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Introduction

The Department of Transportation and Public Facilities Research and Technology Transfer Program (RTT) is funded through the Federal Highway Administration’s (FHWA) State Planning and Research Program (SPR), Local Technical Assistance Program (LTAP), Surface Transportation Program (STP), and state matching funds.

Research staff conducts and oversees research projects on behalf of the department. Through the research staff, the department also maintains reciprocal activity with the national and international transportation research community to obtain research findings that may have application in Alaska. Research staff provide research results to appropriate department staff, local agencies, and the public through publications, training, and other means. Research staff also help to implement research findings.

The RTT program includes the department’s LTAP, also known as the Technology Transfer (T2) Program, and the Border Technology Exchange Program (BTEP). While these programs are also funded by FHWA, they focus on technology transfer to local governments and the Yukon Territory in Canada.

Finally, the RTT program includes the American Association of State Highway Transportation Officials Transportation and Civil Engineering (AASHTO TRAC) program, the National Highway Institute (NHI) training program, and the Technology Applications Program (TAP). AASHTO TRAC is an outreach to schools, aiming to interest students in engineering careers. The NHI training program provides federal and state matching funds to sponsor technical training for department employees, local government workers, and the private sector involved in transportation projects. TAP includes training and seminars provided by FHWA via Demonstration Projects, Application Projects, Test and Evaluation Projects, and Special Projects. The RTT staff may undertake work using additional state funds or funds from other agencies, such as the Alaska Science and Technology Foundation, should they become available.

The goals of the RTT program are to:

• improve procedures, techniques, materials, and equipment used by the department to plan, design, construct, operate, and maintain state transportation systems and facilities;
• ensure the improved procedures, techniques, materials, and equipment are implemented within the department and in local communities;
• advance safety;
• use state and federal resources efficiently;
• ensure that transportation systems are constructed and operated with minimal adverse effect on the environment;
• construct, maintain, and operate facilities at the lowest life-cycle cost; and
• protect the department’s capital investments.

Nearly all department research reports and current research projects can be found by going to http://www.dot.state.ak.us:

• rest the cursor on “World of DOT&PF”
• rest the cursor on “Programs”
• double-click on “Research & Technology”
• click on “RTT Library” and follow the search instructions

DOT&PF’s research reports are also found in the Transportation Research Information System (TRIS). Their searchable web address is http://ntl.bts.gov/tris/. They can also be found by going to http://ntl.bts.gov.
2002 Alaska Research Program Peer Exchange

Introduction

Between June 11 and 14, 2002, a research peer exchange was conducted with the Alaska Department of Transportation and Public Facilities (AKDOT&PF) Research Program. Included in the exchange process was the Local Technical Assistance Program (LTAP), an integral part of the research program. The following people participated in the peer exchange:

Billy Connor       AKDOT&PF, Research Manager       Fairbanks, Alaska
Doyt Bolling      Utah LTAP Coordinator, Utah State University  Logan, Utah
Denis Donnelly    Consultant                      Denver, Colorado
Larry Schofield   Arizona DOT Research Engineer, Phoenix, Arizona
Craig Larson       FHWA-Colorado Div., Planning and Research Engineer Lakewood, Colorado
Stephen Boch      FHWA-Alaska Division, Bridge and Research Engineer Juneau, Alaska

This was the second research peer exchange conducted since the initial exchange in 1998. Peer exchanges are required by the Federal Highway Administration (FHWA), approximately every three years to provide a means for all parties to exchange information about their research programs. Meeting with research peers from other states helps the AKDOT&PF Research Program assess quality and effectiveness while transferring technical information and ideas to the review team for dissemination in their home states.

Prior to the exchange, members of the team were provided copies of the Alaska’s Research Procedures Manual, the fiscal year 2001 Annual Progress Report, and status reports of ongoing research projects. Interviews were conducted with members of AKDOT&PF Central Region, Southeast Region, Northern Region, and Headquarters. The Matanuska-Susitna Borough, the Fairbanks-North Star Borough, the City of Fairbanks, the University of Alaska Anchorage, and the University of Alaska Fairbanks were also interviewed.

Findings

Since the last peer exchange conducted in 1998, the State’s Research Program has seen major improvements. This was especially evident to Doyt Bolling and Denis Donnelly who participated in the initial exchange. The significant improvements are reflected in the following list of findings by the 2002 peer exchange:

• There is overwhelming departmental acceptance and utilization of the research program staff and resources.
• There have been major improvements in the research program since the 1998 peer exchange.
• Research program end results are being used department wide.
• There is excellent communication between departmental staff and the research group.
• Participation outside the research section by operational staff in both research and implementation has improved overall effectiveness and created several success stories.
• Research is responsive to the users needs through research and personalized technical assistance.
• Improved completion of research projects and implementation of research products.
• The competitive research selection process is working very well. A blend of university, private consultant, and state-performed research provides appropriate expertise and technical diversity for each project.
• Training and technology transfer efforts are very effective to the state, local governments, and industry.
• The Research Advisory Board is highly supportive and active in research.
• Upper management supports the research program and implementation of findings.
• The Research Procedures Manual is a good working document summarizing all aspects of the research program.

Suggested Improvements
Although the state’s Research Program is working very well, the group agreed on the following list of suggested improvements. The improvements are minor in nature, but will improve the effectiveness of an already excellent program.
• Use focus groups within subject areas, such as materials, structures, and construction, to develop and prioritize research problem statements before they are presented to the Research Advisory Board.
• A focus group member should champion their problem statements by attending the Research Advisory Board meeting.
• Management needs to continue to support operational staff participation in the research program.
• The research group should provide periodic briefings to the regional directors and focus groups.
• Promote and encourage multimodal involvement, since the state performs a substantial amount of work for the Federal Aviation Administration.
• Encourage more environmental research efforts to support the department’s desire to become better environmental stewards.
• Market research program successes: Toot your own horn, when you get good results.
• Look into increased staffing for the Research Program using a combination of full-time, interns, co-ops, retirees, or temporary help. Increased demand seems to warrant additional staffing.

Conclusion
AKDOT&PF has a well organized and successful research program. Every effort should be made to maintain the integrity of this program. Due to the possible change in upper management, often occurring after a gubernatorial election, the need to maintain program consistency will be paramount. The current support for the program is phenomenal—we hope it continues well into the future.

The members of the group thank everyone for their excellent cooperation during this review. We felt there was open, honest dialogue among all participants and the genuine hospitality was greatly appreciated. The 2002 peer exchange was a very successful event.
Last Year Research and Technology Transfer (RTT) overhauled the procurement process for professional research services and implemented World Wide Web-based Requests for Proposals (RFPs). Research project RFPs are now found at http://www.dot.state.ak.us. The online RFPs have links to Information and Instructions for Preparing Research Proposals, which
- has requirements for preparing and submitting RFPs, and
- describes the contracting procedures.

