDT staff informed on the latest advancements in the field of pavements.		
If no, please explain. Click or tap here to enter text.		

Part D: Approval			
Mary Gayle Padmos	☒ Yes	☐ No	4/24/2018
Technical Representative Name	Technical Representative Approval		Date
Jeff Jackson	☒ Yes	☐ No	4/24/2018
Bureau Chief Name	Bureau Chief Approval		Date

MONTANA MDT DEPARTMENT OF TRANSPORTATION

RESEARCH PROGRAMS

Research Partnering Project Annual Evaluation Form

INSTRUCTIONS

Complete this form to request funding for research projects and programs where MDT will not be the lead and will not contribute all funds for the project/program, such as AASHTO pooled fund programs/projects (TPF) and Technical Service Programs (TSP). Send completed form to the Research Programs Manager.

Part A: General Project/Program Information			
Date: 3/23/2018	**Solicitation or Project Number:** TPF-5(299)	**Lead Entity: FHWA**	
		Technical Representative: Mary Gayle Padmos	
Title: Improving the quality of pavement surface distress and transverse profile data collection and analysis			
Project/Program URL: http://www.pooledfund.org/Home/Participate			
Project/Program Begin Date: 2014		**Project/Program End Date: 2020**	
Annual MDT Contribution: $15,000	**Number of Years for Annual Contribution: 6**	**Total Contributed: $60,000**	**Total Yet to Contribute: $30,000**

Part B: Evaluation – Technical Representative		
Evaluation		
Is this project/program making progress toward stated goals?	☒ **Yes**	☐ **No**
If yes, please describe. Several Research Needs Statements have been funded or are in development. These include data Quality Plans and pavement surface data collection which will assist MDT's ongoing data quality data collection efforts.		
If no, please explain why. Click or tap here to enter text.		
What knowledge and/or deliverables has MDT received to date from participation in this project/program? More awa the improvements and changing requirements going on in the data collection industry.		
Do you anticipate that any results of this project/program will be implemented/used at MDT?	☒ **Yes**	☐ **No**
If yes, please describe. Some activities will evolve into collection standards revisions and MDT follows these standards fo pavement data collected.		
If no, please explain why. Click or tap here to enter text.		
Communications		
How often are meetings held? Annual in person meetings are attended by a Pavement Management employee. A few telephone meetings are held each year.		
Are you able to attend?	☒ **Yes**	☐ **No**
Do you at least receive quarterly progress reports?	☒ **Yes**	☐ **No**
If no, please explain. Click or tap here to enter text.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**

If yes, please explain. As the performance measures guide departmental goals, the Pooled Fund is working in data level to ensure quality procedures, equipment standards and data formats are available. TPF-5(299) ends in 2019 with new starting in 2020. Will need to commit to new Pool Fund number.
If no, please explain. Click or tap here to enter text.

Part C: Evaluation – Bureau Chief		
What benefits has participation had on your bureau, staff, and/or on MDT? It has kept staff cutting edge on technology		
Advancements in the field of pavement management as well as informed on the data quality management plan requirements. Should MDT continue to contribute? Yes	**☒ Yes**	**☐ No**
If yes, please explain. It keeps MDT staff informed on the latest advancements in the field of data collection.		
If no, please explain. Click or tap here to enter text.		

Part D: Approval			
Mary Gayle Padmos	☒ Yes	☐ No	4/6/2018
Technical Representative Name	Technical Representative Approval		Date
Matt Strizich	☒ Yes	☐ No	4/6/2018
Bureau Chief Name	Bureau Chief Approval		Date

MONTANA MDT DEPARTMENT OF TRANSPORTATION

RESEARCH PROGRAMS

Research Partnering Project Annual Evaluation Form

INSTRUCTIONS

Complete this form to request funding for research projects and programs where MDT will not be the lead and will not contribute all funds for the project/program, such as AASHTO pooled fund programs/projects (TPF) and Technical Service Programs (TSP). Send completed form to the Research Programs Manager.

