

# State Planning and Research

**2007  
SPR**

## Work Program and Estimate of Cost



MINNESOTA DEPARTMENT OF TRANSPORTATION

In cooperation with the  
U.S. DEPARTMENT OF TRANSPORTATION  
Federal Highway Administration



# STATE PLANNING AND RESEARCH

## Calendar Year 2007

### STATE OF MINNESOTA

### DEPARTMENT OF TRANSPORTATION

In cooperation with

### US DEPARTMENT OF TRANSPORTATION

### FEDERAL HIGHWAY ADMINISTRATION

#### **PART I: PLANNING**

#### **PART II: RESEARCH, DEVELOPMENT & TECHNOLOGY TRANSFER**

#### **PART III: FINANCIAL SUMMARY**

This program is prepared and submitted according to provisions of Title 23, United States Code, regulated under 23 CFR Part 420. On August 10, 2005, the new surface transportation reauthorization legislation, the Safe, Accountable, Flexible, Efficient, Transportation Equity Act: A Legacy for Users (SAFETEA-LU) was signed into law. SAFETEA-LU is a 5-year bill covering FFY 2005 – 2009. The funding levels for FFY 2007 are \$7.7 million for Statewide planning, 5 million for Metropolitan Planning Organization planning, and \$2.5 million for research activities.

The contents of this program describe the continued efforts of the Minnesota Department of Transportation in State Planning and research activities. This document is organized into several parts. Part I of this program is a summary of the Statewide and MPO Planning program. Part II is a summary of the State Research and Development program. Part III is the financial summary of the total participation costs of the program. Appendix A details the task objectives and methodologies, and products by office in the Minnesota Department of Transportation. Appendix C summarizes pooled fund projects with balances but not contributed to in the 2007 SP&R program.

Status reports on products will be prepared and submitted to document the progress of Part I of the program. Part II research activities are updated on a quarterly basis.

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**PART I: PLANNING: STATEWIDE****ITEMIZED COST ESTIMATED****JANUARY 1, 2007 – DECEMBER 31, 2007****FUNDING SUMMARY: STATEWIDE PLANNING PORTION OF PART I**

<b>Office of Investment Management</b>	<b>\$3,692,913</b>
<b>Office of Transportation Data Analysis</b>	<b>\$2,235,638</b>
<b>Office of Transit</b>	<b>\$720,000</b>
<b>Office of Finance</b>	<b>\$10,000</b>
<b>Office of Traffic, Security and Operations</b>	<b>\$128,000</b>
<b>Office of State Aid</b>	<b>\$822,915</b>
<b>Office of Technical Support</b>	<b>\$1,600,000</b>
<b>Office of Freight &amp; Commercial Vehicle Operations</b>	<b>\$472,338</b>
<b>Total Needs</b>	<b>\$9,681,804</b>
<b>Total Federal Statewide Planning funds available</b>	<b>\$7,776,966</b>
<b>State funded difference</b>	<b>\$1,904,838</b>

**OFFICE OF INVESTMENT MANAGEMENT**

State Transportation Improvement Program.....	\$117,250
Salaries...../14 Person Months	
State Transportation Plan and Statewide Planning Services.....	\$853,235
Salaries...../ 107 Person Months	
Federal & State Transportation Programs.....	\$938,000
Salaries...../112 Person Months	
Transportation & Economic Analysis.....	\$369,358
Salaries...../ 54 Person Months	
Land Use Access Management.....	\$177,190
Salaries...../ 45 Person Months	
Research Program Development and Financial Mgmt .....	\$1,031,850
Salaries...../174 Person Months	
Library and Information Mgmt.....	\$206,030
Salaries...../36 Person Months	
 <b>TOTAL ESTIMATED COST.....</b>	 <b>\$3,692,913</b>



## OFFICE OF TRANSPORTATION DATA &amp; ANALYSIS

Transportation Information System (TIS) & GIS BaseMap Data Maintenance.....	\$166,129
Salaries .....	166,129/37.5 Person Months
Vehicle Classification and Truck Weight Studies .....	\$320,908
Salaries .....	317,408/58.4 Person Months
Travel .....	3,000
Overtime .....	500
Traffic Counting.....	\$304,079
Salaries .....	301,579/65.4 Person Months
Travel .....	2,000
Overtime .....	500
Traffic Forecasting for Highway Design .....	\$234,426
Salaries .....	233,926/37 Person Months
Travel .....	500
Transportation Information System (TIS) Development & Maintenance .....	\$56,106
Salaries .....	56,106/9 Person Months
Transportation Information System (TIS) Support.....	\$134,790
Salaries .....	134,790/24 Person Months
Municipal Maps.....	\$154,844
Salaries .....	154,844/50.5 Person Months
St. Paul – Minneapolis Area Maps.....	\$29,353
Salaries .....	29,353/5.5 Person Months
County Maps.....	\$72,551
Salaries .....	72,551/13 Person Months
State Maps.....	\$49,591
Salaries .....	49,591/9 Person Months
Roadway History & Project Log .....	\$134,844
Salaries .....	134,844/30 Person Months
Transportation Data & Analysis IT Development (TDAITD).....	\$514,194
Salaries .....	514,194/118.5 Person Months
Transportation Information System IT Replacement (TIS-ITR).....	\$63,823
Salaries .....	63,823/11 Person Months
<b>TOTAL ESTIMATED COST.....</b>	<b>\$2,235,638</b>

**OFFICE OF TRANSIT**

Transit Program Planning.....	\$203,000
Salaries...../30 Person Months	
Travel.....	3,000
Newsletter.....	4,000
Misc.....	4,000
Transit Research & Program Evaluation.....	\$120,000
Salaries...../18 Person Months	
Travel.....	2,000
Misc.....	2,000
Bikeway Planning.....	\$397,000
Salaries...../60 Person Months	
Travel.....	5,300
Professional/Technical.....	35,000
(SBAC) State Bicycle Adv. Comm. .	8,000
Misc.....	9,000
<b>TOTAL ESTIMATED COST .....</b>	<b>\$720,000</b>

**OFFICE OF FINANCE**

Highway Statistics .....\$10,000

Salaries.....1.7 Person Months

**TOTAL ESTIMATED COST.....\$10,000**

## OFFICE OF TRAFFIC, SECURITY AND OPERATIONS

Speed Data Summaries .....	\$20,000
Salaries...../0.33 FTE's (at \$28.74 per hour)	
Accident Surveillance .....	\$108,000
Salaries...../1.50 FTE's (at \$33.52 per hour)	
Mainframe Computer & Systems Services (at \$250 per month)	
<b>TOTAL ESTIMATED CY2007 COST.....</b>	<b>\$128,000</b>

**OFFICE OF STATE AID**

County State Aid Highway .....\$440,860

Salaries.....\$432,826/47 Person Months

Travel.....\$4,944

Supplies.....\$3,090

Municipal State Highway Need Study.....\$382,055

Salaries.....\$377,355/38 Person Months

Supplies.....\$2,500

Travel.....\$2,200

**TOTAL ESTIMATED COST.....\$822,915**

**OFFICE OF ENVIRONMENTAL SERVICES (CULTURAL RESOURCES UNIT)**

Trunk Highway and County/Municipal Cultural Resource Investigations

Contracts .....\$1,600,000

Cultural Resources Firms

**TOTAL ESTIMATED COST.....\$1,600,000**

**OFFICE OF FREIGHT AND COMMERCIAL VEHICLE OPERATIONS (2007)**

Freight Planning, Studies and Data Management.....\$472,338

Salaries ..... 72 Person Months

**TOTAL ESTIMATED COST.....\$472,338**

**PART I: PLANNING:**

**METROPOLITAN PLANNING ORGANIZATION (MPO)**

**FUNDING DISTRIBUTION**

**CALENDAR YEAR 2007**

<b>MPO</b>	<b>FHWA (PL)</b>	<b>FTA (Sec. 5303)</b>	<b>TOTAL (Planning funds avail.)</b>
<b>Twin Cities Metropolitan Council</b>	\$2,512,322	\$724,537	\$3,236,859
<b>Duluth-Superior MIC</b>	382,230	110,233	492,463
<b>St. Cloud APO</b>	358,842	103,488	462,330
<b>Rochester – Olmsted COG</b>	342,107	98,662	440,769
<b>Fargo – Moorhead COG</b>	123,066	35,492	158,558
<b>Grand Forks/E. Grand Forks MPO</b>	29,693	8,563	38,256
<b>La Crosse Area Planning Committee</b>	20,221	5,832	26,053
<b>TOTAL</b>	<b>\$3,768,481</b>	<b>\$1,086,807</b>	<b>\$4,855,288</b>

**Notes**

The MPOs and Mn/DOT developed a formula for the distribution of the Consolidated Planning Grant (CPG) funds, which was approved by both FHWA and FTA.



**PART II: RESEARCH AND DEVELOPMENT****ITEMIZED COST ESTIMATED****CALENDAR YEAR 2007**

<b>State Study No. *(Asterisk denotes lead state project) **(Double asterisk denotes 80/20 MN state project)</b>	<b>Study Title</b>	<b>Commitment in Dollars (\$)</b>	<b>New (N), Modification (M) Ongoing(O)</b>	<b>Mn/DOT Contact</b>
<b>STATE RESEARCH &amp; DEVELOPMENT</b>				
*MPR-6(002)	Research Peer Exchange	\$50,000	N	Kahle
**MPR-6(003)	Strategic Program Development	\$160,000	N	Johnson
**MPR-6(004)	Implementation and Closeout of Completed Research Projects	\$160,000	N	Moe
**MPR-6(005)	Research Management System	\$160,000	N	Johnson
**MPR-6(006)	SPR Program Administration Research and Contracts Accounts	\$295,200	N	Kahle Johnson
**MPR-6(007)	Hear Every Voice (HEV)	\$112,000	N	Palsch
**MPR-6(009)	TH36 - Full Closure Construction: Evaluation of Traffic Alternatives and Lessons Learned	\$120,000	N	Rindels
*MPR-6(010)	Census Transportation Planning Package (CTPP)	\$102,546	N	Kreideweis
0003(017)	Midwest State Crash Test (additional dollars added for annual meeting costs)	\$56,700	O	Elle
0003(020)	Enterprise	\$25,000	O	Arnebeck
0003(042)	Aurora	\$25,000	O	Curt Pape
0003(049)	Urban Mobility Study	\$25,000	M	Henkel
0003(074)	Pavement Research & Technology	\$15,000	O	Olson
TPF-5(004)	Long Term Pavement Performance (LTPP) Specific Pavements Study (SPS) Traffic Data Collection	\$105,000	O	Kreideweis
TPF-5(029)	High Occupancy Vehicle	\$100,000	O	Thompson
TPF-5(039)	Falling Weight Deflectometer (FWD)	\$25,000	O	Bullock

State Study No. *(Asterisk denotes lead state project) **(Double asterisk denotes 80/20 MN state project)	Study Title	Commitment in Dollars (\$)	New (N), Modification (M) Ongoing(O)	Mn/DOT Contact
TPF-5(066)	Material & Construction Optimization	\$15,000	O	Schwartz
*TPF-5(080)	Investigation of Low Temperature Cracking in Asphalt Pavements	\$147,713	O	Worel
TPF-5(090)	Pavement Tools Consortium	\$20,000	O	Olson
TPF-5(092)	Test & Evaluation of Materials, Equipment & Methods for Winter Maintenance	\$25,000	O	Taylor
*TPF-5(093)	North/West Passage (phase II)	\$50,000	O	Nelson
TPF-5(099)	Evaluation Of Low Cost Safety Improvements	\$65,000	O	Hill
TPF-5(114)	Roadside Safety Research Program	\$50,000	O	Dehdasht
TPF-5(116)	Investigation of the Fatigue Life of Steel Base Plate to Pole Connections for Traffic Structures	\$12,000	O	Merritt
TPF-5(128)	Accelerated Implementation of Intelligent Compaction Technology for Embankment Subgrade Soils, Aggregate Base and Asphalt Pavement Material	\$25,000	O	Ravn
*TPF-5(129)	Recycled Unbound Pavement Materials (MnROAD Study)	\$60,000	O	Johnson
*TPF-5(134)	PCC Surface Characteristics – Rehabilitation (Mn/ROAD Study)	\$60,000	O	Izevbekhai
TPF-5(139)	PCC Surface Characteristics: Tire-Pavement Noise Program Part 3	\$20,000	O	Izevbekhai
TPF-5(144)	Use of Video feedback in Urban Teen Drivers	\$40,000	O	Starr
<b>TOTAL – STATE RESEARCH &amp; DEVELOPMENT – (NEW STUDIES &amp; MODIFICATIONS)</b>		<b>\$1,184,746</b>		

	AMOUNT	TOTAL
SPR-0001(047) Research Projects, Technology Transfer, Implementation, Special Projects & Administration (FFY 2007) available but not obligated	\$2,592,322.00	\$2,592,322.00
SPR-0001(046) Research Projects, Technology Transfer, Implementation, Special Projects & Administration (FFY 2006) available but not obligated	\$2,411,320.00	\$5,003,642.00
Previous Years – (FFY 2005) – 0001(045) Obligated (H56)	\$1,984,635.00	\$6,988,277.00
Previous Years – (FFY 2004) – 0001(044) Obligated (H56)	\$1,529,074.15	\$8,517,351.15
Previous Years – (FFY 2002) – 0001(042) Obligated (Q56)	\$767,869.59	9,285,220.74
Previous Years – (FFY 2001) – 0001(041) Obligated (Q56)	\$133,328.23	\$9,418,548.97
<b>RESEARCH TOTAL</b>		<b>\$9,418,548.97</b>
Less 2007 Research & Development (New & Modifications)	\$1,184,746.00	\$8,233,802.97

**KEY**

New	N	OIM/RSS does the paperwork and forwards to FHWA
Modification	M	federal aid section of Finance does the paperwork on modifications and forwards to OIM
Ongoing Projects	O	“Commitment” column is shaded and shows last obligation amount. These amounts don’t carry forward to the coop research total
Lead State Project	*	Mn/DOT has responsibility for administration of the project
MN 80/20 projects	**	Mn/DOT has responsibility for administration of the project

**PART III**  
**FINANCIAL SUMMARY**  
**STATE PLANNING AND RESEARCH PROGRAM**  
**Calendar Year 2007**

**TOTAL ESTIMATED PARTICIPATION**

	<b>Federal Participation</b>	<b>Fed. Project Number</b>	<b>Appropriation code</b>
<b>Statewide Planning</b>	\$7,776,966	SPR-0001(047)	L55
<b>MPO Planning</b>	\$3,768,481	--	L45
<b>Research</b>	\$2,592,322	SPR-0001(047)	L56
<b>Total</b>	\$14,137,769	NA	NA

Notes:

- State funds added \$1,904,838 for a State-wide planning total of \$9,681,804.
- MPO Planning funds are supplemented by FTA funds, State funds and Local funds.
- Research program is supplemented by State funds.

**APPENDIX A**

**OFFICE OF**

**INVESTMENT**

**MANAGEMENT**

**TASK TITLES:** State Transportation Improvement Program (STIP)

**ESTIMATED COST:** \$117,250.00

**WORK AUTHORITY NUMBER:** TH 101

**WORK PERFORMED BY:** Program Development Section

**OBJECTIVES:**

- Provide guidance in the planning and development of the federally required, fiscally constrained, three year STIP document that includes all anticipated expenditures for all modes of transportation under the authority of Mn/DOT. Publish and distribute the final Web Page availability. Provide analysis as requested. Process STIP amendments and publish web site.

**ACTIVITIES:**

- Prepare State Transportation Improvement Program & Amendments
- Prepare State Transportation Improvement Program Guidance
- State Transportation Improvement Program Analysis

**METHODOLOGY:**

- STIP Guidance and Development: Guidance for the development of the State Transportation Improvement Program (STIP) is provided through continuous communication with the District/ATPs and other partners. A Guidance document provides transportation goals objectives and direction for use in making statewide transportation investment.
- The Area Transportation Partnerships (ATPs) submit prioritized lists of candidate projects based upon the integration of transportation priorities from modal interest, RDC's and MPO's and Mn/DOT consistency. A draft STIP is developed and reviewed by the District/ATP and with their comments considered. A final STIP is prepared.

**PRODUCTS:**

- STIP Guidance and STIP: Guidance is updated periodically and sent to the districts. The three-year State Transportation Improvement Program is produced annually.

**TASK TITLES:** Statewide Transportation Plan and Statewide Planning Service

**ESTIMATED 2007 COST:** \$853,235.

**WORK AUTHORITY NUMBER:** TH 102

**WORK PERFORMED BY:** Statewide Planning & Analysis Section

**OBJECTIVES:**

- Assist the Metropolitan Planning Organization (MPO's) in developing and maintaining a transportation planning process that fulfills the requirements of the appropriate federal regulations.
- Develop, update, and implement a statewide multi-modal transportation plan including. Provide statewide guidance and planning services to districts and other partners/customers. This effort includes planning studies statewide in scope, public participation, coordination, consultation and other required or necessary activities. Monitoring of system performance (infrastructure and operations) is also included.

**ACTIVITIES:**

- MPO Planning Office and in Field
- Statewide Transportation Plan
- Statewide Transportation Planning Services
- RDC Area Planning
- Periodic performance reporting to Mn/DOT management and stakeholders.

**METHODOLOGY:**

- Coordinate with Mn/DOT district planning staff in the development, review and /or approval of MPO planning documents to ensure the MPOs maintain certifiable transportation planning. Facilitate MPO planning committees to ensure awareness and use of state-of-the-art planning procedures; facilitate training and technical assistance that responds to mutual transportation concerns.
- Prepare, update, implement, and monitor statewide transportation plan that provides a frame work for district and modal plans and that guides Mn/DOT investments. Assist districts in developing district long-range transportation plans. Coordinate, review and respond to national and state initiatives, policies, and proposed regulations which impact on transportation. Administration and

coordination of Mn/DOT transportation planning committees, coordination and consultation with units of local government and other stakeholders. Work program direction and oversight for related consultant services.

- Maintain the capability to periodically assess system infrastructure and operations.
- Functional Class & National Highway System: Create, maintain and provide maps and records in an up-to-date status/revision as necessitated for the Functional Classification system and the National Highway system.

**PRODUCTS:**

- Annual MPO Planning Work Programs and Funding Distribution Agreements.
- Annual MPO Transportation Improvement Program (TIP) and Certification.
- Development of the Statewide Transportation Plan revisions and updates, including long-range district and modal plans and highway operations plan.
- Development of guidelines and performance measures to support statewide transportation policies.



**TASK TITLES:** Federal & State Transportation Programs

**ESTIMATED COST:** \$938,000

**WORK AUTHORITY NUMBER:** TH 103

**WORK PERFORMED BY:** Programming and Project Authorization Unit and Program Analysis unit.

**OBJECTIVES:**

- Provide administration of the Federal Aid Highway Program to maximize federal funds and utilize those funds efficiently. Provide budgetary control and fiscal management of the State Road Construction Programs in accordance with legislative constraints and Mn/DOT policy.
- Maintain computerized Mn/DOT program delivery schedules and to further develop the financial tracking of projects in PPMS.

**ACTIVITIES:**

- Transportation Program Administration
- Federal Aid Coordination
- Emergency Relief Program
- State Planning and Research Program
- Federal Aid System Interface
- Transportation Revolving Loan Fund Program
- Program & Project Management System (PPMS)

**METHODOLOGY:**

- Conduct the Federal Aid Programming process, the FHWA project status and the submittal of projects to FHWA for authorization. Coordinate compliance with all federal aid requirements, engineering and fiscal constraint by other division of Mn/DOT offices. Provide directions to the flow of federal funds between Mn/DOT and FHWA for their most efficient innovative use. Ensure the program content is compatible with program funding distribution. Maintain program budget status by listing expenditures, anticipated expenditures and balances. Make the necessary adjustments that conform to legislative budget limits.

- Special federal aid programs: Program all viable projects in compliance with the published FHWA guidelines. These include:
  - Forest Highways
  - Public Lands Highways
  - Emergency Relief
  - State Planning and Research
  - High Priority Projects (HPP)
  - Surface Transportation Projects (STP)
  - Other Annual Earmarks
- Using the project management system to update data such as letting dates, project funding estimates, amounts of contract awards, type of funding, funding agreements, post award changes and program status.

**PRODUCTS:**

- Efficiently use federal and other transportation funds in Federal Program.
- Use a current on-line state program as a tool in managing State Aid, Transit and Mn/DOT Construction program as a statewide program management and project scheduling system.

**TASK TITLES:** Transportation and Economic Analysis

**ESTIMATED 2007 COST:** \$369,358.

**WORK AUTHORITY NUMBER:** TH 104

**WORK PERFORMED BY:** Economic Analysis & Special Studies Section

**OBJECTIVES:**

- Determine the most cost effective investments for transportation system improvements. Develop investment criteria to evaluate economic feasibility and priority for proposed projects. Analyze economic, demographic transportation and the related trends for their impact on transportation demand. Analyze transportation financing trends and transportation issues like Interregional Corridors. Conduct economic analysis for specific transportation investments especially on benefit/cost analysis, financial analysis and business development impact analysis.