The online process applies only to research projects eligible for State Planning and Research funds. Alaska law excludes acquiring research-related equipment and services from its procurement regulations. To avoid potential conflicts of interest and abuse, we needed to implement a fair and objective process to hire research contractors. Also, because research work is unique and innovative by nature, we found procurements to be hindered by the awkward and often inappropriate traditional professional service procurement process, which works well for work products that conform to common professional practices and specifications. However, the process is ill suited to innovative, developmental, or experimental work. Research project managers require greater flexibility and authority to accommodate and respond quickly to dynamic research needs.

The research contracting procedures are a product based on the experience collected by the National Cooperative Highway Research Program (NCHRP). We developed our procedures from two of NCHRP’s guidance documents:
1. Procedural Manual for Agencies Conducting Research in the National Cooperative Highway Research Program, and
2. Information and Instructions for Preparing Proposals.

NCHRP developed these documents from its many years of expertise in administering a national applied research program. Both documents are available at http://www4.trb.org/trb/crp.nsf.
### FFY 01/02 Research Work Program

#### PART A: ADMINISTRATION, TECHNOLOGY TRANSFER AND CONTINUING PROGRAMS

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**Part A Totals**

| | $1,240,822 | $1,271,680 | $0 | $2,512,502 | 77 |

**Federal Funds in Part A**

| | $1,019,022 | $1,109,344 | $2,128,366 | 12 |

**State Funds in Part A**

| | $221,800 | $162,336 | $0 | $384,136 | 77 |

* 100% FHWA funds
** 50% FHWA funds, 50% BIA funds
*** 90% FHWA funds, 10% state match

### PART B: COMPLETION OF EXISTING STUDIES

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**Part B Totals**

| | $482,334 | $30,000 | 0 | $512,334 | 41 |

**Federal Funds in Part B**

| | $385,867 | $24,000 | 0 | $409,867 | 41 |

**State Funds in Part B**

| | $96,467 | $6,000 | 0 | $102,467 | 41 |

- Evaluation of Wetland Assessment Models for Alaska est. completion date: 7/31/03 Pg. 19
- Effectiveness of Paving on Airborne Particulate Matter in Kotzebue, Alaska est. completion date: 1/2005 Pg. 20
- Evaluation of Detectable Warnings in Alaska est. completion date: 7/2003 Pg. 66
- Evaluation of Pavement Blisters for Southeast Region, Alaska DOT&PF complete Pg. 62
- Evaluation of LiDAR as a Data Acquisition Technique in Alaska est. completion date: 6/2003 Pg. 61
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<td>Evaluation of Live Load Distribution Factor in Alaska Decked Bulb-tee Girders</td>
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<td>Evaluation of Overheight Warning Devices</td>
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<td>Development and Verification of an Efficient Fish Barrier Protocol for Highway Culverts</td>
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<td>Impact of Ice Forces on Streambank Protection</td>
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<td>High Float Surfacing for Gravel Roads</td>
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<td>Evaluation of Bioengineered Bank Stabilization Success in Alaska</td>
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<td>Effect of Multiple Freeze-Thaw Cycles</td>
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Completed Projects

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<td>Rock Fall Model Applicability</td>
<td>Geotechnical</td>
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<td>Stabilized Base Under Asphalt Surface</td>
<td>Geotechnical</td>
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<tr>
<td>Alaskan Soil Stabilization Manual</td>
<td>Materials/Construction</td>
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<tr>
<td>Cost-effective Rut Repair Methods</td>
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<tr>
<td>Light Weight Aggregate Feasibility Study for Alaska</td>
<td>Materials/Construction</td>
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<tr>
<td>Using Geophysical Methods in Pits</td>
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<tr>
<td>Alaska Design Information System (First Year)</td>
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<td>Cost-effectiveness of Hard Aggregate Sources</td>
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<td>Socioeconomic impacts of Paving Gravel Roads</td>
<td>Environmental</td>
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<tr>
<td>Vetch Control Within State Right of Way</td>
<td>Environmental</td>
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<tr>
<td>Impact of Ice Forces on Stream Bank Protection</td>
<td>Hydraulics</td>
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<td>Evaluation of Overheight Warning Devices (Draft Report)</td>
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<td>Snowplow Survivability of Guardrail</td>
<td>Maintenance</td>
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<td>Wake Wash Study</td>
<td>Marine Highways</td>
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<tr>
<td>Pavement Marking Materials (Draft Report)</td>
<td>Traffic/Safety</td>
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Research and Technology Transfer Staff

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clint Adler, P.E.</td>
<td>Research Engineer</td>
<td>451-5321</td>
</tr>
<tr>
<td>Billy Connor, P.E.</td>
<td>Research Manager</td>
<td>451-5479</td>
</tr>
<tr>
<td>Linda Gavin</td>
<td>Administrative Clerk</td>
<td>451-5320</td>
</tr>
<tr>
<td>Simon Howell</td>
<td>Training Specialist</td>
<td>451-5284</td>
</tr>
<tr>
<td>Steve Saboundjian, P.E.</td>
<td>Implementation Engineer</td>
<td>451-5322</td>
</tr>
<tr>
<td>Dave Waldo</td>
<td>LTAP Manager</td>
<td>451-5323</td>
</tr>
<tr>
<td>Fax</td>
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Research Advisory Board

Voting Members

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
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<tbody>
<tr>
<td>Thomas Brigham</td>
<td>Statewide Planning Director</td>
</tr>
<tr>
<td>George Capacci</td>
<td>Director, Southeast Ferry Operations</td>
</tr>
<tr>
<td>Robert Doll</td>
<td>Director, Southeast Region</td>
</tr>
<tr>
<td>Michael Downing, P.E.</td>
<td>Chief Engineer, Design &amp; Engineering Services, Chair</td>
</tr>
<tr>
<td>David Eberle</td>
<td>Director, Southcentral Region</td>
</tr>
<tr>
<td>Gary Hayden, P.E.</td>
<td>Southeast Operations Director</td>
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<tr>
<td>Frank Richards, P.E.</td>
<td>Statewide Maintenance Engineer</td>
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<tr>
<td>Ralph Swarthout, P.E.</td>
<td>Northern Region Director</td>
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Non-Voting Members

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<tr>
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<tr>
<td>Billy Connor, P.E.</td>
<td>Secretary</td>
</tr>
<tr>
<td>Steve Boch, P.E.</td>
<td>FHWA</td>
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</table>
The budget for Research Administration is based on the anticipated cost of operating the research program. This account provides for:

- Research staff salaries (added in FY 02)
- Research staff salary and travel not directly related to projects
- Developing the research program by soliciting research needs statements and selecting projects
- Travel for the Research Advisory Board to attend board meetings
- Early project development,
- Miscellaneous expenses such as supplies, office equipment and related maintenance contracts, etc.
TRB Dues

Project Number: 01-06
Estimated Completion Date: Project is renewed annually
Estimated Cost FY 02: $86,000

Project Manager: Billy Connor

Project Description

The Transportation Research Board (TRB) is a unit of the National Research Council under the National Academy of Sciences. It promotes the publication of transportation research results; hosts annual meetings each January in Washington, D.C., for research presentations and discussions; sponsors committees of researchers active in specific fields; and prints and distributes Transportation Research Records and other publications to all member states.

