Research Need Statement 572

I. Need Statement Champions and Information

I.A. Need Statement Champion Information

I.A.1. First and Last Name of Research Champion: **Jeff Meek**
I.A.2. Research Champion's Office: **Sustainability & Public Health**
I.A.3. Research Champion's Phone Number: **651-366-4263**
I.A.4. Research Champion's Email: **jeffrey.meek@state.mn.us**

I.B. Research Co-Champion

I.A.1. First and Last Name of Research Co-Champion: **Tim Sexton**
I.A.2. Research Co-Champion's Office: **Sustainability & Public Health**
I.A.3. Research Co-Champion's Phone Number: **651-366-3622**
I.A.4. Research Co-Champion's Email: **timothy.sexton@state.mn.us**

I.C. Research Needs Title (115 Characters): Have Minnesota's Warmer Winters Increased the Number of Freeze Thaw Cycles?

I.D. Project Sponsor: Joint MnDOT and Local Road Research Board

II. Research Need Background and Description

II.A. Research Need Background

II.A.1. Describe the problem or opportunity.
It's been well documented that Minnesota's winters have gotten warmer over the last several decades. Our winters have warmed significantly faster than our summers. That trend is forecasted to continue into the foreseeable future. It's possible that this warming has increased the length of time spent around 32F and increased the average number of freeze/thaw events. However, it's also possible that this warming has resulted in no change in the number of freeze/thaw events.

II.A.2. If applicable, describe how this project will build on previous research.

II.A.3. If applicable, include the title/s or previous research.
See literature search for relevant related research.

II.A.4. What is the objective of the proposed research?

This study would attempt to quantify the number of freeze/thaw events daily, monthly, and annually from historical temperature records, freeze gauges, and other data. It would also attempt to collect ground/pavement temperature and study its correlation with air temperature during freeze/thaw events.

III. Strategic Priorities, Benefits, and Expected Outcomes

Section III. is for MnDOT sponsored and co-sponsored projects only; all LRRB projects proceed to section IV.

III.A. MnDOT Strategic Priorities

Instructions: Briefly describe how the project aligns with the following MnDOT Research Strategic Priorities. Complete all that apply.

III.A.1. Innovation & Future Needs: **This project would look at potential needs associated with winter temperatures trending towards 32F for longer periods of time and increasing frequency of freeze/thaw events.**

IIIA.2. Advancing Equity:

III.A.3. Asset Management: **Freeze/thaw cycles have a major impact on pavement lifecycle. Quantifying freeze/thaw events can help allocate maintenance funds and prepare us for trends in freeze/thaw frequency.**

III.A.4. Safety:

III.A.5 Climate Change & Environment: **This project looks at if winter temperature trends over the past several decades have resulted in more freeze thaw events.**

III.B. Expected Outcomes

Instructions: Check all expected direct outcomes of this research.

- ☐ New or improved technical standard, plan, or specification
- ☐ New or improved manual, handbook, guidelines, or training
- ☐ New or improved policy, rules, or regulations
- ☐ New or improved business practices, procedure, or process
- ☐ New or improved tool or equipment
- ☐ New or improved decision support tool, simulation, or model/algorithm (software)
- ☐ Evaluation of a new commercial product
- ☒ Other. Please specify below: **Evaluation on historical temperature data and quantifying freeze thaw events.**

III.C. Expected Benefits

Instructions: Select all expected benefits that may be realized if the findings and recommendations from this research is adopted or implemented

III.C.1. Construction Savings Choose an item.

III.C.2.Decrease Engineering/Administrative Costs Choose an item.

III.C.3. Environmental Aspects Choose an item.

III.C.4. MnDOT Policy Choose an item.

III.C.5. Lifecycle Other lifecycle impacted.
May have to adjust lifecycle of pavements if freeze/thaw events are increasing.

III.C.6. Operations and Maintenance Savings Other operations and maintenance savings.
Prepared for potential additional maintenance.

III.C.7. Reduce Risk Choose an item.

III.C.8. Reduce Road User Cost Choose an item.

III.C.9. Safety Choose an item.

III.C.10. Technology New method of using technology
Quantifying historical data currently available into freeze/thaw even detail.

III.C.11. Other, please describe below:

IV. Technical Advisory Panel

Instructions: Please list the name and affiliation of individuals to consider for the Technical Advisory Panel.

Your assigned Project Advisor is available to answer questions and provide guidance (assigned by the Office of Research & Innovation).
Your Project Advisor is: Marcus Bekele, (651)366-3903, marcus.bekele@state.mn.us