Part A: General Project/Program Information			
Date: 4-23-18	**Solicitation or Project Number:** TPF-5(313)	**Lead Entity: CP Tech Center @ Iowa State University**	
		Technical Representative: Matt Needham	
Title: Technology Transfer Concrete Consortium (TTCC) and National Concrete Consortium (NCC)			
Project/Program URL: http://www.pooledfund.org/Details/Study/562			
Project/Program Begin Date: 2015		**Project/Program End Date: August 31, 2020**	
Annual MDT Contribution: $12,000	**Number of Years for Annual Contribution: 6**	**Total Contributed: $48,000**	**Total Yet to Contribute: $24,000**

Part B: Evaluation – Technical Representative		
Evaluation		
Is this project/program making progress toward stated goals?	☒ **Yes**	☐ **No**
If yes, please describe. Please See Appendix A		
If no, please explain why. Click or tap here to enter text.		
What knowledge and/or deliverables has MDT received to date from participation in this project/program? See Appendix A		
Do you anticipate that any results of this project/program will be implemented/used at MDT?	☒ **Yes**	☐ **No**
If yes, please describe. See Appendix A		
If no, please explain why. Click or tap here to enter text.		
Communications		
How often are meetings held? Biannually		
Are you able to attend?	☒ **Yes**	☐ **No**
Do you at least receive quarterly progress reports?	☒ **Yes**	☐ **No**
If no, please explain. Click or tap here to enter text.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**

If yes, please explain. Please See Appendix A
If no, please explain. Click or tap here to enter text.

Part C: Evaluation – Bureau Chief		
What benefits has participation had on your bureau, staff, and/or on MDT? Benefit to MDT is documented in Appendix A		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. MDT sees benefit through this pooled fund in variety of ways. Appendix 1 contains information regarding the benefits we have received.		
If no, please explain. Click or tap here to enter text.		

Part D: Approval			
Paul Bushnell	☒ Yes	☐ No	4/23/2018
Technical Representative Name	Technical Representative Approval		Date
Jeff Jackson	☒ Yes	☐ No	4/23/2018
Bureau Chief Name	Bureau Chief Approval		Date

Appendix A –

Benefits:

- Regional and National Contacts, including an easy to use list serve to many subject matter experts.

List Sever questions can be posed to the group of member states and representatives from the CP Tech center. We have used this to gather information to make informed decisions to best serve our traveling public. Recently we queried states and their acceptance of Type IL cements and used the gathered responses to help us determine that allowing type IL cements was in the best interest of our Department. We are currently using materials gathered from a list serve question within our joint MDT/Industry Dispute Resolution Process team.

- Training and training reference manuals.

Training from this program comes in many forms. The Bi-annual technology transfer meetings feature presentations from Knowledge leaders in Academia, Industry and FHWA and State Agencies. The information gained from these presentations have helped our staff gain working knowledge of concrete topics and help us as a Department make informed decisions on new and existing concrete technologies. The presentations are available for reference and review on the CP Tech Center website: http://www.cptechcenter.org/ncc/TTCC-NCCMeetings.cfm

Reference manuals stemming from funding provided through this partnership have been useful for our department. MDT uses the Guide to Concrete Overlays and Design of Concrete overlays extensively (check to see if it really is extensively). Information from these presentations and reference manuals has been influential in the structure our current concrete specifications and construction practices.

- Technical briefs and other documents.

The Technical briefs and available documents funded through this program provide an easy to use database allowing timely review of pertinent materials for decisions on our best practices.

- Reduce repeated research.

The research suggested by the NCC group allows us to better use our available funds. The CP Tech Center maintains a database of research performed by member states which allows us to review the most current research performed. This allows us to either incorporate the findings of the completed research or spend our research dollars to further the knowledge while not duplicating efforts that have already been completed.

Through the NCC group research projects of common interest are also funded. We as a member state have a voice in the direction of this research. NCC Deployment for 2017 will contain a research topic on fibers for pavements and bridge decks. We will benefit from the pooled research which may help us further our efforts to reduce cracking bridge decks.

- Promote and implement new ideas.

Several topics of information transfer have been used to implement specifications by MDT including:

Surface resistivity, optimized gradations and Portland limestone cement.

Performance Engineered Concrete mix designs (PEC) specifications are currently in progress and MDT will benefit from incorporating portions of the forthcoming specification.

- Development of new training programs.