This project funds Alaska’s annual contribution for support of the Transportation Research Board. It enables Alaska to receive distributions of all TRB publications, with individual copies of each to all interested personnel in the department. It also provides for unlimited literature search services through the Transportation Research Information Services (TRIS) and listings of abstracts on any transportation-related topic at no additional cost to the state. Finally, it provides travel cost reimbursements to all TRB committee chairmen in return for their services at annual committee meetings and free registration for all DOT&PF employees who attend TRB’s annual meetings.

No personnel costs are involved in this project account. This account provides the mechanism for paying the annual billing for these services. The TRB executive board finalizes billing amounts for this program in January, and state participation agreements are sent out by TRB in March.

The Transportation Research Information Services database is a computerized information file maintained and operated by the TRB. It is sponsored by FHWA, the Federal Transit Administration, the National Highway Traffic Safety Administration, U.S. Department of Transportation, the fifty state highway and transportation departments, the District of Columbia, Puerto Rico, American Automobile Manufacturers Association, National Asphalt Pavement Association, U.S. Army Corps of Engineers, and Association of Railroads. TRIS covers both U.S. and international research. It contains information on various modes and aspects of transportation, including planning, design, finance, construction, maintenance, equipment, traffic, operations, management, marketing, and other topics. TRIS contains more than 400,000 abstracts of completed research and research in progress.

Services available from TRIS include literature searches, topical searches, and publications: Transit Research Abstracts, Highway Safety Literature, and the quarterly Highway Research Abstracts.

The research staff enters information about the department’s active and completed research into TRIS, as required by 23 CFR 420.207(a)(4).

Available Project Reports

All completed DOT&PF Research reports are available through TRB, as are all research reports from other state highway agencies.
Project Description

The DOT&PF supports and participates in the National Cooperative Highway Research Program (NCHRP), a joint program of AASHTO and FHWA. The Transportation Research Board (TRB) administers the program. NCHRP, established in 1962, provides a program of systematic, well-designed applied research. Program funding comes entirely from contributions from state transportation agencies. FHWA recommends contributions of 5.5% of each state’s planning and research program (SPR) allocation of federal highway funds. NCHRP contributions do not require the 20% in state matching funds common to other SPR-funded research activities.

NCHRP projects are developed in a two-stage, two-year process. In the first stage, NCHRP solicits ideas for research projects of a national scale from state representatives. In stage two, these projects are condensed and refined from over 100 first-stage projects to 50 or more second-stage projects. Next, NCHRP solicits interest from national experts in the project area to participate in project panels. The panels develop project statements, solicit proposals, and select research agencies to perform the work. Finally, the participating states vote to select the projects that will be completed with the available funds. The DOT&PF research manager is responsible for coordinating NCHRP project submissions and panel participation.

Available Project Reports

All reports are available through the Transportation Research Board or the Keith B. Mather Library at the University of Alaska Fairbanks.
Implementation of Completed Research

Project Number: 01-02
Estimated Completion Date: Project is renewed annually
Estimated Cost: $85,000

Project Manager: Billy Connor

Project Description
The Research and Technology Transfer staff work to remain informed of research outside of the department. They disseminate this information within the department and recommend implementation of others’ research as warranted. An implementation engineer coordinates DOT&PF’s efforts to implement research results.

The implementation engineer also coordinates implementation of research results from:
- experimental features built as part of construction projects;
- projects conducted by other state of Alaska agencies or local governments;
- projects conducted by other states, federal agencies, or foreign governments; and
- projects conducted by the private sector, provided all copyright and patent laws are followed.

Implementation activities must be considered from the inception of a project. Potential users of research results should be identified, contacted, and considered for appointment as technical advisors. Potential users should be involved throughout the project. A variety of methods to promote the use of research results need to be identified for each project. These could include but are not limited to briefings, short demonstrations, traveling road show, a video or CD-ROM, and training.

Project Objectives
The main goal of DOT&PF’s research program is that successful research results be implemented or incorporated into standard practice.

Project Status
Ongoing

Available Project Reports
None
Bridges and Structures

Evaluation of Live Load Distribution Factor in Alaskan Decked Bulb-tee Bridge Girders

Project Number: 01-12
Estimated Completion Date: 9/30/03
Estimated Cost: $75,000

Project Manager: Clint Adler
Technical Advisory Committee: Elmer Marx,
Bridge Design

Problem Statement

AKDOT&PF commonly uses the Alaska decked bulb-tee precast girder for its bridges. AKDOT&PF designs bridges in conformance with AASHTO bridge design specifications. AKDOT&PF’s current bridge design practice has been to use the AASHTO multiple-lane live load distribution factors for both single and multiple loaded lane configurations. The result of this practice has been that the theoretical load carrying capacity of bridges constructed with Alaska bulb-tee girders is lower than that for other types of bridges.

Although the AASHTO specifications provide a method for calculating live load distribution factors for multiple-loaded lanes, there is no comparable method prescribed for calculating single lane live load distribution factors. Single-lane distribution factors are required to perform bridge load ratings—the evaluation of live load carrying capacity of an existing bridge. The multiple-lane DF will overestimate the live load carried by a girder due to single lane loading, resulting in a reduction in the allowable live load carried by the bridge.

The AASHTO code recommends using the “lever rule”—a method of determining the live load carried by a single girder assuming that the deck acts as a simply supported span between girders. Using the “lever rule” results in two perceived problems for the AKDOT&PF:

1. The “lever rule” is invalid for Alaska decked bulb-tee girders. The deck formed by these girders has a longitudinal joint midway between adjacent girders. This longitudinal joint acts like a hinge. The assumption of hinges over the girders would result in an instability in the system using the “lever rule.”

2. The “lever rule” method may be overly conservative for analyzing Alaska decked bulb-tee girders. The consequence of the conservative method is that the “operating” or maximum bridge live load capacity is reduced.

Research Objectives

The goal of this project is to produce an accurate method of analysis for the calculation of the single-lane distribution factor for Alaska decked bulb-tee bridge girders. Subsequent bridge load ratings will incorporate the new single-lane distribution factor, resulting in a more accurate determination of a decked bulb tee girder bridge live load capacity. The safety of the bridge will be improved as well as a potential increase in the live load capacity of the bridge.

