2012-TPF-5(215)TS
Published December 2012

TRANSPORTATION POOLED FUND PROGRAM

TECHNICAL SUMMARY

MnDOT Technical Liaison:
Maureen Jensen
Maureen.Jensen@state.mn.us

MnDOT Project Coordinator:
Deb Fick
Deb.Fick@state.mn.us

TOTAL STATE CONTRIBUTIONS TO DATE:

$200,000

MnDOT CONTRIBUTIONS TO DATE:

$37,500

PARTICIPATING STATES:

IA, MI, MN, ND, NY, WI plus FHWA

One of TERRA's missions is to broaden the use of MnROAD, Minnesota's state-of-the-art pavement research facility consisting of two road segments next to I-94.

RESEARCH SERVICES

OFFICE OF POLICY ANALYSIS, RESEARCH & INNOVATION

Pooling Our Research: The Transportation Engineering and Road Research Alliance

Why a Pooled Fund Study?

To ensure a strong transportation network, MnDOT invests heavily in pavement research and innovation. A major portion of this investment is directed to MnROAD, Minnesota's state-of-the-art outdoor pavement research facility distinguished by its network of electronic sensors embedded in six miles of test pavements. MnROAD includes a 3.5-mile mainline consisting of a working interstate freeway carrying more than 26,000 vehicles a day; a low-volume, 2.6-mile closed loop where controlled vehicle weights and traffic volumes simulate rural road conditions; and a short farm-loop test track, which represents a typical low-volume rural road.

TPF-5(215): The Transportation Engineering and Road Research Alliance. *TERRA works to put research results into practice and supports MnROAD, where pavement research has saved Minnesota taxpayers $33 million or more per year and taxpayers nationwide $750 million.*

To broaden MnROAD's unique capabilities and to make it a regional, national and international resource, in 2004 MnDOT spearheaded the development of the Transportation Engineering and Road Research Alliance (TERRA). TERRA is a collaboration of MnDOT and several other states that brings together government, industry and academia in a dynamic partnership to advance innovations in road engineering and construction.

What is the Pooled Fund Study's Goal?

TERRA's mission is to:

- Develop, sustain and communicate a comprehensive program of research about pavement, materials and related transportation engineering challenges, including issues related to cold climates.
- Provide a network for collaboration and information sharing between industry, academia and public agencies.
- Expand entrepreneurial use of the capacity and capabilities of the MnROAD facility by pursuing opportunities to serve a broader research community.

What Have We Learned?

TERRA has sponsored numerous projects in such areas as construction, low-volume roads, pavement design and sustainability, and communicates lessons learned through its website and in fact sheets about various topics. Completed projects include:

- MnROAD Lessons Learned, which reviewed projects from MnROAD's first 10 years of operation involving more than 50 interviews; 300 published and unpublished reports, papers and briefs; and an online survey of pavement professionals.
- Pervious Concrete Pavement Study, which evaluated the performance of pervious concrete pavements in Minnesota's cold weather climate. Researchers constructed test cells on MnROAD's low-volume road and monitored their response to the environment. Results have shown that with regular maintenance, pervious concrete can provide many benefits in addition to stormwater management and reduced runoff, including a quieter ride.
- Field Investigation of Highway Base Material Stabilized with High Carbon Fly Ash, which examined the use of high carbon fly ash to increase strength and stiffness of

continued

"TERRA has had a dramatic effect on MnDOT's approach to research, increasing its focus on finding partners and existing solutions before commencing projects."

—Maureen Jensen,
Road Research Engineer, MnDOT Office of Materials

"By bringing partners together to collaborate on transportation research problems, TERRA both gives MnDOT a broader perspective and keeps it focused on results and implementation."

—Deb Fick,
Research SP&R Administrator, MnDOT Research Services

Produced by CTC & Associates for:
Minnesota Department
of Transportation Research Services
MS 330, First Floor
395 John Ireland Blvd.
St. Paul, MN 55155-1899
(651) 366-3780
www.research.dot.state.mn.us

Using test cells in a TERRA-sponsored project on MnROAD provides a unique opportunity to monitor the environmental and load responses of thin unbonded concrete overlays.

pavement base layers consisting of recycled pavement materials and crushed stone. Results showed that fly ash significantly increased the resilient modulus of base materials.

What's Going On Now?

There are more than 25 ongoing projects planned and initiated through TERRA. Current projects of particular importance to MnDOT include:

- Performance of Thin Unbonded Concrete Overlays on High-Volume Roads, a five-year study to test the performance of thinner unbonded concrete overlays subject to interstate traffic and Minnesota's extreme climate. Two overlays were successfully constructed on MnROAD and on Trunk Highway 53 near Duluth, Minnesota, and are being monitored for their performance. These projects could lead to reductions in overlay thickness by nearly half compared to conventional designs.
- Investigation of Low Temperature Cracking in Asphalt Pavements–Phase II, a completed pooled fund study that evaluated different laboratory procedures, material properties and pavement features important for optimal selection of low temperature crack resistant materials. The project monitored two sections at MnROAD to validate Phase I development of a fracture mechanics-based specification for asphalt binders and mixtures that better resist crack formation and propagation.
- Permeable HMA Pavement Performance in Cold Regions, a completed project that evaluated the durability, hydrologic characteristics and environmental effects of porous asphalt pavement when used on a low-volume roadway in a cold climate. A fully instrumented MnROAD low-volume road test section was monitored for pavement performance and stormwater runoff volume and quality. Researchers also documented appropriate construction and maintenance procedures.

What's Next?

TERRA regularly hosts events such as recent webinars on chip sealing and HMA pavement warranties, and the TERRA Innovation Series, which shares findings from TERRA-sponsored studies. TERRA's 17th annual pavement conference will be held in February 2013 in St. Paul, Minnesota. TERRA will also continue to conduct regular board and committee meetings, screen potential research projects, seek partners, and communicate and disseminate research results. In the last few years TERRA has grown significantly and will increase its focus on research and implementation as it looks ahead to the next phase of MnROAD, which will begin in 2016.

This Technical Summary pertains to the ongoing Pooled Fund TPF-5(215), Transportation Engineering and Road Research Alliance. Details of this effort can be found at http://www.pooledfund.org/Details/Study/443. *More information is available at* http://www.terraroadalliance.org/.

For more than 25 years, FHWA's Transportation Pooled Fund Program has been providing state DOTs and other organizations the opportunity to collaborate in solving transportation-related problems. The TPF Program is focused on leveraging limited funds, avoiding duplication of effort, undertaking large-scale projects and achieving broader dissemination of results on issues of regional and national interest.