As part of our membership in this pooled fund we are eligible for training on demand in a variety of concrete technologies. Presentations are provided from leaders in the field of concrete technology. This benefit is at no additional cost to the Department. We have worked with the CP Tech center to arrange for a Pavement Preservation presentation that is tailored to our needs. We arranged to have the presenters prepare their presentations to cover our pavements in Montana and make our Maintenance staff the target audience. Due to budgetary constraints at the time, the 1-day presentation was postponed. This is still available to us.

- Reviews and developments conducted with other state representatives.

Partner states include: AL , CA , CO , FL , GA , IA , ID , IL , IN , KS , LA , MI , MN , MO , MT , NC , ND , NE , NV , NY , OH , OK , OR , PA , RI , SD , TN , TX , UT , WA , WI

The training, networking, research opportunities and available reference information make this allocation of funds an easy and smart decision.

Background:

Increasingly, state departments of transportation (DOTs) are challenged to design and build longer life concrete pavements that result in a higher level of user satisfaction for the public. One of the strategies for achieving longer life pavements is to use innovative materials and construction optimization technologies and practices. In order to foster new technologies and practices, experts from state DOTs, Federal Highway Administration (FHWA), academia and industry must collaborate to identify and examine new concrete pavement research initiatives. The purpose of this pooled fund project is to identify, support, facilitate and fund concrete research and technology transfer initiatives.

The Iowa DOT will serve as the lead state for the execution of the pooled fund project

described in this proposal. The Iowa DOT, through the National Concrete Pavement Technology Center (CP Tech Center) at Iowa State University, will handle all administrative duties associated with the project. The CP Tech Center will also serve as the lead research institution for the project.

Objectives:

The goal of the TTCC is to:

- Identify needed research projects
- Develop pooled fund initiatives
- Provide a forum for technology exchange between participants
- Develop and fund technology transfer materials
- Provide on-going communication of research needs faced by state agencies to the FHWA, industry, and CP Tech Center
- Provide guidance on priorities for the Next Gen CP Road Map (For information on the CP Road Map: http://www.cproadmap.org/)
- Provide assistance as requested by the Next Gen CP Road Map Executive Committee on other select tracks as needed
- Provide technical leadership for the national initiative to develop performance engineered concrete mixes

It is anticipated that this consortium would become the national forum for state involvement in the technical exchange needed for collaboration and new initiatives, and provide input to the Next Gen CP Road Map Mix Design and Analysis Track team.

Scope of Work:

This pooled fund project allows for state representatives to continue the collaborative efforts of TPF-5(159) that originally began in TPF-5(066) Materials and Construction Optimization. The TTCC is open to any state agency desiring to be a part of new developments in concrete.

It is envisioned this partnership will be part of the Track Team for the Next Gen CP Road Map Mix Design and Analysis Track. The Track Team will include state representatives along with FHW A representatives, industry representatives (from ACPA, ACPA chapters, and material suppliers), consultants, and academic representatives. This pooled fund will be the opportunity for all states interested in the Mix Design and Analysis Track to become part of that endeavor.

TTCC will meet in conjunction with the National Concrete Consortium (NCC), twice a year. NCC Bylaws and the Executive Committee membership can be found at http://www.cptechcenter.org/ncc/TTCC-NCCMeetings.cfm.

Efforts by the TTCC will be focused towards these project activities and deliverables:

• Identify and guide the development and funding of technology transfer materials such as tech brief summaries and training materials from research results
• Review the Next Gen CP Road Map initiatives and provide feedback to the FHWA, industry, and the CP Tech Center on those initiatives
• Provide input to the Track Team for the Next Gen CP Road Map Mix Design and Analysis Track providing guidance to coordinating activities with the track.
• Provide research ideas to funding agencies
• Identify and instigate needed research projects
• Include current activities and deliverables of the pooled fund on the CP Road Map project website
• Maintain the pooled fund project website with current activities and deliverables
• Maintain the TTCC pooled fund listserv
• Track TTCC listserv posted problems and discussions and categorize them for inclusion in a library on the project website
• Develop pooled fund research problem statements for solutions to concrete and concrete pavement issues
• Act as a technology exchange forum for the participating entities
• Contribute to a technology transfer newsletter on concrete pavement research activities every six months in cooperation with the Next Gen CP Road Map activities
• Publish electronic quarterly reports following lead state guidelines
• Post quarterly reports to the website
• Submit a final report to participants that documents the results of the entire project