Project Status

Project under contract to University of Alaska Fairbanks. A literature review has been completed. Researchers will conduct field testing of bridges early in the Summer of 2003.

Available Reports

Interim: n/a
Final: At project end
Experimental Study on Seismic Retrofit Techniques for Cap Beams, Columns, and Their Connections of Highway Bridges

Project Number: RES-02-08
Estimated Completion Date: 9/30/04
Estimated Cost: $20,000

Project Manager: Steve Saboundjian
Technical Advisory Committee: Elmer Marx, Bridge Design

Problem Statement
Due to the effect of ice impact on columns, most bridges in Alaska were designed with improper seismic design considerations. Therefore, the columns are often stronger than the cap beams and may fail without warning during a strong earthquake. A recent investigation indicated that there is a high propensity for excessive damage of bridge joints if hit by a major earthquake.

The application of the proposed study will lead to retrofit schemes that will be both efficient and economically competitive. The proposed schemes will address the following requirements: (1) it is rather easy and simple to implement in the field, (2) traffic disruptions are maintained at minimum levels, and (3) it is durable.

Research Objectives
1. to experimentally investigate the shear and flexural capacity of cap beams and their corresponding columns that are typical in the states of Missouri and Alaska,
2. to study the cyclic behavior of beam-column joints, and
3. to develop effective retrofit techniques for the seismic upgrading of the cap beams, columns, and their connections.

Project Status
Work started upon signing the Memorandum of Agreement between University of Missouri-Rolla and AKDOT&PF. Project under contract to UMR (Dr. Genda Chen and Dr. Pedro Silva).

Available Reports
Interim: n/a
Final: At project end
Synthesis of Best Management Practices for Snow Storage Areas

Project Number: 01-33
Estimated Completion Date: 7/31/03
Estimated Cost: $50,000

Problem Statement
AKDOT&PF often stores snow removed from roads and highways in central storage areas where it can melt in the spring/summer (road-related snow storage areas). Regulatory agencies require or may soon require best management practices (BMPs) for handling and treating the melt water from these facilities before it enters the environment.

AKDOT&PF lacks comprehensive information necessary for efficiently and systematically selecting economical best management practices (BMPs) for handling and treating the melt water from these facilities before it enters the environment.

Research Objectives
The objectives of this research are to develop and present:

1. a synthesis of current, economic best management practices potentially applicable to road-related snow storage areas in Alaska;
2. a concise guide for the selection and development of economical BMPs;
3. recommendations for future research where information necessary for the identification and development of promising, economical BMPs is lacking;
4. a list of impediments to successful development and/or implementation of potential economic BMPs.

The project will explore the technical, economic, and regulatory feasibility of oceanside snow disposal (i.e., pushing snow into marine outfall areas).

AKDOT&PF will use the results of this study to focus future efforts on the identification and design of BMPs for road-related snow storage areas throughout Alaska.

Project Status
Under contract to University of Alaska Fairbanks. Researchers are conducting literature search and analyses. A preliminary report should be available by mid-May 2003

Available Reports
Interim: n/a
Final: At project end
**Socioeconomic Impacts of Paving Gravel Roads**

Project Manager: Clint Adler  
Technical Advisory Committee:  
  - Bill Ballard, Statewide Environmental Coordinator  
  - Kurt Smith, Statewide Traffic Engineer  
  - Scott Thomas, Southcentral Region Traffic Engineer

**Problem Statement**  
AKDOT&PF prefers to pave gravel roads to reduce long-term maintenance costs and minimize environmental impacts from dust and runoff. AKDOT&PF has little documentation on the socioeconomic and environmental impacts of paving gravel roads.  
AKDOT&PF has been unable to respond comprehensively to questions on the direct and indirect effects of paving gravel roads on traffic, tourism and land use. The inability to adequately address these questions has significantly affected several projects, causing project delays.  
As the department increasingly pursues paving gravel roads to reduce maintenance costs and improve drivability, the public, special interest groups and agencies will continue to ask what are the direct and indirect socioeconomic impacts of these projects. Projects will continue to be delayed or threatened until AKDOT&PF can respond adequately to these concerns. In addition, the Federal Highway Administration (FHWA) has recently (June 1999) indicated that the continued lack of documentation on the effects of paving gravel roads will not be acceptable.

**Research Objectives**  
AKDOT&PF desires general qualitative and quantitative documentation of expected direct and indirect socioeconomic and environmental impacts and cost effectiveness of paving gravel roads in Alaska. AKDOT&PF will use the results of this study in documentation of project needs and impacts during project development.  
The study explored expected primary, secondary, and cumulative impacts on traffic volume and speed, community cohesion, mobility, safety, accessibility, relocation of people and businesses, employment, community facilities, land use, property values, and land development. In addition, the study attempted to quantify the potential response of users to improved roadways.  
Environmental impacts of paving gravel included expected potential impacts on aesthetics, air and water quality, noise, wildlife, and fragile ecosystems.  
The study explored cost effectiveness of paving gravel roads in light of the socioeconomic and environmental impacts, mitigation of expected adverse impacts, and ongoing maintenance.

**Project Status**  
Project complete.

**Available Reports**  
Vetch is one of many problematic non-native plants that have become prevalent along Alaska's picturesque highways. Known by the common names tufted vetch, bird vetch and cow vetch, Vicia cracca has infested many disturbed areas in south central and interior Alaska, often smothering other vegetation.

AKDOT&PF lacks information on the nature, extent, and consequences of vetch invasions—especially in road rights-of-way throughout Alaska. Without this information, AKDOT&PF is unclear if and how the invasion of vetch in Alaska road rights-of-ways will compromise landscaping, erosion control, aesthetic, and safety objectives. AKDOT&PF expends significant funds and effort on erosion control measures, landscaping, and revegetation in road rights-of-ways. The lack of information on vetch invasions and control in Alaska threatens to compromise the success, efficiency, and economics of such efforts.

Control of vetch may be important as the AKDOT&PF prepares to expend funds to landscape the parks and highways throughout Alaska. Public sentiment has not favored AKDOT&PF's use of chemical pesticides. If the AKDOT&PF determines that vetch control is necessary, it likely must identify and use nonchemical control measures. Currently, the AKDOT&PF does not actively control vetch species in its right-of-ways.

AKDOT&PF expects to define the general nature and extent of the vetch problem in Alaska. Of particular interest is the determination of the specific species, their life histories, noxious characteristics, and geographical extent in Alaska's road rights-of-ways and establishing whether, when, and where there may be a need for control measures in road rights-of-ways in Alaska.

If available information suggests that control measures may be necessary, AKDOT&PF desires suggestions for potential, environmentally friendly (nonchemical) control strategies for use in landscaped road rights-of-ways as well as suggestions for developing education and outreach programs for adjoining landowners.

