2008 ANNUAL REPORT FOR THE MONTANA DEPARTMENT OF TRANSPORTATION RESEARCH PROGRAMS

FHWA/MT-09-001/8010

Annual Report

prepared for
THE STATE OF MONTANA
DEPARTMENT OF TRANSPORTATION

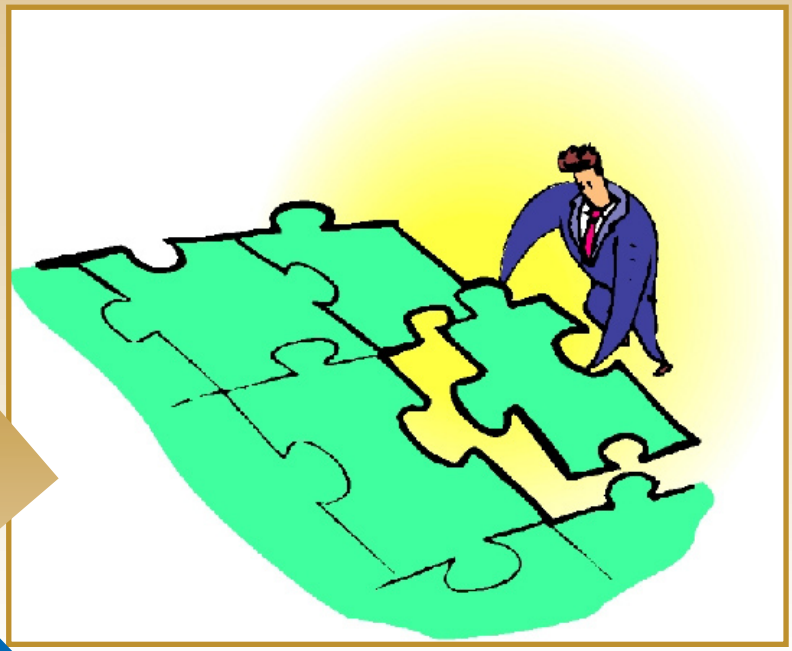
in cooperation with
THE U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

January 2009

prepared by

Susan C. Sillick
Craig Abernathy

Montana Department of Transportation



RESEARCH PROGRAMS

Montana Department of Transportation
serving you with pride

FFY 2008 ANNUAL REPORT
FOR THE MONTANA DEPARTMENT OF TRANSPORTATION
RESEARCH PROGRAMS

Prepared by
Susan C. Sillick
Craig Abernathy

Montana Department of Transportation

January 2009

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. FHWA/MT-09-001/8010	**2. Government Accession No.**	**3. Recipient's Catalog No.**
4. Title and Subtitle FFY 2008 Annual Report for the Montana Department of Transportation Research Programs	**5. Report Date** January 2009 **6. Performing Organization Code** 5401	
7. Author(s) Susan C. Sillick and Craig Abernathy	**8. Performing Organization Report No.**	
9. Performing Organization Name and Address Research Programs Montana Department of Transportation 2701 Prospect Avenue PO Box 201001 Helena MT 59620-1001	**10. Work Unit No.** **11. Contract or Grant No.**	
12. Sponsoring Agency Name and Address Research Programs Montana Department of Transportation 2701 Prospect Avenue PO Box 201001 Helena MT 59620-1001	**13. Type of Report and Period Covered** Annual Report; 10/1/07-9/30/08 **14. Sponsoring Agency Code** 5401	

15. Supplementary Notes Research performed in cooperation with the Montana Department of Transportation and the US Department of Transportation, Federal Highway Administration. This report can be found at http://www.mdt.mt.gov/research/annual_report.shtml.

16. Abstract

The Montana Department of Transportation (MDT) conducts research to discover, develop, or extend knowledge needed to operate, maintain, and improve the statewide multimodal transportation system. Specific goals include: evaluation and advancement of new technologies, materials, and methods; development of design and analysis techniques; and study of current transportation challenges. The purpose of this report is to give an overall description of research, development, and technology transfer activities for federal fiscal year (FFY) 2008 within the Research Programs of the Montana Department of Transportation (MDT). Through these activities, the Research Programs enhances MDT's ability to deliver efficient and effective transportation services. MDT's mission is to serve the public by providing a transportation system and services that emphasize quality, safety, cost effectiveness, economic vitality, and sensitivity to the environment. MDT's Research Programs impacts each and every part of MDT's mission. Research projects completed in FFY 2008 yielded results that when fully implemented will improve:

- Efficiency and effectiveness of MDT operations and technology transfer, including improving training of and encouraging young individuals to enter the transportation construction work force, cost estimating, procedures and policies, contractor relations, and marketing;
- Economic vitality;
- Sensitivity to the environment, including decreasing vehicle-wildlife collisions, improving habitat connectivity and roadside revegetation, decreasing erosion and bridge pier scour, reducing the effects of traffic noise, and increasing recycling efforts;
- Safety, by decreasing roadside hazards and young driver accidents; and
- Quality of what we do and how we do it, including bridge design and inspection, pavement design and preservation, context-sensitive design, smart land-use planning, use of the most efficient materials and technology, and materials testing and acceptance.

17. Key Words Montana, Research Programs, Annual Report, Transportation, Research Projects, Experimental Projects, Technology Transfer, Experimental Features.		**18. Distribution Statement** Unrestricted. This document is available through the National Technical Information Service, Springfield, VA 21161.	
19. Security Classif. (of this report) Unclassified	**20. Security Classif. (of this page)** Unclassified	**21. No. of Pages** 110	**22. Price**

ALTERNATIVE FORMAT STATEMENT

MDT attempts to provide accommodations for any known disability that may interfere with a person participating in any service, program, or activity of the Department. Alternative accessible formats of this document will be provided upon request. For further information, call (406) 444-7693, TTY (800) 335-7592, or Montana Relay 711.

ACKNOWLEDGEMENTS

We would like to thank Jerry Stephens of the Western Transportation Institute, Montana State University – Bozeman for his exceptional editing skills.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

The purpose of this report is to give an overall description of research, development, and technology transfer activities for federal fiscal year 2008 within the Research Programs of the Montana Department of Transportation (MDT). Through these activities the Research Programs enhances MDT's ability to deliver efficient and effective transportation services.

Responsibilities of the MDT Research Programs include:

- Administer the Research portion of the State Planning and Research Program (SPR);
- Lead and participate in cooperative research efforts with other states, universities, industry, and other partners through pooled-fund and other cooperative research, development, and technology transfer efforts;
- Assist MDT staff in identifying and finding ways to meet research needs;
- Provide leadership for research, development, technology, and technology transfer initiatives within MDT;
- Conduct the Research and Experimental Projects Programs, and the Technology Transfer Program;
- Assist with the implementation of research results; and
- Conduct project and program evaluation.

In taking a look back at where we have been, we are given a clearer view of where we are heading, continuously improving as we move forward.

Janus, this Roman God symbolizes change and transition, such as the progression from past to future or of one vision to another.

2 RESEARCH PROJECTS

2.1 OVERVIEW

Once a year, the Research Programs Manager solicits research ideas from as wide a variety of individuals as possible. This open solicitation enhances the possibility of receiving a diverse spectrum of research suggestions.

Before a problem statement can be prioritized, it must have a champion and a sponsor. A champion is internal to MDT, and is willing to support the problem statement to the Research Review Committee (RRC) and serve as the technical panel chairperson should the problem statement move forward to this stage. In doing this, the champion asserts there is a research need and this need is important to MDT. A sponsor is at least at the level of a Division or District Administrator who agrees the research is important to MDT and is willing to ensure implementation occurs. Only problem statements with both a champion and sponsor move forward to the project prioritization stage.

The champions for each problem statement present their topic to the RRC and District Administrators (DA). At this same meeting, the RRC and District Administrators then select the high priority topics for that solicitation cycle. These topics are chosen because they address actual concerns of the Department.

Following the selection of these high priority topics, Research Programs staff forms a technical panel for each topic. Technical panels are formed to follow research projects from inception through implementation. Technical panels are typically composed of three to ten people with knowledge or expertise, and interest in the specific area of research. Panel members are drawn from MDT's Division and District offices, as well as from outside the Department. The technical panel's responsibility begins with a review of the literature to determine the need for research, if any, and continues with the development of a viable research plan. This plan should include: what tasks need to be accomplished; how much time and money needs to be expended; who should perform the research; what are the barriers to implementation and how to reduce or eliminate these barriers; and what research products should be delivered to facilitate implementation. Final funding is approved by the RRC.

During and following the research, the Research Programs representative on each technical panel serves as MDT’s project manager and liaison between the technical panel and the consultant. The technical panel monitors research progress by reviewing quarterly, final, and any other reports produced by the principal investigator. Finally, the technical panel makes implementation recommendations to the appropriate MDT Administrator, through the RRC.

The research projects process as detailed above is shown in Figure 1. In addition to the solicitation process (as described above), there are a number of other methods to initiate research projects: Montana Partnership for the Advancement of Research in Transportation (MPART Small Projects), partnership projects, and Administration High Priority topics (Figure 1).

MDT has contracts in place with both Montana State University and The University of Montana for small projects (<$25,000 and 1 year) under our MPART Small Projects agreement. If there is a need for a small project, such as a synthesis project, which includes a review of the literature and a survey of the state of the practice, similar to National Cooperative Highway Research Program (NCHRP) synthesis projects, the steps below are followed:

- Champion notifies Research Programs of need.
- Technical panel is formed.
- Proposal is obtained.
- Technical panel recommends proposal for funding to RRC.
- RRC approves or denies funding request.

Partnership projects can be any projects where we decide to partner with others to conduct research. The process varies depending on whether these projects are pooled-fund studies or other partnering projects and whether MDT is the project lead or not.

Finally, if MDT Administration identifies a research need that requires immediate attention, the Research Programs manager is informed, a technical panel is formed, and a proposal(s) is obtained and approved either by the RRC or Administration.

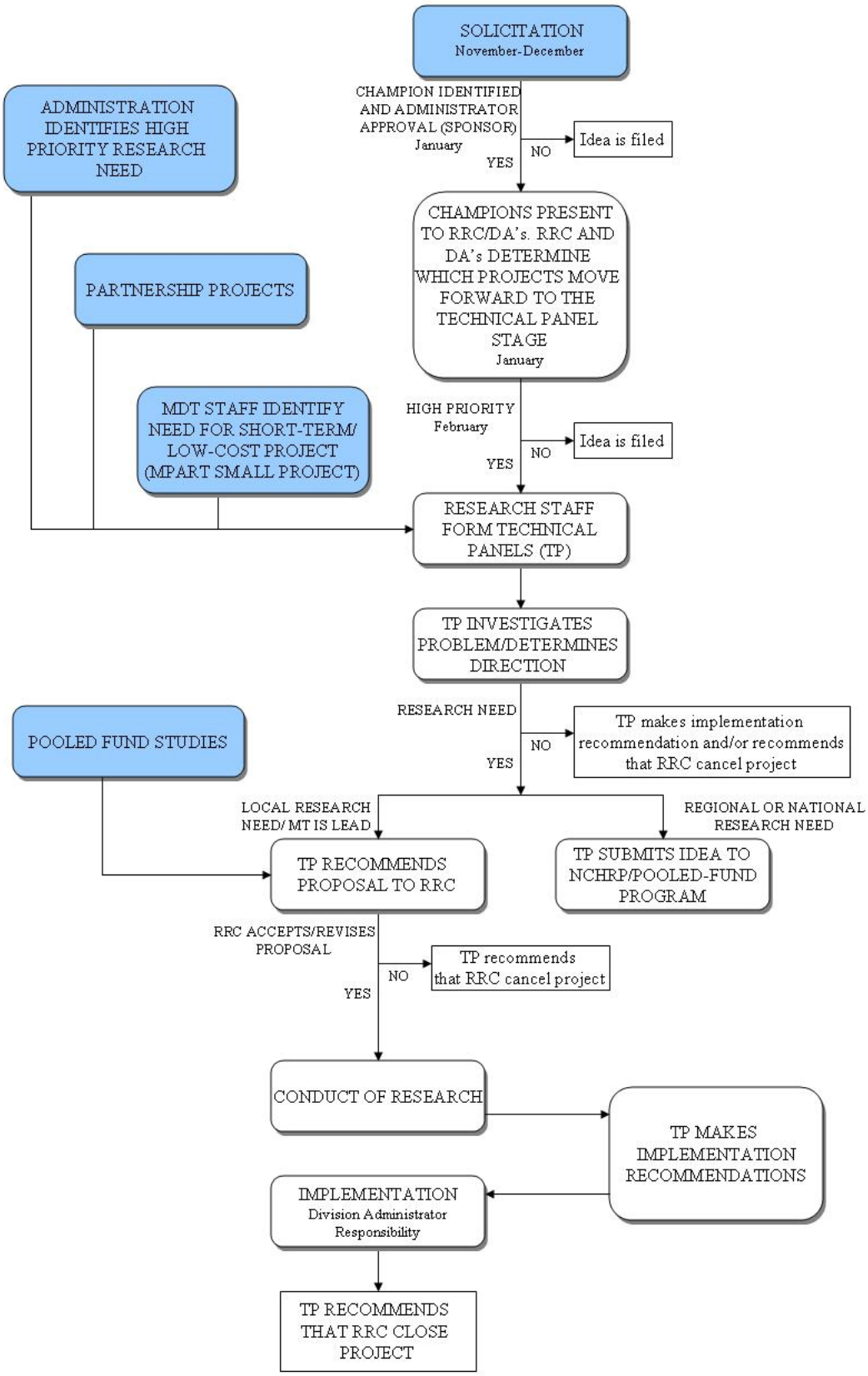


Figure 1: Research projects process.

2.2 ADMINISTRATIVE RESEARCH PROJECTS

2.2.1 Continuing Projects

2.2.1.1 Administration and Conduct of Research Programs

Project Number:	8010	Project Number:	8020
Start Date:	10/1/07	Start Date:	10/1/07
Completion Date:	9/30/08	Completion Date:	9/30/08
Total Cost:	$251,821	Total Cost:	$21,050
SPR Funds:	$251,821	SPR Funds:	$21,050
FFY 2008 Funds Expended:	$251,821	FFY 2008 Funds Expended:	$20,723
FFY 2008 MDT Indirect Costs:	$28,336	FFY 2008 MDT Indirect Costs:	$2,426
Status:	Continuing	Status:	Continuing

Objective:

The purpose of these two ongoing projects is threefold. The first purpose is to plan and administer the Research Programs and related research activities of MDT in finding solutions to existing highway and transportation challenges in Montana. The second purpose is to manage, coordinate, and conduct a program to test and properly evaluate new highway materials, products, designs, methods, etc., for the ultimate purpose of improving highway performance; decreasing various highway costs; or attempting to solve existing highway construction, rehabilitation, or maintenance problems in Montana. The third purpose is to plan and conduct a program of technology transfer and to develop and maintain a knowledge and understanding of the latest highway research projects and programs.

Progress-Research Projects:

During FFY 2008, for the Research Projects Program, one solicitation cycle was completed, resulting in nine new research projects. This is a 125% increase as compared to FFY 2007.

- Assessment of Sediment Disturbance in Streams During Construction;
- Determine Erionite Occurrence in Southeastern Montana and Relationship to MDT Highway Construction, Past and Future;
- Field Investigation of Geosynthetics used for Subgrade Stabilization;
- Ground Penetrating Radar Analysis;
- Impact of Increased Canadian Economic Development on Northern Montana Highways;

- Keep Encouraging Young Driver Safety Pilot Study: Increasing Parent Involvement in Teenage Driving through Driver Education;
- Measurement and Evaluation of Subgrade Soil Parameters;
- Pile Static Load Test; and
- Swimming and Leaping Abilities of Montana's Coldwater Fish for Fish Passage through Culverts.

One MPART projects was initiated in FFY 2008:

- Keep Encouraging Young Driver Safety Pilot Study: Increasing Parent Involvement in Teenage Driving through Driver Education.

Funds were contributed for twelve partnering projects:

- Dynamic Passive Pressure on Abutments and Pile Caps;
- Evaluation of Test Methods for Permeability and Development of Performance Guidelines for Durability;
- Extending the Season for Concrete Construction and Repair: Phase III;
- National Cooperative Highway Research Program (NCHRP);
- National Testing and Product Evaluation Program (NTPEP);
- Objective Evaluation of an Education-Based Distracted and Drowsy Driving Intervention for Teen Age Drivers in Rural America;
- Pacific Northwest Snowfighters;
- Subsurface Drainage for Landslide and Slope Stabilization;
- Transportation Asset Management Research Program;
- Transportation Research Board Core Services;
- Western Maintenance Partnership; and
- Western Pavement Preservation Partnership.

Thirteen projects are contracted and remain active:

- Bozeman Pass Wildlife Linkage and Channelization and Highway Safety Studies;
- Business Market Analysis;
- Developing a One-Stop Shop for Public/Specialized Transportation Information in Montana;
- Disparity/Availability Study;
- Effects of Defensive Vehicle Handling Training on Novice Driver Safety: Phase 3 Analysis of Safety Data;
- Evaluation Methods of Estimation of Bridge-Pier Scour for Streams with Coarse Bed Materials Based on Observed Scour in Montana;
- Field Investigation of Geosynthetics Used for Subgrade Stabilization;
- Highway Project Cost Estimating Best Practices;
- Keep Encouraging Young Drivers Safety Study: Increasing Parent Involvement in Teenage Driving through Driver Education;
- Local Technical Assistance Program – SFY 2009;

- Logistics and Marketing Research in Support of Container on Flatcar Shuttle Train on the Burlington Northern Santa Fe Mainline to Port of Seattle or Tacoma;
- Monitoring Wildlife Crossings on US 93 South; and
- Smart Transportation and Land Use Planning.

In addition, eleven projects are pending technical panel and RRC review and approval:

- Automated Crash Notification
- Best Management Practices to Mitigate Burrowing Mammals Impacts on Montana's Highways;
- Compost Application for Optimized Vegetation Response;
- Computerized 3-Dimensional Highway Design and Modeling;
- Determining Swimming and Leaping Abilities of Montana's Coldwater Fish for Passage Through Culverts;
- Effects of Carcass Composting on Chronic Wasting Disease;
- Ground Penetrating Radar Analysis;
- Impact of Increased Canadian Economic Development on Northern Montana Highways;
- Measurement and Evaluation of Subgrade Soil Parameters: Phase 1 – Synthesis of Literature;
- Pile Static Load Testing; and
- Review of MDT's Planted RIPRAP Program.