**ACTIVITIES:**

- Transportation & Economic Analysis (Non-project specific)
- Transportation & Economic Analysis (Project specific)

**METHODOLOGY:**

- Investigate the relationship between transportation along with highways and the economies of the state and nation on topics such as:
- Effects of major demographic business and economic trend on transportation system demands and revenues.
- Economic efficiency or financial returns of major transportation system segments and corridors.
- Extend of benefit accrued to local, regional, statewide and/or nation economies from transportation projects.
- Economic impact of alternative solutions to urban transportation problems.
- Focus on economic activities and transportation relationship among Twin Cities, regions and inter-regions of other states.
- Distributional effects of transportation investments.
- Develop criteria for evaluating the economic impact and feasibility of transportation projects through activities such as:

- Conduct benefit/cost analysis of proposed transportation projects.
- Calculate the economic rate of return to transportation investments.
- Evaluate benefit-cost on transportation investments across identified groups in society.
- Develop standard techniques and practices to implement investment analysis.
- Incorporate accepted criteria on investment analysis to prioritize and project selection process.
- Provide personnel involved in transportation process technical training and implement investment analysis.
- Communicate outcome of investigations by means of reports, presentations or others technique to appropriate audience the status of projects identified.

**PRODUCTS:**

- Components in scoping, environment and other documents for pending projects. (ongoing)
- Training on use of investment analysis tools in transportation investment. (ongoing)
- Reports in different formats, for examples memos, working papers and research reports, on issues investigated and appropriate status noted above and intended audiences. (ongoing)
- Investment guidelines or criteria. (ongoing)
- Economic analysis training materials such as methodologies and standard values. (ongoing)

**TASK TITLES:** Land Use Access Management

**ESTIMATED 2007 COST:** \$177,190.

**WORK AUTHORITY NUMBER:** TH 105

**WORK PERFORMED BY:** Statewide Planning & Analysis Section

**OBJECTIVES:**

Provide policy guidance and technical assistance to Mn/DOT Districts/Metro Division and local government partners on approaches to manage access on all types of roads throughout the state. Produce and maintain the Access Management Manual that defines a Roadway Access Category System. Recommend access spacing. Outline methodologies for application of the System to corridor planning, project development and local land use transportation planning. Establish a uniform access permitting procedure. Provide training to planners and engineers on the Manual content at Mn/DOT Districts, Divisions, offices and local government. Provide technical assistance to Mn/DOT and local partners in planning efforts to coordinate long range land use and transportation plan with a special emphasis on IRC Corridor related issues.

**ACTIVITIES:**

- Develop and administer land use and access management policies
- Design and implement research and demonstration projects
- Access management/land use technical assistance

**METHODOLOGY:**

- Research, develop and implement a comprehensive set of strategies that integrate engineering, land use planning and legal approaches to improve land use and access management practice throughout Minnesota.
- Promote stronger intergovernmental partnerships by providing common access guidelines for use by all partners. Education training and technical assistance in access management and land use integration.
- Promote the safety and mobility of the traveling public.
- Protect and extend the useful life of the public's investment in the State's highway system.
- Support the economical vitality, character and livability of the local community.

- Achieve stronger integration of local government land use decision with state transportation goals and policies including Smart Growth, Interregional Corridors and Multi-modalism.
- Obtain traffic data needs from Office of Transportation Data & Analysis.

**PRODUCTS:**

- Permitting Procedures
- District Training and Technical Assistance
- Local Government Workshops and Technical Assistance
- Model Access Management and Overlay Ordinance.

**TASK TITLES:** Research and Financial Mgmt

**ESTIMATED COST:** \$1,031,850

**WORK AUTHORITY NUMBER:** TH 901

**WORK PERFORMED BY:** Research Services Section

**OBJECTIVES:**

- Supports measurable improvements in Minnesota's transportation system by meeting the knowledge needs and finding solutions for transportation practitioners and the transportation community.
- Obtain research results that are of practical value in the most cost effective manner possible. Research must be theoretically rigorous and accurate, but ultimately has the potential to improve the way Mn/DOT does business by providing cost effective solutions to transportation problems.
- Convey research results through effective technology transfer and outreach.

**ACTIVITIES:**

- Develop research management processes
- Understanding Mn/DOT issues – providing strategic research vision
- Manage and leverage various research funds and resources
- Develop, solicit and select research proposals
- Develop and administer research contracts
- Plan and ensure that Implementation occurs
- Evaluate the impact of Mn/DOT's research investments
- Perform Technology Transfer and outreach of research results

**METHODOLOGY:**

- Educate clients about the value of knowledge and research and inspire them to learn through customer focus groups and develop various methods to show customers the value of knowledge and research.
- Continuously evaluate client needs, expectations and awareness of our services by measuring the frequency of customer contacts and the development and sharing of research specific performance measures.

**METHODOLOGY (CONTD.):**

- Encourage partners to share new knowledge techniques and technologies they acquire by enhancing current partnerships, and identifying and capitalizing on opportunities for new partnerships.

**PRODUCTS:**

- Annual research report
- Research newsletter
- Published research reports
- Research exhibits at conferences and events
- Research Coordinator meeting
- Project Orientation meetings
- Research web site
- Trading Cards
- Technical Research Summaries
- Implementation plans, close out memos and performance measures
- Research Road Map



**TASK TITLES:** Library and Information Mgmt

**ESTIMATED COST:** \$206,030

**WORK AUTHORITY NUMBER:** TH 901

**WORK PERFORMED BY:** Research Services Section – Library Unit

**OBJECTIVES:**

- Provide information for its customers faster, better, and/or cheaper than they can do so for themselves.
- Meet the transportation-related information needs of the employees of the Minnesota Department of Transportation, other transportation practitioners throughout the state, especially city and county engineers, consultants under contract to Mn/DOT, other librarians, both locally and globally, and the general public.

**ACTIVITIES:**

- Develop and maintain web sites providing access to online<sup>4</sup> databases, full text information resources and organized links to most frequently needed transportation information
- Reference – provide assistance & searches for literature
- Develop and contribute catalog data for Mn/DOT information resources to TL cat.
- Share Information Resources with Other Libraries
- Loan Information Resources to Library Customers

**METHODOLOGY:**

- Develop and participate in library networks, local to international in scope
- Educate clients about the available resources and encourage them to take advantage of those resources to meet their own knowledge needs by delivering information to customers, simplify and improve customer access to information, and utilizing improving technology to support Mn/DOT's processes and needs.
- Inform clients how we can help with the research and knowledge needs through promotion of the library resources and services and library tours.

**PRODUCTS:**

- Document delivery
- Periodical Routing
- Internet and Intranet Development
- Circulation Services
- Collection Development
- Reference Assistance
- Recent Acquisitions List
- Alerting Services

**OFFICE OF  
TRANSPORTATION  
DATA & ANALYSIS**

**TASK TITLES:** Transportation Information System (TIS) & GIS BaseMap Data Maintenance

**ESTIMATED COST:** \$166,129

**WORK AUTHORITY NO:** TH 202

**WORK PERFORMED BY:** Geographic Mapping & Information Section

**OBJECTIVE:**

- To maintain TIS and GIS BaseMap data within Mn/DOT's Location Data Manager (LDM) software environment by providing data collection, data updating and data enhancements.
- To provide analyses of TIS and GIS BaseMap data by providing data quality controls and assurances.
- To provide liaison and user support for both internal and external users/contributors of the LDM's Transportation Data System (TIS) and GIS BaseMap data components.

**METHODOLOGY:**

The Office of Transportation Data and Analysis is the steward for Mn/DOT's Location Data Manager (LDM) - a major Information Resource System comprised of a number of databases and systems used for transportation planning and analysis. This system incorporates graphical representations (GIS BaseMap) and associated data (TIS) about roads, railways, navigable waters, and airports. This data includes physical characteristics (both vertical and horizontal), geometric features, various attributes such as bridges, railroad crossings, traffic volumes and classification, crashes, and designation information such as route system and number, federal classification, street names etc.

This task consists of data collection, data analysis, data maintenance, LDM training and user support. Data is collected from a variety of sources such as construction plans, roadway status reports, imagery, and requests to various governmental offices and agencies for resolutions, mapping etc., and various other sources as listed under item number TH 606, County Maps. This information is used to update current information and create new records and is made part of the LDM through several methods such as manual data entry, file transfers, etc.

The information contained in the LDM's core of TIS and BaseMap data is used by transportation decision makers, planners and analysts and is provided in multiple forms such as text reports, graphs, and attribute maps for transportation planning, asset management, investment tradeoff analysis and project development. It allows for the use of "windowing in" on a statewide map down to regional, district, county, city or even corridor specific maps. Users are able to display and analyze data from many sources and in any of the several location reference systems. These additional capabilities and resulting flexibility produce a better picture of transportation networks

and interrelationships within the State of Minnesota. The LDM is under continuous development and it will be enhanced and maintained by Mn/DOT.

**PRODUCTS:**

- Current and accurate GIS BaseMap and corresponding TIS file updates using data collection and maintenance methods which meet the needs of the end users.
- Current data on the physical characteristics of roads, trunk highway construction histories, mileage, traffic and crashes to be used for various studies and for reporting to the FHWA's Highway Performance Monitoring System (HPMS) and HSIS.
- TIS data is used to support reporting requirements for other departmental needs and activities such as bridge management, pavement management, and bikeway management.
- Local road attributes maps for use by DPS and law enforcement agencies and Road Life records, Construction Project Logs, and Control Section Listings to be used as references by districts and other offices and agencies.
- From 1996 through 2000, the State of Minnesota BaseMap was produced annually and distributed via CD-ROM. Beginning in 2001, the BaseMap was made available via the Internet on Mn/DOT's Web site at: <http://www.dot.state.mn.us/tda/basemap/index.html>.
- Maps, reports, user manuals, memos and articles relating to GIS BaseMap and TIS data input into the LDM.
- Mn/DOT's GIS BaseMap is also available on TDA's Web site at: <http://www.dot.state.mn.us/tda/basemap/index.html> .
- Mn/DOT's TIS roadway data is also available on TDA's Web site at: <http://www.dot.state.mn.us/tda/html/roadwaydata.html> .

**TASK TITLES:** Vehicle Classification / Truck Weight Studies

**ESTIMATED COST:** \$320,908

**WORK AUTHORITY NO:** TH 213

**WORK PERFORMED BY:** Traffic Forecasting and Analysis Section & Weight Data & Enforcement Policy Coordination Section

**OBJECTIVE:**

To determine the types and weights of vehicles using the States roadways and continually improve the methods used to accomplish this. Analyze and report on the data in the format needed by Mn/DOT traffic forecasters, FHWA, and various other public and private parties.

- Process vehicle classification data collected both manually and automatically throughout the state. About 100 locations are counted on a two year cycle with approximately 900 other site counted on a six year cycle.
- Process the truck weight data collected by Weight-In-Motion scales at permanent locations.
- Evaluate and update traffic data collection and analysis methods through the use of statistics, new technology and computer software while making available additional traffic data in the Transportation Information System (TIS).
- Provide expertise and coordination in the development and dissemination of weight enforcement policies and regulations.
- Install permanent vehicle classifiers to collect, edit and report on the data. Since 2003, twenty-five such classifiers have been installed and are reporting data.

**METHODOLOGY**

Through the use of PC based programs, the raw data is processed to represent average day of the year values. Review of current methods and the use of innovative techniques will facilitate meeting users' needs.

- Develop plans and enforcement policy proposals and make recommendations; attend various meetings and hearings and provide technical advice. Carry out strategy changes and equipment purchases to improve weight enforcement productivity.

**PRODUCTS:**

- Annual Vehicle Classification and Truck Weight reports.
- Truck volumes produced biennially on the state traffic flow map.
- Heavy Commercial volumes input into TIS.
- Analysis of data and special studies.
- Weight enforcement policies
- Improved interagency coordination and communication processes.
- Improved weight data expert system development.

**TASK TITLES:** Traffic Counting

**ESTIMATED COST:** \$304,079

**WORK AUTHORITY NO:** TH 214

**WORK PERFORMED BY:** Traffic Forecasting and Analysis Section

**OBJECTIVE:**

- To conduct and continually improve our traffic counting program which provides data for determining annual average daily traffic (AADT), vehicle miles of travel (VMT) and growth trends for Mn/DOT traffic forecasters, FHWA, and various other public and private agencies.

**METHODOLOGY:**

- Determine short duration and continuous (Automatic Traffic Recorder – ATR) traffic data requirements and sampling plan for the State's traffic Monitoring Program.
- Coordinate and oversee the collection of traffic data from central office, District and local government agencies, and maintain the data processing infrastructure to process and manage traffic data.
- Develop and apply proper axle correction and seasonal/day-of-week adjustment factors to trunk highway (TH) and local road short duration counts and develop official AADT for all segments according to the count cycle schedule (either 2 or 4 years).
- Help to ensure that all traffic monitoring equipment is tested and repaired when necessary.
- Continuously improve methods for screening, interfacing and reporting raw and final traffic estimates using statistics, new technology, and computer software.

**PRODUCTS:**

- Statewide, seven county metropolitan area and 52-sheet series, county and city maps depicting TH, County Road and Municipal State Aid street AADT's on paper and CD and via the office web page.
- An ATR summary report containing annual AADT and monthly comparisons, rank order hourly volume data, and maps illustrating ATR locations.
- Count location maps and supporting materials for fieldwork activities.
- Analysis of data to determine adjustment factors, trends and VMT estimates in addition to other special studies and technical assistance.



**TASK TITLES:** Traffic Forecasting and Highway Design

**ESTIMATED COST:** \$234,426

**WORK AUTHORITY NO:** TH 216

**WORK PERFORMED BY:** Traffic Forecasting and Analysis Section

**OBJECTIVE:**

- To provide training, traffic monitoring data, auditing and reports for traffic forecasting to the districts and Metro Division.
- Maintain database of traffic forecasts.
- Provide Metro Division and Districts with technical support in traffic forecasting, especially in the use of Travel Demand Modeling.
- Monitor and report short-term traffic trends.
- Assist Metropolitan Planning Organizations and communities with traffic forecasting training and technical studies.

**METHODOLOGY:**

- Through the use of various computer traffic models, forecasting techniques and analysis of traffic data, provide Metro Division and the districts with instructions on calculating projections of future truck and auto volumes.

**PRODUCTS:**

- Systems Planning and Analysis reports.
- Individual highway traffic volume and load estimates.
- Estimates of truck volumes and movements.
- Special studies and reports.
- Statewide trunk highway traffic and heavy commercial volume projections for long-range planning efforts.

**TASK TITLES:** Transportation Information System (TIS) Development & Maintenance

**ESTIMATED COST:** \$56,106

**WORK AUTHORITY NO:** TH 224

**WORK PERFORMED BY:** Data Systems & Coordination Section

**OBJECTIVE:**

- To design, build, test, deploy, and maintain new applications and technology in order that TIS maintenance and data retrieval efforts are constantly improved.
- To design, build, and test database enhancements (including changes to existing tables, creation of new tables, and maintenance of stored procedures and scripts) to improve performance or enhance data retrieval.
- To provide technical support for the applications and databases required by the TIS users to ensure that the applications and databases remain in an operational state and are accessible to users.
- To work with partners to develop new tools and methods for exchanging and sharing data, including use of the office web site.
- To provide up-to-date and accessible reports, data, and maps via an efficient, effective office web page.

**METHODOLOGY:**

The Office of Transportation Data and Analysis is responsible for the department's Transportation Information System (TIS) and the spatial data in Mn/DOT's Location Data Management (LDM). These systems incorporate data about roads (trunk highways and all other roads), railways, and bridges. These data include spatial roadway network features, physical characteristics (both vertical and horizontal), geometric features, various attributes such as crashes traffic volumes and classification, accidents, and designation information such as route system and number, federal classification, street names, etc.

The information contained in the TIS is used by transportation decision makers, planners and analysts and is provided in multiple forms such as text reports, graphs, and attribute maps for transportation planning, investment tradeoff analysis and project development.

This task consists of developing and maintaining TIS reporting applications and databases, enhancing connectivity between the TIS system and other data systems. It includes developing extraction tools and scripts to easily share data with other users, as

well as the creation of tools to receive data updates from external partners such as the Department of Public Safety.

Additional work under this task includes:

- Maintaining and enhancing the office web site which is receiving an average of 4,000 hits per day, and working with county, city, MPR and RDC partners to exchange data and move closer to the goal of entering data once and using it often.
- Ensuring that this system is available whenever it is needed and the data maintenance and report generating functions operate properly and efficiently support is provided for software and hardware maintenance and troubleshooting.
- Providing programming and system analysis services, hardware installations, system enhancements and modifications, and overall system support.

## **PRODUCTS:**

- Location Data Manager (LDM) application for updating and managing line work on the Mn/DOT GIS BaseMap and roadway attributes in the Transportation Information System (TIS).
- TIS Report applications and files able to be accessed by users with remote terminals.
- ArcGIS extensions for managing traffic data on TIS.
- Hardware configuration, system data files, computer programs, and systems documentation to meet the needs of various internal and external users.
- Office web page with links to TIS report, GIS BaseMap and traffic volume maps.
- User manuals, metadata dictionaries, memos and articles detailing TIS capabilities.
- Tools for providing crash data for the Office of Traffic, Security and Operations and the Department of Public Safety.
- Tools for providing pavement data for the Office of Materials and Road Research.
- Tools for providing bridge locations for the Bridge Office.
- Tools for providing data for Mn/DOT's Route Builder System.

**TASK TITLES:** Transportation Information System (TIS) Support

**ESTIMATED COST:** \$134,790

**WORK AUTHORITY NO:** TH 610

**WORK PERFORMED BY:** Data Systems & Coordination Section

**OBJECTIVE:**

- To manage and provide user support for TIS data management and reporting applications, including ongoing conversion and migration from historical computer legacy systems.
- To act as liaisons between various Mn/DOT offices using the Location Data Manager (LDM) and TIS data and to maintain relationships with both internal and external users of the LDM and TIS applications.
- Respond to requests for TIS data providing information, maps, and data to customers.

**METHODOLOGY:**

The Office of Transportation Data and Analysis is responsible for the department's Transportation Information System (TIS) and the spatial data in Mn/DOT's Location Data Management (LDM). These systems incorporate data about roads (trunk highways and all other roads), railways, and bridges. These data include spatial roadway network features, physical characteristics (both vertical and horizontal), geometric features, various attributes such as crashes traffic volumes and classification, accidents, and designation information such as route system and number, federal classification, street names, etc.

The information contained in the TIS is used by transportation decision makers, planners and analysts and is provided in multiple forms such as text reports, graphs, and attribute maps for transportation planning, investment tradeoff analysis and project development.

This task consists of operating TIS report applications, training users, and providing reports and maps as needed or requested. It includes using extraction tools and scripts provide data and maps to users and external partners such as the Department of Public Safety.

As part of this task systems personnel (analysts, programmers, data maintainers, users, etc.) are provided with training, manuals, and periodic articles and information to assure everyone is kept current of any relevant TIS changes or problems and their resolution.

**PRODUCTS:**

- Customer support for TIS Report applications and data extraction tools and methods.
- Prompt, efficient and accurate TIS file updates using up-to-date, state of the art data maintenance and collection methods, which meet the needs of the end users.
- Maps and reports regarding TIS data as requested by TDA customers
- In-house and on-site training in TIS reporting functionality, LDM data maintenance and operations, and other tools related to TIS data access.
- Data for Mn/DOT's HPMS submittal to FHWA.
- Data for Mn/DOT's HSIS submittal.

**TASK TITLES:** **Municipal Maps**

**ESTIMATED COST:** \$154,844

**WORK AUTHORITY NUMBER:** TH 601

**WORK PERFORMED BY:** Geographic Information and Mapping Section

**OBJECTIVES:**

- To prepare and maintain a complete set of planimetric street maps at suitable scales for all incorporated municipalities in Minnesota. These maps are used by the department for general-purpose planning and operational functions and for municipal corporate boundary reference. In addition, many federal, state and local agencies and the general public use these maps for business and recreational purposes.

**METHODOLOGY:**

- The original base maps of all incorporated municipalities are prepared in accordance with standards outlined in the *FHWA Guide for a Highway Planning Map Manual (Volume 20, Appendix 25)*. Municipalities are categorized as being over or under 5,000 population. The procedures followed in producing these maps are the same in both cases.
- Municipalities having a population of 5,000 or greater are represented individually on one or more 24" x 36" map sheet. Municipalities with less than 5,000 populations are grouped by county on one or more 24" x 36" sheets with as many municipalities on a sheet as space will allow.
- At present there are 139 incorporated municipalities having a population of 5,000 or more on 151 map sheets; and 716 incorporated municipalities of less than 5,000 population on 256 sheets. This makes a total of 855 municipalities represented on 407 24" x 36" map sheets.
- In the development and maintenance of municipal maps, all possible current information is collected and compiled from the same various map information sources as listed under county maps. (See TASK TITLES on County Maps.)
- With the implementation for Computer-Assisted Design and Drafting (CADD), we have converted all our map products to computer-generated maps. These digital map files store the locations of geographic features (those elements to be mapped) as digital x, y coordinates in a computer file.
- Update and revision are achieved by entering any revisions to be made in the appropriate digital file and obtaining a new plot.
- Graphic records for all of Minnesota's municipal corporate boundaries are maintained by the Geographic Information and Mapping Unit. For the past three years, an

average of over 350 boundary revisions per year have been processed. Due to age, many of these paper graphic files are in poor condition. We are in the process of converting those plats that are in the most serious condition and those that generate the most revision activity to a digital format.

- For those deteriorating graphic records that only need preservation, a technique called “scanning” is used to generate a digital raster file. For those graphic records that have constant or extensive revisions to be mapped, digital vector CADD files are created from the existing analog map and supplemented with additional information from appropriate Mn/DOT Right-of-Way maps, plat maps, legal land descriptions, local government GIS files and city engineer maps.
- Municipal State Aid Street (MSAS) maps are produced for all municipalities having a population of 5,000 or more. MSAS maps delineate state trunk highways, County State-Aid Highways (CSAH), County Road (CR) and MSAS routes on the appropriate municipal map. These various route systems are shown by computer generated line patterning on the corresponding route. Additionally, MSAS streets are labeled with the number assigned in the Commissioner’s Order that establishes the designation.