AKDOT&PF believes that the study team can accomplish these goals within the scope of a literature search, site surveys, and interviews with staffs of appropriate agencies.

Project Status

Project Completed.

Visual surveys and intensive communication with industry professionals indicate vetch presence in significant amounts in the core area of the Matanuska-Susitna Valley, Fairbanks, and Anchorage with smaller areas present in Seward, Girdwood, Homer, Sutton, Soldotna, Delta Junction, Nenana, Denali Park, a few runways along the Kuskokwim River, and sporadically along the Parks Highway. Though infestations are considered a problem, more research is needed to determine the invasiveness of this species before eradication control measures are implemented. Including this species in a general weed management plan is appropriate. Care must be taken not to misidentify other native legumes with similar growth habits as the problem vetch. Many strategies are effective at controlling it, but mowing is preferred.

Available Reports

Evaluation of Wetland Assessment Models for Alaska

Project Number: 01-03 (Research Response Program)
Estimated Completion Date: 7/31/03
Estimated Cost: Phase I - $20,000
Project Manager: Clint Adler

Technical Advisory Committee:
Bill Ballard, Statewide Environmental Coordinator

Problem Statement
ADOT&PF is required to obtain a permit from the U.S. Army Corps of Engineers (USACOE) when construction activities will disturb a wetland. To apply for a permit, ADOT&PF must present the USACOE with the functions and values of the wetland to be disturbed, as well as a mitigation plan.

Currently the ADOT&PF’s determination of the functions and values of wetlands is based upon an individual’s best professional judgment. Many states, as well as USACOE and the Federal Highway Administration, have developed wetland assessment techniques for this purpose. Several difficulties are encountered when applying a technique developed for the contiguous states to Alaska:

• First, Alaska contains diverse climate regions, from continuous permafrost in the north to rainforest in the southeast. For instance, in the northern region, permafrost areas are considered wetlands because of the perched water on top of the frozen ground, while in the southeast, wetlands frequently occur on the sloping sides of hills. Few if any previously developed assessment models deal with these and other wetland areas that are unique to Alaska.

• Second, a large percentage of Alaska’s land area is classified as regulated wetlands. Development routinely occurs in wetland areas of Alaska. USACOE’s criteria states if an activity is not water-dependent, an upland alternative is presumed to exist. This logic is largely not applicable in Alaska.

Research Objectives
To overcome these difficulties in determining the functions and values of Alaskan wetlands, and consequently the breadth of the mitigation effort, ADOT&PF desires a wetland assessment model developed for Alaska-specific functions and values. This model should deal effectively with the diverse and unique wetlands of Alaska and be applicable statewide. In addition the model should be a rapid assessment technique so that it can be efficiently applied to the numerous wetland projects conducted by ADOT&PF. With a statewide wetland rapid assessment model in place, ADOT&PF will be able to defensibly, and in a standardized manner, satisfy the permit conditions of USACOE.

Project Status
RFP expected in spring 2003.

Available Reports
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**Effectiveness of Paving on Airborne Particulate Matter in Kotzebue, Alaska**

Federal Project Number: RT-0002 (143)
Estimated Completion Date: January 2005
Cost: $1,692,500

**Problem Statement**

AKDOT&PF lacks quantitative information on the impact of paving silt-based gravel roads in rural Alaska and its effectiveness in reducing the levels of airborne particulate matter.

Kotzebue, one of the larger cities in northwest Alaska, has undergone a steady population growth over the past 20 years. This growth has resulted in a vast expansion in the local road network. This demand for new roads led to a substantial increase in the number of unpaved road surfaces as well as an increase in vehicular traffic and dust. This elevation in the level of particulate air pollution is causing Kotzebue residents to experience an increase in respiratory illnesses. When the air becomes dusty, the number of health problems and hospital visits increase.

**Research Objectives**

The objective of this project is to determine if paving a portion of Kotzebue’s dirt roads will be effective in reducing the levels of particulate emissions from the road surface due to vehicle traffic and winds and assess the overall reduction in the concentration of dust. The goal is to demonstrate a minimum emissions reduction of 65 to 75% in the vicinity of the road surface and an overall reduction of particulate levels in Kotzebue of 10 to 20%.

**Project Status**

AKDEC installed air monitors and collected air particulate data during the summer and fall of 2002. AKDOT&PF will pave streets during the summer of 2003, and AKDEC will monitor air quality through the summer and fall of 2004.

**Available Reports**

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Improving Stormwater Treatment (RNS-02-39)

Project Number: 01-58
Estimated Completion Date: 9/30/03
Estimated Cost: $25,000

Project Manager: Clint Adler
Technical Advisory Committee: Carol Sanner,
AKDOT&PF, Central Region Environmental
Ralph Kiehl, AKDOT&PF Central Region
Design
Scott Wheaton, Municipality of Anchorage

Problem Statement
Throughout the Lower 48 states, departments of transportation use constructed wetlands as a best management practice for the treatment of stormwater runoff, while the practice is still relatively new in Alaska. AKDOT&PF has designed a limited number of sedimentation basins in conjunction with constructed wetlands for the purpose of treating stormwater runoff; however, their effectiveness has not been evaluated to determine if their design meets regulatory requirements in Alaska.

In the past four years, AKDOT&PF constructed three of these systems to treat stormwater runoff entering sensitive receiving waters. The goal of these systems is to achieve heavy metal and sediment removal. However, postconstruction monitoring on these systems has not been conducted to evaluate their performance.

Research Objectives
The objective of this research is to obtain information that demonstrates the level of effectiveness of sedimentation basins in conjunction with constructed wetlands in treating stormwater runoff in Alaska.

Project Status

Available Reports
Interim: n/a
Final: At project end
Problem Statement
Roadway embankments constructed in areas of warm permafrost (interior Alaska) experience high rates of failure due to thaw-induced settlement of the foundation soils. The problem is most pronounced beneath the embankment shoulders where additional snow cover in winter (due to snow plowing operations) and hot dry conditions during summer conspire to produce mean annual surface temperatures that are several degrees higher than their preconstruction values. Thaw settlement beneath embankment shoulders often causes side-slope stability and the formation of large longitudinal cracks in the asphalt pavement surface with consequent maintenance requirements.

To reduce maintenance costs and improve roadway safety, a new type of thermal treatment that uses an open highly porous rock cover on the shoulder side slope is being investigated. Modeling studies and field measurements will be used to understand the thermal behavior of these ventilated shoulder features and formulate design procedures.

Research Objectives
The aim of this study is to produce a design manual to be used by AKDOT&PF and private contractors. Data generated with advanced models will be combined with field measurements and synthesized into a set of design guidelines. These guidelines will be incorporated into the design manual.

Project Status
This project will be initiated once preliminary data from project “Eliminating Longitudinal Cracking” (Loftus Road experimental study) is acquired and analyzed.