Nine active research projects were completed:

- Automated Cost Recovery;
- Axial Capacity of Piles Supported on Intermediate Geomaterials;
- Evaluation of MDT's Research Project Solicitation, Prioritization, and Selection Processes;
- Evaluation of Wildlife Crossing Structures on US Highway 93 Evaro to Polson;
- Industry Best Practices for Application Development Processes;
- Local Technical Assistance Program – SFY 2008;
- Preventing Adverse Effects from Highway Noise: A Toolkit for Local Planners;
- Summer Transportation Institute – FFY 2007; and
- Summer Transportation Institute – FFY 2008.

A research project close-out questionnaire was sent to all technical panel members at the completion of each research project. Results were compiled and disseminated with the ultimate goal of improving conduct and management of research projects.

Finally, seven projects were cancelled:

- Assessment of Sediment Disturbance in Streams during Bridge Construction;
- Determination of Unbound Base and Subgrade Resilient Moduli for use in the Mechanistic-Empirical Pavement Design Guide;
- Design of a Vertical Shape Portable Concrete Barrier;

- Determine Erionite Occurrence in Southeastern Montana and Relationship to MDT Highway Construction, Past and Future;
- I-15 North Corridor - Canadian Truck Load Bridge and Roadway Analysis;
- Implementation of the Mechanistic Empirical Pavement Design Guide for Designing Flexible Pavements in Montana; and
- Soil Stabilization using Byproducts.

Progress – Experimental Projects:

During FFY 2008, four experimental projects were completed

- 100 mm Thin Composite Whitetopping;
- Cold In-Place Recycled Asphalt;
- Cold In-Place Recycled Asphalt using Koch's CIR-Engineered Emulsion; and
- Detectable Warning Devices.

Sixteen experimental projects are active.

- 130 mm Thin Composite Whitetopping;
- Bridge Deck Evaluations: Comparison of Conventional and High-Performance Concrete Decks;
- Chip Seal as an Asphalt Cement Interlayer to Retard Reflective Cracking;
- Chip Stockpiling;
- Corrugated Steel Pipe Culvert Rehabilitation;
- Crack Sealing Milled Asphalt Pavement prior to Overlay;
- Edge-Line Pavement Markings on Rumble Strips;
- Emulsified Asphalt Treated Aggregate Base Effect on Pavement Performance;
- Fixed Automated Spray Technology Device for use on Bridge Decks;
- GeoRidge Erosion Control Permeable Ditch Berm;
- High-Density Polyethylene Culverts in Mainline Application;
- High-Performance Concrete Bridge Deck;
- In-Laid Thermoplastic Pavement Markings prior to Seal Coat Application;
- Paving Fabrics to Mitigate Transverse Cracking;
- Recycled Plastic Mat as Weed Prevention and Erosion Control around Guardrail Posts; and
- Tower-Mounted Wind Turbine for the Generation of Supplemental Power for the Anaconda Interchange Rest Area.

Three experimental projects are pending construction:

- Aggregate Base Preparations;
- Cement-Treated Base; and
- Deer Reflectors.

Progress – Library Services:

Library activities for FFY 2008 presented here include various performance measures and a web site analysis report.

Library services to employees, other Montana state agencies, and others include:

- Circulation;
- Book suggestions and brief assistance;
- New patrons registered and deleted;
- In depth reference questions;
- E-mail responses;
- Literature searches;
- Photocopying;
- Locating websites;
- Original and copy cataloging of new reports (books, e-books, and other formats);
- Retrieving articles from websites and databases;
- Sending library items to outlying sites;
- Presenting library awareness at conferences;
- Interlibrary loans, borrowing and lending;
- Marketing of library topics, database, and catalog in MDT interchange;
- Donating reports to state department's of transportation libraries and others;
- Copying reports from other agencies for employees;
- Supporting management classes through book recommendations and presentations;
- Attending education workshops to improve library operations;
- Maintaining shelf collection for improved retrieval;
- Lobbying efforts for databases useful to MDT employees from the Montana State Library (MSL);
- Networking with other library groups to improve operations, access, and operations, as found in transportation librarian toolkit;
- Tracking of overdue items to maintain catalog integrity;
- Addition of transportation research thesaurus subject headings;
- Requesting reports from other libraries' giveaway lists;
- Contributions to library networks through participation, such as taking minutes of meetings;
- Library training;
- Developing procedures manual;
- Creating four quarterly newsletters; and
- Sending reports to print shop for patrons and library collection.

Web Site Analysis Report:

- Nearly 1.4 million visits to the research web pages.

- 6,608 visits from library catalog browsers. The library page has the second highest hits, second only to the Research home page. This indicates many patrons who use the library are going directly to the online catalog.
- Most visitors to the Research Internet Web sites are referred from the main MDT website, nearly 220,000. The next largest referrals come from Google (16,479) and Google Scholar (8,383). Other visitors, in decreasing order, include: Yahoo, India, TRB, Canada, China, Indonesia, UK, Malaysia, Australia, Vietnam, Egypt, and Taiwan.
- 10,342 files were downloaded from the Research web pages. The portable document file (PDF) is the most common file type accessed.
- Nearly 43,000 unique visitors to the Research web pages, nearly 5 visitors per hour and nearly 10,000 repeat visitors.
- Average number of pages viewed per day was over 1,000, and the average visitor stayed over 21 minutes.

Library Analysis Report:

- There were 1,335 titles in all formats (1,624 total copies) added to the collection (http://www.mdt.mt.gov/research/unique/services.shtml) in FFY 2008: 1 audio recording, 933 books, 208 Internet resources, 79 DVDs, 51 videocassette recordings , 39 CDs, 14 journals, 4 summaries, 3 maps, and 3 kits (Figure 2). This is about a 14% increase as compared to FFY 2007.

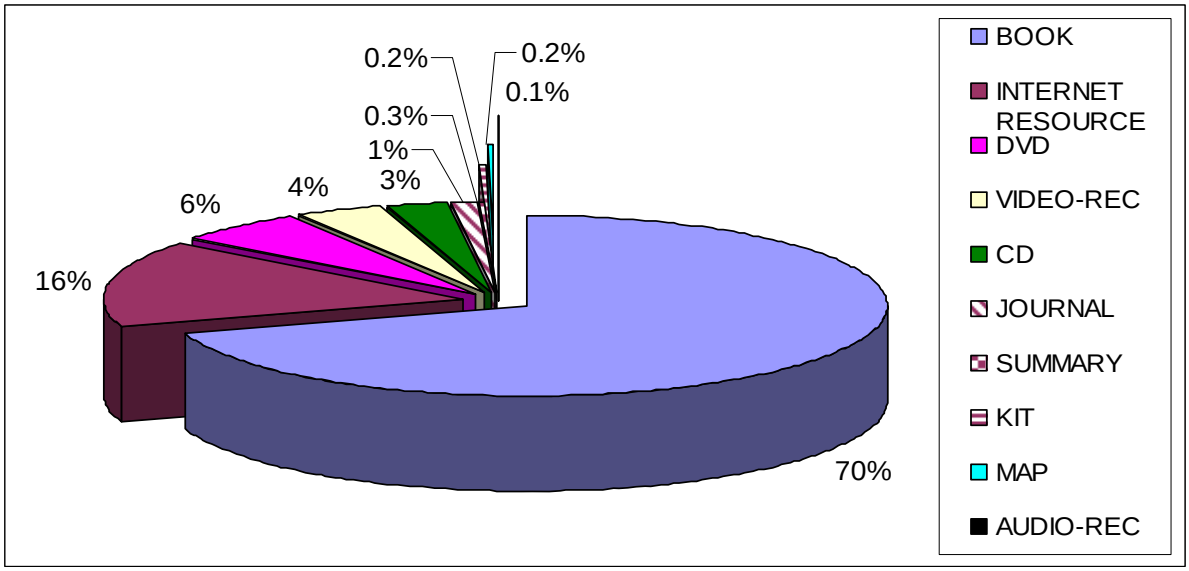


Figure 2: Total number of titles by item type added to the catalog in FFY 2008.

- There were 23,898 total titles (27,886 copies) in collection at the completion of FFY 2008. By item type the collection contained: 13,304 books, 9,274 Internet resources, 839 videocassette recordings, 221 CDs, 133 DVDs, 58 kits, 29 audio

recordings, 17 journals, 9 summaries, 8 pamphlets, 3 maps, and 3 microforms (Figure 3). This is about a 4% increase as compared to FFY 2007.

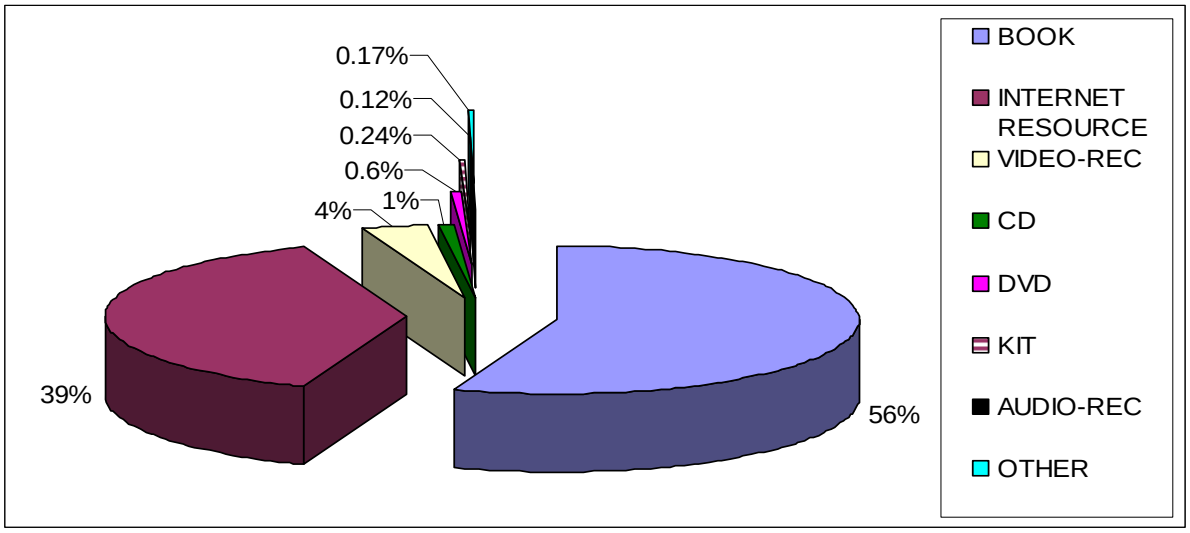


Figure 3: Total number of titles by item type in the catalog through FFY 2008.

- In FFY 2008, total circulation was 940, by item type: 8 audio recordings, 550 books, 98 CDs, 50 DVDs, 11 kits, 12 microforms, and 211 videocassette recordings (Figure 4). This is about a 19% increase as compared to FFY 2007.

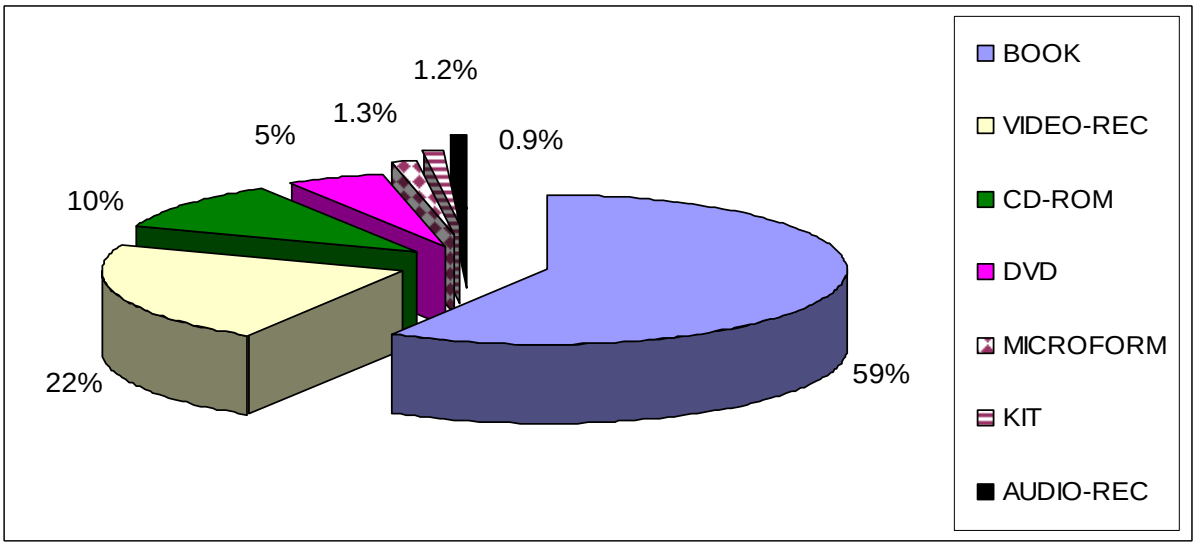


Figure 4: Total circulation by item type in FFY 2008.

Reports/Training/Technology Transfer:

- Research and experimental project progress and final reports were published on the Research Programs website (http://www.mdt.mt.gov/research/) and/or in hard copy.
- Four newsletters were published (http://www.mdt.mt.gov/research/tech_trans/newsletters.shtml).
- The FFY 2007 Annual report was published in early FFY 2008 (http://www.mdt.mt.gov/research/annual_report.shtml).
- The Research Review Committee (RRC) met three times throughout the year to discuss research and pooled-fund projects.
- The Research Programs Manager and Research and Experimental Projects Manager attended the Transportation Research Board Annual Meeting (TRB). Also, the Research Programs Manager attended TRB Conduct of Research Committee mid-year meeting via webinar, American Association of State Highway and Transportation Officials (AASHTO) National Research Advisory Committee Meeting, and the New York DOT Peer Exchange. The Librarian attended Montana Shared Catalog meetings.
- Finally, performance appraisals were conducted for all Research Programs staff and performance plans were developed for the upcoming year.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

2.2.1.2 Evaluation of Experimental Projects

Project Number:	8021
Start Date:	10/1/07
Completion Date:	9/30/08
Total Cost:	$8,323
SPR Funds:	$8,323
FFY 2008 Funds Expended:	$2,323
FFY 2008 MDT Indirect Costs:	$957
Status:	Continuing

Objective:

The purpose of this ongoing project is to provide a limited funding source for fieldwork involved in the inspection and evaluation of experimental projects and the conduct of research, where other funds are not appropriate or available.

Progress:

Field support for the evaluation of experimental projects was provided.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

2.2.1.3 Transportation Research Board Support

MDT provides ongoing financial support to the Transportation Research Board (TRB) in two ways. Support of core services is provided through a pooled-fund study (see Section 4.0, http://trb.org/, and http://www.pooledfund.org/projectdetails.asp?id=360&status=6). The amount of funding is based on a triennium. For each year in the current triennium, MDT paid $99,900 to support TRB core services. The National Cooperative Highway Research Program (NCHRP) is also supported through research funds (see http://www.trb.org/CRP/NCHRP/NCHRP.asp). The annual support amount is 5.5% of the total State Planning and Research (SPR) funds. For FFY 2008, support was provided in the amount of $358,252.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

2.2.1.4 Montana Local Technical Assistance Program (LTAP)

Project Number:	2443
Start Date:	7/1/07
Completion Date:	6/30/08
Total Cost:	$310,003
SPR Funds:	$68,003
Federal Funds:	$140,000
State Funds:	$100,000
Contractor Cost Share:	$2,000
FFY 2007* Funds Expended:	$310,003
FFY 2007* MDT Indirect Costs:	$22,744
Status:	Continuing
Contractor:	Montana State University
URL:	http://www.mdt.mt.gov/research/ltap/ltap.shtml

* Note: The LTAP program is run on a state fiscal year. Hence, it is run nine months behind the federal fiscal year. FFY 2008 LTAP is currently active running from 7/1/08 to 6/30/09. Therefore, the FFY 2007 LTAP Program is presented here.

Objective:

The mission of the national Local Technical Assistance Program (LTAP) is to foster a safe, efficient, and environmentally sound transportation system by improving skills and knowledge of local transportation providers through training, technical assistance, and technology transfer.

LTAP centers enable local counties, parishes, townships, cities, and towns to improve their roads and bridges by supplying them with a variety of training programs, information clearinghouse, new and existing technology updates, personalized technical assistance, and newsletters.

Through these core services, LTAP centers provide access to training and information that may not have otherwise been accessible. Centers are able to provide local road departments with work force development services, resources to enhance safety and security, solutions to environmental, congestion, capacity and other issues, technical publications, and training videos and materials.

Montana has over 70,000 miles of roads in cities, counties, and highway districts. Montana LTAP has focused on assisting state and county road offices and city street departments in road and bridge maintenance and repair. By sharing technical information and improving the distribution of this information, the program promotes efficient use of local transportation agencies' scarce resources.

Specific LTAP tasks in FFY 2007 included: compile and maintain a mailing list, publish a quarterly newsletter, provide technology transfer materials, provide information and on-site technical assistance, conduct or arrange seminars/training sessions, and program evaluation.

Progress:

LTAP's mailing list has been revised and updated with current information. There were four quarterly newsletters published. Technical assists and information were distributed and responded to through phone calls, faxes, personal contact at workshops, conferences, and e-mail. Eighty-four workshops were presented to a total of 2,864 attendees. Workshops covered diverse topics, including: Work Zone Traffic Control Technician, Traffic Control Supervisor, Highway Safety: Loss Control, Work Zone Flagging, APWA Snow Rodeo and Equipment Safety, Preventative Maintenance of Roads & Lawsuits, Winter Safety, Winter Survival, Sign Vandalism, Storm Water Reporting, Street Maintenance Issues, ADA Compliant/CTEP Projects, Finer Points of an Unpaved Road, Road Safety Audits, Proper Sign Placement, The Prism in Road Standards, Gravel Roads Maintenance, Forklift Operations, Safety Engineering/Designs of Roads, Summer Survival, and Leadership.