#### **PRODUCTS:**

- A complete set of planimetric street maps of all 855 incorporated municipalities in Minnesota.
- Municipal State Aid Street (MSAS) maps for all incorporated Minnesota municipalities having population of 5,000 or more.
- Graphic boundary record maps for all 854 incorporated municipalities in Minnesota.
- Mn/DOT municipal maps are also available on TDA’s Web site at:  
[http://www.dot.state.mn.us/tda/html/Cities\\_alpha.html](http://www.dot.state.mn.us/tda/html/Cities_alpha.html) .

**TASK TITLES:** St. Paul–Minneapolis Metropolitan Area Maps

**ESTIMATED COST:** \$29,353

**WORK AUTHORITY NUMBER:** TH 604

**WORK PERFORMED BY:** Geographic Information and Mapping Section

**OBJECTIVES:**

- To prepare and maintain maps of the St. Paul–Minneapolis Metropolitan Area showing existing streets and roads, route system designations, railroads, political boundaries and other miscellaneous features. These maps provide the department and various other governmental agencies with basic mapping for general-purpose planning and operation functions.

**METHODOLOGY:**

- The Geographic Information and Mapping Unit maintains a digital base map for the entire Seven County Metropolitan Area. This set of 55 map sheets is referred to as the Metro Area Street Series. While prepared, maintained and usually plotted as 55 individual digital map files these sheets are structured to be seamless and can be mosaiced into any desired metro area coverage.
- These maps show all roads and streets in single line format. Route systems such as state trunk highways or county roads are portrayed by different weights as well as their respective route designation symbol and number. These maps also show all political boundaries, hydrography and railroads as well as selected references to the Public Land Survey System (section, township and range) and geodetic location (lat/long and state plan coordinates).
- The Computer-Assisted Design and Drafting (CADD) method was used to produce the Metro Street Series. Using high-resolution computer graphic workstation and Bentley MicroStation® software, a mapping technician “digitizes” all the various graphic elements contained within the computer map file. (See Task Title on Municipal Maps for explanation of digitizing.)
- USGS 1:24000 scale 7½ minutes quadrangle (quad) maps are used as the source for positioning control and the initial line-work to be digitized. Using the same digitizing techniques this “skeletal” line-work is then supplemented with other more up-to-date map information sources such as aerial photographs, road plans, satellite imagery, GIS files and other maps.
- Individual Metro Area Street Series map street coverage is formed by merging and “clipping” appropriate Mn/DOT “skeletal” quad files within the computer. The symbolical and text annotation needed to complete the map are also entered into the digital file. The finished map file is used to produce computer file plots. From this same digitizing, the Geographic Information and Mapping Unit has formatted a single map sheet file entitled the St. Paul–Minneapolis Area map. Features depicted on this



map include all state trunk highways and county state-aid highways, selected county roads and other local arterial roads, hydrography and political/civil boundaries. The graphic format and level assignment of this file resembles that of the county mapping activity. (See Task Title for County Maps.)

- Additionally this same Metro Area Street Series digitizing serves as the base for formatting individual municipal maps for those cities within the seven county metropolitan areas.

**PRODUCTS:**

- A 55-map sheet set (Metro Area Street Series) covering the entire Seven County St. Paul–Minneapolis Area at a scale of 1:24000 (one inch equal 2000 feet).
- A single sheet St. Paul–Minneapolis Metropolitan Area Map.
- The Metro Area Street Series is also available on TDA's Web site at: [http://www.dot.state.mn.us/tda/maps/GIM/index\\_maps/metross.pdf](http://www.dot.state.mn.us/tda/maps/GIM/index_maps/metross.pdf).
- The St. Paul-Minneapolis Metropolitan Area Map is also available on TDA's Web site at: <http://www.dot.state.mn.us/tda/maps/GIM/metroarea.pdf>.

**TASK TITLES:** County Maps

**ESTIMATED COST:** \$72,551

**WORK AUTHORITY NUMBER:** TH 606

**WORK PERFORMED BY:** Geographic Information and Mapping Section

**OBJECTIVES:**

- To maintain a complete set of current, accurate, legible county maps at a scale of one inch equals to one mile. Prints and/or duplicate reproducibles of these maps are used in the planning, location and design of projects by the Minnesota Department of Transportation. Additionally these maps are used as base maps by most state agencies, local and county government units, many federal agencies, private sector business application, such as transit and transportation industry, utilities, manufacturing etc., and by the general public for business or recreational purposes.

**METHODOLOGY:**

- The original, full-scale county maps are prepared and maintained in accordance with standards outlines in the FHWA Guide for the Highway Planning Map Manual (Volume 20, Appendix 25).
- Currently 126 map sheets are required to map Minnesota's 87 counties. These are produced on a uniform sheet size of 36" x 56" requiring from one to seven sheets for a single county.
- In the development of a new county map base, all possible current information is obtained from the following reliable sources:
  1. County Maps
  2. U.S Geographical Survey 1:24000 Quadrangle Maps
  3. Mn/DOT Project Construction Plans
  4. Aerial photography obtained from Mn/DOT Photogrammetric Unit, U.S, NAPP, Department of Natural Resources and Metropolitan Council
  5. Road Status Reports from County and Municipal Council
  6. Municipal and County Project Construction Plans
  7. Mn/DOT Intermodal Programs Division, Transportation Data Section Road Note Data
  8. Railroad and Public Utilities
  9. Minnesota Department of Natural Resources
  10. Various United States agencies such as Bureau of Land Management, Bureau of India Affairs, U.S. Forest Service, Federal Aviation Administration and Federal Highway Administration

## 11. Decisions from the U.S. Board of Geographic Names

## 12. Others

- After all data is collected the information is plotted using colors to denote various items. Colors are used to facilitate the later map preparation. Maps are prepared at a scale of one-inch equals to one mile, with the exception of six of the seven metropolitan area counties that are mapped at a scale of two inches equals to one mile using a polyconic projection. These are classified as full-scale maps.
- County map sheets are prepared utilizing Computer-Assisted Design And Drafting (CADD). The procedures for this process are described in the section on "Municipal Maps". This method is labor intensive in the initial stages but saves considerable time when making annual updates. The positional accuracy of the map product and the ability to seamlessly combine adjoining counties to create area maps are important benefits of this method. After completion and checking, copies are submitted to FHWA for approval.
- Minor revisions are received almost daily. These revisions are filed for reference and every county map is updated at least once each year to reflect these changes.

**PRODUCTS:**

- A complete set of digital county general highway maps covering the entire state.
- Mn/DOT county general highway maps are also available on TDA's Web site at: <http://www.dot.state.mn.us/tda/html/counties.html> .

**TASK TITLES:** State Maps

**ESTIMATED COST:** \$49,591

**WORK AUTHORITY NUMBER:** TH 608

**WORK PERFORMED BY:** Geographic Information and Mapping Section

**OBJECTIVES:**

- To prepare and maintain current, accurate and legible Minnesota maps depicting Minnesota's transportation systems statewide. These state maps are used by Mn/DOT for administrative and planning activities as well as by other federal, state and local government agencies in relating their concerns to Minnesota's transportation systems. Public utilities, private industry and businesses, and the general public also make use of these maps for their individual needs.

**METHODOLOGY:**

- State map originals are prepared and maintained in accordance with the standards outlines in the FHWA "Guide for a Highway Map Manual", Volume 20, Appendix 25.
- When Mn/DOT (formerly Minnesota Highway Department) began producing its own Official Highway Map in 1965, the base map showed the state and county lines and the state trunk highway system, and served as the base for all other departmental statewide mappings. (See State Map Products.) In 1992 work was completed on digitizing a new base map for the Official Minnesota Highway Map utilizing the capabilities of Computer-Assisted Design and Drafting (CADD).
- The new Official Highway map base was created in much the same manner as described in the section on "Municipal Maps". Digitizing was done using the U.S.G.S 1:100,000 quadrangle map series for Minnesota as the basis. Prior to digitizing all pertinent map data was supplemented and updated with current information from all available sources. With the completion of this project considerable flexibility is available in generating the necessary overlays for printing and the current map.
- Revision of the digitized base map and overlays to show current status is achieved by researching maps and data produced by other governmental mapping agencies and various other sources as listed under item number TH 606, County Maps. The Official Highway Map is updated every two years while the other map derivatives are updated as needed in accordance with the current map production schedules.

**PRODUCTS:**

- The Official Highway Map is produced biennially under this project. All of the cartography, photography text and artwork for this publication are produced in-house. Offset four-color printing is accomplished by low bid from a commercial printer. Mn/DOT funds are used for purchasing the number of maps needed by Mn/DOT distribution outlets at a unit price that covers the cost of printing. Other state agencies may also purchase quantities of maps at per unit printing cost by coordinating their purchase request with Mn/DOT through the Department of Administration.
- The state trunk highway system map and the state county outline map were prepared by digitizing U.S. Geological Survey 1:100,000 scale maps. Appropriate map features from these 69 individual source maps were merged into one digital file of statewide coverage for computer plotting at any desired scale
- Other miscellaneous state maps that portray transportation related data statewide are either derivatives of or overlays to the state trunk highway system map. These types of maps are plotted and/or printed on as needed basis.
- The Official Highway Map is also available on Mn/DOT's Web site at: <http://www.dot.state.mn.us/statemap/> .

**TASK TITLES:** Roadway History & Project Log

**ESTIMATED COST:** \$134,844

**WORK AUTHORITY NUMBER:** TH 609

**WORK PERFORMED BY:** Geographic Information and Mapping Section

**OBJECTIVES:**

- Roadway History provides an historical representation of the vertical roadway structural layers on state trunk highway system. Project Log provides an index of construction and maintenance projects within a trunk highway control section. The data contained in these files are used by the Office of Materials in calculating pavement deterioration rates as part of Mn/DOT's Pavement Management System and district materials engineers to review roadway profiles as part of the project design and pavement selection process.

**METHODOLOGY:**

- The Office of Transportation Data and Analysis is responsible for the maintenance and update of both the Roadway History and Project Log data files. The updating tasks include the collection, research and interpretation of various source documents – construction plans being the primary source. Appropriate update information is incorporated into the Transportation Information System (TIS) so that TIS contains accurate and up-to-date data.

**PRODUCTS:**

- Roadway History data is available through several TIS reports including cross-section lists and project contract lists. The data from these lists is incorporated into the Office of Materials' annual Pavement Management System reporting.
- Project Log provides a line diagram file containing one line per project which includes state project number, year work performed, type of work and a diagrammatic location map. Project Log data is also available on TDA's Web site at:  
<http://www.dot.state.mn.us/tda/reports/projectlog.html>.

**TASK TITLES:** Transportation Data and Analysis IT Development (TDA-ITD)

**ESTIMATED COST:** \$514,194

**WORK AUTHORITY NO:** TH47 xxx? (NEW)

**WORK PERFORMED BY:** Geographic Information and Mapping Section

**OBJECTIVE:**

- To enhance or modify tools, functions, or infrastructure that is part of the current TIS system as part of a specific IT project

**METHODOLOGY:**

The Office of Transportation Data and Analysis (TDA) is the steward of Mn/DOT's Transportation Information System (TIS). The TIS is an enterprise-wide database that maintains information on all public roads in the state, including physical characteristics (both vertical and horizontal), geometric features, and designation information such as route system and number, federal classification, and street names. In addition, TIS tracks information on roadway related assets such as bridges, railroad crossings, traffic volumes and classification, and crashes. TDA is also responsible for the GIS BaseMap. This product maintains geo-spatial representations of the public road network in Minnesota, providing a graphic counterpart to the tabular TIS data.

In Mn/DOT, any significant bundle of work that would enhance or modify the existing functions, tools, or infrastructure of a production system such as TIS or the GIS BaseMap would have to be conducted as part of a project managed from the Office of Information Technology (OIT). Typically, Mn/DOT desires to track resources assigned to these OIT projects via OIT's job numbers, which are separate from SP&R job numbers. This has resulted in work that is SP&R fund eligible being coded to non-eligible job codes.

This work authority number would be used to cover tasks that are conducted as part of a specific Information Technology Project designed to enhance the existing TIS system but are SP&R fund eligible. These tasks would be tracked under existing SP&R work authority numbers if we were not required to report them under a specific number for OIT resource accounting.

These tasks would include:

- Improving data collection, editing, and quality control methods and processes
- enhancing existing data editing tools to increase efficiency, access new data, or improve quality control
- modifying existing TIS reporting applications and databases
- enhancing connectivity between the TIS system and other data systems
- other tasks falling under TH 224, but being conducting within the bounds of a IT project.

**PRODUCTS:**

- Processes for data update and creation in the TIS and BaseMap systems that result in more accurate and timely data for analysis and decisions support.
- Effective and efficient applications for updating and managing roadway attributes and roadway-related assets in the Transportation Information System (TIS).
- TIS Report applications and files able to be accessed by users with remote terminals.
- Hardware configuration, system data files, computer programs, and systems documentation to meet the needs of various internal and external users.
- User manuals, metadata dictionaries, memos and articles detailing TIS capabilities.
- Tools for providing crash data for the Office of Traffic, Security and Operations and the Department of Public Safety.
- Tools for providing pavement data for the Office of Materials and Road Research.
- Tools for providing bridge locations for the Bridge Office.
- Tools for providing data for Mn/DOT's Route Builder System.



**TASK TITLES:** Transportation Data and Analysis IT Development (TDA-ITD)

**ESTIMATED COST:** \$514,194

**WORK AUTHORITY NO:** TH47 xxx? (NEW)

**WORK PERFORMED BY:** Geographic Information and Mapping Section

**OBJECTIVE:**

- To enhance or modify tools, functions, or infrastructure that is part of the current TIS system as part of a specific IT project

**METHODOLOGY:**

The Office of Transportation Data and Analysis (TDA) is the steward of Mn/DOT's Transportation Information System (TIS). The TIS is an enterprise-wide database that maintains information on all public roads in the state, including physical characteristics (both vertical and horizontal), geometric features, and designation information such as route system and number, federal classification, and street names. In addition, TIS tracks information on roadway related assets such as bridges, railroad crossings, traffic volumes and classification, and crashes. TDA is also responsible for the GIS BaseMap. This product maintains geo-spatial representations of the public road network in Minnesota, providing a graphic counterpart to the tabular TIS data.

In Mn/DOT, any significant bundle of work that would enhance or modify the existing functions, tools, or infrastructure of a production system such as TIS or the GIS BaseMap would have to be conducted as part of a project managed from the Office of Information Technology (OIT). Typically, Mn/DOT desires to track resources assigned to these OIT projects via OIT's job numbers, which are separate from SP&R job numbers. This has resulted in work that is SP&R fund eligible being coded to non-eligible job codes.

This work authority number would be used to cover tasks that are conducted as part of a specific Information Technology Project designed to enhance the existing TIS system but are SP&R fund eligible. These tasks would be tracked under existing SP&R work authority numbers if we were not required to report them under a specific number for OIT resource accounting.

These tasks would include:

- Improving data collection, editing, and quality control methods and processes
- enhancing existing data editing tools to increase efficiency, access new data, or improve quality control
- modifying existing TIS reporting applications and databases
- enhancing connectivity between the TIS system and other data systems
- other tasks falling under TH 224, but being conducting within the bounds of a IT project.

**PRODUCTS:**

- Processes for data update and creation in the TIS and BaseMap systems that result in more accurate and timely data for analysis and decisions support.
- Effective and efficient applications for updating and managing roadway attributes and roadway-related assets in the Transportation Information System (TIS).
- TIS Report applications and files able to be accessed by users with remote terminals.
- Hardware configuration, system data files, computer programs, and systems documentation to meet the needs of various internal and external users.
- User manuals, metadata dictionaries, memos and articles detailing TIS capabilities.
- Tools for providing crash data for the Office of Traffic, Security and Operations and the Department of Public Safety.
- Tools for providing pavement data for the Office of Materials and Road Research.
- Tools for providing bridge locations for the Bridge Office.
- Tools for providing data for Mn/DOT's Route Builder System.

**TASK TITLES:** Transportation Information System IT Replacement (TIS-ITR)

**ESTIMATED COST:** \$63,823

**WORK AUTHORITY NO:** TH xxx? (NEW)

**WORK PERFORMED BY:** Data Systems and Coordination

**OBJECTIVE:**

- To design, develop and test tools, functions, or infrastructure to replace existing portions of the TIS system as part of a specific IT project

**METHODOLOGY:**

The Office of Transportation Data and Analysis is the steward of Mn/DOT's Transportation Information System (TIS). The TIS is an enterprise-wide database that maintains information on all public roads in the state, including physical characteristics (both vertical and horizontal), geometric features, and designation information such as route system and number, federal classification, and street names. In addition, TIS tracks information on roadway related assets such as bridges, railroad crossings, traffic volumes and classification, and crashes.

In Mn/DOT, any significant bundle of work that would replace the existing functions, tools, or infrastructure of a production system such as TIS would have to be conducted as part of a project managed from the Office of Information Technology (OIT). Typically, Mn/DOT desires to track resources assigned to these OIT projects via OIT's job numbers, which are separate from SP&R job numbers. This has resulted in work that is SP&R fund eligible being coded to non-eligible job codes.

This work authority number would be used to cover tasks that are conducted as part of a specific Information Technology Project designed to enhance the existing TIS system but are SP&R fund eligible. These tasks would be tracked under existing SP&R work authority numbers if we were not required to report them under a specific number for OIT resource accounting.

These tasks would include:

- Designing new tools, functions, and reports required as part of the new TIS system
- Developing the new features in an architecture and infrastructure consistent with the new TIS system
- Testing features and functions of the new TIS system.
- other tasks falling under TH 224, but being conducting within the bounds of a IT project to replace the current TIS system.

**PRODUCTS:**

- Effective and efficient applications for updating and managing roadway attributes and roadway-related assets in a new Transportation Information System (TIS).
- New TIS Report applications and files able to be accessed by users with remote terminals.
- Hardware configuration, system data files, computer programs, and systems documentation to meet the needs of various internal and external users consistent with the new TIS system.
- User manuals, metadata dictionaries, memos and articles detailing the capabilities and specifications of the new TIS.
- New tools for providing crash data for the Office of Traffic, Security and Operations and the Department of Public Safety.
- New tools and methods for providing pavement data for the Office of Materials and Road Research.
- New tools and methods for providing bridge locations for the Bridge Office.
- New tools and methods for providing data for Mn/DOT's Route Builder System.

# OFFICE OF TRANSIT

**TASK TITLES:** Transit Program Planning

**ESTIMATED COST:** \$203,000

**WORK AUTHORITY NUMBER:** TH 301

**WORK PERFORMED BY:** Office of Transit

**OBJECTIVES:**

- To prepare transit and para-transit program plans and reports in cooperation with participating agencies and staff.
- To analyze, document and recommend transit and para-transit program policies that encourage coordination and cost-effectiveness of transit services.
- To develop, evaluate and recommend alternative program strategies and performance criteria.

**METHODOLOGY:**

- Produce an annual report that concisely summarizes public transit activities.
- Prepare specialized reports and present results to internal and external customers. Legislative and regulatory development will be monitored.
- Develop a transit information network that will maintain information on all transit services in the state in order to further coordination and cost effectiveness of public transit services. Alternative strategies are developed and analyzed when issues arise.
- Establish performance measures that are applicable to the various transit services and providers. Policies and other considerations are combined and documented as part of the overall program strategy implementation.
- Review and update a variety of policy and planning documents that are used by the department and external customers.
- Maximize the transportation investment in transit projects.
- Support office-planning activities.
- Produce results as needed and to be used as a focus for testing new approaches and implementation for practical improvements in transit services.
- Sponsor transit safety and security seminars and workshops (e.g. FTA Substance Abuse, Homeland Security Preparedness).
- Sponsor transit coordination activities, forums, workshops, studies and plans.

**PRODUCTS:**

- Annual Report
- Policy Analysis Reports
- Transit Issue Presentations
- Public Education & Involvement Plans
- Project Oversight
- Quarterly Progress Reports
- Annual DBE Reports
- In-Transit Newsletter/Transit Bulletin
- Transit Website
- Drug and Alcohol Testing Policies
- Transit System Safety Plans
- Transit Coordination Study/Action Plan
- United We Ride (Coordination) Workshops
- Guidebooks (e.g. transit facilities - type/size)
- Safety and Security Workshops
- Implement public communication and awareness project (Arrive MN)

**TASK TITLES:** Transit Research and Program Evaluation

**ESTIMATED COST:** \$120,000

**WORK AUTHORITY NUMBER:** TH 302

**WORK PERFORMED BY:** Office of Transit

**OBJECTIVES:**

- To research and prepare a variety of specialized reports, site studies and surveys to ensure that adequate information is available to identify and evaluate alternative options involving numerous transit issues.
- To provide technical assistance to transit programs and project managers on specific transit planning and research projects.
- To develop research programs using a comprehensive computerized transit program database and specialized software.

**METHODOLOGY:**

- Prepare specialized reports on current transit topics.
- Analyze market characteristics for changing transit service area.
- Conduct site studies for existing public transit systems.
- Develop, implement and analyze on-board transit surveys to continually update ridership profiles.
- Analyze trends (economic, social, demographic, etc.) that have current and/or potential impacts on public transit via utilization of specialized computer software.
- Support office research and program evaluation activities.