Available Reports
Interim: n/a
Final: n/a
Eliminating Longitudinal Cracking

Project Number: 01-31 (00-38 previously)
Estimated Completion Date: 9/30/04
Estimated Cost: $40,000

Project Manager: Steve Saboundjian
Technical Advisory Committee:
Steve Saboundjian, Billy Connor, Research & T2

Problem Statement
Many interior Alaska roads are constructed in regions of warm permafrost and experience a significant rate of failure due to longitudinal cracking. Longitudinal cracking occurs because the permafrost thaws at an accelerated rate at the south slopes of the embankment. The thawing results from high mean temperatures on the side-slope. Two sources cause the higher mean temperatures: (1) thick snow layers in winter because of snow clearing operations, and (2) relatively high summer temperatures. Foundation soils subsiding beneath the side slopes causes road shoulders to rotate, creating longitudinal cracking. Deep cracks in the pavement surface result in hazardous driving conditions and frequent maintenance.

Research Objectives
This research examines new techniques to cool embankment side slopes, with the goal of avoiding accelerated thaw and longitudinal cracking. Techniques similar to the air-cooled embankment (ACE) involve the use of a layer of a uniformly graded coarse aggregate with low fines content and very high permeability. High permeability will allow circulation of ambient air through the shoulder of the embankment during winter, thus providing an enhanced cooling effect. Also, the horizontally embedded thermosyphon technique will be evaluated. If these techniques prove viable, this project could offer a cost-effective method to avoid longitudinal cracking, improving safety and reducing maintenance.

Project Status
Under contract to Prof. Doug Goering, Mechanical Engineering Dept., UAF.
Analytical simulations and modeling were performed to study the effect of different embankment configurations and geometries on temperature variation over time within the system. Three configurations will be included in the Geist/Loftus Road extension project in Fairbanks, as an experimental feature. Embankment and foundation temperatures will be monitored over time.

Available Reports
Final: At project end
Rock Fall Model Applicability

Project Number: 01-20 (01-40 previously)
Estimated Completion Date: 11/30/02
Estimated Cost: $20,000

Project Manager: Steve Saboundjian
Technical Advisory Committee: Dave Stanley, Bob Lewis, Bruce Brunette, Tom Moses

Problem Statement
Rock falling onto our roads is a continuing problem for maintenance forces and the travelling public. The cost of removing rock from the roadway and for stabilizing slopes is a significant part of the maintenance budget. The cost of rock excavation and stabilization is also a major component of our construction contracts. Research into the applicability of new hazard assessment methods and management systems as applied to Alaska conditions are useful in giving direction for prudent designs, resulting in reduced costs of claims and for design, construction, and maintenance of our slopes.

Present rock slope design practices within AKDOT&PF vary from region to region and do not adequately address rockfall hazard mitigation. Adoption and use of a statewide rock slope design methodology will reduce the rockfall hazard and will allow avoidance of costs associated with rockfall related accidents.

A regional pooled-fund study regarding rockfalls has produced the report “Rockfall Catchment Area Design Manual and Research Report” (RCAD). The study focuses on technical aspects of rockfall, design of ditches, and other factors. The question is: can and should AKDOT&PF adopt (with or without adaptation) the RCAD model into our design and management of rock slopes?

Research Objectives
• Evaluate the RCAD method as a tool to design rock slopes and evaluate the potential for its use for DOT&PF projects.
• Decide whether to adopt RCAD as a design method.
• Determine whether additional research is needed to establish a comprehensive suite of rock slope design methods.

Project Status
The TAC decided to adopt the RCAD as the AKDOT&PF design method. A memo will be distributed to this effect.

Available Reports
Final: n/a
Updating AKDOT&PF’s Geotechnical Procedures

Project Number: 01-19 (01-38 previously)
Estimated Completion Date: 12/31/02
Estimated Cost: $25,000

Project Manager: Steve Saboundjian
Technical Advisory Committee: Dave Stanley, Diana Solie, Bruce Brunette

Problem Statement
AKDOT&PF presently uses its own geotechnical procedures manual. The latest version (1993) of the manual is seven years old. The manual is outdated and there are now significant departures of standard procedures from the 1993 manual. Procedures and references for procedures have changed. The geotechnical community has made advances in exploration methods, testing, and evaluation of geotechnical conditions. This project is intended to update the geotechnical manual. This will result in more efficient investigations and analysis of geotechnical conditions. It will also reduce the risk of some construction claims.

Research Objectives
The main objective of this in-house project is to bring AKDOT&PF’s geotechnical procedures up to present day industry standards. The manual will consist of introductory comments, then a set of stand-alone guides to cover various topics.

Project Status
A draft of the Alaska Soil Classification Guide has been distributed to TAC members for review and comments. Next, the Geotechnical Report Preparation Guide should be available for review about Oct. 15. The third guide will be the Rock Mapping and Engineering Classification Guide, which should be ready by the end of Nov. ’02.

Available Reports
Final n/a
Problem Statement
The department wants to stabilize poor-quality subgrade materials. We added a proprietary organic stabilizing agent, EMC2, a product of Soil Stabilization Co., Inc., to poor-quality subgrade materials in an area where better materials are not reasonably available.

The stabilized subbase test section abuts a normally constructed control section. Except for roto-milling EMC2 into the top of subbase, workers constructed the test and control sections using the same methods and materials. The sections will be monitored for four years by visually assessing the pavement performance and collecting falling weight deflectometer (FWD) deflection data.

Research Objectives
• Determine the structural capacity of the pavement structure in terms of equivalent single axle loads to failure.
• Determine if using a low-cost soil-stabilizing additive will improve the structural performance of a roadway with an asphalt surface treatment.

Project Status
The construction project, including the test area, was completed in 1996. In spring 1997, visual inspection of the research site showed like-new condition, except for one thermal crack. According to the FWD deflection data taken in spring 1997, the EMC2 section appeared to be a problem. The initial prognosis for the EMC2 section was for relatively early failure. The EMC2 seems to have softened the subbase structure.

Backcalculation of moduli using FWD deflection data obtained in the summer of 2001 revealed that the unstabilized subbase in the control section is about 30% stiffer than the EMC2 stabilized subbase.

Therefore, it was found that the use of this particular additive in the subbase did not improve the structural performance of this experimental roadway section (covered with an asphalt surface treatment in the form of a high float surfacing). It might also be possible that the control section contains undisturbed sublayers of asphalt concrete, which could act as subgrade reinforcement, actually strengthening the section.