Reports:

Four quarterly progress reports were submitted and can be viewed at the above URL.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

Contractor Project Manager:

Steve Jenkins
406.994.6100
stevenj@coe.montana.edu

2.2.1.5 Montana Summer Transportation Institute-2007

Project Number:	6439-872
Start Date:	10/1/06
Completion Date:	4/30/08
Total Cost:	$45,353
SPR Funds:	$0
Federal funds:	$38,154
Cost Share:	$7,200
FFY 2008 Funds Expended:	$38,154
FFY 2008 MDT Indirect Costs:	$2,304
Unexpended Funds:	$2,014
Status:	Continuing
Contractor:	Western Transportation Institute, Montana State University

URL: http://www.mdt.mt.gov/research/projects/admin/summer.shtml

Objective:

The objectives of this annual program are to: increase students' awareness of the importance of different modes of transportation; expose high school students to the variety of transportation careers available and demonstrate how transportation professionals work to identify and solve real-world issues that have society-wide impacts; increase students' understanding of the importance and need for creative and innovative transportation solutions; improve students' analytical and problem-solving skills; develop students' communication, collaboration, and leadership skills; and bolster student confidence by improving academic skills and providing college and career guidance.

Progress:

All research has been completed. The final report was published early in FFY 2008.

Reports:

Four progress reports were submitted. The final report was completed, published, distributed and can be viewed at the above URL.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

Contractor Project Manager:

Susan Gallagher
406.994.6559
sgallagher@coe.montana.edu

2.2.1.6 Montana Summer Transportation Institute-2008

Project Number:	6439-801
Start Date:	10/1/07
Completion Date:	9/30/08
Total Cost:	$43,802
SPR Funds:	$0
Federal funds:	$36,602
Cost Share:	$7,200
FFY 2008 Funds Expended:	$36,602
FFY 2008 MDT Indirect Costs:	$4,214
Unexpended Funds:	$0
Status:	Continuing
Contractor:	Western Transportation Institute, Montana State University

URL: http://www.mdt.mt.gov/research/projects/admin/summer.shtml

Objective:

The objectives of this annual program are to: increase students' awareness of the importance of different modes of transportation; expose high school students to the variety of transportation careers available and demonstrate how transportation professionals work to identify and solve real-world issues that have society-wide impacts; increase students' understanding of the importance and need for creative and innovative transportation solutions; improve students' analytical and problem-solving skills; develop students' communication, collaboration, and leadership skills; and bolster student confidence by improving academic skills and providing college and career guidance.

Progress:

All research has been completed.

Reports:

The final report was completed, published, distributed and can be viewed at the above URL.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

Contractor Project Manager:

Susan Gallagher
406.994.6559
sgallagher@coe.montana.edu

2.2.2 Completed Projects

2.2.2.1 Industry Best Practices for Application Development Processes

Project Number:	8117-25
Start Date:	5/1/05
Completion Date:	11/30/07
Total Cost:	$23,460
SPR Funds:	$0
State Funds:	$23,460
FFY 2008 Funds Expended:	$0
Unexpended Funds:	$2,599
Status:	Complete
Contractor:	Montana State University

URL: http://www.mdt.mt.gov/research/docs/research_proj/app_dev/ibp.shtml

Objective:

The Industry Accepted Best Practices and Methodologies checklists, process metrics, and templates for each step of the software development life cycle (SDLC) are not readily available from one source, but could be cooperatively collected through numerous professional sources and universities. This proposed research involved the compilation and synthesis of this information as it pertains to the standard SDLC for MDT.

Progress:

All research is complete.

Reports:

The final report was completed, published, distributed and can be viewed at the above URL.

Implementation:

The research showed that the proposed SDLC which had been provided to the researchers did indeed follow industry best practices. Hence, MDT ISD Applications staff continued refining the MDT ISD SDLC with the understanding that the final SDLC phases and tasks would encompass those identified as following industry best practices. Since the research results showed that the MDT ISD SDLC already satisfies current industry best practices there is no need to implement changes to the MDT ISD SDLC.

Future refinements to the MDT ISD SDLC may involve suggestions for enhancing the Requirements Development process and UML modeling approaches and strategies.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

Contractor Project Manager:

Ray Babcock
406.994.4870
babcock@cs.montana.edu

2.2.2.2 Evaluation of MDT's Research Project Solicitation, Prioritization, and Selection Processes

Project Number:	8117-29
Start Date:	9/13/05
Completion Date:	1/31/08
Total Cost:	$27,021
SPR Funds:	$23,351
Contractor Cost Share:	$4,670
FFY 2008 Funds Expended:	$0
Unexpended Funds:	$0
Status:	Complete
Contractor:	The University of Montana
URL:	http://www.mdt.mt.gov/research/docs/research_proj/research_eval/final_report.pdf

Objective:

The Montana Department of Transportation needed information about the research solicitation, prioritization, and selection process used by peer Departments of Transportation from around the United States. Obtaining this information was an important step in MDT's process of maintaining and improving the quality of its Research Projects Process. This research involved reviewing the web sites and hard copy publications of MDT's peer research organizations, conducting a web-based survey with key research staff in MDT's peer organizations, conducting in-depth interviews with selected key informants from MDT's peer organizations, and conducting in-depth interviews with selected key informants from within MDT to gather this information.

Progress:

All research is complete.

Reports:

The final report was completed, published, distributed and can be viewed at the above URL.

Implementation:

The desire was expressed to more strategically focus MDT's Research Program. Methods and process to accomplish this goal will be explored.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

Contractor Project Manager:

Daphne Herling
406.243.5614
Daphne.Herling@business.umt.edu

2.2.3 Contracted Projects

2.2.3.1 Business Market Analysis

Project Number:	8187
Start Date:	11/1/06
Completion Date:	12/31/08
Total Cost:	$77,784
SPR Funds:	$77,784
FFY 2008 Funds Expended:	$12,553
Unexpended Funds:	$256
Status:	Contracted
Contractor:	NewWest Strategies

URL: http://www.mdt.mt.gov/research/docs/research_proj/business_market/final_report.pdf

Objective:

The objective of this project is to determine what opportunities are available for a new or expanding business in Montana highway construction and consulting industries through the Montana Department of Transportation (MDT). The information provided by this study would help the DBE Supportive Services (Disadvantaged Business Enterprise) program within the Department inform subcontractors and subconsultants of these identified opportunities, requirements, and challenges.

Progress:

All research is complete.

Reports:

The final report is in review. Project information can be viewed at the above URL.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

Contractor Project Manager:

Richard L'Heureux
406.495.8111
rick@newweststrategies.com

2.2.3.2 Disparity/Availability Study

Project Number:	8190
Start Date:	4/1/07
Completion Date:	5/31/09
Total Cost:	$833,616
SPR Funds:	$833,616
FFY 2008 Funds Expended:	$412,267
FFY 2008 MDT Indirect Costs:	$33,654
Unexpended Funds:	$119,411
Status:	Contracted
Contractor:	D. Wilson Consulting Group
URL:	http://www.mdt.mt.gov/research/projects/admin/disparity.shtml

Objective:

The purpose of this research project is to determine the extent to which barriers exist that impact small, disadvantaged businesses' ability to participate in federally assisted contracting opportunities in the transportation industry in Montana.

Progress:

All research is complete. The final report is in review.

Reports:

Seven progress reports were submitted and can be viewed at the above URL.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

Contractor Project Manager:

Deirdre Kyle
904.757.9300
ddkyle@dwilsongroup.net

2.3 BRIDGE AND HYDRAULICS RESEARCH PROJECTS

2.3.1 Contracted Projects

2.3.1.1 Evaluation Methods of Estimation of Bridge-Pier Scour for Streams with Coarse Bed Materials Based on Observed Scour in Montana

Project Number:	8154
Start Date:	7/1/00
Completion Date:	8/31/09
Total Cost:	$324,039
SPR Funds:	$163,144
Contractor Cost Share:	$160,895
FFY 2008 Funds Expended:	$10,693
FFY 2008 MDT Indirect Costs:	$1,318
Unexpended Funds:	$1,000
Status:	Contracted
Contractor:	United States Geologic Survey
URL:	http://www.mdt.mt.gov/research/projects/hyd/bridge_scour.shtml

Objective:

The overall objective of this project is to improve pier-scour estimates at bridges in Montana. To this end, this project has two major components. The first component is an analysis of existing bridge-scour data in Montana and adjacent mountain states similar to the comparison study done on a national basis. The second component is a long-term pier-scour data collection program for bridges over coarse-bed streams throughout Montana. The goal is to obtain on-site pier-scour measurements at selected sites per year over a 5-year period.

Progress:

All research is complete.

Reports:

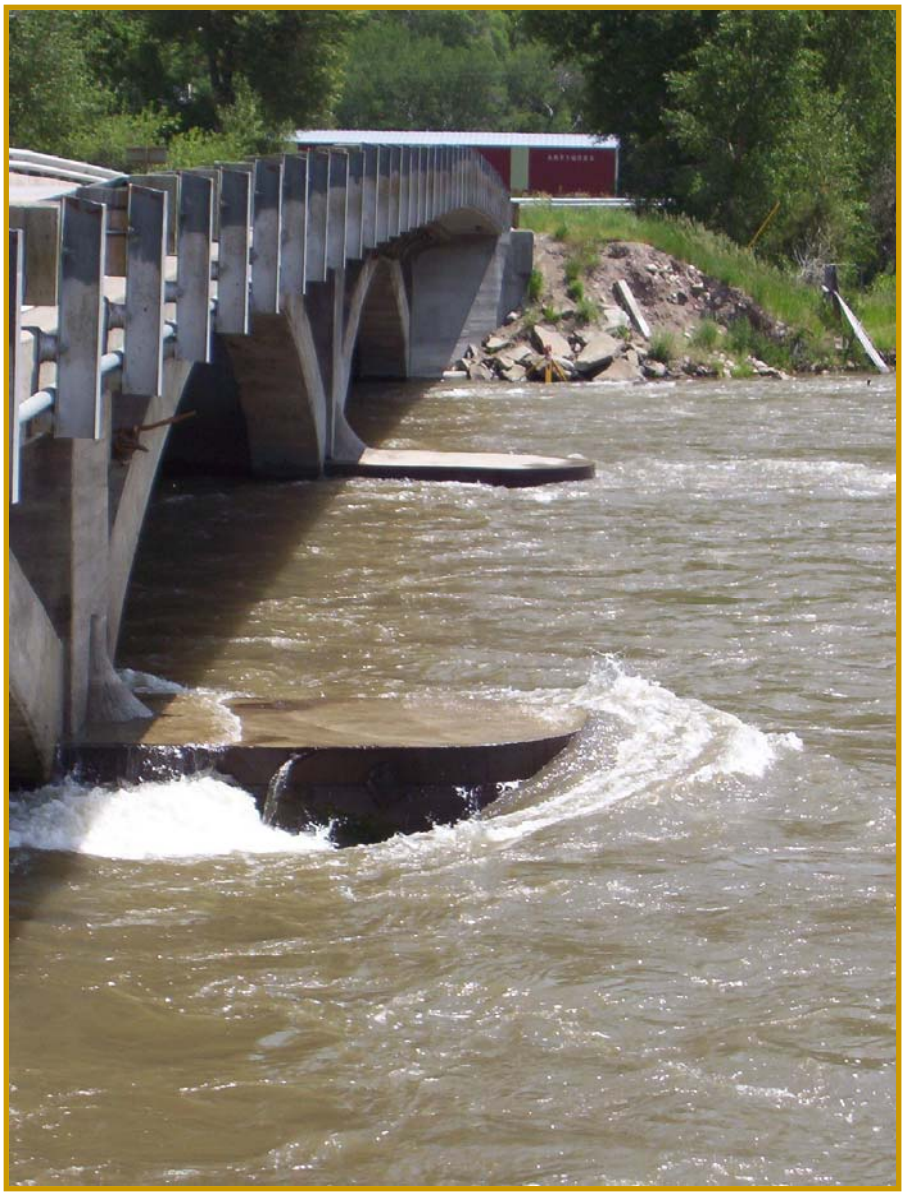
The final report is in publication. Project information can be viewed at the above URL.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

Contractor Project Manager:

Stephen Holnbeck
406.457.5929
holnbeck@usgs.gov



2.4 ENVIRONMENTAL RESEARCH PROJECTS

2.4.1 Completed Projects

2.4.1.1 Evaluation of Wildlife Crossing Structures on US Highway 93 Evaro to Polson

Project Number:	1744
Start Date:	2/9/02
Completion Date:	6/30/08
Total Cost:	$597,804
SPR Funds:	$147,804
Federal Funds:	$450,000
FFY 2008 Funds Expended:	$4,288
FFY 2008 MDT indirect Costs:	$473
Unexpended Funds:	$0
Status:	Complete
Contractor:	Western Transportation Institute, Montana State University
URL:	http://www.mdt.mt.gov/research/projects/env/wildlife_crossing.shtml

Objective:

In December 2000, the Confederated Salish and Kootenai Tribes (CSKT), the Federal Highway Administration (FHWA), and the Montana Department of Transportation (MDT) agreed to reconstruct 90 km of US Highway 93 on the Flathead Indian Reservation, Montana. The reconstruction discussions and plans focused on improving driver safety and preserving the natural and cultural heritage of the CSKT.

The plans included 41 wildlife crossing structures to provide safe animal passage under, and in one case over, the highway. In addition, there are 15 km of wildlife exclusion fencing to reduce animals from accessing the roadway and to funnel movements to these crossings, at an estimated cost of $9 million for all of these installations. This effort was unprecedented in North America and provided an opportunity to study the effectiveness of wildlife crossing and fencing structures in a landscape that accommodates not only wildlife, but also agricultural, residential, business, recreational, and cultural activities.

The Western Transportation Institute (WTI) at Montana State University will evaluate the effectiveness of the US 93 wildlife crossing structures and develop best management practices that can be applied to future projects. The goal of the evaluation is to quantify the effect the mitigation efforts have on the following two parameters: 1) animal-vehicle

collisions and 2) wildlife movements across US 93, with a focus on deer species and black bear. Effectiveness will be defined *a priori* and will ultimately be determined based on a comparative analysis of pre- and post-construction animal-vehicle collisions and animal crossings of the highway.

Progress:

All work on the preconstruction evaluation project is complete. The postconstructiion evaluation project has not begun yet.

Reports:

The final report was completed, published, distributed and can be viewed at the above URL.

Implementation:

A postconstruction proposal was prepared. Timing of construction and partnering opportunities will dictate when this evaluation begins.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

Contractor Project Manager:

Marcel Huijser
406.543.2377
mhuijser@coe.montana.edu

2.4.1.2 Preventing Adverse Effects from Highway Noise: A Toolkit for Local Planners

Project Number:	8117-36
Start Date:	3/31/07
Completion Date:	3/31/08
Total Cost:	$8,205
SPR Funds:	$8,205
FFY 2008 Funds Expended:	$3,480
FFY 2008 MDT Indirect Costs:	$378
Unexpended Funds:	$0
Status:	Complete
Contractor:	Headwaters Policy/Planning Partnership and Wyatt Design

URL:http://www.mdt.mt.gov/research/docs/research_proj/noise_plan/final_report.pdf

Objective:

The purpose of this project was to develop a user-friendly booklet designed to help and encourage local Montana governments to incorporate noise compatibility into their land use planning. The document was modeled after a similar report produced by the South Dakota Department of Transportation (*Tools for Preventing Adverse Effects from Highway Noise: A State and Local Partnership Approach*).

Progress:

The toolkit is complete.

Reports:

The toolkit can be viewed at the above URL.

Implementation:

Training will be developed to further enhance implementation of this tool at the local level.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

2.4.2 Contracted Projects

2.4.2.1 Bozeman Pass Wildlife Linkage and Highway Safety Pilot Study

Project Number:	8173
Start Date:	2/28/03
Completion Date:	5/31/10
Total Cost:	$98,983
SPR Funds:	$83,983
Contractor Cost Share:	$15,000
FFY 2008 Funds Expended:	$12,876
FFY 2008 MDT Indirect Costs:	$1,485
Unexpended Funds:	$44,630
Status:	Contracted
Contractor:	Western Transportation Institute, Montana State University
URL:	http://www.mdt.mt.gov/research/projects/env/boz_wildlife.shtml

Objective:

This project will evaluate the effectiveness of wildlife fencing that will be installed at the Montana Rail Link (MRL) overpass on I-90 near Bear Canyon. Data on wildlife crossings and animal-vehicle collisions will be collected before and after installation of the fencing in order to evaluate if the fencing reduces animal-vehicle collisions, as well as if animals maintain movements across the transportation corridor by traveling under I-90 through existing culverts and the MRL overpass.

A related project was recently completed. The objective of this recently completed project was to test the use of Intelligent Transportation Systems (ITS) in addressing wildlife-vehicle conflicts on Bozeman Pass. Intelligent Transportation Systems are advanced technologies (such as highway advisory radio or electronic message signs) that can be installed on roads to improve safety or address other transportation issues that affect drivers. This project addressed whether wildlife advisories on automated roadside message signs may help reduce animal-vehicle collisions. This effort included a speed study and driver survey to quantify potential effects that wildlife advisory messages may have on speed and driver behavior. In addition, a driver simulator study tested how drivers respond to wildlife advisory messages, as well as how their speed influences the occurrence of an animal-vehicle collision.

Together, these two projects will provide a better understanding of the effectiveness of highway construction options and traveler information methods in reducing wildlife-transportation conflicts on Bozeman Pass. This information can be used for long term

planning efforts to ensure that future highway construction promotes both wildlife protection and traveler safety.

The first study is contracted through the MDT Research Programs.

Progress:

Data management and reporting, road kill surveys, and track bed, photo, and infrared counter monitoring occurred as part of post-construction monitoring in FFY 2008.

Reports:

Twelve progress reports were received in FFY 2008. These reports and other project information can be viewed at the above URL.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

Contractor Project Manager:

Angela Kociolek
406.994.6308
angela.kociolek@coe.montana.edu

2.4.2.2 Monitoring Wildlife Crossings on US 93 South

Project Number:	8194
Start Date:	8/31/08
Completion Date:	7/31/15
Total Cost:	$469,304
SPR Funds:	$469,304
FFY 2008 Funds Expended:	$0
FFY 2008 MDT Indirect Costs:	$0
Unexpended Funds:	$469,304
Status:	Contracted
Contractor:	Patricia Cramer
URL:	http://www.mdt.mt.gov/research/projects/env/us93_wildlife.shtml

Objective:

The objective of this project is to determine the effectiveness of animal crossing structures and associated wildlife fencing in providing improved public safety and permeable roadways by investigating animal-vehicle collisions and animal crossing structure usage before and after construction. White-tailed deer is the species of focus for this investigation; however, it is likely that data on other species will also incidentally be collected and may be useful.

Progress:

An RFP was issued, a contractor was chosen, and a contract was executed. The project kick-off meeting will be held in early FFY 2009.