**PRODUCTS:**

- Program Performance Reports
- System Performance Evaluations
- Demographic Trend Analysis Reports
- Site Studies for Transit Systems
- New Starts Service Designs/System Service Redesigns
- Transit Peer Group Analyses
- Transit Needs Assessments
- DBE Program Technical Assistance
- Drug and Alcohol Program Technical Assistance



**TASK TITLES:** Bike and Pedestrian Ways Planning

**ESTIMATED COST:** \$397,000

**WORK AUTHORITY NUMBER:** TH 117

**WORK PERFORMED BY:** Office of Transit, Bicycle and Pedestrian Section

**OBJECTIVES:**

- To promote and facilitate the delivery of non-motorized modes into our multi-modal transportation system

**METHODOLOGY:**

- This objective will be achieved by devoting staff time to the following sections:
  - Policy Development and Planning  
This section is responsible for the creation, review, and updating of a variety of policy and planning documents that are used by the department and external customers in the integration of non-motorized modes in Minnesota's transportation system.
  - Outreach and Awareness  
This section of staff time is devoted to managing the relationship between Mn/DOT and its customers
  - Training  
In a typical year the section works with a broad base of transportation professionals to provide them with tools to apply the principals of non-motorized modes to their transportation planning and projects. Training also provides the additional benefits of allowing staff to meet people in the field and gain immediate and direct customer feedback that in turn improves the categories of consulting and policy development.
  - Consulting  
The staff is frequently sought out for assistance in their areas of technical expertise. This work is also an important source of customer feedback that allows us to have first hand experience with what is working and being used as well as an effective way for our staff to increase our pool of shared knowledge.
  - Research  
This section manages and participates in research to promote the application and benefits of non-motorized modes. The section also serves as the Technical Liaison on Tourism/Transportation Research, the U of M (CTS) Environmental Research Council, and provides council to the Hubert Humphrey Institute's Research on Cost Benefits of Bicycling and their work on Bicycle Safety (Toward Zero Deaths).

- **SAFETEA-LU Program Management and Liaison**  
As a result of this Congressional action, Mn/DOT has taken on the program implementation in Minnesota of the new national Safe Routes to School. Although the program is funded with federal monies, the Bicycle and Pedestrian Section provides management for this program's implementation. Additionally, Minneapolis is one of four pilot test areas in the U.S. receiving federal monies to initiate Section 1807 of SAFETEA-LU. The Bicycle and Pedestrian Section provides staff liaison among the key program stakeholders in the Metro Area and represents Mn/DOT on the Bike-Walk Advisory Committee that is helping Transit for Livable Communities implement this program.
- **Staff Development and Support**  
This section reflects the time that is spent in managing resources and ensuring continued growth and development as a departmental resource. These activities include resource management, internal communication, work planning, training, conference participation, and other professional development

**PRODUCTS:**

- Non-motorized Modal Plan (Bike, Pedestrian, Transportation Action Model)
- Mn/DOT Road Design revisions for bicycle facilities
- Highway Project Development Process: Part II, Section D, Subject Guidance: Bikeways and Pedestrians
- Bicycle Design Guideline revisions
- Mn/DOT's Design Advisory Committee inputs
- Federal Surface Transportation Program Solicitation Process for Metro Area
- State Bicycle Maps
- Metro Bicycle Mapping and System Plan
- Mississippi River Trail
- State Bicycle Advisory Committee
- National Bike and Pedestrian Coordinators (AASHTO Task Force on Non-motorized Transportation)
- National Safe Routes to School Coordinators
- Community Bike and Pedestrians events
- Bike Facility Design Technical Assistance
- Participation in State Planning Groups
- Modal representation checklist
- Transportation Plan Performance Measures
- Requested plan reviews
- Economic impact of Bicycling in Minnesota- University of Minnesota

- Cost/Benefit of Bicycle Facilities – Hubert Humphrey Institute’s National Study
- Bicycle Safety Education Campaign, “Share the Road” promotion and support
- Implement new Safe Routes to School federal program
- Participate in developing the Non-Motorized Transportation Pilot Program
- Promoting Bicycle Commuting State-wide

# **OFFICE OF FINANCE**

**ESTIMATED COST:** \$10,000

**WORK AUTHORITY NUMBER:** TH 401

**WORK PERFORMED BY:** Accounting Systems Section, Financial Reporting Unit

**OBJECTIVES:**

- To furnish information on motor vehicle registration, fees and taxes, driver license regulation and fees, and fuel consumption. This data is used to develop motor vehicle and motor fuel usage for forecasting future highway user imposts and determining vehicle and fuel tax use in the formulation of highway policy, and administration of highway matters, informational use by legislators, public officials and the general public.

**METHODOLOGY:**

- The procedures used to obtain statistical and financial data for reporting purposes are as follows:
- Motor vehicle registration and drivers' license data are received on an annual basis from the registrar of motor vehicles, Department of Public Safety. These data are researched, analyzed and compiled for use in the preparation of reports in accordance with instructions contained in Chapters 3, 4 and 5 of FHWA "A guide to Reporting Highway Statistics".
- Motor fuel statistics are received monthly from the Petroleum Tax Division, Department of Revenue. Upon receipt of this information, monthly computations are made and placed on tabular form for gasoline and special fuel gallonage. These statistics are used in the preparation of annual reports and in accordance with Chapter 2, FHWA "A guide to Reporting Highway Statistics". Periodic checking occurs prior to FHWA use for apportionment purposes.
- Financial reports are prepared from information acquired from the Department's Financial Operations Section records. These records are extensively examined and tabulated. They are prepared for assistance and used in the preparation of annual reports in accordance with the guidelines contained in Chapters 8 and 9 of FHWA "A Guide to Reporting Highway Statistics".
- Local government financial reporting is based on information furnished to the department by all cities, towns and counties on an annual basis. This information is assembled and then forwarded to the Federal Highway Administration in accordance with instructions in Chapter 10 of FHWA "A Guide to Reporting Highway Statistics".

- Travel takes place in connection with training workshops, seminars, etc. that are scheduled annually for increasing effectiveness and efficiency of financial and statistical reporting.

**PRODUCTS:**

FHWA-531	State Highway Income
FHWA-532	State Highway Expenditures
FHWA-534	Capital Outlay and Maintenance Expenditures
FHWA-536	Local Highway Finance Report – cities, counties and townships
FHWA-541	State Transportation obligations issued during year and allotment of Proceeds
FHWA-542	Status of State Transportation Debt
FHWA-543	State Transportation Sinking Funds and Debt Service transactions
FHWA-556	State Motor Fuel Receipts and Initial Distribution by Collection Agencies
FHWA-551M	Monthly Motor-fuel Consumption
FHWA-561	State Motor-fuel Tax Receipts and Initial Distribution by collecting agencies
FHWA-562	State Drivers' Licenses and Fees
FHWA-566	State Motor Vehicle registration fees and other receipts, initial distribution by collecting agencies
FHWA-571	Receipts from State Taxation of Motor Vehicles operated for hire and other motor carriers

These reports are used as a basis for the statistical data and the U.S. Department of Transportation's annual publication "Highway Statistics."

**OFFICE OF**

**TRAFFIC, SECURITY AND**

**OPERATIONS**

**TASK TITLES:** Speed Data Summaries CY2007

**ESTIMATED COST:** \$20,000

**WORK AUTHORITY NUMBER:** TH 501

**WORK PERFORMED BY:** Office of Traffic, Security and Operations (OTSO)

**OBJECTIVES:**

- To monitor highway speeds and develop speed characteristics at various sites located on five highway categories. Data summaries are reported quarterly and annually.

**METHODOLOGY:**

- Data collection procedures are developed by the Office of Traffic, Security and Operations (OTSO). Monitoring 24-hour period is desirable and therefore Mn/DOT uses a combination of automated traffic recorder stations and weigh-in-motion stations at sites with speed monitoring equipment accessible by telephone telemetry. Different software programs download the data, format it and finally analyze and print the reports. Data is still visually screened to verify accuracy and potential hardware problem. The TDA office maintains the hardware and OTSO does the data analysis. This automated methodology has helped decrease the number of person hours required compared to previous years.

**PRODUCTS:**

- A complete file of speed characteristics on each category of highways – These files are used to develop quarterly and annual report to evaluate motorists' compliance with speed limits.
- Data may also be used to evaluate effectiveness of enforcement and public awareness programs. Speed trends also play a role in evaluating accident trends.



**TASK TITLES:** Crash Surveillance

**TASK TITLES:** Crash Surveillance CY2007

**ESTIMATED COST:** \$108,000

**WORK AUTHORITY NUMBER:** TH 502

**WORK PERFORMED BY:** Office of Traffic, Security and Operations

**OBJECTIVES:**

- To provide crash data and estimated safety risks to reveal high crash locations and over represented crash characteristics on all roads and streets in the State. This information relates to the highway facility, vehicle, environment and human factors and provides input for establishing highway safety needs and priorities for development of a long-range safety improvement program.

**METHODOLOGY:**

- Traffic crashes, reported per state law by investigating officers and citizens are processed by DPS and are on-line no later than ninety days afterward. A wide range of variables from the vehicle, injury, roadway, driver and environment support the federal emphasis of crash analysis and safety counter measure development. Various TIS software programs and transportation modeling tools are executed by OTSO and a report is developed for a requesting agency or internal application.

**PRODUCTS:**

- Semi-annual crash reports will be prepared for road authorities.
- Comprehensive reports are prepared using district boundaries for comparative analysis of accidents within specified areas or highway categories.
- Customized reports can be developed for technical or non-engineering disciplines upon request.
- Crash rates can be calculated for isolated intersections, highway categories or statewide systems as designated by the scope of the requester.
- Surrogate measures of safety levels can be estimated with appropriate modeling tools for selected high risk locations.
- This timely crash data and summarized reporting provides road authorities an objective basis for prioritizing and developing safety countermeasures, dedicated enforcement efforts and also minimizes tort liabilities.

**OFFICE OF**

**STATE AID**

**TASK TITLES:** County State-Aid Highway Needs Study

**ESTIMATED COST:** \$440,860

**WORK AUTHORITY NUMBER:** TH 701

**WORK PERFORMED BY:** State Aid

**OBJECTIVES:**

- To compile a computerized record of the entire County State-Aid Highway System with specific attention given to mileage and money needs. "Money needs" is defined as the construction cost required to improve the county state-aid system to approved standard. Based on the directions from the County Engineers Screening Board, each county's mileage and annual money needs is presented to the Commissioner of Transportation. Using this information and pursuant to Minnesota Statutes, Chapter 162, the Commissioner apportions the County State-Aid part of the road user fund to the various counties.

**METHODOLOGY:**

- Each county engineer is required annually to update his needs study based on the construction accomplished, system revision, traffic, need reinstatement and any other necessary changes. With these updates, the computer record is revised and a new completely updated needs study is created.
- In order to keep the needs study prices current each year, a five-year average unit price study is produced. Using the results from this study, the County Engineers Screening Board develops new unit prices for inclusion into the needs study.
- Each year approximately 25% of the counties have their traffic counted. This information arrives at the Data Management Section and is transfer onto the records in the needs study.
- All the above data is presented to the County Engineers Screening Board for the use of making an annual recommendation for mileage, lane/miles and money needs to the Commissioner of Transportation.

**PRODUCTS:**

- Two County Engineers Screening Board Reports
- One County State-Aid Apportionment Booklet
- Miscellaneous legislative, auditor and client requests

**TASK TITLES:** Municipal State-Aid Street Needs Study

**ESTIMATED COST:** \$382,005

**WORK AUTHORITY NUMBER:** TH 702

**WORK PERFORMED BY:** State Aid

**OBJECTIVES:**

- To maintain the Municipal State-Aid Needs Studies which result in the annual determination of State-Aid Apportionment in municipalities over 5,000 populations according to Minnesota Statutes, Rules and Screening Board Directives.

**METHODOLOGY:**

- The city engineers annually report the construction accomplishments, system revisions, certification of mileage and status corrections as outlines in the State-Aid Manual. Also the Twin Cities Metropolitan area traffic data is updated every two years and the out-state cities every four years. These items are processed through a computer program together with unit prices, which are annually updated and approved by the Municipal Screening Board at their spring meeting.
- The resulting needs and tentative apportionments are reported to the Municipal Screening Board at their Fall meeting. Prior to November 1 each year, the board recommends the money needs to be used by the Commissioner of Transportation for the following year's allotment to the municipalities over 5,000 population. The actual allotment is made by the Commissioner of Transportation in January of the following year when the funds available are known.

**PRODUCTS:**

- Two reports to the Municipal Screening Board for use in making annual recommendations to the Commissioner of Transportation
- One annual "Municipal Apportionment" report to the municipalities over 5,000 populations showing their annual allotment and the methods of determining the amounts.

**OFFICE OF  
ENVIRONMENTAL  
SERVICES**

**TASK TITLES:** Cultural Resources Investigations

**ESTIMATED COST:** \$1,600,000.00

**WORK AUTHORITY NUMBER:** TH 46801 through TH 46899

**WORK PERFORMED BY:** Office of Environmental Services

**REFERENCE NUMBERS:** Pre-Qualification System

**OBJECTIVES:**

- To preserve and/or document cultural resources subject to disruption due to proposed highway improvements. This work is necessary to ensure that the effects of projects on cultural resources is being taken into account as per the requirements of 36 CFR 800 (Section 106 of the National Historic Preservation Act) so that projects can receive federal funding. This includes the archaeological survey and evaluations of prehistoric and historic sites, standing structures surveys and evaluations, geomorphological studies, and/or archaeological data recovery. The information from these investigations is included in the environmental impact study of highway corridors. Results are also forwarded to the State Archaeologist and the State Historic Preservation Office (SHPO).

Cultural resource investigations are done in conformance with:

- National Historic Preservation Act (36 CFR 800), as amended
- Department of Transportation Act of 1966 (PL 89-670)
- Executive Order 11593
- Archaeological and Historic Preservation Act of 1974 (PL 93-291)
- Title 36 of the Code of Federal Regulations (CFR) Parts 60-66 and 800
- Native American Graves Protection and Repatriation Act of 1990 (PL101-601)
- Secretary of the Interior's Standards and Guidelines for Archaeology and Historic preservation Activities. As published in the Federal Register in September 29<sup>th</sup>, 1983, Volume 248, No. 190 Part IV (48 FR 44716 through 44740)
- Association of Iowa Archaeologist's Guidelines for Geomorphological Investigation in Support of Archaeological Investigations (1992)
- State Historic Preservation Office (SHPO) Guidelines for Archaeological Projects in Minnesota, and Manual for Standing Structures
- Minnesota state historic preservation statutes

**METHODOLOGY:**

- Project that have the potential to affect cultural resources are determined by the professionally qualified staff of the Mn/DOT Cultural Resources Unit (CRU). These projects include District, County, and City projects. These projects are assigned to vendors in the pre-qualified program on a rotational basis based on the vendor's expertise, workload and availability. Projects are defined by type of investigation and phase as required by Mn/DOT CRU after review of the proposed project area. Types are geomorphology, historical, archaeological and architectural phases are defined as:

Phase I – Initial Reconnaissance

Phase II – Intensive Survey (Determine Significance)

**PRODUCTS:**

- Monthly progress reports, field notes are submitted.
- Pictures and documentation of historic sites if historic research is cited.
- If archaeology is identified, artifacts are curated.
- Final reports and conclusion of research and findings.

**OFFICE OF**

**FREIGHT AND**

**COMMERCIAL VEHICLE**

**OPERATIONS**



**TASK TITLES:** Freight Planning, Studies and Data Management

**ESTIMATED COST:** \$472,338

**WORK AUTHORITY NUMBER:** TH 220

**WORK PERFORMED BY:** Freight Planning & Program Development

**OBJECTIVES:**

- To improve our knowledge and integration of freight transportation into our policy, long range planning and investment processes. Make better decisions that improve or augment freight transportation service productivity and safety.
- To improve freight transportation by providing information, direction and service to internal and external customers.
- To provide for and facilitate cooperative action, private or public, to improve Intermodal freight transport specifically and freight transportation in general.

**METHODOLOGY:**

- Integrate the new freight policy “ Provide an integrated system of freight transportation in Minnesota – highway, rail, water, air cargo, and intermodal terminals – that offers safe, reliable, and competitive access to statewide, national, and international markets” its six policy direction and 34 strategies in Mn/DOT’s planning, programs, investments and system management.
- By increasing Mn/DOT’s basic knowledge of freight transportation and improving the comprehension of freight transport’s relation to Minnesota’s economic, social and environmental health.
- Conduct regional freight studies.
- Maintain and improve the Mn/DOT freight facilities database.
- Staff utilizes the Minnesota Freight Advisory Committee (MFAC) comprised of private industry and public sector members to provide and intermodal perspective and foster public/private cooperation.
- Enhance the efficiency of goods movement in Minnesota and support economic growth through policies and programs that optimize a multimodal transportation system.

**PRODUCTS:**

- Develop and update freight performance (rural and metro w/cluster approach) measures as well as supporting and recommending other statewide transportation measures.
- Provide and articulate freight related policies, issue and trend analysis that reflected a district, statewide and system level perspective.
- Provide both the frame work and information necessary for districts and regions to plan, improve and develop transportation facility information that account for interregional corridor and trade center influences, function as systems and area consistent with State goals.
- Provide information and stimulate discussion to guide statewide policy development and also local regional transportation investment decisions as well.
- Maintain a high level of freight transportation expertise available to all levels of the Department to provide advice and assistance on freight issue resolution.
- Maintain current freight information, commodity flows and database information
- Provide commodity flow data and information to improve the level of understanding of customer needs, Minnesota markets, transportation demand and freight's relationship to economic activities.
- Concentrate on the broader statewide, multi-state national/internal flows while working with MPOs, RDCs, districts and Metro division to develop regional and localized information.
- Develop techniques, report formats, mapping capabilities or other ways to turn "data" into information useful in the planning and investment decision process.
- Initiate, support and recommend freight research
- Provide development of research proposals and stay current with freight related research efforts regionally and nationally. Coordinate within Mn/DOT and provide freight information to internal and external customers
- Develop regional freight profiles summarizing geographic area, such as land mass and the percentage of land devoted to people employed in different types of industries (e.g., agriculture, manufacturing and service). It will also include a high level overview of the transportation infrastructure important to the region.
- Identify and designate NHS Intermodal connectors. Also identify other major freight generating facilities and their connector routes.



**APPENDIX B:**

**DESCRIPTION OF**

**RESEARCH STUDIES**

**DESCRIPTION OF RESEARCH STUDIES****STATE RESEARCH AND DEVELOPMENT PROGRAM****RSS - RESEARCH PROJECTS, TECHNOLOGY TRANSFER, IMPLEMENTATION, SPECIAL PROJECTS & ADMINISTRATION - SPR-0001(047)**

This project provides for the preparation of proposals, detailed work outlines and cost estimates for research studies to be submitted for the SP&R Work Program. This includes incidental and miscellaneous expenses which occur during the course of the year and which are pertinent to the overall research, development and implementation efforts. Included will be the costs of support staff and researchers needed to administer and monitor the studies in the State's Research Program. These studies can be found in this section. Many of these studies are part of the Mn/ROAD and ITS research effort. This project also provides for attendance and participation in various meetings and workshops including the annual FCP conference, which contribute to a better understanding of current problems and fosters the exchange of technical information and leads to improved research management practices.

The studies in the Cooperative Research description section follow the format of the recently established Transportation Pooled Fund web site ([www.pooledfund.org](http://www.pooledfund.org)). The information has been edited to include only the pertinent information relevant to Mn/DOT's involvement. However, in addition to the information below the web site also has, or links to, project documents such as work plans, reports, project updates, etc. An individual can also sign up to be notified of new studies as they are posted. The site also has a browse and search feature.