Available Reports
Hydraulics

Verification of Roughness Coefficients

Project Number: 01-38 (00-09 previously)
Estimated Completion Date: 9/30/03
Estimated cost: $88,000

Problem Statement

Sufficient hydrologic information necessary for predicting flood heights and stream flows during spring runoff and flood events is lacking for many Alaska streams. Inaccurate information can lead to culvert and bridge designs that inadequately prevent wash out or destructive scour. We start by measuring stream flow and channel data from Alaska streams over several years. The flows in Alaska streams often respond differently to precipitation events than streams in the rest of the United States. When designing culverts and bridges, department hydraulic engineers use available stream roughness (friction) coefficients that were developed in Lower 48 states, mostly in the southeastern United States, where there are few large cross sections and steeper streams. Alaska has many cascading-flow and boulder-cobble streams, particularly in the southeast and southcentral areas, as well as braided glacial streams on the Dalton Highway up to Atigun Pass in the northern, arctic region. To date, Alaska designers have had to extrapolate roughness coefficients from the Lower 48 data, and experience shows that doing so isn’t sufficient to protect our culverts and bridges.

Research Objectives

• Derive better channel roughness estimates for Alaska streams.
• Improve engineer’s computation of flood heights and stream volumes when designing bridges and culverts.
• Improve cost-effectiveness of bridge and culvert designs by more closely matching stream crossing structures with stream flow behavior.
• Reduce stream crossing maintenance costs by reducing scour and washouts.

Project Status

This project supports a continuing United States Geological Survey (USGS) effort to collect additional hydrologic data on numerous Alaska streams. Southeast Alaska produced valuable data, with higher than normal stream flows. This allowed stream flow modeling researchers to perform calibration and verification of channel roughness.

Initial results from stream flow modeling indicate that we need higher estimates of roughness coefficients on steep Alaska streams. Researchers are finding that current, nationally published roughness coefficients tend to lead designers to underestimate roughness and underestimate flood heights on many of Alaska’s mountain streams. Continuing research is likely to improve stream channel roughness estimates in Alaska which are critical to effective stream crossing designs. The USGS and AKDOT&PF will continue to gather and analyze additional data and refine estimates of stream roughness in Alaska.

Available Reports

None.

Much of the hydrologic data gathered has been published on USGS Alaska District Internet site http://www-water-ak.usgs.gov/
Development and Verification of an Efficient Fish Barrier Assessment Protocol for Highway Culverts

Project Number: 01-15 (01-14 previously)
Estimated Completion Date: 6/30/03
Estimated Cost: $100,000

Problem Statement
In Alaska, highway culverts may be restricting fish passage in many watersheds. AKDOT&PF currently owns an unknown number of culverts that may restrict or prohibit fish passage. Beginning in Fiscal Year 2001 (FY01), AKDOT&PF has established an annual project to retrofit or replace culverts that block or impair fish passage. However, AKDOT&PF and the Alaska Department of Fish & Game (AKDF&G) do not have a comprehensive culvert inventory and fish barrier assessment protocol for efficiently prioritizing and programming fish barrier mitigation.

Because AKDOT&PF appropriates limited resources for culvert retrofits and replacements annually, AKDOT&PF and AKDF&G must economically and accurately assign priorities for culvert retrofits or replacements in order to mitigate the most egregious problems first. Efficient resource appropriation, fish barrier mitigation, and habitat restoration are not possible without an accurate culvert inventory and a streamlined culvert assessment and prioritization protocol.

Research Objectives
AKDOT&PF and AKDF&G expect to develop and verify a streamlined version of a culvert assessment protocol that the United States Forest Service (USFS) developed as part of their road condition survey for Alaska’s Tongass National Forest.

A streamlined culvert assessment protocol will give the state agencies the ability to:
1. rapidly collect sufficient data for use in identifying culverts that pose fish passage barriers,
2. efficiently use computer software such as FishXing that will assist engineers and habitat biologists in the design and assessment of culverts for fish passage, and
3. prioritize the replacement of problem culverts according to the degree of harm that the culvert poses to fish populations and/or availability of upstream habitat.

AKDF&G and AKDOT&PF believe that these goals can be achieved within the following scope of the research effort:
1. modification of the culvert assessment portion of the USFS road condition survey
2. verification of the modified culvert assessment protocol for use with fish passage assessment computer software such as USFS’s FishXing (http://www.stream.fs.fed.us/fishxing/)
3. verification of the modified protocol for use in prioritization of culvert replacement/reconfiguration
4. development and testing of a prioritization routine based on the efficient protocol

Project Status
During the summer of 2001, AKDOT&PF and AKDF&G collected stream data. AKDOT&PF hydraulic engineers and AKDF&G biologists are analyzing the data to jointly validate the streamlined assessment protocol and develop a mechanism for prioritizing the replacement or retrofit of problem culverts.

Available Reports
Interim: n/a
Final: At project end
Impact of Ice Forces on Stream Bank Protection

Project Number: 01-16
Estimated Completion Date: Complete
Estimated Cost: $50,000

Problem Statement
AKDOT&PF commonly protects stream banks by placing rock riprap in the vicinity of roads and bridges. The Federal Highway Administration (FHWA) manual, Hydraulic Engineering Circular #11 (HEC-11), “Design of Riprap Revetment,” is the primary design guide. The HEC-11 procedure considers four factors:
1. the imposed tractive stress of the water flow,
2. the riprap material critical shear stress,
3. the bank inclination angle, and
4. the specific gravity of the riprap material.

The procedure defines a “stability factor” (SF) as the ratio of the resistive shear force to the imposed tractive force.

Given the channel velocity and bank angle, hydraulic engineers use the primary design equation to calculate a nominal diameter ($D_{50}$) for the riprap material size. The hydraulic engineers adjust this $D_{50}$ value with two correction factors that account for the specific gravity and stability of the rock.

HEC-11 makes only brief mention of ice damage consideration (Sec. 1.3, 4.1.1.1 and 4.1.3). It states that riprap designers do not generally need to consider ice forces, but, if they judge them to be a problem, they can use an increased stability factor (SF). In the case of historical ice problems, the procedure recommends a SF of 1.2 to 1.5. The “normal” SF is 1.2. By comparison, riprap design for channel sections with rapidly varying flow and channel bends may raise the value to 2.0 and 1.7 respectively. HEC-11 equates ice impact with floating debris impact and also states that, in general, ice forces are not a problem and “…riprap sized to resist flow events will also resist ice forces.”

AKDOT&PF has found that this rudimentary consideration of ice forces has not worked for Alaska streams and believes that riprap designs should consider other forces such as:
• Anchor ice rafting and moving rocks
• Raft ice impact damage
• Raft ice pushup onto shore
• Ice jams causing velocity increase
• Rock encasement by ice with reduction of specific gravity
• Increased longitudinal effective tractive force imposed by stream ice cover

Research Objectives
The objective of this study is to develop a consistent procedure to determine how to adjust the HEC-11 stability factor to allow for ice forces on stream bank protection. The overall goal is to specify the riprap size with a greater degree of confidence and to potentially reduce the amount of material stable stream banks require.