Reports:

No reports were due in FFY 2008. Project information can be viewed at the above URL.

MDT Project Contact:

Sue Sillick
406.444.7693
ssillick@mt.gov

Contractor Project Manager:

Patricia Cramer
435.797.1289
patricia.cramer@usu.edu

2.4.3 Pending Projects

2.4.3.1 Best Management Practices to Mitigate Burrowing Mammals Impacts on Montana's Highways

This topic was submitted during MDT's FFY 2007 research project solicitation cycle. The Technical Panel met a number of times and developed the following scope of work. A proposal was submitted. This project will be considered for funding in FFY 2009. Project information can be viewed at http://www.mdt.mt.gov/research/projects/env/burrow_mammal.shtml.

Purpose:

Montana mammals, including, but not limited to gophers and moles, are choosing their habitat in and around Montana's roadway shoulders and under paved surfaces. This choice of habitat creates burrows, which allows water to infiltrate the subsurface and causes premature failure of the pavement structure. The Montana Department of Transportation (MDT) Maintenance Division requires cost-effective solutions to mitigate this type of damage.

Objective:

The overall objective is to develop best management practices for the reduction of damage to the roadbed by invasive mammal species. The project will entail but not be limited to the following tasks.

Tasks:

1. It will be necessary to understand how the Department's Maintenance operations currently handle the repair or prevention of roadbed damage by rodents. This will entail meeting with pertinent Maintenance personnel (home office and District) to discuss the issue of mammal damage. This will also entail site visits by the consultant at current affected areas, past fixes or sites that currently depict mammal damage.
2. The consultant will review past documented research involved with this subject and contact departments of transportation/provinces in their experiences with this issue. MDT will supply a survey conducted in 2007, which will supplement the contractor in their contacts and give some information on current publications and case studies to this effort.
3. The contractor will determine effective practice for the alleviation of mammal damage. For each procedure there will be:
    - Delineation of the species type.

- Complete description of type of repair required for the geometric attribute of the roadway feature.
- Determine cost and quantities for repair.
- Determine need for special permitting or staff qualifications, and/or training that may be required for each repair.
- Consider the environmental issues for each application.
- Determine the potential public perception of each type of procedure.
- Develop a rational decision process.

4. The contractor will also review and report on construction practices that may effectively reduce mammal damage. If possible, relate this information to Task 3. Basically, Tasks three and four should result in a toolbox of treatments to address specific conditions.

   The intent is to move away from reactive maintenance to a preventative maintenance process or a planned strategy of cost-effective treatments to address the specific requirement.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

2.4.3.2 Compost Application for Optimized Vegetation Response

This topic was submitted during MDT's FFY 2005 research project solicitation cycle. It was put on hold until a previous phase (Phase 2) was completed. After completion of Phase 2, the Technical Panel developed a scope of work and issued an RFP. A proposal was received at the end of FFY 2008 and approved for funding in early FFY 2009. Project information can be viewed at http://www.mdt.mt.gov/research/projects/env/organic_matter.shtml.

Objective:

Revegetation of roadside disturbances has proven difficult when inhospitable growth media has been encountered. Recognizing that compost application may dramatically improve vegetation development, MDT contracted with Montana State University (MSU) Reclamation Research Unit to perform a research investigation evaluating compost application and incorporation on steep cut slopes. This research project was initiated during 2003. Several research plots were constructed near Happys Inn on U.S. 2 and near Miles City on U.S. 12. Summer 2004 was the first growing season for of all the research plots. Vegetation response spanned a wide range from robust vegetation development on the compost treated plots at Happys Inn to incipient vegetation growth at the Miles City research site. The problems observed with compost application technologies are two-fold. First, the rate of application has not been optimized to minimize cost. Two application rates were applied during construction of research plots; a 1 inch and 2 inch layer. In the high moisture regime of northwest Montana, plants flourished in both treatments. It is probable that a lower application rate can achieve acceptable vegetation results, and make the use of compost more attractive by virtue of reduced cost. A need exists to optimize application rates to reduce cost. Second, compost applied as a blanket at the Miles City research site was desiccated during the summer months reflecting drought conditions observed in eastern Montana. Concurrent wind removal of the compost prior to plant establishment diminished the potential treatment benefit. Substantial areas on the treated plots were negatively impacted by wind transport of applied compost. A need exists to develop techniques to stabilize compost and prevent adverse wind effects.

In summary, development of compost amendment techniques show great promise for aiding in revegetation of difficult parent material along Montana transportation corridors. Preliminary results from existing test plots are very promising. Prior to adoption of compost-based revegetation prescriptions for large scale construction projects, optimization of the techniques employed and rates of application is required to address limitations observed. The compost application rate needs to be adjusted downward on sites with abundant rainfall to identify an optimal rate and techniques need to be developed to prevent compost loss in wind-prone areas.

Progress:

An RFP was issued, a contractor was chosen, and a contract was executed to begin FFY 2009. The project kick-off meeting was held early FFY 2009. Finally, project construction occurred in early FFY 2009.

Reports:

No reports were due in FFY 2008. Project information can be viewed at the above URL.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

Contractor Project Manager:

Rob Ament
406.994.6423
rament@coe.montana.edu

2.4.3.3 Determining Swimming and Leaping Abilities of Montana's Coldwater Fish for Passage through Culverts

The following problem statement was submitted to MDT in FFY 2008. It was approved to move forward to the Technical Panel Stage. The Technical Panel met once to determine the merits of the project. A proposal is in preparation. Project information can be viewed at http://www.mdt.mt.gov/research/projects/env/fishleap.shtml.

Problem Statement:

The weakest link in our ability to design new culverts, or assess existing culverts, with respect to fish passage is the lack of reliable information concerning the swimming and leaping ability of Montana's coldwater fish. Information for surrogate or *design* fish are currently used - essentially an anecdotal composite of what little information is available for species that are similar in name or nature. For example, one interested in designing a culvert to accommodate passage of bull trout would be required to use a combination of the limited information available for brook trout or rainbow trout. Furthermore, information relative to the size class of fish of interest may not exist at all. This compromise occurs with respect to both swimming ability and barrier leaping ability.

Research Proposed:

A combination of replicated field and lab studies should be undertaken. The species of fish used in the trials should reflect the coldwater species of interest in Montana. If lab trials are used (indoor or outdoor), the trials should be conducted in a manner that represents natural stream conditions as closely as possible. The trials should be designed to arrive at statistically appropriate probabilistic-based estimates of leaping and swimming abilities by size class for the species of interest. The one and only example in current literature of probability-based swimming capabilities is given in Fish Passage in Montana Culverts: Phase II – Passage Goals (FHWA/MT-07-010/8181). In this report the probability that spawning-class Yellowstone cutthroat and rainbow trout passed through study culverts was presented as a function of the water velocity in the culvert.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

2.4.3.4 Effects of Carcass Composting on Chronic Wasting Disease

The following problem statement was submitted in FFY 2008 for the FFY 2009 solicitation cycle. A Technical Panel was formed to see if this high priority topic could be moved forward. The Technical Panel prepared and issued a survey. The results are currently being analyzed.

Problem Statement:

Determine if the end-product of composted roadkill deer could potentially spread chronic wasting disease (CWD), if the composted animals were themselves infected. Currently, MDT is composting roadkill at 9 sites around the state. We are unable to re-use the composted material as a vegetation enhancement on our roadsides because the State Dept of Agriculture and Fish, Wildlife and Parks are afraid that the practice could spread CWD (which has not yet been documented in MT).

Research Proposed:

Proposed research would involve composting animals infected with CWD and then seeing if the material can infect uninfected animals.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

2.4.3.5 Review of MDT's Planted RIPRAP Program

A number of years ago, MDT initiated a planted RIPRAP program. An initial evaluation was conducted in the early 2000's. In FFY 2008, another evaluation was requested for this program. A Technical Panel was formed and met once. The Technical Panel determined the first step was to visit a number of planted RIPRAP sites. These site visits will occur in FFY 2009. Based on the results of the site visits, the Technical Panel will determine if further research is appropriate.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

2.4.4 Cancelled Projects

2.4.4.1 Assessment of Sediment Disturbance in Streams during Bridge Construction

The following problem statement was submitted for the FFY 2008 research program. It was approved to move forward to the Technical Panel Stage. The Technical Panel met once to discuss the research topic. It was decided that research was not the best venue with which to address this issue. The project was cancelled.

Problem Statement:

Montana water-quality standards for sediment disturbance in streams at construction sites are based on standards that describe a qualitative visual assessment of turbidity increases. As a result, the allowable degree of disturbance is ambiguous, which makes it difficult to know with certainty whether or not a job site is within compliance. A quantitative assessment of suspended-sediment concentrations and loads at selected locations upstream and downstream from bridges before, during and shortly after construction activities would provide a more reliable means to evaluate the magnitude and duration of disturbance.

Research Proposed:

It is proposed that the U.S. Geological Survey (USGS) obtain concurrent suspended-sediment samples and turbidity measurements, bed-material size data, and flow measurements at multiple bridge locations across Montana scheduled for repair or construction activities. The bridges would be located on various stream types representing a range of geomorphic settings and channel characteristics in order to develop a database describing the degree of construction-related sediment disturbance in channels of varying size, substrate, and hydrologic characteristics. Suspended-sediment concentrations would be documented quantitatively at one transect upstream and multiple transects downstream from the bridge to comparatively assess the progression from natural background condition to incremental spatial variations in sediment disturbance. Sampling would be conducted twice during the day: 1) during a period of active construction and 2) shortly after (within 1-3 hours) construction activities have ceased for the day. The differences in suspended-sediment concentrations during and shortly following construction activities would provide a measure of the duration of construction-related effects on suspended-sediment concentrations.

The USGS and others have demonstrated a correlation often exists between suspended sediment concentration and turbidity. An additional component of this study would include measurements of turbidity at the construction sites to further develop this

correlation and create a surrogate for suspended sediment. Work done by Newcombe and others with the Ministry of Environment, British Columbia, has developed standards for severity of ill effects on fisheries related to suspended sediment concentration, duration of exposure, turbity, and duration of exposure. The data collected as part of this effort could be compared to the standards developed by Newcombe.

After compilation of data from a wide range of stream types over 2-3 years, correlations between flow, suspended-sediment concentrations and loads, turbidity, and channel substrate can be examined. These data can be used to evaluate the relative vulnerability of different stream types to construction-related sediment increases above background conditions and the potential for adverse impacts on aquatic life, recreation, or other beneficial water uses. After enough stream types are sampled, the information could be presented to the Montana Department of Environmental Quality to aid in developing numeric standards that would represent realistic compliance goals that could be easily verified by onsite measurements of turbidity or analysis of water samples for suspended-sediment concentration.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

2.4.4.2 Determine Erionite Occurrence in Southeastern Montana and Relationship to MDT Highway Construction, Past and Future

A problem statement for this project was submitted for the FFY 2008 research program. It was approved to move forward to the Technical Panel Stage. The Technical Panel met twice to develop the following scope of work. This scope of work was rejected by the RRC and the project was cancelled.

Scope of Work:

Erionite is a naturally occurring zeolite mineral usually found associated with volcanic ash that has been altered by weathering and groundwater interaction. It is a wooly fibrous mineral with properties very similar to asbestos. Potential serious health hazards, similar to those associated with asbestos have been identified with Erionite. The U.S. Environmental Protection Agency and the State of North Dakota have documented occurrences of Erionite in western North Dakota in the Arikaree, Brule, and Chadron Formations. These deposits were used extensively as construction aggregate in Dunn County, North Dakota. The Arikaree Formation is mapped in several locations in southeast Montana in the vicinity of Ekalaka and north of Alzada.

This research effort has been envisioned as a two-phase process. This request covers Phase I, an assessment of the presence of Erionite in Montana and its potential impact in use on past construction projects and the risk to future activities. If feasible an effort will be made to segregate those past projects and recommend the processes required to insure the safety of highway workers and travelling public in dealing with the potential presence of Erionite. Phase II, if warranted, would be to conduct sampling and analysis at qualified sites to ascertain the presence of Erionite within the highway corridors or aggregate sources. This project will include, but not be limited to:

Phase 1

1. Through a review of current literature, report on information that can assist in the formulation of recommendations with the following tasks.
2. Report on the known potential human health risk of exposure to Erionite.
3. Through available information, demarcate the geological regions or known formations which contain Erionite within the State of Montana and adjacent areas of North Dakota and South Dakota.
4. Determine aggregate sources that may have been used as material supply for past highway construction projects involving the Montana State Highway System designations in the formations known to contain Erionite. In addition, ascertain which past State highway projects may have used those sources. Proposed approaches to gathering this information should be detailed in the proposal; data

needs must be identified in the work plan and how the contractor intends to obtain that information.

5. Report on the level of processes required during a maintenance or construction project to minimize the exposure to Erionite contaminated materials directly related to that activity. The contractor may also relate this task to other similar activities relating to agriculture, wild land firefighting, etc.
6. Develop procedures and special provisions to identify and deal with the mineral Erionite that may have been used on past highway and other public works projects for use in future construction or maintenance projects that will insure the safety of the workers and travelling public.

Based on the outcome of the above tasks and recommendations, there may be an impetus to conduct soils testing for Erionite within the right-of-way at those highway corridors, aggregate sources, and/or adjacent areas. The contractor is asked to justify the testing regime, and determine location and frequency of soil testing for potential Erionite contamination.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

2.5 GEOTECHNICAL, MATERIALS, AND PAVEMENTS RESEARCH PROJECTS

2.5.1 Completed Projects

2.5.1.1 Axial Capacity of Piles Supported on Intermediate Geomaterials

Project Number:	8117-32
Start Date:	3/1/06
Completion Date:	9/30/08
Total Cost:	$42,828
SPR Funds:	$26,684
Contractor Cost Share:	$16,144
FFY 2008 Funds Expended:	$8,521
FFY 2008 MDT indirect Costs:	$930
Unexpended Funds:	$0
Status:	Complete
Contractor:	Western Transportation Institute, Montana State University

URL: http://www.mdt.mt.gov/research/docs/research_proj/axial/final_report.pdf

Objective:

The axial capacity, driving resistance, and long-term resistance of piles driven into intermediate geomaterials are not well established. There is little to no published guidelines for addressing the properties of these materials in terms of pile axial capacity.

Intermediate geomaterials are encountered throughout Montana and it is anticipated that a significant number of future bridge foundations will be founded in these materials, especially in the eastern portion of the state. Because the expense of conducting pile loading tests is cost prohibitive for most bridge projects, MDT geotechnical engineers and geologists could greatly benefit from improved empirical procedures for performing axial pile analyses, predicting driving resistances, predicting axial resistance, and estimating pile tip depth.

The primary objective of this study was to develop empirically based guidelines for the analysis and design of piles driven into intermediate geomaterials. The guidelines were developed by conducting back analyses using previously collected data from pile installation projects.

Results from this study will have the potential to improve the reliability and cost effectiveness of a significant number of future bridge foundations in the state of Montana.

Progress:

All work is complete.

Reports:

The final report was completed, published, distributed and can be viewed at the above URL.

Implementation:

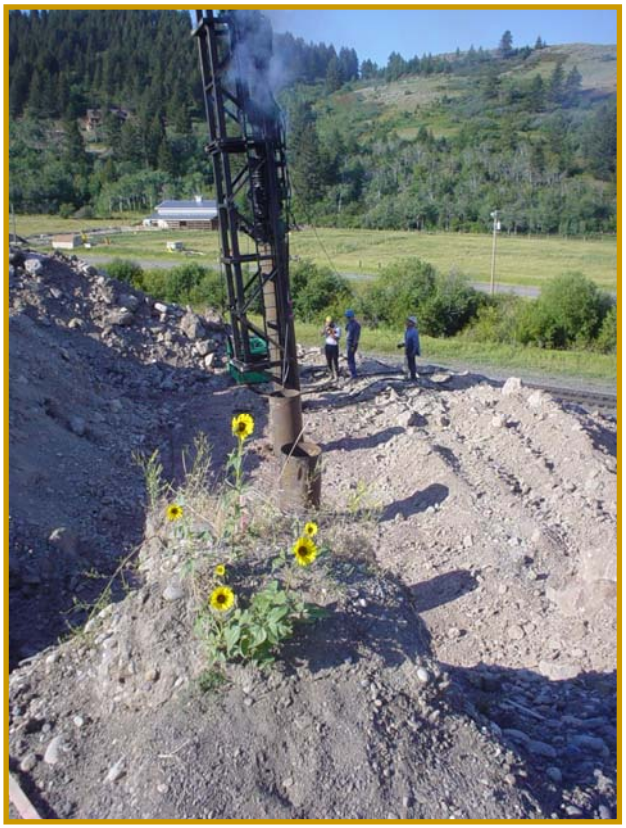
This study indicates that traditional semi-empirical methods developed for soil may yield unreliable predictions for piles driven into intermediate geomaterial (IGM) deposits. The computed results may have little to no correlation with CAPWAP capacities measured during pile installation. Currently, CAPWAP capacity determinations during pile driving or static load tests represent the only reliable methods for determining the capacity of piles driven into IGM formations. Therefore, no change in process is required.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

Contractor Project Manager:

Bob Mokwa
406.994.7277
rmokwa@ce.montana.edu



2.5.2 Contracted Projects

2.5.2.1 Field Investigation of Geosynthetics Used for Subgrade Stabilization

Project Number:	8193
Start Date:	2/1/08
Completion Date:	4/30/09
Total Cost:	$314,379
SPR Funds:	$95,570
Contractor Cost Share:	$94,102
Partner Cost Share:	$124,707
FFY 2008 Funds Expended:	$80,859
FFY 2008 MDT indirect Costs:	$8,824
Unexpended Funds:	$14,712
Status:	Contracted
Contractor:	Western Transportation Institute, Montana State University

URL: http://www.mdt.mt.gov/research/projects/geotech/subgrade.shtml

Objective:

The use of stiff geosynthetics in unpaved roads on soft subgrade is known to provide a reinforcing benefit to the road allowing better distribution of applied loads and increased bearing capacity, especially for fill depths of less than 0.4 m and subgrades with a CBR of less than 3. Overall, the reinforcing benefit of a geosynthetic can be directly seen in rut formation, with up to ten times as many standard axle passes needed than for an unreinforced road.

Design of a geosynthetic unpaved road should take into consideration the results of preceding laboratory and field investigations because there is not yet an accepted standard design technique that incorporates the material properties of the geosynthetic in the design to account for the reinforcement due to their inclusion.