Pooled fund activities and budgets are discussed at the semi-annual meetings. Proposals for minor research, synthesis studies, and/or training are often presented by partners and then discussed and voted on at the semi-annual meetings. NCC members may propose needed research and/or training, however they may not vote on how to utilize the federal pooled funds. Selection of needed work by partners does not guarantee work can be conducted under this pooled fund project since the Iowa DOT and FHWA must ensure the work will fit within the funding guidelines and scope of the project. Occasionally e-mail discussions and votes are warranted.

Research Partnering Project Annual Evaluation Form

RESEARCH PROGRAMS

INSTRUCTIONS

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Part A: General Project/Program Information			
Date: 4/30/2018	**Solicitation or Project Number: TPF-5(316)**	**Lead Entity: FHWA**	
		Technical Representative: Danielle Bolan	
Title: Traffic Control Device Consortium			
Project/Program URL: http://pooledfund.org/Details/Study/565			
Project/Program Begin Date: 10/1/2015		**Project/Program End Date: 9/30/2019**	
Annual MDT Contribution: $10,0000	**Number of Years for Annual Contribution: four years**	**Total Contributed: $30,000**	**Total Yet to Contribute: $10,000**

Part B: Evaluation – Technical Representative		
Evaluation		
Is this project/program making progress toward stated goals?	☒ **Yes**	☐ **No**
If yes, please describe. The Traffic Control Device Consortium has completed research on lane merge arrows and research on several symbols for highway signs. Both reports have been published and provides guidance to FHWA, NCUTCD (National Committee on Uniform Traffic Control Devices), and MDT.		
If no, please explain why. N/A		
What knowledge and/or deliverables has MDT received to date from participation in this project/program? We have received two completed reports on the above mentioned report. We have identified several other topics in need of research and have rated those topics to decide which should go forward with research. The group has identified and prioritized areas that will be a benefit to MDT (signing for multilane roundabouts, sign clutter, and signing for zipper merge).		
Do you anticipate that any results of this project/program will be implemented/used at MDT?	☒ **Yes**	☐ **No**
If yes, please describe. We will use the knowledge gained from this research to evaluate our signing practices in mutilane roundabouts and change where necessary, the research on the sign clutter will help the sign committee in establishing policy and standard of practice on what we allow within our right-of-way, and the research on the zipper merge can be used in our workzones on active construction projects.		

If no, please explain why. N/A		
Communications		
How often are meetings held? We have an annual meeting in the spring to go over new research ideas and receive updates on ongoing projects. We have received and reviewed research problem statements outside of this meeting. It was discussed in our last meeting to conduct more of this via e-mail so that we can move projects forward in a more timely fashion.		
Are you able to attend?	☒ **Yes**	☐ **No**
Do you at least receive quarterly progress reports?	☒ **Yes**	☐ **No**
If no, please explain. N/A		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. We can pool our resources together to research traffic control devices that we would not be able to fund on our own. The projects that are completed by this group are lower cost research projects and would not be able to compete in the NCHRP research projects and would not receive funding elsewhere.		
If no, please explain. N/A		

Part C: Evaluation – Bureau Chief		
What benefits has participation had on your bureau, staff, and/or on MDT? Research completed by this pooled fund study has been used by FHWA and NCUTCD to implement guidance or uniform TCD in the MUTCD (Manual of Uniform Traffic Control Devices). MDT uses the MUTCD and we do not develop our own manual, so this research is implemented on Montana roadways through our use of the MUTCD. The research can be used prior to formal adoption in the MUTCD by MDT to update our standard of practice.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. This pooled fund study provides a way to look at TCD that are being used by several states and the research conducted by this pooled fund study provides information to gain uniformity in the use of TCD.		
If no, please explain. N/A		

Part D: Approval			
Danielle Bolan	☒ Yes	☐ No	4/30/2018
Technical Representative Name	Technical Representative Approval		Date
Roy Peterson	☒ Yes	☐ No	4/30/2018
Bureau Chief Name	Bureau Chief Approval		Date

MONTANA DEPARTMENT OF TRANSPORTATION

RESEARCH PROGRAMS

Research Partnering Project Annual Evaluation Form

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Complete this form to request funding for research projects and programs where MDT will not be the lead and will not contribute all funds for the project/program, such as AASHTO pooled fund programs/projects (TPF) and Technical Service Programs (TSP). Send completed form to the Research Programs Manager.