<b>Study Number:</b>	MPR-6(002)
<b>Title:</b>	<b>Financial Peer Review</b>
<b>Lead Agency:</b>	Minnesota Dept. of Transportation
<b>Statement of Need:</b>	Administrative funding category to cover expenses associated with hosting the Research Peer Exchange focusing on Financial Management.
<b>Study Objectives:</b>	A peer exchange is conducted every three years to gather feed back on the performance of the department's research program. Areas of excellence as well as potential improvement are identified. Per State Planning & Research Guide exchanges can be on the management process or a focused area. Minnesota chooses to focus on financial aspects of managing, state planning and research funds.
<b>Research Tasks:</b>	Representatives from other states DOT's are invited to the department to participate in two to three days of panel interviews

<b>Project Deliverables:</b>	<p>with various individuals in the department. The department identifies specific areas of focus for the exchange.</p> <p>The panel participants provide a summary of their observations relative to focus of the exchanges as well as recommendations for improvements and ideas</p>
<b>Study Number:</b>	MPR-6(003)
<b>Title:</b>	<b>Strategic Program Development</b>
<b>Lead Agency:</b>	Minnesota Dept. of Transportation
<b>Background:</b>	<p>Annually Mn/DOT makes significant investments in a transportation research program through state and SP&amp;R funds. Historically this program has been developed through a “grass roots” process. That is, ideas for research came from individuals and were prioritized by decision making entities. There is anecdotal evidence that this approach has been successful at solving individual problems. However, the implementation of these solutions has been sporadic and it is felt that more significant and “demonstratable” benefits can be realized from this program.</p>
<b>Objective:</b>	<p>The objective of this work plan is to provide expertise and resources in assisting Mn/DOT’s Research Services Section (RSS) in the review of current procedures for developing the Mn/DOT transportation research program, in the exploration and evaluation of alternative procedures, and in the creation of recommendations for new research program development procedures. These new procedures will be identified as developing a roadmap for main issues within each office. A prototype roadmap will be created in one office and be used as a discussion topic within the strategic visioning seminar that is scheduled to be held after this contract has been initiated.</p> <p>Improved development procedures should significantly improve the capabilities of the Mn/DOT transportation research program in implementing research results and in evaluating program impacts. Furthermore, new program development procedures are expected to be effective in addressing priority department goals and issues and will lead to the transfer of technology and knowledge to Mn/DOT practitioners and leaders.</p>
<b>Scope:</b>	<p>Project work will be coordinated with and performed under the direction of RSS. It is related to other RSS projects aimed at improving Mn/DOT’s research program. As required, work within this project will be coordinated with other related projects. The work will also include making contacts with stakeholders in the Mn/DOT transportation research program, reviewing documents and reports related to current procedures, soliciting and developing innovations for improving procedures, supporting the evaluation of current and innovative practices, summarizing and reporting on products of these efforts, demonstrating a research program roadmap, and taking other actions identified by RSS staff.</p>

<b>Study Number:</b>	MPR-6(004)
<b>Title:</b>	<b>Implementation And Closeout Of Completed Research Projects</b>
<b>Lead Agency:</b>	Minnesota Dept. of Transportation
<b>Background:</b>	<p>Mn/DOT is seeking to develop research implementation plans and/or closeout memos based on Federal, State and Local research findings. The implementation plans will help bring research findings and current technologies to state, county and city governments, in a way that facilitates application at all levels. The closeout memos will assist in identifying the impacts of research investments.</p> <p>Research and implementation enjoy a close relationship and intersect in many ways. Research may lead to an issue that requires further research, it may lead to knowledge gained, or it may lead to a practical application. In order to identify what completed research has provided, an evaluation of the research results is required that will assist in identifying the knowledge gained, provide direction for application of the research results, or identify impacts of implementation activities which were a direct result of the research investment. The kind of collaboration required in executing research evaluation and implementation depends on the building of successful relationships within and outside of Mn/DOT. The Consultant will work closely with Mn/DOT's RSS, the LRRB, sponsoring Mn/DOT offices, local transportation agencies and the organizations that support their research and implementation activities.</p>
<b>Objectives:</b>	<p>It is the goal of this project to provide Mn/DOT and the LRRB with implementation plans that will outline the tasks and methods for application of research results to transportation problems and issues. In some cases, the plan may involve communication, marketing and training. In other cases, the plan may require collaboration with other agencies, organizations, private industry or involve product development. An additional goal of this project is to provide Mn/DOT with completed closeout memos that provide information describing the research effort, research results, implementation effort and impacts of the implementation.</p>
<b>Scope:</b>	<p>The Consultant will perform evaluation of up to 70 completed research projects that will produce information necessary to complete implementation plans or closeout memos. Implementation plans and closeout memos are subject to approval from Mn/DOT's RSS and the sponsoring Mn/DOT office or local agency.</p>
<b>Study Number:</b>	MPR-6(005)
<b>Title:</b>	<b>RESEARCH MANAGEMENT SYSTEM (Phase I: Development of a Conceptual Design)</b>
<b>Lead Agency:</b>	Minnesota Dept. of Transportation

**Background:**

Producing high-quality, well-targeted research products that can be directly applicable in addressing real world problems has been the main goal of the research programs at state DOTs.

While the importance of ‘implementing’ research results has been long recognized at state DOTs, most research programs still lack an effective management system that can systematically ensure the ‘implementation possibility’ of research results at different stages of the research process. Although a past NCHRP (20-33) study had identified a set of factors affecting the implementation of research results, the importance of effective facilitation of incorporating those factors into the research process may need further studies.

Developing and managing research projects that can produce the results with the high possibility of implementation requires a multi-stage process, where ‘implementation’ needs to be considered throughout the entire research process. Figure 1 shows a schematic diagram of a generalized research process, where ‘implementation’ is explicitly considered at each stage of research management. As indicated in this figure, the key element for such management is the effective facilitation of the various stakeholder involvements throughout the process. While some agencies have developed individual tools to manage certain components of the process, the availability of a comprehensive electronic system that can be used to facilitate the entire research process is still not known. Developing such a management system is of critical importance for improving the productivity of a research program.

**Research Objectives:**

The goal of this research is to develop a software system that can be used for effectively managing the entire research process, so that research results with the high possibility of implementation can be produced within budget/time limitations. Further, such a management system can reduce the time lag between the completion of a research project and implementation of the results. In the proposed study, Phase 1, a detailed framework of such a system will be developed. The specific objectives of Phase 1 include:

- Review of the current implementation practices for research results and issues at selected State DOTs,
- Assessment of the current research management tools in facilitating effective implementation process,
- Development of a conceptual design for the new research management/implementation system for Mn/DOT.

The results from the Phase 1 will be used to design and develop a prototype system which will be implemented and tested in the subsequent phases.



<b>Scope of Research:</b>	First, several state DOTs with active research programs will be selected and their research processes/management tools will be reviewed focusing on the implementation process of research results. Based on the review results, a set of the key factors affecting the effective implementation of research products will be identified and a process framework for managing research projects and implementing results under the Mn/DOT environment will be developed. The functionalities of the existing research management tools, ARTS, will be analyzed in terms of its adaptability to the new research management framework. The research performance measures that have been used at Mn/DOT will be compared with those from the NCHRP 20-63. Finally a detailed framework of the new research management system, including the functionalities of each module, will be identified. The resulting conceptual design will be used as the basis for developing a prototype system in the subsequent phases.
<b>Study Number:</b>	MPR-6(006)
<b>Title:</b>	<b>SPR Program Administration – Research and Contracts Accounts</b>
<b>Lead Agency:</b>	Minnesota Dept. of Transportation
<b>Statement of Need:</b>	Administrative funding category to cover expenses associated with managing the State Planning and Research Program.
<b>Objective:</b>	Minnesota is requesting funding to manage State Planning and Research funds. Assistance is needed in developing new policy and procedures for the increasingly complicated authorization and reimbursement process.
<b>Tasks:</b>	Analyze the new funding guidelines from the Federal Highway Administration and determine the best implementation for Minnesota Department of Transportation. Coordinate with various offices within the Department of Transportation and the Federal Highway Administration to establish efficient authorization, billing and reimbursement of State Planning & Research Programs. Administer projects and ensure carried out as authorized.
<b>Deliverables:</b>	Develop policies and procedures in managing the State Planning & Research Program in accordance with Federal Highway Administration. Maintain a positive Federal Cash flow through development of effective accounting systems to manage the billing and reimbursement related to the State Planning and Research Programs. Projects are administered in accordance with the federal authorization.
<b>Evaluation Criteria:</b>	Program will be evaluated bi-annually reporting progress and current workload.
<b>Study Number:</b>	MPR-6(007)
<b>Title:</b>	<b>‘Hear Every Voice’ (HEV) Public Involvement Plan</b>

<b>Lead Agency:</b>	Minnesota Dept. of Transportation
<b>Background:</b>	Mn/DOT's public involvement guidelines have not been updated since a 25-member Public Involvement Task Force developed and published them as "Hear Every Voice: A Guide to Public Involvement at Mn/DOT" in 1999. Also, Mn/DOT has not developed or provided the training that was initially intended and needed to support more effective and consistent application of the public involvement guidance into practice statewide.
<b>Objectives:</b>	The pooled fund project is needed to: 1) cover the costs of expediting the updating and reformatting of Mn/DOT's "Hear Every Voice" public involvement guidelines as a statewide Mn/DOT Public Involvement Plan, consistent with federal requirements (i.e. the SAFETEA-LU Federal Transportation Reauthorization Act) deadlines (July 1, 2007) and current best practices (i.e. per the International Association of Public Participation – IAP2), and 2) development and deployment of a training curriculum that would support more effective and successful implementation of the Mn/DOT Public Involvement Plan consistent with federal requirements and intent.
<b>Summary:</b>	In summary, we propose the following basic components of a consultant work plan: 1) document efforts to date, 2) update guidelines, 3) recommend Mn/DOT policy integrations, 4) update tools and resources, 5) edit and rewrite <i>Hear Every Voice</i> (for hard-copy and online approval and publication, 6) develop marketing recommendations, 7) develop a strategy and curricula for "leadership awareness" and deploy multiple half-day training workshop sessions to further assist Mn/DOT leadership in implementing <i>HEV</i> guidelines, policy and best practices, 8) develop a recommended HEV training framework and suggested courses or modules, 9) deployment of a statewide HEV employee training program and 10) develop a recommended evaluation strategy for the "documented" statewide public involvement process and a recommended quality assurance and control strategy, and 10) develop and deploy a recommended implementation plan.
<b>Study Number:</b>	MPR-6(009)
<b>Title:</b>	<b>TH 36 Full Closure Construction: Evaluation of Traffic Alternatives and Lessons Learned</b>
<b>Lead Agency:</b>	Minnesota Dept. of Transportation
<b>Background:</b>	Transportation professionals are sensitive to public dissatisfaction with work zone congestion, delay, and safety; they are continually developing new approaches to improve traffic operations in and around work zones. Transportation agencies are challenged with balancing an increasing need for work zones and allowing safe mobility to all motorists and pedestrians. To find the balance between these conflicting needs, transportation agencies are

	<p>considering full road closure during the project planning and design stages.</p>
<b>Objectives:</b>	<p>The benefit from this project will be that in the future engineers nationwide will have strong resources to guide their decision regarding major roadway improvement design, scheduling, construction and traffic management planning.</p> <p>Additionally, due to the nature of the proposed analysis methodology new methods regarding traffic management evaluation through simulation will be developed. Such methods will be beneficial to transportation engineers in other cases that involve major roadway closures, traffic redirection, or evaluation of driver route choices.</p>
<b>Scope of Work:</b>	<p>A contract is currently underway to collect traffic data in the surrounding area of the future construction project. The contract also involves the consultant to collect data during and after the project as well. Background information will be collected from the identified area of influence and use the data acquired from the consultant to evaluate the traffic operation alternatives between full closure and partial closure. Cost estimates for full closure and partial closure construction will be provided. Along with the construction estimates, road-user cost estimates will be developed and compared. Stakeholders involved in the project will be interviewed to get the perspectives of Mn/DOT engineers, construction company engineers, consultants, and local area government officials like city and county engineers. Market research will also be done to get the public's perspective before, during and after the project. The final deliverable will be a Lessons Learned Full Closure Guide that will identify the issues engineers need to be aware of when considering a Full Closure as a construction alternative. Along with the guidebook, a one-day workshop will ensue to present the final product and explain its contents.</p>
<b>Study Number:</b>	MPR-6(010)
<b>Title:</b>	<b>Census Transportation Planning Products (CTPP) from the American Community Survey</b>
<b>Background:</b>	<p>A WAIVER OF THE NON-FEDERAL MATCH FOR THE USE OF SP&amp;R and PL FUNDS FOR THIS PROJECT HAS BEEN APPROVED.</p> <p>In 1990 and again in 2000, AASHTO partnered with all of the states on pooled fund projects to support the development of special census products and data tabulations for transportation. These census transportation data packages have proved invaluable in understanding characteristics about where people live and work, their journey to work commuting patterns, and the modes they use for getting to work. Characteristics about workers include age, sex, industry and occupation; characteristics about households include household size, number of workers, vehicle availability and income. These characteristics combined</p>

with the journey-to-work characteristics (travel mode, departure time, travel time, and work destination) make the CTPP a valuable data product. Significant cost savings were achieved by using a nationwide coordinated approach, and resulted in data availability at detailed geography (census tract and TAZs where specified) for the entire nation.

The American Community Survey is the replacement for the decennial census long form and requires multiple years of data accumulation before small area tabulations can be released. Because of this change in survey methods, a research project to improve the useability of the data for transportation planning is needed. To address current and future needs for census data, AASHTO has decided to initiate a new five-year CTPP based on the ACS.

**Objectives:**

To provide data tabulations from the American Community Survey (ACS) that are designed specifically for the needs of transportation planners. This data project will be called Census Transportation Planning Products (CTPP). This will include tabulations for residence, workplace, and flow between home and work. Both 3-year ACS data aggregates, and 5-year ACS data aggregates will be used for the tabulations.

The geographic level of detail for the 5-year ACS will include Transportation Analysis Zones (TAZs) and census tracts. The data will be distributed to State DOTs and MPOs using the best format available which may include Internet or CDs and DVDs.

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The geographic level of detail for the 5-year ACS will include Transportation Analysis Zones (TAZs) and census tracts. The data will be distributed to State DOTs and MPOs using the best format available which may include Internet or CDs and DVDs.

In addition to data tabulations, the project will include technical support, training and capacity building, research, and project oversight.

**Scope of Work:**

The CTPP includes five major components: data tabulations, on-demand technical support, training and capacity building, research, and project oversight.

- Develop and Distribute Data tabulations
- Coordinate table design with AASHTO SCoP Census Working Group
- Coordinate with Census Bureau staff on data processing and production
- 5-year ACS data using 2005/06/07/08/09 data

Residence, workplace, and flow data including TAZs and small census geography including tracts and block groups.

Requires TAZ definition software for submitting boundaries to the Census Bureau for tabulation.

Requires improvements to the workplace geocoding operations and allocation process.

3-year ACS data using 2005/06/07 data (and maybe 2007/08/09)

Residence, workplace, and flow data limited to large geographic areas

Requires large transportation zones boundaries submitted to the Census Bureau for tabulation

Requires improvements to the ♣ workplace geocoding operations and allocation process.

Re-package annual ACS data for transportation planners

Develop data access and data visualization tools

On-demand Technical Assistance for transportation planners focusing on State DOTs, MPOs.

On-call user support via telephone, email, web-conferencing.

Develop quick data profiles especially for trend analysis

Triage for problems and develop methods to resolve problems

Training and Capacity Building

- Develop training materials, which could include a guidebook

- Conduct Web-based training

- Conduct on-site training

- Maintain website as clearinghouse for case studies, best practices, computer-based tools

- Prepare and distribute newsletter

Research Activities

- Improve methods for workplace allocation

- Research synthetic data approaches

- Develop synthesis of best practices in using CTPP data

- Research methods for integrating multiple data sets, particularly public and private data sources

- Research alternatives for minimizing data suppression

Project Oversight and liaison with U.S. Department of Transportation and U.S. Census Bureau. This includes meetings of the AASHTO SCoP Census Working Group to lead the project by defining specific goals for each year and to review progress.

For both 1990 and 2000 CTPP, all states participated in the program. The benefit to the transportation community for a nationwide program is that data is available for all geographies. It is easier for the U.S. Census Bureau to process the ACS data files for the entire country rather than to pick and choose. It eliminates the need to track all requests to make sure that assistance is provided only to those States and MPOs who sponsored the project.

**Study Number:** 0003(017)  
**Status:** Contract signed  
**Title:** **Midwest States Pooled Fund Crash Test Program**  
**Lead Agency:** Nebraska Department of Roads  
**Study Partners:** CT, FL, IA, KS, MN, MODOT, MT, NE, OH, SD, TX, WI  
**100% SP&R**  
**Approval:** Approved  
**Objectives:** To crash test highway roadside appurtenances to assure that they meet criteria established nationally.  
**Comments:** Ongoing: Study has proved to be successful to this point, and will remain active going forward. For more information please refer to the Midwest Roadside Safety website: <http://www.mwrsf.unl.edu/>

**Study Number:** 0003(020)  
**Status:** Cleared by FHWA  
**Title:** **IVHS Study (ENTERPRISE)**  
**Lead Agency:** Iowa Department of Transportation  
**Study Partners:** AZ, CO, IA, KS, MI, MN, NC, VA, WA  
**100% SP&R**  
**Approval:** Pending Approval  
**Objectives:** To investigate and promote IVHS approaches and technologies that are compatible with other national and international IVHS initiatives.

**Study Number:** 0003(042)  
**Status:** Cleared by FHWA  
**Title:** **Aurora Program**  
**Lead Agency:** Iowa Department of Transportation  
**Study Partners:** IA, IL, MN, NY, PA, SD, VA, WI  
**100% SP&R**  
**Approval:** Approved  
**Objectives:** Aurora is an international program collaborative research, development and deployment in the field of road and weather information systems (RWIS), serving the interest and needs of public agencies. The Aurora vision is to deploy RWIS to integrate state-of-the-art road and weather forecasting technologies with coordinated, multi-agency weather monitoring infrastructures. It is hoped this will facilitate advanced road conditions and weather monitoring and forecasting capabilities for efficient highway maintenance, and provision of real-time information to travelers. (updated 7/7/01)  
**Comments:** Study is ongoing and will continue for the foreseeable future. Members contribute funds annually; propose research projects on RWIS-related projects (Road Weather Information Systems); manage contracts for the

research; and prepare reports/submit results for publication. One of Aurora's goals is to provide guidelines for RWIS implementation and usage. Refer to <http://www.aurora-program.org/> for project updates. (updated 2/7/02)

**Study Number:** 0003(049)  
**Status:** Contract signed  
**Title:** **Urban Mobility Study**  
**Lead Agency:** Texas Department of Transportation  
**Study Partners:** CA, CO, MD, MN, NY, OH, OR, PA, TX, WA  
**100% SP&R**  
**Approval:** Approved  
**Objectives:** 1) Form Steering Committee, which will decide on the congestion reduction methods to include in the new methodology and which cities will be included in study. 2) Continuously Refine the Congestion Index to include multimodal operations or regional operational improvement programs (i.e., ITS service, incident detection and response, travel demand management, transportation systems management, and computerized signal control coordination. 3) Maintain Existing Congestion Measures. 4) Add Additional Urban Areas 5) Respond to Requests for Mobility Data.  
**Comments:** Ongoing. States are still encouraged to participate. (2/7/02)

**Study Number:** 0003(074)  
**Status:** Cleared by FHWA  
**Title:** **Pavement Research and Technology**  
**Lead Agency:** Washington State Department of Transportation  
**Study Partners:** MN, TX, WA  
**100% SP&R**  
**Approval:** Approved  
**Objectives:** Under this project, each state will create funding to allow technical staff and university researchers to participate in a series of project meetings focused on sharing information, identifying critical issues of mutual interest, developing plans for joint research and testing, and educating transportation professionals on the latest developments in the design, construction, reconstruction and maintenance of highway pavements. (updated 7/7/01)  
**Comments:** The participating states have met 11 times to discuss pavement issues and to visit various venues such as Waterways Experiment Station, National Center for Asphalt Technology, and Western Research Institute. The project will run through the year 2005. (updated: 10/16/03)

**Study Number:** TPF-5(004)  
**Status:** Contract signed

<b>Title:</b>	<b>Long Term Pavement Performance (LTPP) Specific Pavements Study (SPS) Traffic Data Collection</b>
<b>Sponsoring Agency:</b>	Federal Highway Administration
<b>Lead Agency:</b>	Federal Highway Administration
<b>Contractor:</b>	International Road Dynamics, Inc., MACTEC
<b>Study Partners:</b>	AZ, CO, CT, FL, GA, ID, IL, KS, LA, MD, MI, MN, MS, NM, NY, OH, PA, TX, VA
<b>100% SP&amp;R Approval:</b>	Approved
<b>Objectives:</b>	The goal of this study is to improve the quality and quantity of monitored traffic data (volumes, classifications, and weights) on the LTPP SPS -1,-2,-5,-6 and -8 projects. A core objective of the SPS studies is to understand and quantify the relationship between pavement performance, truck volumes, and axle loadings.
<b>Comments:</b>	<p>This is a two-phase project. Phase I involves assessing, evaluating, and calibrating Weigh-In-Motion (WIM) systems at the SPS sites. Phase II involves procuring, installing, repairing, and maintaining the WIM equipment at the test sites.</p> <p>The Phase I contract was awarded August 2003. A draft RFP for Phase II was sent out for industry comment the summer of 2003. A final RFP will be solicited the beginning of 2004.</p> <p>Although work is underway, States are still welcomed and encouraged to join this project. Visit the LTPP website at <a href="http://www.tfhrc.gov/pavement/ltp/spstraffic/index.htm">http://www.tfhrc.gov/pavement/ltp/spstraffic/index.htm</a> or contact Ms. Walker for details. 11/18/03</p>
<b>Study Number:</b>	TPF-5(029)
<b>Status:</b>	Contract signed
<b>Title:</b>	<b>High Occupancy Vehicle (HOV) Systems Pooled Fund Study</b>
<b>Sponsoring Agency:</b>	Federal Highway Administration
<b>Lead Agency:</b>	Federal Highway Administration
<b>Contractor:</b>	Battelle
<b>Study Partners:</b>	CA, FHWA, GA, MA, MD, MN, NJ, NY, TN, VA, WA
<b>100% SP&amp;R Approval:</b>	Approved
<b>Background:</b>	The High Occupancy Vehicle (HOV) Systems Pooled Fund Study (PFS) is intended to serve as a forum and provide an opportunity for the participants to identify, address and collectively take on the key issues and challenges that are common among public agencies that are responsible for managing and operating HOV facilities. The HOV PFS focuses on the critical program, policy, technical, and other issues that arise throughout the life cycle of an HOV facility. The HOV PFS also provides an opportunity to facilitate the interaction, sharing of information, and successful practices with a broader audience to advance and improve upon the current