The performance of geosynthetic material, particularly junction integrity, under traffic loading in field conditions is also desirable. While laboratory tests can indicate junction strength by a number of methods, the survivability of the junction to installation and loading requires field investigations.

This project aims to construct test sections in the field to investigate the relative benefit of various geosynthetics available on the market to an unpaved road. A prepared and placed subgrade will provide equivalent conditions for each test section; likewise, the gravel surfacing along the entire test bed will be uniform. Controlled traffic loading with frequent rut profile measurements will indicate performance benefits of each

geosynthetic in the test sections. Additionally, post-traffic examination of the geosynthetic will provide invaluable information regarding the performance and installation survivability of the geosynthetics.

Progress:

All research was completed in FFY 2008; the final report is in preparation.

Reports:

Two progress reports were required and submitted in FFY 2008. Project information can be viewed at the above URL.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

Contractor Project Manager:

Eli Cuelho
406.994.7886
elic@coe.montana.edu

2.5.3 Pending Projects

2.5.3.1 Ground Penetrating Radar Analysis

A problem statement for this project was submitted for the FFY 2008 research program. It was approved to move forward to the Technical Panel Stage. The Technical Panel met once to develop the following scope of work. An RFP was issued. The evaluation committee will meet in early FFY 2009 to review the proposals submitted for this project. Project information can be viewed at http://www.mdt.mt.gov/research/projects/pave/gpr.shtml.

Scope of Work:

The Pavement Analysis Section of the Montana Department of Transportation (MDT) started using ground penetrating radar (GPR) in 2006 in an effort to assist in the design of pavement sections for statewide reconstruction and rehabilitation projects.

It is for this reason the Montana Department of Transportation is initiating a research project to determine the feasibility of expanding the GPR program by maximizing the confidence level of the GPR data.

Note: This project will be a phased effort. The results of Phase 1 will determine if a Phase 2 will be required. The State may elect to either continue with a recommended next phase, to discontinue the project, or choose to solicit another contractor for this work.

Objective:

The overall objective is to provide statistically defensible recommendations for the use of GPR statewide to aid in the determination of reconstruction and rehabilitation treatments. This objective is dependent on the ability of GPR to determine the variability of roadbed characteristics and to what extent GPR can delineate those characteristics in regards to determining the structural layer prevailing conditions. Note: This effort will only focus on roadbeds using bituminous asphalt. This project will include, but not be limited to:

Phase 1: Feasibility Study:

Tasks:

1. Through a review of current literature, industry practice, and interviews with State DOTs and Provinces; report on the current practice relating to the use of GPR in conjunction with pavement analysis programs. This task will put emphasis on the

technical aspects of those programs that pertain to the objective of this effort. This is not a software development project; however, the contractor may report on existing software or emerging technology related to this effort.
2. It will be necessary for the contractor to understand how the Department currently conducts the GPR program. The contractor will report on all aspects of the non-destructive testing (NDT) activities and process relating directly to GPR use at MDT and how these activities relate to other NDT programs.
3. The variability of road bed structure by region, environmental, or seasonal factors that may influence the GPR analysis is a key element with this effort. There must be baseline documentation to reasonably ascertain that variability and to what extent GPR can be used for and conversely what GPR cannot delineate. The contractor must report on current GPR use and contemporary technology to delineate pavement layers. This must be substantiated prior to proceeding with any proposed sampling efforts.

Phase 2: Field Validation:

Tasks:

1. Current consensus within MDT indicates core samples may be required in the determination of which variables affect the quality of the GPR output. The sampling methodology must be warranted and will be conducted and coordinated by the contractor with acceptance by MDT. GPR sampling will be conducted by MDT in coordination with the needs of the contractor. The contractor may submit other scenarios for validation.
2. The contractor is required to estimate the level of visitation to field and headquarter locations. The contractor is also responsible for the coordination of those events. If in-state data sampling phase is approved, all field work and data sampling activities must be in concurrence with and approved by MDT.
3. The contractor must make recommendations as to which conditions, project types, etc lend themselves to GPR analysis.
4. The prospective contractor must also submit a technical support plan to assist MDT with future in-house calibration activities. This plan must be complete and sufficient enough to allow MDT to conduct all necessary calibration activities.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

2.5.3.2 Measurement and Evaluation of Subgrade Soil Parameters: Phase 1 – Synthesis of Literature

The following problem statement was submitted to MDT in FFY 2008. It was approved to move forward to the Technical Panel Stage. The Technical Panel met once to determine the merits of the project. A proposal was submitted late in FFY 2008. Funding will be requested for this proposal early in FFY 2009. Project information can be viewed at http://www.mdt.mt.gov/research/projects/pave/subgrade_soils.shtml.

Problem Statement:

Many soils in Montana pose significant problems for constructability and long-term pavement performance. The current method (R-value testing) used by the Department for quantifying the suitability of these soils for subgrade strength may yield unsatisfactory results. Other investigatory techniques may yield more consistent and reliable results, which will improve pavement performance and save significant construction and maintenance funds. Two other testing methods are in common use: the California Bearing Ratio and the Resilient Modulus test. Furthermore, several state DOTs are evaluating the use of Atterberg Index tests for correlation to mechanistic pavement design and subgrade improvement.

Research Proposed:

Proposed research includes a comprehensive literature review of the state of the practice in current testing used in subgrade evaluation. Additionally, it is recommended that several problem soils be evaluated using California Bearing Ratio and Resilient Modulus testing. Lacustrian silts from Montana's glacial lakes are particularly problematic, however, expansive clays derived from Cretaceous shales in the Eastern regions of the state warrant evaluation also. If greater reliability and ability to distinguish problem subgrade soils is found with one of these methods, this research should conclude with recommendations to augment current MDT testing with the more reliable test method. Research into the practicality of implementing the proposed test method should be included in the conclusions.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

2.5.3.3 Pile Static Load Testing

The following problem statement for this project was submitted for the FFY 2008 research program. It was approved to move forward to the Technical Panel Stage. The Technical Panel met twice to evaluate the need for this research. The Technical Panel determined this testing should be included in construction as an operational item. This project is pending FHWA approval of including pile static load testing in construction projects.

Problem Statement:

In recent years MDT has been using Pile Driving Analyzer (PDA) tests to estimate the capacity of piles during driving and for determining the acceptability of the final tip elevation. The Department needs to verify the estimated capacity against the actual capacity of the piles with a Static Load Test. Results on several recent projects have been questionable and this testing will increase the PDA testing's reliability.

Research Proposed:

Conduct Static Load Testing on piles driven into representative soil and rock conditions found in Montana and compare the results to the PDA tests performed during driving. Testing can be performed on MDT bridge projects using production piles or as a stand alone project.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

2.5.4 Cancelled Projects

2.5.4.1 I-15 North Corridor - Canadian Truck Load Bridge and Roadway Analysis

Project Number:	8192
Start Date:	8/15/07
Completion Date:	7/31/08
Total Cost:	$1,284
SPR Funds:	$1,284
FFY 2008 Funds Expended:	$1,284
FFY 2008 MDT indirect Costs:	$140
Unexpended Funds:	$0
Status:	Cancelled
Contractor:	Western Transportation Institute, Montana State University

Objective:

The purpose of this project is to investigate the infrastructure impacts of allowing Canadian B-trains operating at the weight limits used in Alberta, Canada to travel on Interstate Highway 15 between Great Falls and the Canadian Border. This weight is currently allowed by Federal law between Shelby and the Canadian Border. In an 8 axle configuration, the maximum allowable gross weight of a B-train in Alberta of 140,000 pounds (Alberta Government, 2007) is significantly higher than the allowable gross weight on a comparable 8 axle Montana A-train of 117,000 pounds. If Federal law is changed to allow Canadian B-trains to run further south than Shelby, it is expected that users and providers of transportation services would make adjustments in their operations to take advantage of this increased cargo capacity. Potential highway system impacts associated with these adjustments range from changes in the composition of the traffic stream along this corridor, to changes in the demands the new vehicle stream places on the highway infrastructure of the corridor. Investigation of these potential impacts is needed to respond to inquiries from shippers, businesses, and Alberta interests, and to help inform decisions on infrastructure issues relative to this topic. Ideally, the information developed in this project (and the processes followed) can be used as a model to assess any corridor that is identified for future analysis of Canadian B-train operation relative to potential infrastructure impacts on Montana's highway infrastructure.

Progress:

This project was cancelled shortly after it was contracted.

Reports:

No reports were due prior to cancellation of the project.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

Contractor Project Manager:

Jerry Stephens
406.994.6113
jerrys@ce.montana.edu

2.5.4.2 Determination of Unbound Base and Subgrade Resilient Moduli for use in the Mechanistic-Empirical Pavement Design Guide

This project was pending completion of *Pavement Performance Prediction Models*. In discussions with the requesting office, it was determined this research is no longer needed.

Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

2.5.4.3 Implementation of the Mechanistic Empirical Pavement Design Guide for Designing Flexible Pavements in Montana

This project was pending completion of *Pavement Performance Prediction Models*. In discussions with the requesting office, it was determined this research is no longer needed.

Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

2.5.4.4 Soil Stabilization using Byproducts

The following problem statement was submitted to MDT in FFY 2007. It was approved to move forward to the Technical Panel Stage. Later, it was decided this problem could best be approached through the Experimental Projects Program. Therefore, it was transferred to that program.

Problem Statement:

Disturbed soils (construction, mining, fire) are highly sensitive to erosion. We propose that erosion from such disturbed sites could be minimized by treating exposed soil with camelina meal. Production of Camelina sativa is rapidly expanding in Montana for production of omega-3 culinary oils and production of biodiesel. Camelina seed exudes a gum which coats the seed and absorbs water. The resulting water reservoir increases the drought tolerance and enhances the germination of the seed. Oilseed is processed by pressing the oil from the seed. The by product of oil extraction is the seed meal which is generally fed to livestock. The gum remains in the seed meal. The meal can absorb 8-10 fold its weight in water. We have shown that soil erosion in controlled greenhouse studies can be reduced simply by spraying or spreading a layer of camelina meal over exposed soil. Once the meal contacts water, it establishes a gelatin layer which limits soil erosion. The meal can also be used as a carrier for desirable reclamation seed and as an effective dust suppressant.

Research Proposed:

We propose to work directly with the MT DOT to evaluate camelina meal as a means to reduce erosion along disturbed road construction sites. The efficacy of camelina meal will be compared with the efficacy of more traditional erosion controls such as burlap. Camelina meal will be evaluated as a carrier for selected reclamation seeds including plant germination and establishment. Finally, the camelina meal will be evaluated as a dust suppressant.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

2.6 PLANNING AND SAFETY RESEARCH PROJECTS

2.6.1 Completed Projects

2.6.1.1 *Automated Cost Recovery*

Project Number:	8186
Start Date:	11/1/06
Completion Date:	8/31/08
Total Cost:	$110,492
SPR Funds:	$57,442
Contractor Cost Share:	$53,050
FFY 2008 Funds Expended:	$32,059
FFY 2008 MDT Indirect Costs:	$3,499
Unexpended Funds:	$6,207
Status:	Complete
Contractor:	Western Transportation Institute, Montana State University

URL:http://www.mdt.mt.gov/research/docs/research_proj/cost_recovery/final_report.pdf

Objective:

The purpose of this project was to identify technologies such as smart cards or other cost recovery methods that could be deployed in transit systems in Montana. This project determined if there are technologies that could be feasibly initiated in transit systems in Montana to make the process of collecting fares and reporting information to various agencies more effective and efficient.

Progress

All research is complete.

Reports

Two progress reports were received in FFY 2008. In addition, the final report was prepared, published, and distributed. The final report can be viewed at the above URL

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

Contractor Project Manager:

David Kack
406.994.7526
dkack@coe.montana.edu

2.6.2 Contracted Projects

2.6.2.1 Keep Encouraging Young Drivers Safety Study: Increasing Parent Involvement in Teenage Driving through Driver Education

Project Number:	8117-37
Start Date:	6/15/08
Completion Date:	9/30/09
Total Cost:	$24,490
SPR Funds:	$24,490
Contractor Cost Share:	$12,000
FFY 2008 Funds Expended:	$0
FFY 2008 MDT Indirect Costs:	$0
Unexpended Funds:	$24,490
Status:	Contracted
Contractor:	Montana State University - Northern
URL:	http://www.mdt.mt.gov/research/projects/planning/keys.shtml

Objective:

Teen driving is deeply rooted in the American and Montana culture, but, unfortunately, crashes are the leading cause of death and injury among teens ages 14 to 19. Producing "safe" teen drivers was traditionally the role of driver education in the schools; however, institutionalized limitations and evolving complexities of driving and the highway transportation system reduced its effectiveness. Given that safe driving is a product of more than just knowing how to maneuver a car, current efforts to produce safe teen drivers must reinvent traditional institutions of the past and focus on innovative solutions; we must change the "culture of teen driving," and graduated driver licensing (GDL) was the first major step in doing so. GDL has established a drawn out process for teenagers to gain a full-privilege license, including mandating phases for increased practice driving and restricted independent driving. No longer can teenagers under 18 get a permit and then days later get an unrestricted license.

However, to ensure that the benefits of GDL are realized, all three countermeasures that address teen driving risk—GDL, driver education, and parent involvement—need to be integrated. Most GDL policies require parent- or adult-supervised practice during the learners permit phase, but "requiring it" and having it done thoroughly and well are not necessarily the same thing. Therefore, integrating parent involvement into driver education could ensure that parents get the necessary information and instruction for supervising practice driving from a highly-qualified source. In addition, although GDL restricts teen independent driving during the provisional licensing phase, restrictions vary from state to state and rarely approach the strictest limits that would be consistent with teen driver safety research. Thus, driver education could also provide parents with

the knowledge and resources necessary for limiting teen independent driving under high-risk conditions during restricted and unrestricted licensing phases.

The goal of the KEYS Pilot Study is to determine the feasibility of integrating parent-teen homework assignments into the Montana driver education curriculum and family support for the use of these homework assignments to increase the effectiveness of parent involvement in supervised practice and restriction of teen driving.

The objectives of this project are to:
1. Engage parents in driver education programs through parent-teen homework assignments.
2. Provide parents with information and tools to more effectively supervise their teens' practice driving and assess their teens' driving skills and readiness.
3. Develop the materials needed to accomplish objectives 1 & 2 utilizing an interdisciplinary group of expert driver educators, driver education policy makers, and young driver safety researchers.
4. Utilize qualitative feedback from driver education instructors, teens, and parents about the process, materials, and effectiveness of involving parents in driver education to assess and revise the materials based on it.

Progress:

The project design team met once. They drafted and reviewed parent/teen homework and driver assessment documents. Also, they participated in training and discussions regarding implementation on the pilot study. Finally, an online survey was drafted to evaluate homework assignments, activities, and outcome behaviors.

Reports:

One progress was due and submitted in FFY 2008. Project information can be viewed at the above URL.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

Contractor Project Manager:

Janice Brady
406.265.3730
jbrady@msun.edu

2.6.2.2 Effects of Defensive Vehicle Handling Training on Novice Driver Safety: A Case Study in Lewistown, Montana: Phase III Analysis of Safety Data

Project Number:	8183-003
Start Date:	5/1/06
Completion Date:	7/31/10
Total Cost:	$173,142
SPR Funds:	$88,142
Contractor Cost Share:	$85,000
FFY 2008 Funds Expended:	$7,181
FFY 2008 MDT Indirect Costs:	$885
Unexpended Funds:	$29,976
Status:	Contracted
Contractor:	Western Transportation Institute, Montana State University
URL:	http://www.mdt.mt.gov/research/projects/safety/defensive.shtml

Objective:

New teenaged drivers have the highest accident rates of any group of drivers. Research shows that drivers under the age of 19 have a crash rate that is four times that of the general driving population and the youngest drivers have a higher accident rate yet. The highest accident rate is experienced within 2 years of receiving the driving license. Obviously, the crash rate decreases with driving experience. Research is needed to determine how to safely equip novice drivers with the important elements of experience before they encounter a need for it in an actual driving situation.

The purpose of this research program is to conduct such a study. This project was divided into three phases. In the first two phases, accident records for young Montana drivers were analyzed and a defensive driving curriculum was designed to address the most common risks. Approximately 400 young drivers were recruited in central Montana to take part in the study. Half received a one day intervention of advanced defensive driving during the summer of 2005. This third phase of this project involves the longitudinal collection and analysis of accident and violation data for the study participants over a multi-year period following the intervention.

Progress:

The 2008 survey of young drivers were mailed to the project participants and the surveys were returned. The results are currently being compiled and analyzed. These results should be available early in FFY 2009.

Reports:

The 2007 annual interim report was submitted in FFY 2008. Project information can be viewed at the above URL.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

Contractor Project Manager:

Laura Stanley
406.994.1399
laura.stanley@ie.montana.edu

2.6.2.3 Developing a One-Stop Shop for Public/Specialized Transportation Information in Montana

Project Number:	8188
Start Date:	12/1/06
Completion Date:	11/30/08
Total Cost:	$135,166
SPR Funds:	$135,166
FFY 2008 Funds Expended:	$41,530
FFY 2008 MDT Indirect Costs:	$4,513
Unexpended Funds:	$9,421
Status:	Contracted
Contractor:	PBS&J

URL:
http://www.mdt.mt.gov/research/docs/research_proj/one_stop/final_report.pdf

Objective:

The purpose of this project is to develop a "one-stop shop" for public and specialized transportation information in Montana. This project will develop an approach to provide a feasible, realistic implementation plan the Montana Department of Transportation (MDT) and its partners will be able to use in order to provide better and more consistent information to the public. The plan recognizes that, while research is a fundamental part of the process, the research has no value unless it can be translated into a results-oriented working document.

Progress

All research is complete. The final report is in review.

Reports:

Five progress reports were received in FFY 2008. The final report was completed early in FFY 2009 and can be viewed at the above URL.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

Contractor Project Manager:

Stacy Unholz
(323) 377-0408
SAUnholz@pbsj.com

2.6.2.4 Highway Project Cost Estimating Best Practices

Project Number:	8189
Start Date:	3/1/07
Completion Date:	12/31/08
Total Cost:	$211,668
SPR Funds:	$211,668
FFY 2008 Funds Expended:	$77,353
FFY 2008 MDT Indirect Costs:	$7,538
Unexpended Funds:	$21,713
Status:	Contracted
Contractor:	Sierra Transportation Engineers
URL:	http://www.mdt.mt.gov/research/projects/const/project_cost.shtml

Objective:

The overall objective of this project is to develop a comprehensive document to determine the best practice of efficient highway cost estimating for Montana.