Part A: General Project/Program Information			
Date: 3/22/2018	**Solicitation or Project Number:** TPF-5(349) WAQTC	**Lead Entity:** WAQTC	
		Technical Representative: Oak Metcalfe	
Title: WAQTC Pooled Fund			
Project/Program URL: www.waqtc.org			
Project/Program Begin Date: Ongoing		**Project/Program End Date:** Ongoing	
Annual MDT Contribution: $12,000	**Number of Years for Annual Contribution:** Ongoing	**Total Contributed: $24,000**	**Total Yet to Contribute: Ongoing**

Part B: Evaluation – Technical Representative		
Evaluation		
Is this project/program making progress toward stated goals?	☒ **Yes**	☐ **No**
If yes, please describe. We use this program to train our field and lab staff in accordance with 23 CFR 637.209(b)		
If no, please explain why. Click or tap here to enter text.		
What knowledge and/or deliverables has MDT received to date from participation in this project/program? The program provides materials and training to MDT so MDT can then train it's field sampling and testing staff.		
Do you anticipate that any results of this project/program will be implemented/used at MDT?	☒ **Yes**	☐ **No**
If yes, please describe. We continue to meet the requirements of 23 CFR 637.209(b)		
If no, please explain why. Click or tap here to enter text.		
Communications		
How often are meetings held? Twice Yearly		
Are you able to attend?	☒ **Yes**	☐ **No**
Do you at least receive quarterly progress reports?	☒ **Yes**	☐ **No**
If no, please explain. Click or tap here to enter text.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. This is how we maintain our 23 CFR 637.209(b) responsibilities.		

If no, please explain. Click or tap here to enter text.

Part C: Evaluation – Bureau Chief		
What benefits has participation had on your bureau, staff, and/or on MDT? See above.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. This is how we maintain our 23 CFR 637.209(b) responsibilities		
If no, please explain. Click or tap here to enter text.		

Part D: Approval			
Oak Metcalfe	☒ Yes	☐ No	4/18/2018
Technical Representative Name	Technical Representative Approval		Date
Jeff Jackson (Acting)	☒ Yes	☐ No	4/18/2018
Bureau Chief Name	Bureau Chief Approval		Date

MONTANA DEPARTMENT OF TRANSPORTATION

RESEARCH PROGRAMS

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Complete this form to request funding for research projects and programs where MDT will not be the lead and will not contribute all funds for the project/program, such as AASHTO pooled fund programs/projects (TPF) and Technical Service Programs (TSP). Send completed form to the Research Programs Manager.

Part A: General Project/Program Information			
Date: 4/26/2018	**Solicitation or Project Number: TPF-5(353)**	**Lead Entity: Minnesota DOT**	
		Technical Representative: Douglas McBroom	
Title: Clear Roads			
Project/Program URL: http://clearroads.org/			
Project/Program Begin Date: 6/1/2017		**Project/Program End Date: 9/30/2019**	
Annual MDT Contribution: $25,000.00	**Number of Years for Annual Contribution: 2 Years**	**Total Contributed: For the la cycle $50,000.00**	**Total Yet to Contribute: $25,000**