	<p>state-of-the-practice related to the management, operation, and performance of HOV facilities.</p>
<b>Objectives:</b>	<p>The goal of this study is to assemble regional, State, and local agencies, service providers, and FHWA to: 1) identify issues common among HOV systems managers, operators, and service providers; 2) suggest approaches to addressing identified issues; 3) initiate and monitor projects intended to address identified issues; 4) provide guidance and recommendations and disseminate results; 5) provide leadership and coordinate with others with HOV interests; and 6) promote and facilitate technology transfer related to HOV issues nationally.</p>
<b>Scope of Work:</b>	<p>The following are offered as broad topics or examples of issues that might be addressed within the intended scope of the HOV PFS:</p> <ul style="list-style-type: none"><li>· HOV System program and policy issues;</li><li>· Facility, corridor, and system planning issues and techniques;</li><li>· Operational policies, procedures, and plans;</li><li>· Program support services and Transportation Demand Management issues;</li><li>· Air quality impacts and modeling tools;</li><li>· Transit facilities and intermodal transport;</li><li>· Facility and system design;</li><li>· Performance monitoring, evaluation, and reporting;</li><li>· Contracting and procurement practices and issues;</li><li>· Implementation and construction work zone issues;</li><li>· Enforcement and traffic incident management; and</li><li>· Marketing and public information outreach.</li></ul>
<b>Comments:</b>	<p>The HOV Systems PFS is now entering its third year. Five projects have been selected and are being initiated based on available funds. Details of the projects and products that have been produced to date are available at the HOV PFS web site at <a href="http://hovpfs.ops.fhwa.dot.gov/">http://hovpfs.ops.fhwa.dot.gov/</a>. An overview of current and future HOV PFS activities is available at <a href="http://hovpfs.ops.fhwa.dot.gov/overview.cfm">http://hovpfs.ops.fhwa.dot.gov/overview.cfm</a>.</p> <p>Desired level of contribution is \$50,000 per year for each agency. However, desired level of commitment may vary, based on size and type of agency (e.g. county and city). Desired minimum level of contribution is \$10,000 per year per agency. State Agencies may join online. Other agencies, such as cities, counties, regional transportation agencies, toll authorities, and port authorities, may join by submitting a commitment form available at the HOV PFS web site via the link below.</p>
<b>Study Number:</b> <b>Status:</b>	TPF-5(039) Contract signed

<b>Title:</b>	Falling Weight Deflectometer (FWD) Calibration Center and Operational Improvements
<b>Sponsoring Agency:</b>	Federal Highway Administration
<b>Lead Agency:</b>	Federal Highway Administration
<b>Contractor:</b>	Cornell University
<b>Study Partners:</b>	CA, CO, FHWA, GA, IA, IN, KS, MN, MS, MT, ND, NJ, NY, PA, SC, SD, TX, WA
<b>Background:</b>	The SHRP/LTPP FWD Calibration Protocol was implemented in 1992 and since then, hundreds of calibrations have been performed in the U.S. Since that time the experience gained calibrating FWDs has shed light on opportunities for improving the calibration process, however changes in computer technology have rendered some calibration equipment nearly obsolete. Many State Highway Agencies have expressed interest in updating the FWD calibration software and equipment and establish a long term plan for support of the calibration facilities and their services.
<b>Objectives:</b>	To update the SHRP/LTPP FWD Calibration equipment, software, protocol and develop and implement long-term plans for FWD calibration centers.
<b>Scope of Work:</b>	The contract has a base period of 2 years with 3 option years. The base period work will include updates to the calibration procedure, equipment, software and documentation, as well as training and installation for at least 4 existing calibration facilities. The option year work will be performed by task order, based on those work items deemed highest priority by the study participants.
<b>Study Number:</b>	TPF-5(066)
<b>Status:</b>	Cleared by FHWA
<b>Title:</b>	<b>Material and Construction Optimization for Prevention of Premature Pavement Distress in PCC Pavements</b>
<b>Lead Agency:</b>	Iowa Department of Transportation
<b>Study Partners:</b>	GA, IA, IN, KS, LA, MI, MN, MODOT, NC, NY, OH, TX, WI
<b>100% SP&amp;R</b>	
<b>Approval:</b>	Approved
<b>Objectives:</b>	To seek ways to optimize materials selection and construction methods to improve the longevity of Portland cement concrete pavements.
<b>Comments:</b>	Solicitation due date: December 31, 2002
<b>Study Number:</b>	TPF-5(080)
<b>Status:</b>	Cleared by FHWA
<b>Title:</b>	<b>Investigation of Low Temperature Cracking in Asphalt Pavements</b>
<b>Lead Agency:</b>	Minnesota Department of Transportation
<b>Study Partners:</b>	CT, IA, ID, IL, KS, MN, ND, NY, VT, WI

**100% SP&R****Approval:**

Approved

**Background:**

Low temperature cracking is the most prevalent distress found in asphalt pavements built in cold weather climates. As the temperature drops the restrained pavement tries to shrink. The tensile stresses build up to a critical point when a crack is formed and partial stress relief occurs. The current Superpave specification attempts to address this issue by specifying a limiting low temperature for the asphalt binder. The specification does a reasonable job predicting performance of conventional asphalt cements, but this does not hold true for polymer-modified asphalt binders that are manufactured to reach very cold temperature grades needed in cold climates. Typically the base asphalt binder controls the low temperature properties. As an example a PG 58-34 is made with an xx-34 grade asphalt and polymer is added to achieve the high end (58). Currently the low temperature specification considers only the asphalt binder. Specifications must be developed for the complete asphalt mixture. Although low temperature cracking appears to be controlled by a single-event mechanism, it is very important to understand the mechanism of crack initiation and propagation. These cracks can be initiated by traffic loading, cycles of temperature changes, and then propagated by a large drop in temperature. In addition, the significant effects of aging and moisture on crack formation and propagation is also not fully understood and needs investigation.

**Objectives:**

The development of a fracture-mechanics-based specification is one of the objectives of this study. It will allow for a better selection of asphalt binders and mixtures with respect to their resistance to crack formation and propagation. This fracture mechanics approach will also be used to investigate the detrimental role of aging and moisture to fracture resistance of asphalt materials.

**Scope of Work:**

Utilize a national Technical Advisory Panel (TAP) to assist in the selection and development of testing methods that measure fundamental material properties related to low temperature cracking.

- Collect samples and mix designs from participating states and industry and run all recommended new testing methods.
- Correlate the test results with documented field performance.
- Develop and refine the most promising new testing methods for low temperature cracking.
- Calibrate and validate the thermal cracking model in the 2002 AASHTO design guide.
- Select mix designs for the reconstruction of MnROAD.

Construction and field validation at MnROAD will be completed in the next phase of the study.

**Comments:**

It is anticipated that each state will contribute

\$50,000 for this project. The funds can be transferred per the agencies discretion into three possible fiscal years 2004, 2005, and 2006. Committing states are asked to do so electronically.

<b>Study Number:</b>	TPF-5(090)
<b>Status:</b>	Cleared by FHWA
<b>Title:</b>	<b>Pavement Tools Consortium</b>
<b>Lead Agency:</b>	Washington State Department of Transportation
<b>Study Partners:</b>	CA, FL, ID, IL, KS, MD, MN, TX, WA
<b>Commitments Received:</b>	\$700,000
<b>100% SP&amp;R Approval:</b>	Approved
<b>Background:</b>	<p>In May 2000, the University of Washington (UW) embarked on a project for the development of a set of pavement tools that can be used by a DOT or paving contractor to improve communication, training and design/construction for the pavement topic area. A key is the use of enabling technologies, such as the Internet and digital media (DVDs and CDs). This concept allowed for the organization of these products into a broad-based format that is easy to access, straightforward to use, and upgraded quickly.</p> <p>Funding for these products has come from a variety of sources including:</p> <ul style="list-style-type: none"><li>· Washington State DOT (WSDOT)</li><li>· Maryland State Highway Agency (Maryland SHA)</li><li>· National Asphalt Pavement Association (NAPA)</li><li>· Transportation Northwest (TransNow)</li><li>· Federal Highway Administration</li></ul> <p><b>Objectives:</b> The objective of the Pavement Tools Consortium (PTC) is to develop and use HMA-oriented, computer-based pavement tools. The major focus of the Consortium is the enhancement of pavement-related training and construction. The goal of the PTC is to further develop and provide pavement tools. Examples include:</p> <ul style="list-style-type: none"><li>· HMA View Database</li><li>· Interactive Pavement Training CD/DVD (including the Virtual Superpave Laboratory)</li><li>· Computer Simulations</li><li>· Distance Learning Content and Delivery</li><li>· Computation Software (EverFe, EverFlex, etc.)</li></ul> <p>Identification of specific pavement tools and the necessary</p>

development efforts will be coordinated through an annual Consortium meeting and electronic communication. The initial collaborative duration is five years. The number of products and versions developed depends on the total annual funding available.

**Scope of Work:** The primary focus for the PTC includes five related areas. The degree of research and development accomplished for each depends on the amount of funding that is available and the agreed upon priorities. These areas currently are:

- HMAView Database
- Interactive Pavement Training CD/DVD Products (includes the VSL)
- Computer Simulations
- Distance Learning Content and Delivery
- Computation Software (EverFe, EverFlex, etc.)

The Consortium members will be provided all the pavement tools shown above and others as they are produced including new versions. Software tools such as HMAView will be limited to use within the participating Consortium member's agency or company. UW will provide support in the form of documentation, troubleshooting, etc. The individual tools can be viewed as an integrated whole; the separate pieces can be made to compliment the others (analogous to Microsoft Office which has separate but complimentary tools such as Word, Excel, PowerPoint, etc.). As currently envisioned, the pavement tools are sorted by the following categories:

**HMAView:** HMAView would be made available to each Consortium member. The software would not be directly adopted for each agency or contractor but modified to maximize the benefit for all Consortium members. The data that is entered and viewed is currently customizable by the user. Near term, updates will include an extensive mapping capability that allows for GPS location of specific field tests. Consortium members will be given access to source code of HMAView for agency or company specific modifications. See Appendix A for the current status of HMAView.

**Interactive Pavement Guide:** The interactive pavement guide would continue to be expanded and improved. A straightforward process would be created that would allow local content to be added by the Consortium members. This Guide, or versions of it, can be produced in languages other than English. A need for more training in Spanish has been expressed by DOTs in Maryland and Texas.

Computer Simulations: The currently available "virtual roller" would be made available to all Consortium members. This will be improved over time. The Consortium members will suggest additional tools, like the roller, that would best serve their training needs. Another planned computer simulation is the VSL.

Distance Learning Content and Delivery: Distance Learning (DL) is a rapidly evolving education delivery approach and the other Pavement Tools will significantly aid this process. The UW team will deliver pavement-related content for the members or aid the Consortium members in conducting their own. Such training is intended to supplement existing training venues already available. DL is an exciting and evolving training delivery approach.

Computation Software: Software such as EverFe (finite element analysis tool for plain jointed concrete pavements) and EverFlex (finite element analysis tool for flexible pavement) will be provided to Consortium members for their use. Documentation and training will be provided. If related computational tools are developed via the Consortium, those too will be distributed to members. EverFlex, for example, can accommodate non-uniform tire contact pressures.

**Comments:** States interested in joining the study may do so by contacting the lead agency contact for more information. Our goal is to involve a maximum of 10 states that will contribute \$20,000 per year for 5 years.

**Study Number:** TPF-5(092)  
**Status:** Cleared by FHWA  
**Title:** **Clear Roads (Test and Evaluation of Materials, Equipment and Methods for Winter Highway Maintenance)**  
**Lead Agency:** Wisconsin Department of Transportation  
**Study Partners:** IA, IN, MN, WI  
**Contract Amount:** \$170,000  
**Commitments**  
**Received:** \$225,000  
**100% SP&R**  
**Approval:** Approved  
**Background:** State departments of transportation are aggressively pursuing new technologies and practices to improve winter highway maintenance. Current research efforts address one or more aspects of the complex task of anticipating and responding to snow and ice events on highways and bridges across local and state jurisdictions. Considerable effort is directed at developing, deploying and evaluating sensing and communication technologies collected

	<p>under the umbrella of anti-icing and road weather information systems (AI/RWIS). Some evaluation of anti-icing and de-icing materials and snow and ice removal equipment is also being carried out--a much needed effort. For the most part, however, these testing activities are related to the properties and characteristics of the materials and equipment in and of themselves--that is, how they meet specifications or perform on standard lab tests. What is needed, in addition, is related field-testing/follow-up.</p>
<b>Objectives:</b>	<p>Conduct structured field testing and evaluation across a range of winter conditions and different highway maintenance organizational structures to assess the practical effectiveness, ease of use, optimum application rates, barriers to use, durability, and so on, of innovative materials, equipment and methods for improved winter highway maintenance.</p>
<b>Scope of Work:</b>	<p>This proposal outlines a new transportation pooled fund research project to investigate the applicability of various winter maintenance materials, equipment and methods for use by state and local highway maintenance crews. The pooled fund will be ongoing, with new projects undertaken as previous work is completed. The Wisconsin Department of Transportation will be the lead agency, responsible for administration of the pooled fund and dissemination of results. Project partners who contribute funds to the study will appoint representatives to serve as members of the Technical Advisory Committee (TAC). The committee will be responsible for identifying needed research, selecting investigators, reviewing progress and approving deliverables.</p>
<b>Comments:</b>	<p>\$25,000 per year commitment requested from each state. More projects will be funded as additional commitments are received. To commit funds, please send an e-mail of interest to Kim Linsenmayer at <a href="mailto:kim.linsenmayer@ctcandassociates.com">kim.linsenmayer@ctcandassociates.com</a> or call 608-628-3806.</p>
<b>Study Number:</b>	TPF-5(093)
<b>Status:</b>	Cleared by FHWA
<b>Title:</b>	<b>North/West Passage Transportation Pooled Fund Program</b>
<b>Contract/Other Number:</b>	
<b>Sponsoring Agency:</b>	Minnesota Department of Transportation
<b>Lead Agency:</b>	Minnesota Department of Transportation
<b>Study Partners:</b>	MN, WI
<b>Contract Amount:</b>	\$75,000
<b>Commitments Received:</b>	\$175,000
<b>100% SP&amp;R Approval:</b>	Approved
<b>Background:</b>	The North/West Passage Corridor, which includes states along I-94 and I-90 from Wisconsin to Washington, is in its second year as

Transportation Pooled Fund (TPF) Study. The Corridor coalition is now soliciting participation in Phase II of the TPF Study, the focus of which is the integration on traveler information across state borders. Today in the North/West Passage Corridor states (North Dakota, Wisconsin, Minnesota, Washington, Idaho, Wyoming, Montana, and South Dakota) there are numerous systems for collecting, processing, and integrating transportation data, and for delivering the information to users. However, this information is not easily shared across state borders. Through their participation in the Pooled Fund Study, North Dakota, Minnesota, and Wisconsin sponsored the development of the North/West Passage Phase I projects, which were selected and approved by the membership. The initial focus of Phase I projects was on the I-94 Corridor within the three funding states. It is envisioned that commitment from other states will expand the geographic focus of Phase II. Phase I projects, which started in March 2004, included development of an Interface Control Document to facilitate the exchange of traveler information data between North Dakota and Minnesota for delivery via each states 511 traveler information service. Also included is the development of plans for integrating Dynamic Message Sign (DMS) operations and bridge deck anti-icing systems across state lines in preparation for a planned system deployment. Focus was also placed on the development of a website for communication of North/West Passage information. For additional information on Phase I projects please visit: <http://www.nwpassage.info>.

**Objectives:**

The goals of this TPF study are to implement and evaluate integrated traveler information systems and coordinate maintenance operations across state borders. Using appropriate delivery systems, traveler information will be made available to internal staff and the traveling public via 511, dynamic message signs and other systems. The long-term vision of the North/West Passage Corridor states is to utilize effective methods for sharing, coordinating, and integrating traveler information across state borders and to influence ongoing standards development.

**Scope of Work:**

The North/West Passage TPF study is pursuing issues and proposed projects that were identified and selected by the membership for Phase II. This membership driven process is intended to ensure that members benefit from their investment in the North/West Passage TPF study. The objective of Phase II of the North/West Passage TPF Study Projects is to develop a North/West Passage ITS Integrated Corridor Strategic Plan. The key elements of this plan are; · Development of a corridor architecture with a focus on center-to-center data sharing across state borders, · Inventory of communication infrastructure for the entire corridor, · Development of a coordinated concept of operations for the sharing of traveler information across state



	<p>borders. Suggested projects for the corridor to pursue will be identified. For your information, the Phase II Work Plan approved by the membership is included in the Study Documents section below.</p>
<b>Comments:</b>	<p>The Minnesota Department of Transportation has taken the initial lead in the development of the coalition. We strongly encourage all states along the corridor to participate in Phase II. The estimated cost of the ITS Integrated Corridor Strategic Plan is \$200,000. The recommended contribution for each state is \$25,000 per year. We are also encouraging states to make a two-year commitment. To join the North/West Passage TPF Study, complete the online commitment form at <a href="http://www.pooledfund.org">www.pooledfund.org</a>. State Departments of Transportation and others may become participants at any time during the year by committing funds to the North/West Passage TPF Study. Early submission of the online commitment form is encouraged to enable all states to participate in the selection of projects to be initiated in FY 2005. For additional information on joining the North/West Passage TPF Study, contact Mark Nelson, 651-284-3484 <a href="mailto:mark.nelson@dot.state.mn.us">mark.nelson@dot.state.mn.us</a></p>
<b>Study Number:</b>	TPF-5(099)
<b>Status:</b>	Cleared by FHWA
<b>Title:</b>	<b>Evaluation of Low Cost Safety Improvements</b>
<b>Lead Agency:</b>	Federal Highway Administration
<b>Study Partners:</b>	FL, IA, IN, KS, MD, MN, MT, NY, OK, PA, TX, VA
<b>Commitments Received:</b>	\$1,305,000
<b>100% SP&amp;R Approval:</b>	Approved
<b>Background:</b>	<p>This project will encompass safety-effectiveness evaluations of priority strategies from the NCHRP Report 500 Guidebooks, Guidance for Implementation of the AASHTO Strategic Highway Safety Plan. The safety effectiveness of many of the strategies in the guidebooks has not yet been rigorously evaluated. In order to achieve a national goal shared by the USDOT, AASHTO, and GHSA to reduce the fatality rate to 1.0 and save 9,000 lives annually by 2008, these "tried" and "experimental" strategies will need to be appropriately implemented. In this project, therefore, data will be collected and before-after safety effectiveness evaluations will be performed at sites where selected safety strategies are being implemented. A steering committee, comprised of pooled fund State DOT representatives, will provide guidance on the strategies selected for evaluation.</p>
<b>Objectives:</b>	<p>The goal of the proposed research is to develop reliable estimates of the safety effectiveness of safety improvements identified as strategies in the NCHRP Report 500 Guidebooks through</p>

<b>Scope of Work:</b>	<p>scientifically rigorous before-after evaluations of sites within the U.S. where these strategies are being implemented.</p> <p>The scope of the Low Cost Safety Improvements Pooled Funds Study is to conduct a research project of priority strategies from all of the NCHRP Report 500 Guidebooks. A target of 24 strategies totaling \$6M over three years is planned, but this will vary depending on the level of support. The data for the study will be gathered from those states that implement the strategies throughout the US. The methodology utilized will typically be an Empirical Bayes evaluation, using before-after data (where the safety improvements are made, as well as untreated base locations), to help determine their effectiveness in reducing the number and severity of crashes. The data will be collected, and evaluation studies performed, as the strategies are implemented over the course of a few years. The greater the number of States implementing the strategies, the faster the rate of after data collection will be collected. This will in turn shorten the total time for each evaluation. The implementation of the strategies and the evaluations will be staggered; grouping a small number of the evaluations together, as appropriate.</p>
<b>Comments:</b>	<p>This project is open to any number of participating states, independent of involvement with the lead state initiative supporting implementation of the AASHTO Strategic Highway Safety Plan. The minimum target amount of funding requested by the participating states should be \$30,000-50,000 per year for three years, totaling (for all states pooled funds) \$3M over 3 years. States wishing to be involved in more than one improvement area (e.g. lane departure, aggressive driving, etc.) are asked to consider increasing their contributions accordingly. FHWA will contribute \$1.5M total, and additional funds will be solicited from other sources.</p>

<b>Study Number:</b>	TPF-5(114)
<b>Status:</b>	Cleared by FHWA
<b>Title:</b>	<b>Roadside Safety Research Program</b>
<b>Sponsoring Agency:</b>	Washington State Department of Transportation
<b>Lead Agency:</b>	Washington State Department of Transportation
<b>Study Partners:</b>	AK, LA, MN, TN, TX, WA
<b>Commitments Received:</b>	\$500,000
<b>100% SP&amp;R Approval:</b>	Approved

<b>Background:</b>	Many state DOT's have sponsored research on roadside safety issues that include crash testing of features in accordance with FHWA adopted standards (NCHRP Report 350). Many of the research and functional problems are common to more than one state and so there is efficiency and cost effectiveness in pooling resources to conduct certain crash tests.
<b>Objectives:</b>	To establish an ongoing roadside safety research program that will meet the research and functional needs of participating states in a cost-effective and timely manner.
<b>Scope of Work:</b>	<p>A committee of representatives from participating states will form a technical committee to identify common research needs, select projects for funding and oversee implementation of results. Specific research activities addressed within the program will include the design, analysis, testing, and evaluation of crashworthy structures, and the development of guidelines for the use, selection and placement of these structures. Crashworthy structures to be addressed include bridge rails, guardrails, transitions, median barriers, portable concrete barriers, end treatments, crash cushions, culverts, breakaway support structures (e.g. sign supports, luminaire supports, mailboxes), and work zone traffic control devices. Research will also address the influence of highway features such as driveways, slopes, ditches, shoulders, medians, and curbs on single vehicle collisions. The problems identified with these structures and features will be addressed through in-service performance evaluation studies, computer simulation, full-scale crash testing, clinical analyses, real-world crash data, and benefit costs analyses. The specific identification, selection and prioritization of research issues will be made by the technical committee on an annual basis, unless emerging issues require committee decisions in the interim.</p>
<b>Study Number:</b>	TPF-5(116)
<b>Status:</b>	Cleared by FHWA
<b>Title:</b>	<b>Investigation of the Fatigue Life of Steel Base Plate to Pole Connections for Traffic Structures</b>
<b>Sponsoring Agency:</b>	Texas Department of Transportation
<b>Lead Agency:</b>	Texas Department of Transportation
<b>Study Partners:</b>	CA, CO, IA, MN, NC, PA, TX, WY
<b>Commitments Received:</b>	\$286,000
<b>100% SP&amp;R Approval:</b>	Approved
<b>Background:</b>	The project is proposed to investigate what improvements can be made to the base plate to pole connections for traffic structures, such as socket welds, to improve their fatigue life. Recent research on the fatigue life of traffic signal mast arm to pole socket welded connections has shown that the fatigue category of this detail is E <sub>2</sub> and sometimes less. The addition of stiffeners did increase the

fatigue performance, but not to the level predicted by the AASHTO Specifications. This research has also shown that small changes in various connection details, such as plate thickness, bolt pattern, and stiffener pattern, can improve the fatigue life of the connection. More research is needed to develop a better understanding of the effect of these changes, and to provide a systematic way that this knowledge can be incorporated into the design process and the AASHTO specifications for signal poles, high mast illumination poles, and other traffic structures.