Progress

All research is complete. The final report is in review.

Reports:

Five progress reports were received in FFY 2008 and can be viewed at the above URL along with other project information.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

Contractor Project Manager:

Sirous Alavi
775.827.4400
sirous@ste-group.com

2.6.2.5 Logistics and Marketing Research in Support of Container on Flatcar Shuttle Train on BNSF Mainline to Port of either Seattle or Tacoma

Project Number:	8191
Start Date:	6/1/07
Completion Date:	2/28/08
Total Cost:	$96,192
SPR Funds:	$96,192
FFY 2008 Funds Expended:	$41,872
FFY 2008 MDT Indirect Costs:	$3,183
Unexpended Funds:	$0
Status:	Contracted
Contractor:	Prime Focus
URL:	http://www.mdt.mt.gov/research/projects/admin/flatcars.shtml

Objective:

The current intermodal situation in Montana and the hardship resulting from the lack of these services represent a substantial challenge to the shippers and economic developers within the State. The Burlington Northern Santa Fe (BNSF) offers intermodal trailer service from Chicago to Billings for select private equipment owners but no outbound freight from Billings is loaded to the train. Competitive rates and services are needed for shippers and receivers in Montana to be competitive in domestic and international markets. Value added agriculture commodities rely on containerized transportation systems to compete in world markets; the absence of these services in Montana represents a significant barrier to their competitive position.

Progress

All research is complete. The final report is in review.

Reports:

Four progress reports were received in FFY 2008 and can be viewed at the above URL along with other project information.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

Contractor Project Manager:

Libby Ogard
920.217.7222
logard@new.rr.com

2.6.2.6 Smart Transportation and Land Use Planning

Project Number:	8195
Start Date:	9/1/08
Completion Date:	12/31/09
Total Cost:	$299,873
SPR Funds:	$299,873
FFY 2008 Funds Expended:	$0
FFY 2008 MDT Indirect Costs:	$0
Unexpended Funds:	$299,873
Status:	Contracted
Contractor:	Cambridge Systematics
URL:	http://www.mdt.mt.gov/research/projects/planning/smart_trans.shtml

Objective:

This research is intended to develop a toolkit of off-the-shelf policies, practices, analytic tools and other ideas that can assist MDT and its local partners in expanding cities to better coordinate transportation and land use planning and decision-making. The nominal objectives for the research are to: 1) identify and transfer to local governments off-the-shelf tools now in use nationally that are practical in Montana; and 2) identify promising but underdeveloped planning approaches that are worthy of further research and/or development. More broadly, however, a successful research product will promote advance planning for future land use development with a process that encourages early engagement of MDT by local jurisdictions so that transportation impacts and needs can be avoided, minimized, and/or otherwise addressed. One way to address the impacts will be to anticipate them (through proactive planning) and then coordinate transportation investments to assure that local, regional, and interregional traffic is able to use facilities that are of appropriate functional nature. The research will deliver this successful product by focusing on four issues: 1) development and extension of local street networks; 2) local transportation system financing; 3) assessment of development impacts on local and state roads; and 4) directions for multimodal/transit development.

Progress:

The research team held internal meetings and began other preparations for the project kick-off meeting, scheduled in early FFY 2009.

Reports:

No progress reports were due in FFY 2008. Project information can be viewed at the above URL.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

Contractor Project Manager:

George Mazur
510.873.8700
gmazur@camsys.com

2.6.3 Pending Projects

2.6.3.1 Automated Crash Notification

MDT received an earmark for $990,000 for the study of automated crash notification in Montana. A technical panel was formed and met numerous times. A proposal was prepared and reviewed. This project will be contracted in FFY 2009.

2.6.3.2 Computerized 3-Dimensional Highway Design and Modeling

The following research problem statement was submitted. The Technical Panel met numerous times. The Department with support from the Technical Panel decided to move this effort to an internal process with the lead taken up by the Survey Issues Committee. Research provided a survey of practice from other state DOTs and Canadian Provinces, including: design specifications, guidelines, mapping standards, and design methodology to assist the committee in this effort.

Problem Statement:

MDT construction contracts are being awarded to contractors who are either currently using machine control or are planning to use machine control in the future. Machine control is an emerging technology that allows a contractor to build a project using very little or no conventional construction staking. Machine control technology involves the use of GPS equipment connected to construction machinery that guides the operator during construction activities. The contractor uses the approved plans to create a 3-D model of the design either in-house or by using a consultant. The 3-D model is then loaded into computers on the machinery and, combined with GPS, guides the equipment in the process of constructing the project. The problem is that once the 3-D model is generated, the approved plans, requiring a signature of the P.E. that is responsible and liable for the design, can be set aside and may have little influence on the construction. If there is no quality control or oversight of the 3-D modeling created and used by contractors, MDT could be exposed to considerable economic risk by any errors or omissions introduced to these 3-D models.

Research Proposed:

MDT has been creating 3-D models for years when we collect topographic data of the existing ground, input that data into GeoPak, and generate a digital terrain model (DTM) or 3-D model. A 3-D model of a project design is much more complicated to create and requires a high level of skill and ability. It may also require some specialized software in addition to MicroStation/GeoPak. The research proposed should focus on the use of and quality control of 3-D modeling done by the contractor and/or creation of 3-D models by MDT.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

2.6.3.3 Impact of Increased Canadian Economic Development on Northern Montana Highways

A problem statement for this project was submitted for the FFY 2008 research program. It was approved to move forward to the Technical Panel Stage. The Technical Panel met once to develop the following scope of work. An RFP was issued. The evaluation committee will meet in early FFY 2009 to review the proposals submitted for this project. Project information can be viewed at http://www.mdt.mt.gov/research/projects/mcs/canada_impact_nhwy.shtml.

Scope of Work:

Recent economic developments in the Canadian provinces of Alberta and Saskatchewan are generating changes in commercial traffic across border crossings into Montana and along associated north-south highway corridors. In response to these developments, area elected officials and other leaders have called for expanded port services and have asked Montana Department of Transportation (MDT) and its provincial counterparts to improve highways on these corridors. MDT is sponsoring this research study to determine how economic growth and change, as well as revised port services, may affect traffic volumes on Montana highways. This information will be used to inform decisions regarding future research and infrastructure needs.

This research effort has been envisioned as a two-phase process. This request covers Phase I, an assessment of current and future economic conditions and an estimate of related commercial vehicle traffic growth with and without expanded port operations. Phase II, if warranted, would identify highway impacts of the future traffic and necessary improvements along the highway corridors leading to the ports.

The scope of this study is limited to north-south highway corridors leading to the nine ports served by paved highways from the Port of Coutts-Sweet Grass to the Port of Regway-Raymond. These include Secondary Highways 232, 233, 241, and 511; Montana Highways 24, 13, and 16; US Highway 191; and Interstate 15. Also, impacts to traffic volumes on other highways, including US Highway 2, will be noted if they are identified during the course of the north-south corridor analysis.

This effort will provide an assessment of current roadway conditions and forecast commercial traffic through the ports with and without port improvements. The regional scale of the economic analysis must be sufficient to capture broad multi-state and provincial linkages that may affect traffic along these corridors. The scope of work will include the following tasks:

1. Review and summarize the relevant literature including recent regional studies.
2. Report on the condition and current level of operation for each of the identified highway corridors to include geometric and capacity characteristics, describe operational procedures and capacity at the ports of entry, and research and summarize federal issues relating to port service infrastructure and/or service expansion including national border security policies and programs.
3. Assess existing and future economic conditions, including trends in energy, agriculture, mining, manufacturing, tourism, and wholesale and retail trade sectors in Alberta, Saskatchewan, Montana and other states that may affect commercial transportation demand on the corridors. The analysis should consider any factors that may significantly affect north-south vehicular traffic. These may include development of refining and distribution facilities (including pipelines), and other sector-specific developments. The economic analysis is expected to require collection of primary data from industries and stakeholders. Proposed approaches to gathering this information should be detailed in the proposal. The contractor is responsible for conducting this work, but all contacts with other governmental agencies and the private sector must have advance approval by MDT. Data needed from state public agencies must be identified in the work plan.
4. Based on the information developed in the previous tasks, estimate future commercial traffic volumes on all corridors for 10 and 20 year planning horizons. Future traffic volumes should be estimated using the ports' current operating schedules as well as 24-hour and other scenarios. Origin and destination data may be necessary to perform portions of the traffic volumes analysis. This task should focus on data that is currently available and that can be reasonably acquired.

Based on the results of Phase I, MDT will determine what if any additional research is needed. If additional research is required, MDT will ask the contractor to either submit a new proposal or revise the previous work plan.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

2.7 TRAFFIC RESEARCH PROJECTS

2.7.1 Cancelled Projects

2.7.1.1 Design of a Vertical Shape Portable Concrete Barrier

The following research problem statement was submitted. The project was cancelled due to lack of activity and interest.

Problem Statement:

Currently, all of the non-proprietary temporary concrete barrier systems in use on the national highway system are comprised of safety shape barrier segments made up of one or more sloped faces. These segments are connected by simple connections that allow the barriers to be easily installed or moved in work zones and other temporary barrier applications. Research has shown the sloped face of safety shape barriers causes increased vehicle instability and rollover, especially with regard to small cars. These studies have shown 8.5 percent of safety shape barrier accidents result in rollover, and that safety shape median barriers pose over twice the rollover rate of other median barriers. The increased rollover potential with these barrier shapes becomes critical because rollover accidents double the risk of incapacitating and fatal injuries.

Vertical shape concrete barriers have been shown to provide the largest reduction in vehicle rollover when compared with safety shape barriers through both computer simulation and full-scale crash testing. However, the use of vertical shapes has not been implemented due to concerns that vertical shapes might increase the lateral loads on impacting vehicles. Review of crash test data has demonstrated that this concern is not valid. Comparison of data from safety shape and vertical shape barrier testing found that vertical shape barriers only increase lateral vehicle accelerations by 5 percent. Vertical shape barriers would be easier to transport and store, thus increasing the functionality of the barrier. In addition, the use of a vertical shape could potentially decrease both the overall height and width of the barrier. Barrier reinforcement could be made simpler and more consistent throughout the barrier section due to its rectangular shape. Pre-cast vertical barrier segments may also be easier to form than the current sloped shapes. Because the new vertical shape barrier would start from a clean sheet of paper, the length of barrier sections and the design of the connection between barriers could be optimized to improve both the functionality and safety performance of the barrier system. Design of the new barrier would also include consideration for tie-down options to constrain barrier motion in critical areas such as barriers placed on a bridge deck edge. Therefore, it is believed that a new vertical shape temporary concrete barrier should be developed that would reduce the potential for vehicle

rollover while improving upon many of the shortcomings in current safety shape barrier designs.

Research Proposed:

The development process of the new vertical shape temporary barrier would include computer simulation modeling of barrier geometries, joint designs, and tie-down options, component testing of the various barrier design elements, and full-scale testing of the free-standing and tie-down barrier designs as well as transitioning methods according to Test Level 3 (TL-3) of NCHRP Report No. 350.

MDT Project Manager:

Sue Sillick
406.444.7693
ssillick@mt.gov

3 EXPERIMENTAL PROJECTS

3.1 OVERVIEW

The incorporation of experimental features into construction and maintenance projects allows for a vital field evaluation of new materials and methods. This evaluation, if performed well and scientifically based, allows MDT to determine the implementation value of these new materials and methods.

3.1.1 Work Plan

Prior to construction of an experimental feature, the Experimental Projects Manager (EPM) writes and submits a formal work plan to FHWA for their approval. This work plan should include the following information:

- Location of project,
- Construction project number,
- Title (type) of project,
- Principal investigator,
- Statement of objectives,
- Experimental design,
- Estimated quantities and costs,
- Evaluation schedule, and
- Reporting requirements.

This work plan is important as it formalizes the project with FHWA, which yields two additional benefits:

- FHWA will participate in the original construction and repair, if the project should fail prematurely, at 100% and
- Proprietary features may be specified.

3.1.2 Construction Report

Following the construction of an experimental feature, the EPM is required to submit a construction report for statewide distribution through the Research Programs. This report should be written within thirty days of completed construction of the project and should include:

- Location of project,
- Construction project number,
- Title (type) of project,
- Principal investigator,
- Statement of objectives,

- Date construction of experimental feature was completed,
- Summary of materials and methods,
- Quantity and cost of experimental feature,
- Construction details, and
- Construction problems and a statement of how these problems might have been alleviated.

3.1.3 Progress and Final Reports

Progress and final reports are required by the FHWA throughout the formal evaluation period as stated in the work plan and should be completed within 30 days of the performance evaluation. Reports consist of a performance summary of the experimental feature to date. The final performance summary should contain information on the experimental feature as specified in the work plan, including implementation recommendations. Implementation recommendations should also be presented to MDT management. This report is due by the end of the final evaluation year

3.2 COMPLETED PROJECTS

3.2.1 100 mm Thin Composite Whitetopping

Project Name:	Glendive Whitetopping
Project Number:	STPP 20-1(8)0 P-20, Highway 16
FHWA Number:	MT 00-04
Construction Date:	May 2001
Completion Date:	June 2008
Status:	Complete
Contractor:	Century Contracting
URL:	http://www.mdt.mt.gov/research/projects/gld_whitetopping.shtml

Objective:

The objective of the project was to test the performance of whitetopping as a pavement preservation method. The existing asphalt pavement was milled and a 100 mm (approximately 4 inches) Portland Cement Concrete Pavement (PCCP) overlay was placed to create a composite pavement. The goal was to extend the pavement service life.

Progress:

The project has been in place for seven years with good performance to date.

Reports:

Reports can be viewed at the above URL.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

3.2.2 Cold In-Place Recycled Asphalt

Project Name:	Fairfield North & South
Project Number:	STPP 3-1(15)18
FHWA Number:	N/A - Informal
Construction Date:	September 2001
Completion Date:	October 2007
Status:	Complete
Contractor:	Riverside Contracting
URL:	http://www.mdt.mt.gov/research/projects/fairfield.shtml

Objective:

This experimental rehabilitation project consists of cold milling approximately 75-90 mm of asphalt cement, replacing it with cold in-place recycled plant mix surfacing (90 mm), and placing a seal & cover.

Progress:

The project is rated as performing well.

Reports:

Reports can be viewed at the above URL.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

3.2.3 Cold In-Place Recycled Asphalt using Koch's CIR-Engineered Emulsion

Project Name:	Red Lodge North
Project Number:	STPP 28-2(22)70
FHWA Number:	MT 00-03
Construction Date:	July 2001
Completion Date:	October 2007
Status:	Complete
Contractor:	Riverside Contracting
URL:	http://www.mdt.mt.gov/research/projects/redlodge.shtml

Objective:

This is an experimental rehabilitation project consisting of cold milling approximately 75 mm of asphalt cement, replacing it with cold in-place recycled (CIPR) using Koch's CIR-EE (Cold In-Place Engineered Emulsion), plant mix surfacing, and placing a seal & cover. This project consists of two control sites and four test sections.

Progress:

The project is rated as performing well.

Reports:

Reports can be viewed at the above URL.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

3.2.4 Detectable Warning Devices

Project Name:	Various
Project Number:	Various
FHWA Number:	N/A - Informal
Construction Date:	Various
Completion Date:	Ongoing
Status:	Completed
Contractor:	Various
URL:	N/A

Objective:

The purpose of this project was to review and report performance on installations of detectable warning devices (DWDs) in various locations in the State.

Progress:

The Research office has formally advised the Department as to which materials proved to be the most effective based on durability and ease of installation. There may be need for further analysis as new materials become available.

Reports:

As requested.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

3.3 ACTIVE PROJECTS

3.3.1 130 mm Thin Composite Whitetopping

Project Name:	Kalispell Whitetopping
Project Number:	STPP 1-2(93)121
FHWA Number:	MT 00-02
Construction Date:	August 2000
Completion Date:	September 2010
Status:	Active
Contractor:	Riverside Contracting
URL:	http://www.mdt.mt.gov/research/projects/kal_whitetopping.shtml

Objective:

The objective of the project is to test the performance of whitetopping as a pavement preservation method. The existing asphalt pavement was milled and a 130 mm (approximately 5 inches) Portland Cement Concrete Pavement (PCCP) overlay was placed to create a composite pavement. The goal is to extend the pavement service life.

Progress:

The project has been in place for eight years with excellent performance to date. Current panel cracking represents only 0.9% (38 panels out of an estimated 4200) of the entire project with no debonding recorded.

Reports:

Reports can be viewed at the above URL.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

3.3.2 Bridge Deck Evaluations: Comparison of Conventional and High-Performance Concrete Decks

Project Name:	Bridge Deck Evaluation
Project Number:	N/A
FHWA Number:	N/A - Informal
Construction Date:	September 2008
Completion Date:	September 2013
Status:	Active
Contractor:	Various
URL:	Pending

Objective:

The objective of the project is to document performance on two recently constructed decks, one with standard class SD design and the other with the high performance concrete (HPC) specification applied. The bridges are located in Livingston and Missoula, respectively. Also, these two structures will be compared with the current South Helena Interchange HPC project.

Progress:

Both decks are constructed. The initial performance analysis will occur in the summer of 2009

Reports:

Pending.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

3.3.3 Chip Seal as an Asphalt Cement Pavement Interlayer to Retard Reflective Cracking

Project Name:	St. Xavier N&S
Project Number:	SFCS 313-1(18)22 CN 5894
FHWA Number:	N/A-Informal
Construction Date:	August 2008
Completion Date:	September 2013
Status:	Active
Contractor:	Riverside Contracting Co.
URL:	http://www.mdt.mt.gov/research/projects/xavier.shtml

Objective:

The object of this project is to determine if a conventional chip seal applied between an existing deteriorated layer of asphalt cement (AC) and a new lift of AC can reduce the occurrence of reflective cracking in the pavement.

Progress:

Project is constructed. Annual evaluations are set to begin in 2009.

Reports:

Reports are pending and can be viewed at the above URL when available.

MDT Project Manager:

Craig Abernathy
406-444-6269
cabernathy@mt.gov

3.3.4 Chip Stockpiling

Project Name:	Various
Project Number:	Various
FHWA Number:	MT08-01
Construction Date:	Summer 2008/2009
Completion Date:	December 2009
Status:	Active
Contractor:	Various
URL:	Pending

Objective:

The purpose of this project is to determine the effectiveness of crushing and stockpiling Type 1 Cover Material for use in future contracts. Chips will be crushed on one project and then later used to chip seal another project.