Part B: Evaluation – Technical Representative		
Evaluation		
Is this project/program making progress toward stated goals?	☒ **Yes**	☐ **No**
If yes, please describe. The Clear Roads Pooled fund is desinged to Develop research Ideas from the Member States priortice and award that research. Clear Roads is a national research consortium focused on rigorous testing of winter maintenance materials, equipment and methods for use by highway maintenance crews. The pool fund routinely funds 30 research proposals every year.		
If no, please explain why. Click or tap here to enter text.		
What knowledge and/or deliverables has MDT received to date from participation in this project/program? The following are link for projects that have been completed in 2017: http://clearroads.org/completed-research/		
Do you anticipate that any results of this project/program will be implemented/used at MDT?	☒ **Yes**	☐ **No**
If yes, please describe. Of the list from the the link listed below, e will use parts of, or in whole, informaiton from the following: 14-07:- Identifying Best Practices for Snowplow Route Optimization, 15.03:- North American Study on Contracting Snow and Ice Response, 12:04 -Snowplow Operator and Supervisor Training14.05:- Snow Removal Performance Metrics, 14.02-Quantifying the Impact That New Capital Projects Will Have on Roadway Snow and Ice Control Operations, and 15.02- Quantifying the Impact That New Capital Projects Will Have on Roadway Snow and Ice		

Control Operations. Additionally, there is other research in other years that we have incorporated. Finally, we have a list serve where MDT can ask over 35 states any questions about snow and Ice removal.
If no, please explain why. Click or tap here to enter text.
Communications: Meetings, Phone calls, and email are the medium for communications
How often are meetings held? Twice a year

Are you able to attend?	☒ **Yes**	☐ **No**
Do you at least receive quarterly progress reports?	☒ **Yes**	☐ **No**
If no, please explain. Click or tap here to enter text.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. This is an Incredibly valuble tool for the Mainteance division. Not only do we benefit from the Research but we can determine the direction and enven have research needed specifically for Montana completed by Clear Roads		
If no, please explain. Click or tap here to enter text.		

Part C: Evaluation – Bureau Chief		
If yes, please explain. This is an Incredibly valuble tool for the Mainteance division. Not only do we benefit from the Research but we can determine the direction and enven have research needed specifically for Montana completed by Clear Roads		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. This is an Incredibly valuble tool for the Mainteance division. Not only do we benefit from the Research but we can determine the direction and enven have research needed specifically for Montana completed by Clear Roads		
If no, please explain. Click or tap here to enter text.		

Part D: Approval			
Douglas McBroom	☒ Yes	☐ No	4/26/2018
Technical Representative Name	Technical Representative Approval		Date
Douglas McBroom	☒ Yes	☐ No	4/26/2018
Bureau Chief Name: Douglas McBroom	Bureau Chief Approval		Date

Research Partnering Project Funding Request Form

RESEARCH PROGRAMS

INSTRUCTIONS

Complete this form to request funding for research projects and programs where MDT will not be the lead and will not contribute all funds for the project/program, such as AASHTO pooled fund programs/projects (TPF) and Technical Service Programs (TSP). Send completed form to the Research Programs Manager.

Part A: General Project/Program Information		
Date: 3/30/2018	**Solicitation or Project Number: TPF-5 (376)**	**Lead Entity: MnDOT**
Title: North/West Passage Transportation Pooled Fund		
Project/Program URL: https://www.nwpassage.info/		
Project/Program Duration: Ongoing – 3 additional years requested.	**Project/Program Begin Date: 2002 – present**	
Total Cost: $25,000 annually	**Total Cost to MDT: $75,000**	**Annual Cost to MDT: $25,000**

Part B: For Bureau Chief		
Brandi Hamilton will be the Technical Representative for this project/program.		
☒ **Yes**	☐ **No**	This employee will be encouraged to request travel approval to attend panel meetings in-person, as funded by the project/program.
☒ **Yes**	☐ **No**	If the employee is not granted travel approval, employee will be allowed to attend via conference call or web meeting, as provided through the project/program.
☒ **Yes**	☐ **No**	I will annually review MDT's participation in this project/program to determine value to MDT.
☒ **Yes**	☐ **No**	If this project/program is funded, but becomes no longer of significant value to MDT, I will alert the Research Programs Manager.

Part C: For Technical Representative		
☒ **Yes**	☐ **No**	I will attend project/program meetings, as funded by the project/program.
☒ **Yes**	☐ **No**	If I cannot attend in-person, I will attend via conference call or web meeting, as provided
☒ **Yes**	☐ **No**	I will review documents and deliverables, determining their value to MDT.
☒ **Yes**	☐ **No**	I will complete an annual evaluation form, for this project/program, and provide comprehensive feedback on its value to MDT.
☒ **Yes**	☐ **No**	If this project/program is no longer of value to MDT, I will alert my Bureau Chief and the Research Programs Manager.