**Objectives:****Objectives**

1. Develop a comprehensive list of connection details that affect the fatigue life of various commonly used connection details
2. Determine which changes to these details could feasibly and most cost effectively be used to increase the fatigue life of base plate to pole connections, with and without stiffeners
3. Determine a quantitative relationship between the changes in the details and their effect on the fatigue life of the connection
4. Develop a fatigue design guide that would show designers how they could quantitatively use the various recommended changes for use in their fatigue designs
5. Develop language to incorporate the above guide into the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals

**Scope of Work:****Phases****1) Literature review**

A review of literature and recent research in the field of fatigue to provide a good idea of what kind of tests have been performed, which ones are worth expanding on, and what factors effect the fatigue life of the connection.

**2) Develop test plan**

After a list of fatigue life influencing factors has been put together, develop a test matrix. The matrix will show which factors or details are going to be tested, the range to test over, the number of tests required, and any combination of factors or details that should be tested together. The matrices shall then be reviewed by fabricators and contributing agencies to ensure that all tests are worthwhile and that other factors that may be important or useful will also be considered. This will help to ensure that the results from testing will yield feasible and cost effective solutions.

**3) Testing**

Since the number of tests required to develop an in depth understanding of the wide gamut of connection possibilities would be quite large, and the costs and time required for such tests also quite large, Finite Element Models (FEM) may be used. These

models will be correlated with actual tests, and they will allow an increase in the number of combinations and changes that can be evaluated with a fixed budget and in a reasonable amount of time.

#### 4) Summarize Results

The results should be summarized in three ways.

1. A final report detailing all of the tests, the test methods, literature review, results, and conclusions.
2. A fatigue design guide which outlines how to quantitatively include improvements in the connection detail in the design process.
3. A list of changes to the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals to recommend to the AASTHO T-12 Committee.

**Study Number:**

TPF-5(129)

**Status**

Cleared by FHWA

**Title:**

**Recycled Unbound Pavement Materials (MnROAD Study)**

**Sponsoring Agency:**

Minnesota Department of Transportation

**Lead Agency:**

Minnesota Department of Transportation

**Study Partners:**

CA, MI, MN, OH, TX, WI

**100% SP&R Approval:**

Approved

**Background:**

In the current global economy, the United States is in competition for non-renewable resources. In this country and Minnesota in particular, aggregate materials are being depleted at a rapid pace. Environmental stewardship will continue to be more restrictive along with permitting criteria. It is becoming increasingly important to investigate the use of recycled materials in pavement construction.

Minnesota has had a long history of using recycled materials in pavement construction. Recycled materials have been used in all layers of the pavement, from the surface down to the unbound supporting layers. Mn/DOT's current Class 7 specification (Spec 3138) allows salvaged or recycled HMA, PCC, and glass to be used as part of the granular base materials. However, their material properties (strength, stiffness, unsaturated properties, etc.) are not well understood. Under the current design procedures, Class 7 materials are assigned the same empirical properties as a typical Class 5 (gravel) material. New mechanistic-empirical design procedures require more detailed material properties in order to accurately predict pavement performance.

In addition, the use of crushed concrete in particular has raised some environmental concerns. These concerns have focused on the relatively high pH of the effluent produced by drainage systems

that remove water from untreated recycled concrete aggregate foundation layers. Also of concern is the identification of some constituents (arsenic, chromium, aluminum, and vanadium) that are considered hazardous in drinking water.

Related studies include:

- NCHRP 4-31: Tests of Recycled Aggregates for Use in Unbound Pavement Layers - recommend procedures for performance-related testing and selection of recycled HMA and PCC materials for use as aggregates in unbound pavement layers, singularly or in combination with other materials (currently underway - ERES)
- RMRC Project 6 - Evaluation of Tests for Recycled Material Aggregates for Use in Unbound Applications - evaluating potential aggregate materials other than reclaimed HMA and PCC (currently underway - New Hampshire)
- Sensitivity Analysis of Flexible Pavement Response and AASHTO 2002 Design Guide to Properties of Unbound Layers - compared predictions and field response calculated from isotropic and anisotropic models; results from the 2002 DG model surprisingly showed that base properties did not influence deformation (ICAR Report 504-1, 2004 - Texas A&M).
- Use of Crushed Concrete Products in Minnesota Pavement Foundations - studied environmental and performance concerns and provided recommendations for revisions to current specifications (Mn/DOT Report 96-12, 1996 - Mark Snyder)
- LRRB 812: Resilient Modulus & Strength of Base Course with Recycled Asphalt - investigate the criteria for using recycled materials with respect to resilient modulus and strength of laboratory specimens (currently underway - University of Minnesota)

Most of the current and former research projects using recycled materials are based on laboratory material characterization and mix design. The research proposed in this pooled fund study seeks to validate many of the previous findings with field performance data. The design guide modeling performed at Texas A&M is also in need of field validation. There is some anecdotal evidence of existing recycled base materials, but this research would provide a controlled field experiment in which quantifiable results could be obtained. This research would also provide a good opportunity to revisit some of the environmental concerns and address ways to mitigate the ill effects of effluent from the recycled concrete base layer. This research will help broaden the application of mechanistic-empirical pavement design methods to the use of recycled materials.

**Objectives:**

The objective of this study is to monitor the performance of several test cells at the Minnesota Road Research Facility (MnROAD)

constructed using recycled materials in the granular base layers, including blended with virgin materials and 100% recycled asphalt and concrete pavement materials. The material properties will be monitored during construction and throughout the pavement life in order to determine their effects on pavement performance. The properties will be used to verify mechanistic-empirical design inputs, especially their variation with changing seasons and moisture regimes.

**Scope of Work:**

This pooled fund study is strictly to perform the recycled materials research on newly built test sections at MnROAD, and its funding will come from Mn/DOT and other participating states. The funding for initial construction of the test sections will be obtained separately from Mn/DOT and other partners.

This project is expected to consist of the following activities:

- Work Plan: The work plan for this pooled fund study will be developed by the participating organizations. This will include selecting recycled materials to construct the base layer for 3 cells at MnROAD. Possibilities include:

- o 100% crushed concrete
- o crushed concrete blended with virgin aggregate
- o RAP blended with virgin aggregate

The pavement surface must also be carefully selected for these sections. Ideally, the same pavement will cover all three cells so as to minimize variables in the experiment.

- Instrumentation Design: Thermocouples, TDRs (moisture), strain gages, etc.

- General Testing & Monitoring: Monitor the pavement performance over time on each test section. Monitoring activities will include FWD tests, rutting measurements, distress surveys, ride measurements, and analysis of pavement sensor data.

- Special Testing & Monitoring: Unsaturated soil properties, resilient modulus, seasonal variation of material properties, etc.

- Design Guide Modeling & Validation: The material properties for recycled unbound layers will be modeled in the new mechanistic-empirical design procedure.

- Pooled Fund Travel: Money for each state to travel to discuss the progress of the study.

- Data Analysis & Reports: Work done under a research contract will develop interim and final reports that document the findings of this study.

**Study Number:**

TPF-5(129)

**Status:**

Cleared by FHWA

**Title:****Recycled Unbound Pavement Materials (MnROAD Study)****Sponsoring Agency:**

Minnesota Department of Transportation

**Lead Agency:** Minnesota Department of Transportation  
**Study Partners:** CA, MI, MN, OH, TX, WI  
**100% SP&R Approval:** Approved  
**Background:** In the current global economy, the United States is in competition for non-renewable resources. In this country and Minnesota in particular, aggregate materials are being depleted at a rapid pace. Environmental stewardship will continue to be more restrictive along with permitting criteria. It is becoming increasingly important to investigate the use of recycled materials in pavement construction.

Minnesota has had a long history of using recycled materials in pavement construction. Recycled materials have been used in all layers of the pavement, from the surface down to the unbound supporting layers. Mn/DOT's current Class 7 specification (Spec 3138) allows salvaged or recycled HMA, PCC, and glass to be used as part of the granular base materials. However, their material properties (strength, stiffness, unsaturated properties, etc.) are not well understood. Under the current design procedures, Class 7 materials are assigned the same empirical properties as a typical Class 5 (gravel) material. New mechanistic-empirical design procedures require more detailed material properties in order to accurately predict pavement performance.

In addition, the use of crushed concrete in particular has raised some environmental concerns. These concerns have focused on the relatively high pH of the effluent produced by drainage systems that remove water from untreated recycled concrete aggregate foundation layers. Also of concern is the identification of some constituents (arsenic, chromium, aluminum, and vanadium) that are considered hazardous in drinking water.

Related studies include:

- NCHRP 4-31: Tests of Recycled Aggregates for Use in Unbound Pavement Layers - recommend procedures for performance-related testing and selection of recycled HMA and PCC materials for use as aggregates in unbound pavement layers, singularly or in combination with other materials (currently underway - ERES)
- RMRC Project 6 - Evaluation of Tests for Recycled Material Aggregates for Use in Unbound Applications - evaluating potential aggregate materials other than reclaimed HMA and PCC (currently underway - New Hampshire)
- Sensitivity Analysis of Flexible Pavement Response and AASHTO 2002 Design Guide to Properties of Unbound Layers - compared predictions and field response calculated from isotropic and anisotropic models; results from the 2002 DG model surprisingly showed that base properties did not influence



deformation (ICAR Report 504-1, 2004 - Texas A&M).  
- Use of Crushed Concrete Products in Minnesota Pavement Foundations - studied environmental and performance concerns and provided recommendations for revisions to current specifications (Mn/DOT Report 96-12, 1996 - Mark Snyder)  
- LRRB 812: Resilient Modulus & Strength of Base Course with Recycled Asphalt - investigate the criteria for using recycled materials with respect to resilient modulus and strength of laboratory specimens (currently underway - University of Minnesota)

Most of the current and former research projects using recycled materials are based on laboratory material characterization and mix design. The research proposed in this pooled fund study seeks to validate many of the previous findings with field performance data. The design guide modeling performed at Texas A&M is also in need of field validation. There is some anecdotal evidence of existing recycled base materials, but this research would provide a controlled field experiment in which quantifiable results could be obtained. This research would also provide a good opportunity to revisit some of the environmental concerns and address ways to mitigate the ill effects of effluent from the recycled concrete base layer. This research will help broaden the application of mechanistic-empirical pavement design methods to the use of recycled materials.

**Objectives:**

The objective of this study is to monitor the performance of several test cells at the Minnesota Road Research Facility (MnROAD) constructed using recycled materials in the granular base layers, including blended with virgin materials and 100% recycled asphalt and concrete pavement materials. The material properties will be monitored during construction and throughout the pavement life in order to determine their effects on pavement performance. The properties will be used to verify mechanistic-empirical design inputs, especially their variation with changing seasons and moisture regimes.

This pooled fund study is strictly to perform the recycled materials research on newly built test sections at MnROAD, and its funding will come from Mn/DOT and other participating states. The funding for initial construction of the test sections will be obtained separately from Mn/DOT and other partners.

**Scope of Work:**

This project is expected to consist of the following activities:

- Work Plan: The work plan for this pooled fund study will be developed by the participating organizations. This will include selecting recycled materials to construct the base layer for 3 cells at MnROAD. Possibilities include:
  - o 100% crushed concrete

- o crushed concrete blended with virgin aggregate

- o RAP blended with virgin aggregate

The pavement surface must also be carefully selected for these sections. Ideally, the same pavement will cover all three cells so as to minimize variables in the experiment.

- Instrumentation Design: Thermocouples, TDRs (moisture), strain gages, etc.

- General Testing & Monitoring: Monitor the pavement performance over time on each test section. Monitoring activities will include FWD tests, rutting measurements, distress surveys, ride measurements, and analysis of pavement sensor data.

- Special Testing & Monitoring: Unsaturated soil properties, resilient modulus, seasonal variation of material properties, etc.

- Design Guide Modeling & Validation: The material properties for recycled unbound layers will be modeled in the new mechanistic-empirical design procedure.

- Pooled Fund Travel: Money for each state to travel to discuss the progress of the study.

- Data Analysis & Reports: Work done under a research contract will develop interim and final reports that document the findings of this study.

**Study Number:**

TPF-5(134)

**Status:**

Cleared by FHWA

**Title:**

**PCC Surface Characteristics - Rehabilitation (MnROAD Study)**

**Sponsoring Agency:**

Minnesota Department of Transportation

**Lead Agency:**

Minnesota Department of Transportation

**Study Partners:**

FHWA, MN, TX

**100% SP&R Approval:**

Approved

**Background:**

People desire smooth, quiet, and safe pavements. To encourage smooth pavements, we need to quantify the effects of other important pavement performance parameters on ride. These parameters include texture, noise, and friction. An understanding of the interaction of texture and ride is still very rudimentary. In 2002 the Mn/DOT Concrete Engineering Unit and the Concrete Pavers Association of Minnesota created a test section on TH 212 at Bird Island to study the effects of texture and joints in pavement smoothness. The results showed that profile index was affected by texture and joints. However, data is so far insufficient to define a global correlation between texture values and their effect on ride, and the results obtained for the effects of joints on ride were not conclusive because of unanticipated construction issues.

One option is for rehabilitating Portland cement concrete

pavements without the need to restore structural capacity is to diamond grind the surface. This process removes much of the pavement roughness and restores texture and friction. Many variables play into the grinding operation, such as blade spacing, depth of cut, kerf configuration, etc. There is a need for a standardized specification for diamond grinding. These parameters affect and govern the preponderant frequencies that cause noise when such frequencies are not randomized. Power spectrum density analysis of results obtained in the Bird Island Test section as well as profilometer-generated roughness showed that diamond grinding did improve the ride. The resulting texture and noise were not measured until 2005 when the FHWA PSC study team measured the site. Minor changes in the geometry of diamond grinding equipment tremendously affect the friction and noise performance, but the optimum geometry is still unknown.

This research item is in harmony with the CPTP track 4 of the CPTP road map. This track seeks better understanding of concrete pavement surface characteristics and provides tools for engineers to help meet pre-determined requirements for ride quality, quietness, safety against hydroplaning and splash/spray, and durability.

Related studies include:

- . TPF 962: Pavement Surface Properties Consortium: A Research Program (Virginia)
- . NCHRP 1-44: Measuring Tire-Pavement Noise at the Source (Illingworth & Rodkin, Inc.)
- . NCHRP 1-43: Guide for Pavement Friction (ERES)
- . TPF 956: PCC Surface Characteristics: Tire -Pavement Noise Program Part 3 - Innovative Solutions /Current Practices (Iowa State)
- . NCHRP 10-67: Texturing of Concrete Pavements (ERES)
- . Fundamentals of Tire/Road Interaction Noise (Purdue University)

The TPF 962 study mentioned above is meant to serve mainly the Eastern United States. The research proposed in this work could be seen as a parallel research study for the Upper Midwest. MnROAD provides a unique opportunity to measure surface characteristics of a variety of PCC pavements with various pieces of equipment in a safe and controlled environment. This research also serves as an extension/validation of several of the current NCHRP studies. The findings relating to measuring noise and frictional characteristics could be validated with a field study at MnROAD.

The current Purdue University study is expected to provide recommendations on pavement surface textures that can provide

**Objectives:**

desirable levels of safety and reduction in noise levels. Along with that may come some recommendations on grinding operations so as to mitigate noise issues. The research proposed in this pooled fund study would serve to validate the recommendations from Purdue. The use of power spectrum density analysis to better characterize tire-pavement noise is also a unique feature to this project. As public demand for quieter pavements increase this study can lead to improved methods for modifying existing PCC pavements to make them quieter without sacrificing friction.

Research findings will enable Mn/DOT to specify friction, ride, and texture ranges of values that will optimize quietness, ride, texture and friction in program delivery. It will reduce the incidence of uncomfortable ride, hydroplaning, and obnoxious whines. The average road user benefits from the results of this study.

Research outcomes will facilitate a family of curves and algorithms that will address the optimization for giving good friction, which unfortunately was interpreted by profilometers as pavement roughness as well as noise and friction.

We will have a prediction of noise level based on the grinding techniques. The project will provide data for optimization of pavement quietness, friction, texture and ride. We will be in a better position to improve our diamond grinding and texture specification if necessary. It will address the question as to what degree of total noise is generated by tire-pavement interaction.

Monitored over time, performance versus time characteristics will be obtained for various grinding techniques.

**Scope of Work:**

This pooled fund study is strictly to perform the surface characteristics research on rehabilitated test sections at MnROAD, and its funding will come from Mn/DOT and other participating states. The funding for the rehabilitation of the test sections will be obtained separately from Mn/DOT and other partners.

A 3-mile concrete section of old westbound I-94 runs parallel to the Mainline at MnROAD. It is possible to use this entire stretch for applying different surface rehabilitation techniques for the purposes of this study. Mn/DOT plans to create contiguous test sections of each of the following rehabilitation techniques:

- . Diamond grinding (several variations)
- . Grooving
- . Exposed aggregate
- . Acid etching

This project is expected to consist of the following tasks:

- . Work Plan: The work plan for this pooled fund study will be developed by the participating organizations.
- . Special Testing & Monitoring: A continuous testing and monitoring program will include:
  - o Profile runs with the single laser LWP on all strips.
  - o Profile runs with the multi laser LWP on all strips.
  - o Profile runs with the Australian Walking Profiler (ARRB WP) on textured and un-textured strips.
  - o Texture measurements at every 5-ft on the textured (each side) and the untextured strips with circular texture meter.
  - o Friction measurements with the FHWA skid trailer on the textured strips compared to the un-textured strips.
  - o Sound measurements (tire pavement interaction) on the textured and untextured strips with the NCAT trailer, close proximity measurements, or roadside measurements.
- . Noise Modeling & Validation: Apply the findings of this study to current noise modeling software (TNM, MINNOISE, etc.).
- . Pooled Fund Travel: Money for each state to travel to discuss the progress of the study.
- . Data Analysis & Reports: Work done under a research contract will develop interim and final reports that document the findings of this study.

<b>Study Number:</b>	TPF-5(139)
<b>Status:</b>	Cleared by FHWA
<b>Title:</b>	<b>PCC Surface Characteristics: Tire -Pavement Noise Program Part 3 - Innovative Solutions /Current Practices</b>
<b>Sponsoring Agency:</b>	Iowa Department of Transportation
<b>Lead Agency:</b>	Iowa Department of Transportation
<b>Study Partners:</b>	CA, FHWA, IA, MN, NY, TX, WA, WI
<b>100% SP&amp;R Approval:</b>	Approved
<b>Background:</b>	The purpose of this pooled fund study (Part 3) is to fully implement the PCC Surface Characteristics program. This project is related to a larger study involving two other parts (Part 1 and 2). Those two parts are summarized in the attached Appendix B. Part 3 will consist of the continuation of the comprehensive data collection and analysis program on new and existing pavements started in 2005; expand on it so that the research results have a broader range of applicability; and develop innovative texturing techniques that have the potential to significantly reduce noise.
<b>Objectives:</b>	At the completion of this overall study, it is anticipated that it will be possible to specify the desirable surface characteristics of individual projects prior to construction to meet the site specific requirements for noise, skid, texture, and smoothness.
<b>Scope of Work:</b>	States included in the pooled fund will be funding part of the field measurements and coordination of work for the new sites. This

work will target those projects from the earlier phase of the field study (Part 2) that show good results and are worth further evaluation relative to constructability and consistency. Also included will be projects that will involve new, innovative processes or equipment that is developed as the project moves forward.

In addition, the pooled fund will cover the cost of the on-going technology transfer that will provide the States the results of the overall study (Parts 1, 2, and 3) and the ways that they can incorporate the study results into their activities to meet noise, friction, and safety requirements. The technology transfer elements will be centered around on-site meetings with the management level staff members of each of the participating states. The technology transfer program will also include technical memorandums and conference presentations indicating the study results and recommendations.

Participation in the pooled fund does not require involvement in field site activities. States involved with the project that participate in field experiment sites will be required to provide staff and financial resources. The involvement varies in accordance with the type of project involved.