Progress:

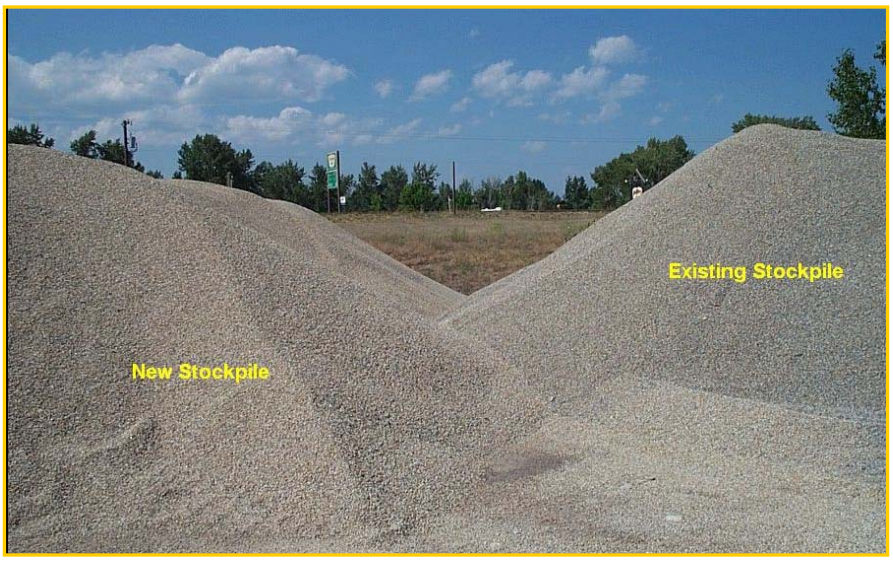
Chips were crushed and stockpiled from one project. These chips will be used in a construction project scheduled for construction in 2009. The evaluation will be conducted in 2009 and will include cost, number of bidders, and liability issues.

Reports:

Reports are pending and can be viewed at the above URL when available.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov



3.3.5 Corrugated Steel Pipe Culvert Rehabilitation

Project Name:	MacDonald Pass Culvert Rehabilitation
Project Number:	NH-HFL 8-1(30)23
FHWA Number:	MT 00-17
Construction Date:	September 2008
Completion Date:	September 2013
Status:	Active
Contractor:	Helena Sand & Gravel
URL:	http://www.mdt.mt.gov/research/projects/macpass_culvert.shtml

Objective:

The objective of this project is to rehabilitate existing deteriorated culverts without traffic disruption. Ten existing corrugated steel pipe (CSP) culverts (600 mm, 24 in) will incorporate two lining applications. The first involves the installation of a (HDPE) plastic lining. The second involves the installation of a cured polymer compound lining. The goal of both treatments is to restore function and structural integrity to the CSP.

Progress:

Installation of the culvert linings is complete. An annual inspection will be conducted in the summer of 2009. Performance documentation will include evaluation of lining integrity and inlet/outlet hydraulic flow.

Reports:

Reports can be viewed at the above URL.

MDT Project Manager:

Craig Abernathy
406-444-6269
cabernathy@mt.gov

3.3.6 Crack Sealing Milled Asphalt Pavement prior to Overlay

Project Name:	Dutton N & S
Project Number:	IM 15-6(35)309
FHWA Number:	MT 00-08
Construction Date:	June 2005
Completion Date:	September 2010
Status:	Active
Contractor:	Schellinger Construction
URL:	http://www.mdt.mt.gov/research/projects/dutton.shtml

Objective:

The objective of this project is to determine if crack sealing milled pavement prior to overlay will deter the migration of transverse cracking, or have an effect on pavement performance, when compared to an adjacent milled pavement that receives no crack sealing.

Progress:

To date, there is no evidence of cracking on either the test or control sections.

Reports:

Reports can be viewed at the above URL.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

3.3.7 Edge-Line Pavement Markings on Rumble Strips

Project Name:	Great Falls N & S
Project Number:	IM 15-5(101)270
FHWA Number:	N/A - Informal
Construction Date:	September 2007
Completion Date:	September 2012
Status:	Active
Contractor:	Riverside Contracting
URL:	http://www.mdt.mt.gov/research/projects/gtf_rumble.shtml

Objective:

The purpose of this project is to review and report performance on the durability of applying edge-line pavement markings on rumble strips.

Progress:

Visual documentation of performance was conducted in May 2008. Pavement markings exhibit substantial loss of material due to snow plow activity. It is premature to determine if the rumble stripes are a factor with the loss of marking material.

Reports:

Reports are pending and can be viewed at the above URL when available.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

3.3.8 Emulsified Asphalt Treated Aggregate Base Effect on Pavement Performance

Project Name:	Sportsmans Campground - East
Project Number:	STPP 46-5(2)51
FHWA Number:	N/A-Informal
Construction Date:	October 2006
Completion Date:	September 2012
Status:	Active
Contractor:	Ascorp Inc. – DBA Debco Construction
URL:	http://www.mdt.mt.gov/research/projects/sportsman.shtml

Objective:

The purpose of this project is to evaluate the asphalt pavement performance of paved emulsified asphalt treated aggregate (EATA) sections installed on the Sportsmans Campground East project

Progress:

Annual analysis will begin in 2009. The performance evaluation includes visual documentation of surface distress.

Reports:

Reports are pending and can be viewed at the above URL when available.

MDT Project Manager:

Craig Abernathy
406-444-6269
cabernathy@mt.gov

3.3.9 Fixed Automated Spray Technology Device for use on Bridge Decks

Project Name:	West Laurel Interchange
Project Number:	IM-STPHS 90-8(152)433
FHWA Number:	MT 00-07
Construction Date:	August 2006
Completion Date:	September 2011
Status:	Active
Contractor:	Boschung America LLC
URL:	http://www.mdt.mt.gov/research/projects/blg_deicer.shtml

Objective:

This project is an experimental trial of an automated anti-icing device for use on a Billings district area bridge for the purposes of decreasing winter accidents. The chosen device is the Boschung Fixed Automated Spray Technology (FAST).

Progress:

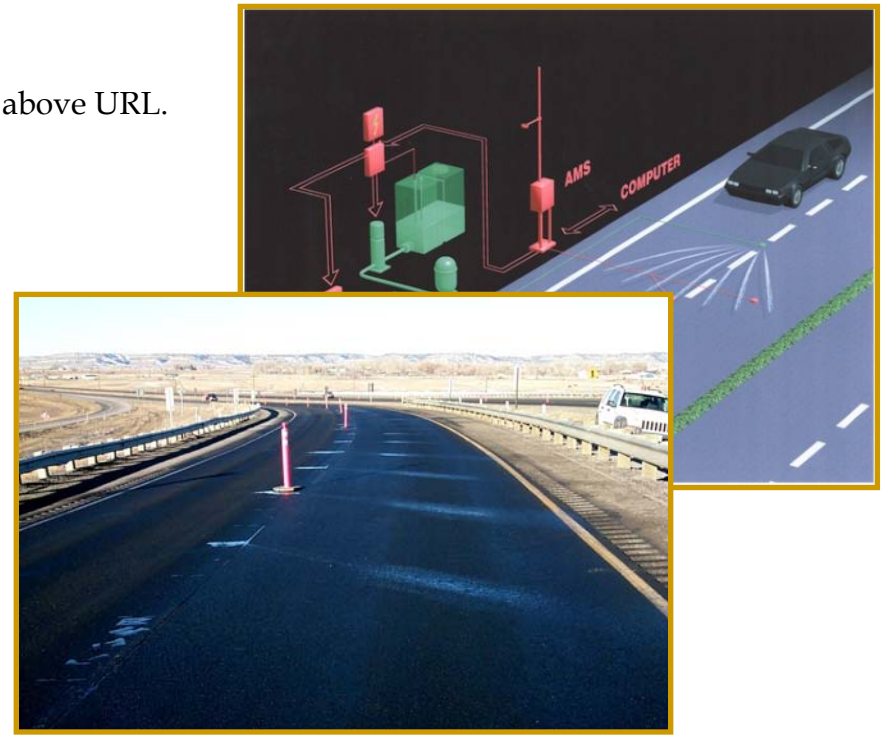
Installation of the FAST anti-icing device was completed in December 2006. Systems check and testing was completed by January 2007. This system was fully functional for the 2007-08 winter season. Equipment effectiveness and safety analyses will be available in spring 2009

Reports:

Reports can be viewed at the above URL.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov



3.3.10 GeoRidge Erosion Control Permeable Ditch Berm

Project Name:	Epsie - East & West
Project Number:	NH 37-3(11)85
FHWA Number:	N/A - Informal
Construction Date:	April 2007
Completion Date:	September 2009
Status:	Active
Contractor:	Wickens Construction
URL:	http://www.mdt.mt.gov/research/projects/epsie.shtml

Objective:

The objective is to deploy and evaluate the effectiveness of the GeoRidge device, a permeable ditch berm designed for erosion and sediment control, as compared to conventional waddles. GeoRidge is constructed as a durable UV stabilized HDPE and manufactured using a fully automated process to trap sediment.

Progress:

An initial inspection was conducted in July 2007. The next inspection will be in 2009. The analysis involves determining the effectiveness of the device in reducing erosion and allowing the sites to regain normal soil stabilization.

Reports:

Reports are pending and can be viewed at the above URL when available.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

3.3.11 High-Density Polyethylene Culverts in Mainline Applications

Project Name:	Angela N&S
Project Number:	STPP 18-1(9)18
FHWA Number:	MT 00-09
Construction Date:	May 2007
Completion Date:	September 2012
Status:	Active
Contractor:	MK Weeding Construction Inc.
URL:	http://www.mdt.mt.gov/research/projects/angela.shtml

Objective:

This project is an experimental trial of three high density polyethylene (HDPE) culvert sizes, 750 mm (30 in), 900 mm (36 in), and 1200 mm (48 in) in diameter, on a primary mainline application. The product chosen is the ADS N-12WT IB corrugated watertight and soil tight, smooth interior polyethylene pipe.

Progress:

Semi-annual evaluations include documentation of internal deflection, bell and spigot connection condition, and flared-end treatment (FETS) integrity. During construction minor vertical deflection occurred during compaction. This deflection has not promulgated since installation. The project is performing well.

Reports:

Reports can be viewed at the above URL.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

3.3.12 High-Performance Concrete Bridge Deck

Project Name:	South Helena Interchange
Project Number:	NH-STPU-CM-MT-STPE 15-4(108)191
FHWA Number:	MT 00-16
Construction Date:	September 2007
Completion Date:	September 2012
Status:	Active
Contractor:	Tamietti Construction Co.
URL:	http://www.mdt.mt.gov/research/projects/shelena.shtml

Objective:

The primary objective of this project is to demonstrate and document the constructability and advantages of high-performance concrete (HPC) in bridge decks. Premature deterioration of concrete bridges and new advances in concrete technology make HPC an attractive option for new bridges. Recent MDT sponsored research resulted in HPC specifications for Montana. This experimental project will serve to test and qualify the use of the new HPC specifications in Montana.

Progress:

The project was constructed at the end of FFY 2007. Placement of the deck proceeded as planned. The bridge deck is performing well. An initial crack map of the project was developed and will be used to determine future performance.

Reports:

Reports can be viewed at the above URL.

MDT Project Manager:

Craig Abernathy
406-444-6269
cabernathy@mt.gov

3.3.13 In-Laid Thermoplastic Pavement Markings prior to Chip Seal

Project Name:	Various
Project Numbers:	Various
FHWA Number:	N/A - Informal
Construction Date:	Fall 2008
Completion Date:	September 2013
Status:	Active
Contractor:	Various
URL:	http://www.mdt.mt.gov/research/projects/thermo_various.shtml

Objective:

The intent of this experiment is to identify a less costly method of preparing plant mix surfaces having hot in-laid thermoplastic pavement markings for use prior to seal coat application.

Progress:

Projects are constructed. Inspections will begin in 2009 and will compare applying thermoplastic material without scarification to the current procedure of scarifying or adding a thin asphalt cement (AC) lift to the removed thermoplastic.

Reports:

Reports are pending and can be viewed at the above URL when available.

MDT Project Manager:

Craig Abernathy
406-444-6269
cabernathy@mt.gov

3.3.14 Paving Fabrics to Mitigate Transverse Cracking

Project Name:	Flesher Pass - East
Project Number	STPS 279-1(14)23 CN 6234
FHWA Number:	MT-00-18
Construction Date:	September 2008
Completion Date:	September 2013
Status:	Active
Contractor:	Riverside Contracting Co.
URL:	http://www.mdt.mt.gov/research/projects/flesher.shtml

Objective:

The purpose of this project is to evaluate paving fabric with regards to mitigating reflective transverse cracking. The fabrics in this evaluation are Glasgrid, Glaspave, PavePrep, and Trupave.

Progress:

The project was partially constructed September 2008. Two additional sections will be constructed in 2009. All test and control sections of the project were crack mapped prior to construction for comparison to future cracking.

Reports:

Project information can be viewed at the above URL.

MDT Project Manager

Craig Abernathy
406-444-6269
cabernathy@mt.gov

3.3.15 Recycled Plastic Mat as Weed Prevention and Erosion Control around Guardrail Posts

Project Name:	Great Falls N & S
Project Number:	IM 15-5(101)270
FHWA Number:	MT 00-10
Construction Date:	September 2007
Completion Date:	September 2012
Status:	Active
Contractor:	United Materials
URL:	http://www.mdt.mt.gov/research/projects/gtf_rubber.shtml

Objective:

The Department currently paves areas around guardrail with asphalt cement (AC) for erosion and weed control. The objective of this project is to test a product made from recycled plastic to determine if this could be a cost effective alternative to paving with AC.

Progress:

Construction is complete and guardrail mats are under review. Evaluation consists of documenting the durability of this product subjected to temperature extremes, sunlight degradation, bracket integrity, and wind. The initial brackets which held the mats in place failed due to a severe wind storm. The brackets were redesigned and the mats replaced. Other than some minor plow damage, the mats are performing acceptably.

Reports:

Project information can be viewed at the above URL.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

3.3.16 Tower-Mounted Wind Turbine for the Generation of Supplemental Power for the Anaconda Interchange Rest Area

Project Name:	Anaconda Interchange Rest Area
Project Number:	IM 90-4(48)208 CN 4296
FHWA Number:	MT 00-15
Construction Date:	June 2008
Completion Date:	September 2013
Status:	Active
Contractor:	Robert Peccia & Associates
URL:	http://www.mdt.mt.gov/research/projects/anaconda.shtml

Objective:

The purpose of this project is to determine the effectiveness in reducing the grid-line power usage through the installation of a tower-mounted utility grid interconnected wind turbine to provide supplemental power to an interstate rest area. Equipment to be deployed consists of a 30 meter (98 ft) in height, free-standing lattice tower supporting a 3 blade, 6.7 meter (22 ft) rotor diameter, Bergey Windpower model 10 kW wind turbine.

Progress:

Installation of the wind turbine was completed in September 2008. Analysis of the effectiveness of the wind turbine should be available by fall of 2009. The basis of analysis is to compare the utility cost of this facility with other rest areas of similar design and power use.

Reports:

Project information can be viewed at the above URL.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

3.4 PENDING PROJECTS

3.4.1 Aggregate Base Preparations

Objective:

Creating premium road base out of troublesome aggregates or soils is part of a successful formula in building superior performing pavements. In this effort, the Montana Department of Transportation will initiate an experimental trial of various aggregate base preparations in effort to determine effectiveness of these treatments.

Progress:

This experimental feature is pending inclusion into a construction project.

MDT Project Manager:

Craig Abernathy
406-444-6269
cabernathy@mt.gov

3.4.2 Cement-Treated Base

Project Name:	Lewistown - West
Project Number:	NH 57-3 (33) 70
FHWA Number:	Pending
Construction Date:	Summer 2009
Completion Date:	Summer 2014
Status:	Active
Contractor:	Pending
URL:	Pending

Objective:

The objective of the project is to incorporate various percentages of class C fly ash with cement-treated base (CTB) in an effort to reduce the use of portland cement (PCCP) on these types of projects.

Progress:

Construction will occur in 2009.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

3.4.3 Deer Reflectors

Project Name:	Fencing-East of Whitehall
Project Number:	HSIP 69-1(22)2
FHWA Number:	Pending
Construction Date:	Summer 2009
Completion Date:	Summer 2014
Status:	Active
Contractor:	MDT – Butte District
URL:	Pending

Objective:

The purpose of this project is to perform an analysis of the effectiveness of Strieter Lite deer reflectors to mitigate animal-vehicle collisions.

Progress:

Construction will occur in 2009.

MDT Project Manager:

Craig Abernathy
406.444.6269
cabernathy@mt.gov

4 POOLED-FUND STUDIES

MDT contributed to the following pooled-fund studies in FFY 2008. Click on the project links to view project information.

Table 1: Pooled-fund contributions for FFY 2008

NUMBER	NAME	FUNDING LEVEL
TPF-5(035)	Northwest Snowfighters http://www.pooledfund.org/projectdetails.asp?id=32&status=1	$10,000
TPF-5(036)	Transportation Asset Management Research Program http://www.pooledfund.org/projectdetails.asp?id=31&status=6	$7,200
TPF-5(109)	Transportation Research Board Support of Core Services http://www.pooledfund.org/projectdetails.asp?id=300&status=6	$99,900
TPF-5(122)	Dynamic Passive Pressure on Abutments and Pile Caps http://www.pooledfund.org/projectdetails.asp?id=354&status=4	$10,000
TPF-5(137)	Western Pavement Preservation Partnership http://www.pooledfund.org/projectdetails.asp?id=366&status=6	$10,000
TPF-5(145)	Western Maintenance Partnership http://www.pooledfund.org/projectdetails.asp?id=401&status=4	$10,000
TPF-5(150)	Extending the Season for Concrete Construction and Repair , Phase III http://www.pooledfund.org/projectdetails.asp?id=377&status=4	$5,000
TPF-5(151)	Subsurface Drainage for Landslide and Slope Stabilization http://www.pooledfund.org/projectdetails.asp?id=378&status=4	$5,000
TPF-5(179)	Evaluation of Test Methods for Permeability and Development of Performance Guidelines for Durability http://www.pooledfund.org/projectdetails.asp?id=406&status=4	25,000
	TOTAL	**$182,100**

5 SUMMARY

5.1 GENERAL

MDT's mission is to serve the public by providing a transportation system and services that emphasize quality, safety, cost effectiveness, economic vitality, and sensitivity to the environment. MDT's Research Programs impacts each and every part of MDT's mission.