Part D: MDT Benefits
Please explain the benefits MDT is expected to achieve through participation in this project/program. There have been numerous benefits for Montana's participation in this pooled fund including; the development of the NWP Traveler Information Website, Corridor-Wide Consistent Event Descriptions to facilitate consistent messages and phrases when sharing messages corridor-wide, traveler information system enhancements, possibilities of information sharing among multiple agencies statewide, motor carrier services coordination, and many other ITS related projects.

Part E: Approval (Technical Representative and Bureau Chief Sections are to be completed prior to submitting form)			
Brandi Hamilton	☒ Yes	☐ No	3/30/2018
Technical Representative Name	Technical Representative Approval		Date
Jon Swartz / Administrator	☒ Yes	☐ No	3/30/2018
Administrator Name	Bureau Chief Approval		Date
RRC Approval	☐ Yes	☐ No	Date: Click or tap to enter a date.

MONTANA MDT DEPARTMENT OF TRANSPORTATION

RESEARCH PROGRAMS

Research Partnering Project Annual Evaluation Form

INSTRUCTIONS

Complete this form to request funding for research projects and programs where MDT will not be the lead and will not contribute all funds for the project/program, such as AASHTO pooled fund programs/projects (TPF) and Technical Service Programs (TSP). Send completed form to the Research Programs Manager.

Part A: General Project/Program Information			
Date: 4/3/2018	**Solicitation or Project Number: TPF-5 (376)**	**Lead Entity: MnDOT**	
		Technical Representative: Brandi Hamilton	
Title: North/West Passage Transportation Pooled Fund			
Project/Program URL: https://www.nwpassage.info/			
Project/Program Begin Date: 2003		**Project/Program End Date: Ongoing**	
Annual MDT Contribution: $25,000	**Number of Years for Annual Contribution: Annually based on an approved workplan by MDT**	**Total Contributed: $250,000**	**Total Yet to Contribute: Annual contribution based on approved work plan**

Part B: Evaluation – Technical Representative		
Evaluation		
Is this project/program making progress toward stated goals?	☒ **Yes**	☐ **No**
If yes, please describe. This is a highly effective pooled fund with projects ranging from ITS Infrastructure, Freight, Interstate speed limits impacts, maintenance operation and collaboration across state borders, connected vehicles, traveler information systems, work zone management practices, commercial vehicle permitting, and many others.		
If no, please explain why. Click or tap here to enter text.		
What knowledge and/or deliverables has MDT received to date from participation in this project/program? Cross border coordination and collaboration for maintenance operations and traveler information, corridor permitting challlenges and benefits, work zone management practices, winter performance measures, TSMO practices, etc.		
Do you anticipate that any results of this project/program will be implemented/used at MDT?	☒ **Yes**	☐ **No**
If yes, please describe. Winter maintenance performance measures, asset management practices, and cross border traveler information coordination		
If no, please explain why. Click or tap here to enter text.		
Communications		

How often are meetings held? Annually		
Are you able to attend?	☒ **Yes**	☐ **No**
Do you at least receive quarterly progress reports?	☒ **Yes**	☐ **No**
If no, please explain. Click or tap here to enter text.		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. This pooled fund has been incredibly successful with addressing issues for commercial and recreational travel issues along the I-90/I-94 corridor (Washington to Wisconsin)		
If no, please explain. Click or tap here to enter text.		

Part C: Evaluation – Bureau Chief		
What benefits has participation had on your bureau, staff, and/or on MDT? Improving traveler information program, coordination of major events across state borders, pooled resources have greater impact		
Should MDT continue to contribute?	☒ **Yes**	☐ **No**
If yes, please explain. This pooled fund has demonstrated benefit with multistate corridor operation and management		
If no, please explain. Click or tap here to enter text.		

Part D: Approval			
Brandi Hamilton	☒ Yes	☐ No	4/3/2018
Technical Representative Name	Technical Representative Approval		Date
Jon Swartz	☒ Yes	☐ No	4/3/2018
Bureau Chief Name	Bureau Chief Approval		Date