Type 1 (new) projects will involve the following activities:

- Pay for extra contractor costs for different textures that are to be used
- Provide traffic control for all testing activities
- Complete friction tests utilizing an ASTM E274 trailer along with an ASTM E 524 smooth tire

Type 2 (existing) and 3 (existing and new) projects will involve the following activities:

- Provide traffic control for all testing activities
- Complete friction tests utilizing an ASTM E274 trailer along with an ASTM E 524 smooth tire

<b>Study Number:</b>	TPF-5(144)
<b>Status:</b>	Cleared by FHWA
<b>Title:</b>	<b>Use of Video Feedback in Urban Teen Drivers</b>
<b>Sponsoring Agency:</b>	Iowa Department of Transportation
<b>Lead Agency:</b>	Iowa Department of Transportation
<b>Study Partners:</b>	IA, MN
<b>100% SP&amp;R Approval:</b>	Pending Approval

<b>Background:</b>	Newly licensed teens have an extremely high risk for crashes. According to the Insurance Institute for Highway Safety, in 2003 there were 5,691 teenagers (13-19 year olds) that died in motor vehicle crashes (IIHS, 2003). This amounts to more than a third of deaths from all causes for teenagers (Chen, Baker, Braver, & Li, 2000; IIHS, 2005). Thus, motor vehicle crashes are a primary cause of death amongst young teens. Moreover, teen drivers (15 to 19 years) are the demographic group with the largest number of fatalities in the state of Minnesota.
<b>Objectives:</b>	The objective of this project is to examine the use of event-triggered video feedback to reduce urban teen unsafe driving. Using system and parent feedback, we hope to significantly reduce the number of unsafe driving behaviors of newly licensed urban teens. This research project is different from other interventional studies because it gives clear, in-context driver feedback in the form of video and audio of the entire event. It is hoped that such feedback will help teen drivers improve their driving for the long-term so that they learn to anticipate other traffic and maneuvers.
<b>Scope of Work:</b>	<p>In response to the epidemic of teen driver fatalities, the Universities of Iowa and Minnesota propose leading a pilot project examining the use of new methods to motivate safe teen driving. This method will examine teen driving during the first 6-12 months after obtaining a driver license and is based on using an event-triggered video system to record and give feedback about unsafe driving behavior for teen drivers. The system provides two forms of feedback to the teen driver. First, the system gives blinks and LED to tell the driver that an event trigger has been detected and recorded. Second, video feedback recorded during the unsafe driving episodes is combined with a parent-teen `coaching` protocol. The coaching protocol is used to provide support for expected behavioral changes in teen drivers. This pilot research program will provide new insights that can be applied to the long-term development of positive driving habits for urban teens.</p> <p>The proposed study will recruit 40 teens (20 males and 20 females) from one high school in the twin cities area. This study would be built on the framework and protocols of a rural teen driver study currently underway in rural Tiffin, Iowa, being conducted by the University of Iowa.</p>

# **APPENDIX C**

## **MINNESOTA POOLED FUND PROJECTS**



**MN POOLED FUND PROJECTS WITH BALANCES BUT NOT CONTRIBUTED TO IN THE 2006 PROGRAM**  
**The table does not include NCHRP numbers.**

STATE	PROJ. NO.	PROJECT NAME	PROJECT STATUS	PROG. CODE	UNDER AGREEMENT	EXPENDITURE	BALANCE*
MINN	0002001	Application of Global Positioning System for Planning	Unknown	0800	15,000.00	11,368.44	3,631.56
MINN	0002002	Geographic Information System-Transportation ISTEAM Management Systems Server-Net Prototype	Unknown	0860	25,000.00	13,750.00	11,250.00
MINN	0002212	Non-nuclear Testing of Soils and Granular Bases Using the GeoGauge	Active	0860	12,000.00	0.00	12,000.00
MINN	0002212	Non-nuclear Testing of Soils and Granular Bases Using the GeoGauge	Active	Q560	24,000.00	13,501.17	10,498.83
MINN	0002126	Integrated Drainage Design Computer System (later labeled HYDRAIN)	Active - Completion Date: March 2, 1994	0800	38,000.00	37,260.03	739.97
MINN	0002136	FHWA Traffic Noise Model (FHWA TNM) Software, Validation, and Training	Active	0860	5,000.00	4,900.00	100.00
MINN	0002144	Testing of Large and Small Support Signs	Testing has concluded.	0800	10,000.00	9,900.00	100.00
MINN	0002146	Testing of Roadside Safety Systems	Unknown	0860	42,000.00	36,833.43	5166.57
MINN	0002146	Testing of Roadside Safety Systems	Unknown	Q560	50,000.00	20,688.97	29,311.03
MINN	0002155	Durability of Geosynthetics for Highway Application	Three final reports on task areas have been published. A 4 <sup>th</sup> final report on another task area is being processed.	0860	30,000.00	23,072.26	6,927.74
MINN	0002157	Detection Technology for IVHS	Project is complete - final report has been posted	0800	20,000.00	9,212.94	10,787.06

STATE	PROJ. NO.	PROJECT NAME	PROJECT STATUS	PROG. CODE	UNDER AGREEMENT	EXPENDITURE	BALANCE*
MINN	0002159	Interpretation of Road Roughness Profile Data	Cleared by FHWA but pending approval on 100% SPR	0860	30,000.00	23,428.25	6,571.75
MINN	0002163	Calcium Magnesium Acetate (CMA) at Lower Production Costs	Final report completed, project closed	0860	25,000.00	23,997.41	1,002.59
MINN	0002165	Horizontally Curved Steel Bridge Research Study	As of 6/22/01 the final rpts. are still in draft form	0860	15,000.00	12,702.31	2,297.69
MINN	0002166	Performance Evaluation of Crumb Rubber Modifier (CRM) in Asphalt Pavements	Project deliverables have been completed and the project has been closed out	0860	20,000.00	15,605.88	4,394.12
MINN	0002167	Development of Anti-Icing Treatments	The final rpt has been completed, project closed out	0860	20,000.00	19,900.00	100.00
MINN	0002168	Management of the Discharge and Quality of Highway Runoff in Karst Areas to Control Impacts on Ground Water	The final report for this study has been received and is under review. Plans are being considered for public release of the report	0860	23,000.00	22,746.49	253.51
MINN	0002168	Management of the Discharge and Quality of Highway Runoff in Karst Areas to Control Impacts on Ground Water	The final report for this study has been received and is under review. Plans are being considered for public release of the report	Q560	5,000.00	639.50	4,360.50
MINN	0002170	High Strength Concrete for Bridges	Supposed to be completed in '01 – delayed because of an environmental lawsuit	0860	180,000.00	27,460.03	152,539.97
MINN	0002171	Predicting HOV Facility Demand	Pending Approval	0860	30,000.00	24,980.02	5,019.98
MINN	0002174	Accelerated Pavement Testing of Crumb Rubber Modified Asphalt Pavements	FHW would like funds for this program to be used for another project	0860	87,000.00	61,129.00	25,870.50

STATE	PROJ. NO.	PROJECT NAME	PROJECT STATUS	PROG. CODE	UNDER AGREEMENT	EXPENDITURE	BALANCE*
MINN	0002176	Validation of SHRP Asphalt and Asphalt Mixture Specifications Using Accelerated Loading	Study is complete. Awaiting the final report	0860	40,000.00	15,988.46	24,011.54
MINN	0002177	Fatigue Test of High Strength Prestressed Concrete Bridge Girders	MN was lead state on this-we show the project as closed	0860	60,000.00	0.00	60,000.00
MINN	0002178	Seasonal Changes in Pavement Material Properties	MN was lead state on this-we show the project as closed	0860	60,000.00	41,871.83	18,128.17
MINN	0002179	Load Testing of Instrumented Pavement Sections	Final report for this study is number 2000-35. Project is completed but needs to be closed out	0860	90,000.00	62,807.80	27,192.20
MINN	0002180	Pavement Performance Model Development	As of 6/12/01 final report is available	0860	10,000.00	0.00	10,000.00
MINN	0002182	Development and Validation of Traffic Data Editing Procedures (TDEP)	As of 2/5/02 study was finishing up. Final was to be issued within 2 months	0860	30,000.00	20,935.91	9,064.09
MINN	0002182	Development and Validation of Traffic Data Editing Procedures (TDEP)	As of 2/5/02 study was finishing up. Final was to be issued within 2 months	Q560	20,000.00	13,608.34	6,3091.66
MINN	0002184	Long Term Monitoring of Mitigating Corrosion Measures	Active - Final report will be completed by 3/31/03.	0860	20,000.00	19,900.00	100.00
MINN	0002185	Development of Fiber-Optic Sensors to Monitor the Impact of Truck Weights on Pavements and Structures [Completion date September, 2002]	Final draft was in prep on 5/9/01	0860	5,000.00	2,701.43	2,298.57
MINN	0002186	Safety Evaluation of Intersection Design Improvements for Safety Management	The study has proven successful, and the draft final report is currently under review. (2/05/02)	0860	75,000.00	63,455.48	11,544.52
MINN	0002187	Roadside Safety Hardware Crash Tested to NCHRP Report 350	Active	0860	50,000.00	20,109.65	29,890.35
MINN	0002188	Crash-Tested Safety Appurtenances for Work Zones	Active	0860	50,000.00	44,676.19	5,323.81

STATE	PROJ. NO.	PROJECT NAME	PROJECT STATUS	PROG. CODE	UNDER AGREEMENT	EXPENDITURE	BALANCE*
MINN	0002189	Support, Maintenance, and Refinement of the National Transportation Control/ITS Communications Protocol (NTCIP) [Completed]	Unknown	0860	5,000.00	0.00	5,000.00
MINN	0002191	Public Service Campaign - Work Zones	COMPLETED. A new campaign, entitled Get The Picture. Listen To The Signs was developed	0860	5,000.00	0.00	5,000.00
MINN	0002192	Durability of Geosynthetics - Phase II	Active - As of 2/2002, the final report is being written. All of the field and lab work have been completed.	0860	20,000.00	5,489.41	14,510.59
MINN	0002193	Accuracy of Traffic Load Monitoring and Projections Related to Traffic Data Collection Parameters	Active as of April of 2000-several deliverables are available on the web	0860	15,000.00	11,588.24	3,411.76
MINN	0002194	Collection of Data to Relate Vehicle Operating Weights to Registered Weights for Highway Cost Allocation and User-Fee Analysis [Completion date 3/31/02]	Active	0860	10,000.00	66.79	9,933.21
MINN	0002195	Resistance Factors for Drilled Shafts with Minor Defects	Complete - Final report disseminated to participating states. Study went as planned and met objectives of FHWA. (2/4/02)	0860	15,000.00	12,667.82	2,332.18
MINN	0002196	Electrochemical Properties and Reactions at the Surfaces and Interfaces of Concrete Aggregates, Cement and Mineral Admixtures	Active -MN not listed as a participant on web – Fed – Aid form dated 2/11/99 to de-obligate in file. File notes indicate continued interest.	Q560	15,000.00	9,149.60	5,850.04

STATE	PROJ. NO.	PROJECT NAME	PROJECT STATUS	PROG. CODE	UNDER AGREEMENT	EXPENDITURE	BALANCE*
MINN	0002197	Bridge Fatigue Screening, Monitoring and Retrofitting Manual	Unknown	Q560	40,000.00	0.00	40,000.00
MINN	0002198	Engineered Flowable Fill Bridge Approaches plus Abutment and Culvert Backfill using Inexpensive Recycled Materials [Cancelled]	Project cancelled – 1998 This study has been merged with NCHRP 24-12 since both studies dealt with the same problem and all concurred.	Q560	20,000.00	12,288.00	7,712.00
MINN	0002199	Optimal Acceptance Procedures for Statistical Construction Specifications	Active -Currently reviewing the draft manual submitted by the contractor. Therefore, completion date of the study has been extended an additional six months through 8/28/02. (2/7/02)	Q560	25,263.00	9,598.58	15,664.42
MINN	0002200	Compilation and Evaluation of Results from High-Performance Concrete Bridge Projects	Active	Q560	4,000.00	14.67	3,985.33
MINN	0002202	HPMS Computer Based Training	The final product has been delivered by the contractor and the software is being disseminated to all of the state DOTs. (2/5/02)	Q560	20,000.00	19,293.26	706.74
MINN	0002207	Traffic Management Center (TMC) Study	Active				
MINN	0002208	Pavement Subgrade Performance Study	Active	0860	60,000.00	29,096.65	30,903.35
MINN	0002208	Pavement Subgrade Performance Study	Active	Q560	60,000.00	41,683.39	18,316.61
MINN	0002209	Enhanced Guidance for Implementation of Safety Strategies	Active	Q560	150,000.00	0.00	150,000.00

STATE	PROJ. NO.	PROJECT NAME	PROJECT STATUS	PROG. CODE	UNDER AGREEMENT	EXPENDITURE	BALANCE*
MINN	0002210	Comprehensive Highway Safety Improvement Model	Active	Q560	50,000.00	7,124.76	42,875.24
MINN	0002211	Bulk Specific Gravity Round Robin Using the Corelok Vacuum Sealing Device	Active – final report being readied	Q560	10,000.00	5,076.56	4,923.44
MINN	0002800	SHRP Implementation Asphalt Test Equipment	Active	0860	335,000.00	266,578.62	68,421.38
MINN	0003010	Crescent Study (Part I Funds) (This study not monitored by R&D)	Unknown	0860	70,000.00	37,556.95	32,443.05
MINN	0003024	HELP, Inc	Unknown	0860	40,000.00	30,000.00	10,000.00
MINN	0003027	Ohio SHRP Test Road-Instrumentation	COMPLETED IN 1998.	0860	4,400.00	0.00	4,400.00
MINN	0003037	Public Perceptions of the Midwest's Highway Pavements	As of 7/7/01 the final reports have been completed. Our files do not indicate receipt.	Q560	146,405.00	135,707.34	10,697.66
MINN	0003044	Base Funding for Northcentral Superpave Center	See TPF-5(021)	0860	20,000.00	18,902.41	1,097.59
MINN	0003044	Base Funding for Northcentral Superpave Center	See TPF-5(021)	Q560	85,000.00	74,468.06	10,531.94
MINN	0003046	Fillet Welding Procedure Qualification Research	Unknown	Q560	20,000.00	13,020.63	6,979.37
MINN	0003055	R&D of the 3rd Phase of an Autonomous Shadow Vehicle Prototype	As of 2/5/02 final rpt is under review	Q560	50,000.00	48,318.51	1,681.49
MINN	0003062	ITS Deployment Research and Professional Capacity Building	File notes state project is cancelled	Q560	50,000.00	17,271.16	32,728.84
MINN	0003063	IVI Specialty Vehicles Program	Active – draft final in review process	Q560	400,000.00	321,543.98	78,456.02
MINN	0003064	Developing a National Strategic Plan for Advanced Construction and Maintenance Systems	Complete per note from Tom West in CA	Q560	60,000.00	45,988.02	14,011.98
MINN	0003065	Geosynthetic Reinforcement of Base Course Layer of Flexible Pavements	Complete – as of 11/15/01	Q560	20,000.00	19,529.80	470.20

STATE	PROJ. NO.	PROJECT NAME	PROJECT STATUS	PROG. CODE	UNDER AGREEMENT	EXPENDITURE	BALANCE*
MINN	0003068	Field Evaluation of the CTCLS Traffic Signal Load Switches	Unknown -	Q560	135,497.00	23,415.66	112,081.34
MINN	0003069	Eastern State Transportation Coalition Train Study	Unknown	Q560	35,000.00	22,445.00	12,555.00
MINN	0003072	Strength and Deformation Analysis of MSE Walls at Working Loads	Active	Q560	20,000.00	15,551.49	4,448.51
MINN	0003073	Micro-Surface Mix Design Procedure	Active	860	25,000.00	4,774.30	20,225.70
MINN	0003073	Micro-Surface Mix Design Procedure	Active	Q560	50,000.00	9,538.68	40,461.32
MINN	0003079	REPORT	Active	Q560	232,500.00	220,477.98	12,022.02
MINN	0003081	HERMES II	Active?	Q560	125,000.00	90,735.87	34,264.13
MINN	0003083	FIXS-Fabrication error Indexed examples and Solutions	Active	Q560	17,500.00	16,462.77	1,037.23
MINN	0003092	Fiber Reinforced Polymer Composite Prestressing Strands	Active - Study has been established and will be initiated when adequate funding commitments have been received.	Q560	25,000.00	24,995.00	5.00
MINN	0003093	Environmental/Durability Evaluation of Externally Bonded Composites for Concrete Strengthening	Active - Study has been established and will be initiated when adequate funding commitments have been received.	Q560	25,000.00	15,281.35	9,718.65
MINN	0003094	Pavement Marking Life Cycle	Active - Study has been established and will be initiated when adequate funding commitments have been received.	Q560	40,000.00	13,902.72	26,097.28
MINN	0003097	Machinability of High-Performance Steel	Active	Q560	10,000.00	366.70	9633.30
MINN	0003100	The Impact of the ISO 9000 Quality Assurance Standard on Safety Performance in the Trucking Industry	Final report approved and published – will be on the web site shortly	Q560	20,000.00	12,099.00	7,901.00

STATE	PROJ. NO.	PROJECT NAME	PROJECT STATUS	PROG. CODE	UNDER AGREEMENT	EXPENDITURE	BALANCE*
MINN	TPF5001	Soil Mix Methods for Highway Application	Active	0860	20,000.00	3,929.08	16,070.92
MINN	TPF5001	Soil Mix Methods for Highway Application	Active	Q560	40,000.00	8,116.54	31,883.46
MINN	TPF5005	Study of Erection Issues and Composite System Behavior of the Full-Scale Curved Girder Bridge Currently under Test at the Turner-Fairbank Highway Research Center	Active	Q560	60,000.00	51,816.12	8,183.38
MINN	TPF5021	North Central Super Pave	Active				
MINN	TPF5023	Investigation of Aggregate Shape Effects on Hot Mix Performance Using An Image Analysis Approach	Active	Q560	20,000.00	13,687.75	6,312.25
MINN	TPF5039	<u>Falling Weight Deflectometer (FWD) Calibration Center and Operational Improvements</u>	Active	Q560	30,000.00	7,927.58	22,072.42
MINN	TPF5042	Investigation of the Long-Term Effects of Magnesium Chloride	Active - Quarterly Progress Report (April 15 - July 15, 2004)	0860	20,000.00	6,358.99	13,641.01
MINN	TPF5042	Investigation of the Long-Term Effects of Magnesium Chloride	Active - Quarterly Progress Report (April 15 - July 15, 2004)	Q560	20,000.00	7,800.30	12,199.70
MINN	TPF5045	Performance Guidelines for the Selection of Hot-Pour Crack Sealants	Active	0860	20,000.00	0.00	20,000.00
MINN	TPF5045	Performance Guidelines for the Selection of Hot-Pour Crack Sealants	Active	Q560	60,000.00	0.00	60,000.00
MINN	TPF5046	Transportation Curriculum Coordination Council (TCCC)	Active				
MINN	TPF5051	Construction of Crack-Free Concrete Bridge Decks	Active	0860	15,000	0.00	15,000
MINN	TPF5051	Construction of Crack-Free Concrete Bridge Decks	Active	Q560	45,000	0.00	45,000



STATE	PROJ. NO.	PROJECT NAME	PROJECT STATUS	PROG. CODE	UNDER AGREEMENT	EXPENDITURE	BALANCE*
MINN	TPF5055	Rapid Bridge Replacement Techniques	Active	Q560	10,000.00	5,777.26	4,222.74
MINN	TPF5068	Long-Term Maintenance of Load and Resistance Factor Design Specifications	Active - <u>Quarterly Report - Ending August 31, 2004</u>	Q560	40,000.00	0.00	40,000.00
MINN	TPF5069	Core Program Services	Active	0860	104,315.00	62,201.13	42,113.87
MINN	TPF5069	Core Program Services	Active	Q560	208,630.00	62,201.13	146,428.87
MINN	TPF5070	International Conference on Accelerated Pavement Testing	Active	Q560	15,000.00	8,007.13	6,992.87
MINN	TPF5073	Portable Non-Intrusive Technologies	Active	Q560	15,000.00	14,067.71	932.29
MINN	TPF5078	Upper Midwest Freight Corridor Study	Active	Q560	60,000.00	0.00	60,000.00
MINN	TPF-5086	Reducing Crashes at Rural Intersections (IDS)	Active	Q860	44,000.00	12,799.88	31,200.02
MINN	TPF-5086	Reducing Crashes at Rural Intersections (IDS)	Active	Q560	22,000.00	13,887.38	8,112.62
MINN	TPF5090	Pavement Tools Consortium	Active – Quarterly Progress Report <u>January 1, 2004 - June 30, 2004</u>	Q560	20,000.00	0.00	20,000.00
MINN	TPF5093	North/West Passage Transportation Pooled Fund Program, Phase 1	Active	Q560	50,000.00	0.00	50,000.00
MINN	TPF5105	Library Connectivity	Active	H560	20,000.00	0.00	20,000.00
MINN	TPF5105	Library Connectivity	Active	Q560	20,000.00	0.00	20,000.00
MINN	TPF5107	Refinement & Field Validation	Active	Q560	30,000.00	0.00	30,000.00
MINN	TPF5109	TRB Core Program Services – ‘07	Active	Q560	127,705.00	0.00	127,705.00
MINN	TPF5112	Midwest States Pooled Fund Pavement Preservation Partnership	Active	H560	10,000.00	0.00	10,000.00
MINN	TPF5112	Midwest States Pooled Fund Pavement Preservation Partnership	Active	Q560	5,000.00	0.00	5,000.00
MINN	TPF5119	North Central Pavement Research Partnership (Frozen Four)	Active	H560	5,000.00	0.00	5,000.00
MINN	TPF5119	North Central Pavement Research Partnership (Frozen Four)	Active	Q560	5,000.00	0.00	5,000.00

STATE	PROJ. NO.	PROJECT NAME	PROJECT STATUS	PROG. CODE	UNDER AGREEMENT	EXPENDITURE	BALANCE*
MINN	TPF5120	Deer Vehicle Crash Information and Research Center	Active	H560	25,000.00	0.00	25,000.00
MINN	TPF5120	Deer Vehicle Crash Information and Research Center	Active	G560	25,000.000	0.00	25,000.00
MINN	TPF5126	Geocomposite Capillary Barrier Drain for Limiting Moisture Changes	Active	H560	35,000.00	1,493.91	33,500.09
MINN	TPF5127	Consortium of Accelerated Pavement Testing (CAPT) AND Technical Exchange Partnership	active	Q560	70,000.00	0.00	70,000.00

TOTAL BALANCE

\$2,487,291.52

\* Balances are good as of the date the FMIS report -12/15/06