Research projects completed in FFY 2008 yielded results that when fully implemented will improve:

- Efficiency and effectiveness of MDT operations and technology transfer, including improving training of and encouraging young individuals to enter the transportation construction work force, cost estimating, procedures and policies, contractor relations, and marketing;
- Economic vitality;
- Sensitivity to the environment, including decreasing vehicle-wildlife collisions, improving habitat connectivity and roadside revegetation, decreasing erosion and bridge pier scour, reducing the effects of traffic noise, and increasing recycling efforts;
- Safety, by decreasing roadside hazards and young driver accidents; and
- Quality of what we do and how we do it, including bridge design and inspection, pavement design and preservation, context-sensitive design, smart land-use planning, use of the most efficient materials and technology, and materials testing and acceptance.

5.2 FISCAL

Research Programs expenditures occurred through research projects, pooled-fund studies, and NCHRP support (see Figure 5). Figure 6 shows these expenditures categorized by subject. The expenditures for the administration subject area are further classified by internal administration (overhead), NCHRP support, pooled-fund studies, and contracted research projects (Figure 7). Figure 8 shows internal administrative expenditures as compared to all other expenditures. MDT, as of July 2007, is required to charge indirect costs. These costs are revised each state fiscal year. From July 2007 to June 2008, the indirect cost rate charged to each expenditure was 12.25% and from July 2008 to June 2008, the indirect cost rate charged to each expenditure is 14.06%. Figure 9 shows these indirect costs as compared to total project expenditures, including projects such as pooled-fund studies that are not charged indirect costs by MDT, for FFY 2008. Finally, Figure 10 shows total funding for all active research projects by funding source.

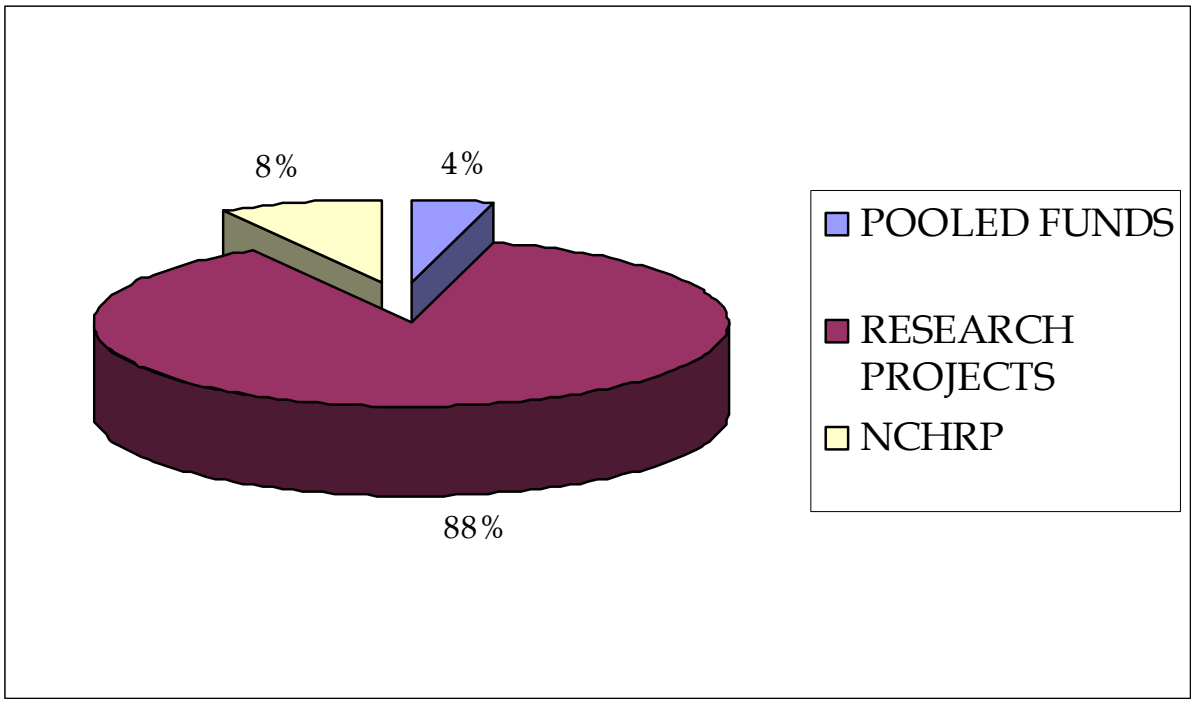


Figure 5: Research Program expenditures for FFY 2008 by project type.

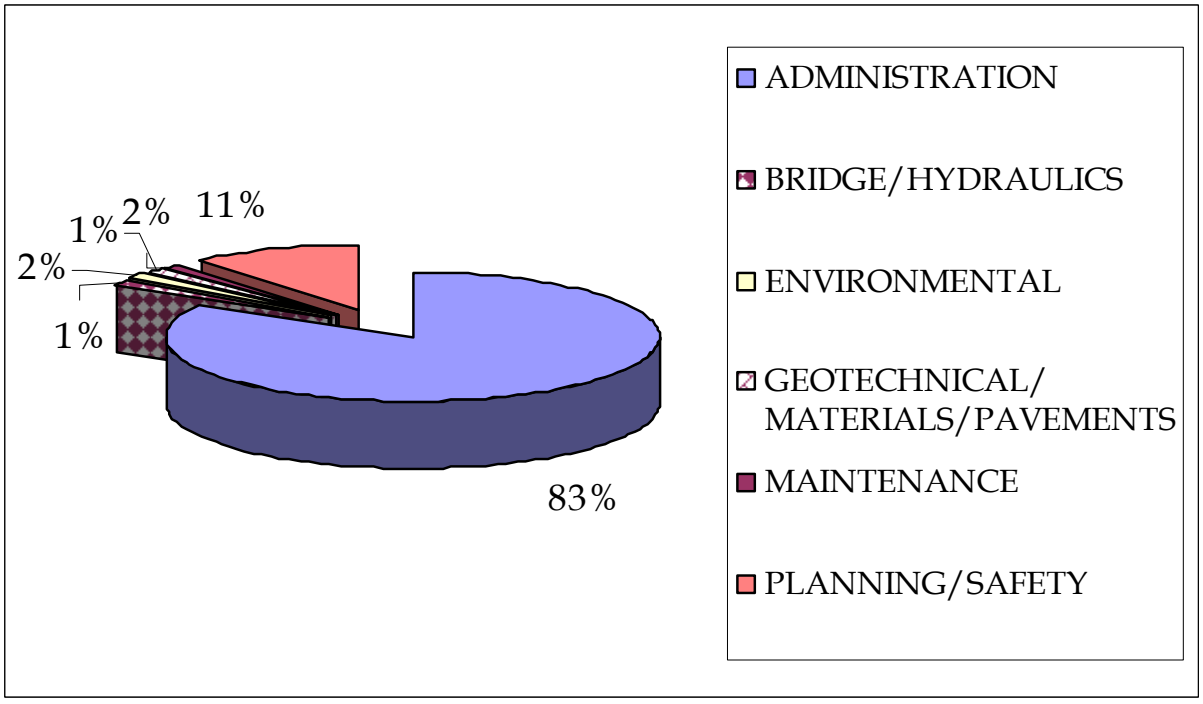


Figure 6: Research Program expenditures for FFY 2008 by subject.

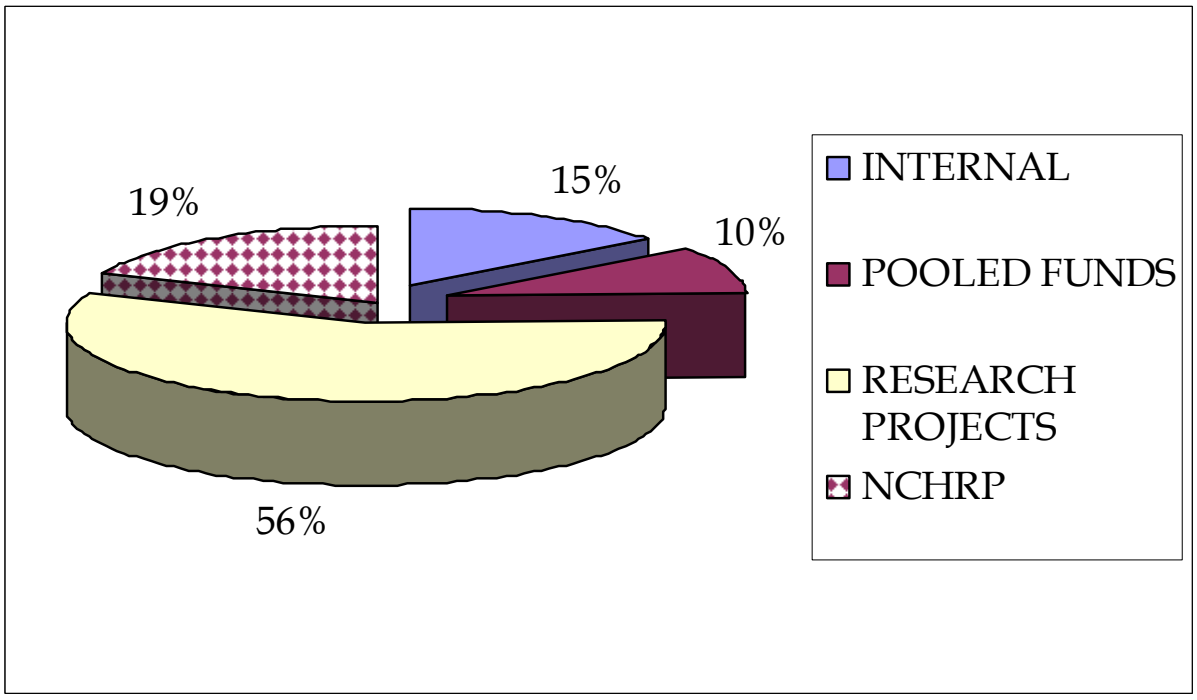


Figure 7: Administration expenditures for FFY 2008 by project type.

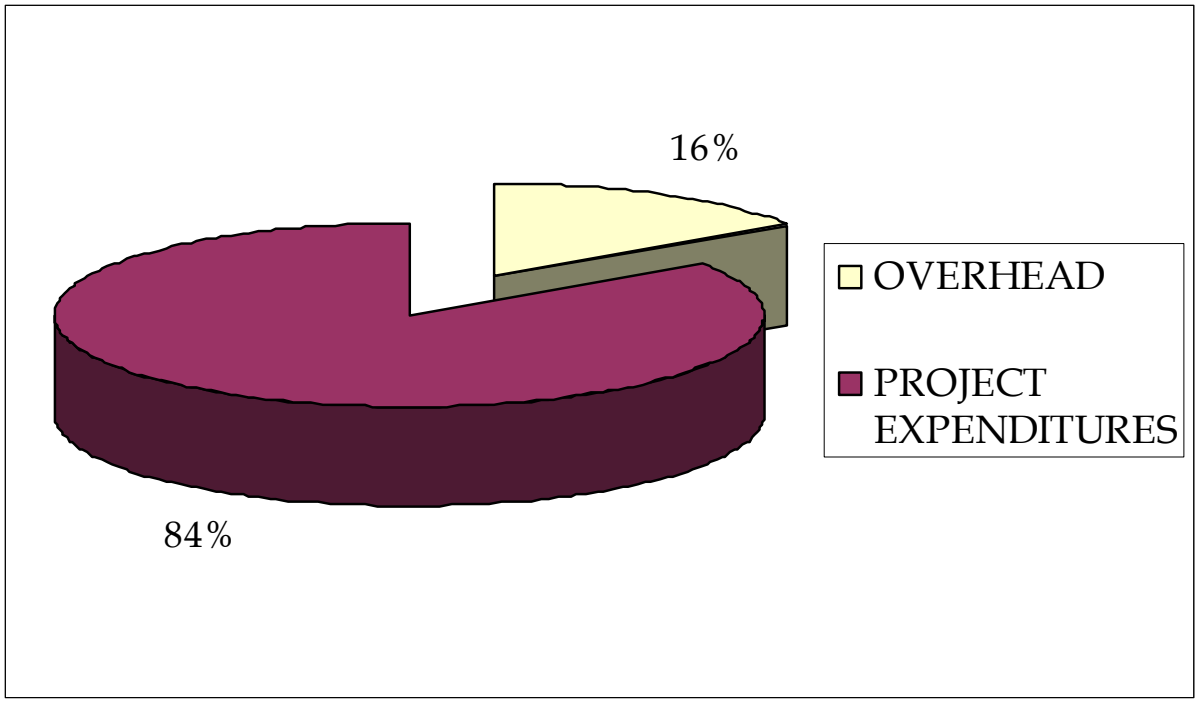


Figure 8: Overhead expenditures for FFY 2008 as compared to all other expenditures.

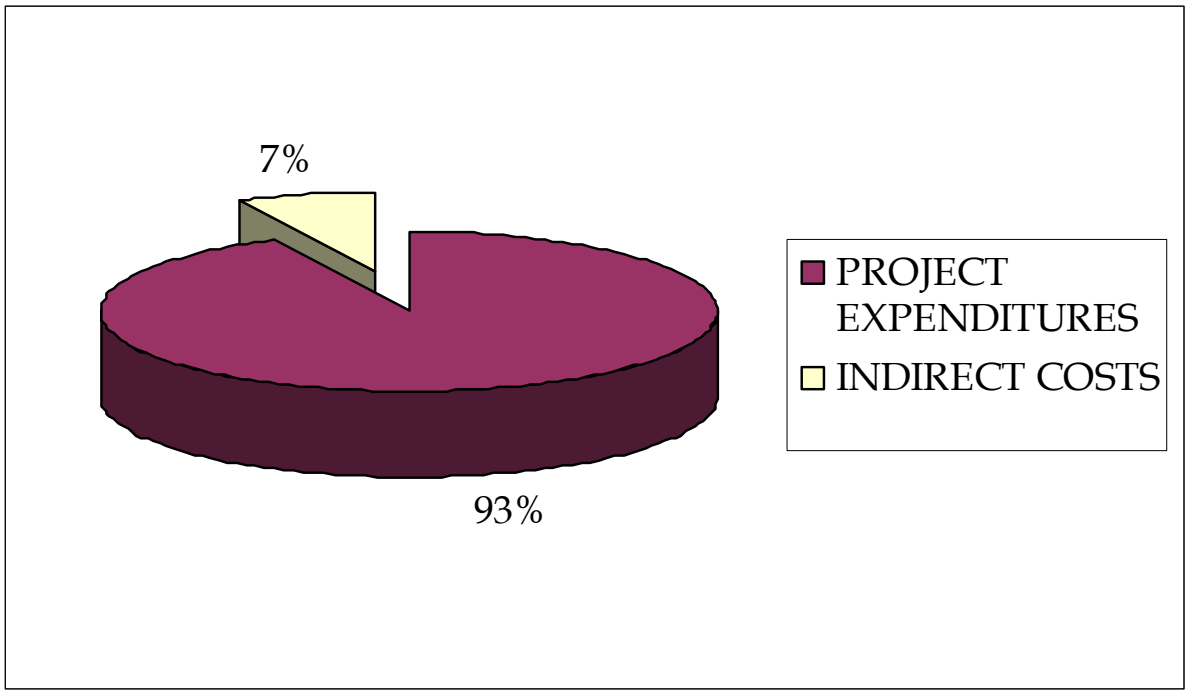


Figure 9: MDT indirect costs as compared to project expenditures for FFY 2008

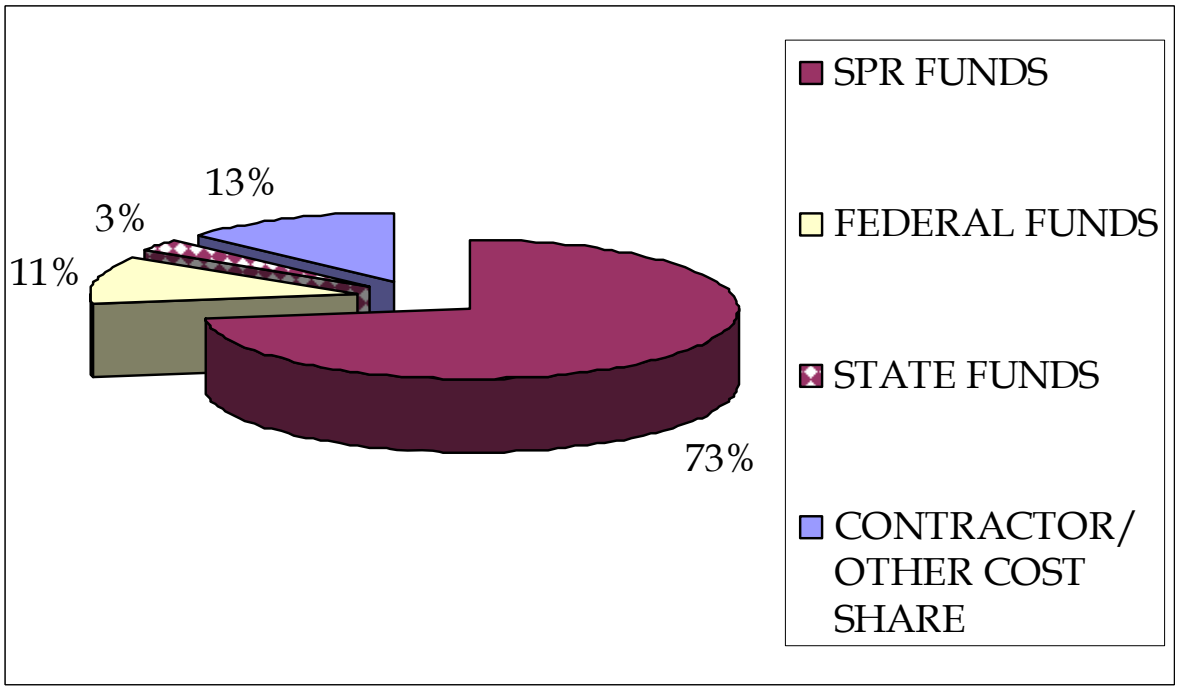


Figure 10: Total funding for all projects active in FFY 2008 by funding source.