The study attempted to include only the expansion of the HEC-11 procedure to allow for the presence of river ice. The hydraulic engineer or designer will still need to develop the flow, channel, and ice information.

Project Status
Complete.

Available Reports
Interim: n/a
Final: FHWA-AK-RD-02-03, “Impacts of Ice Forces on Stream Bank Protection.” Available online at http://www.dot.state.ak.us/stwddes/research/assets/pdf/fhwa_ak_rd_02_03.pdf
Bed Material Retention for Buried Invert Culverts
(RNS-02-32)

Project Number: 01-59
Estimated Completion Date: 9/30/03
Estimated Cost: $60,000

Project Manager: Clint Adler
Technical Advisory Committee:
Mark Miles, Statewide Hydraulic Engineer

Problem Statement
AKDOT&PF hydraulic engineers lack design criteria for providing and installing stable bed material in fish passage culverts. A common permit stipulation for buried invert culverts is that the bed material within the culvert barrel remains stable up to the 50-year design flood. Existing design methods and criteria do not address a “flush bed” horizontal application of riprap in a culvert barrel. They result in an oversized required bed material size for this application.

In addition, existing gradation specifications allow sub-bed flow during low flow conditions.

Research Objectives
The aim of this study is to develop methods, criteria, and specifications for bed material. They will ultimately be incorporated into the AKDOT&PF Drainage Manual for use by engineers designing buried invert culverts for fish passage.

This study will be performed in cooperation with the FHWA Turner-Fairbank Hydraulics Lab.

Project Status
We are working with the FHWA Turner-Fairbank Highway Research Center on a flume study. FHWA will conduct this study jointly with Project 01-48, “Buried Invert Culvert Loss Coefficients for Fish Passage.”

Available Reports
Interim: n/a
Final: At project end
Evaluation of Bioengineered Bank Stabilization in Alaska (RNS-02-15)

Project Number: 01-56
Estimated Completion Date: 12/30/02
Authorized funding: $70,000 with $5,000 match from the U.S. Fish & Wildlife Service

Project Manager: Billy Connor & Clint Adler
Technical Advisory Committee:
   Mark Miles, Statewide Hydraulic Engineer
   Bill Ballard, Statewide Environmental Coordinator
   Mac McLean, AKDF&G
   Lance Trasky, AKDF&G
   Elaine Gross, USFWS
   Anita Goetz, USFWS

Problem Statement

Natural resource agencies in Alaska frequently request “natural” channel and stream bank stabilization methods that provide or maintain fish habitat, such as bioengineering treatments. Bioengineering includes armoring stream banks and channels with toe rock, root wads, coir logs, willows, and other types of riparian vegetation to protect transportation facilities from erosion, scour, and lateral channel migration. However, little engineering guidance, criteria, or standards exist to aid practitioners to design environmentally sensitive channel and bank protection measures with confidence that their designs reliably ensure public safety and transportation facilities protection.

Lacking industry-accepted engineering design standards and performance data for bioengineering in Alaska, AKDOT&PF typically employs more traditional stream bank protection measures such as riprap and gabions. These may not adequately provide productive fish and wildlife habitat. AKDOT&PF stream bank protection designs often conflict with the desires and regulatory purview of Alaska and federal natural resource agencies.

Current national research aims to develop definitive selection criteria, design guidelines, and techniques for the type, size, and placement of environmentally sensitive channel and bank protection measures based on both engineering and environmental considerations. However, Alaska’s unique hydraulic conditions, climate, and vegetation may present undocumented challenges to the implementation of bioengineered channel and stream bank protection.

Research Objectives

The objectives of this research are to:
- gather quantitative information necessary to supplement ongoing national research.
- gain understanding of the factors and conditions that govern successful implementation...
of bioengineered structures in Alaska to satisfy both environmental and engineering goals.

- increase understanding and confidence necessary to design and construct bioengineered structures.

**Expected Implementation**

The information gathered under this study will help hydraulic engineers understand how bioengineered stream bank protection designs perform under a variety of stream flows and conditions. By quantifying the conditions in which bioengineered stream bank protection structures can perform reliably, engineers may eventually design natural stream bank protection projects with greater confidence.

**Project Status**

Contractor has gathered field data during the summer of 2002 and continues to collect data associated with significant flooding that occurred on the Kenai Peninsula in late October 2002. Data analysis and reporting will occur in November–December, 2002. Project report expected by the end of 2002.

**Available Reports**

Interim: n/a
Final: At project end
Buried Invert Culvert Loss Coefficients for Fish Passage (RNS-02-15)

Project Number: 01-48
Estimated Completion Date: 9/30/03
Estimated Cost: $25,000

Problem Statement
AKDOT&PF designers cannot perform reliable hydraulic design calculations for buried invert fish passage culverts. Inlet head losses under low-medium flow are not defined for these types of culverts. As a result, culverts with buried inverts are routinely designed larger than needed for efficient fish passage.

Culvert designers often must resort to using published “unburied,” high flow inlet loss coefficients when designing culverts for low-to-medium flow fish passage discharges. The published inlet loss coefficients often assume quiescent conditions at the inlet. These assumptions may result in overly conservative designs that result in higher materials and construction costs for installing culverts larger than necessary for fish passage.

Research Objectives
The aim of this study is to develop inlet loss coefficients for a range of pipe types, slopes and flows. Results will be incorporated into the AKDOT&PF Highway Drainage Manual and be used in existing hydraulic design software.

This study will be performed in cooperation with the FHWA Turner-Fairbank Hydraulics Lab.

Project Status
We are working with the FHWA Turner-Fairbank Highway Research Center on a flume study. FHWA will conduct this study jointly with Project 01-59, “Bed Material Retention for Buried Invert Culverts.”

Available Reports
Interim: n/a
Final: At project end
Intelligent Transportation Systems

Reliability of Power Sources for Remote Weather Observation Systems

Project Number: 01-14
Estimated Completion Date: 9/30/03
Estimated Cost: $25,000

Project Manager: Clint Adler
Technical Advisory Committee:
Jeff Ottesen, Statewide Planning/ITS
Douglas Lewis, Northern Region M&O

Problem Statement
Providing cost effective and reliable electrical power to operate remote avalanche-monitoring road weather information system (RWIS) sites along coastal mountain ranges in Alaska is a significant challenge. AKDOT&PF’s past attempts at establishing remote, coastal alpine RWIS sites that harnessed solar and wind power in conjunction with battery storage have failed. The power demands of sensor heating elements when combined with the very short winter daylight periods as well as rime ice formation on the wind foils and solar panels reduced power output below what was necessary to recharge batteries. Various engine-driven power systems and thermal electric generators fueled by diesel or propane can provide reliable energy but require very large capital investments and have high annual operating costs attributed to on-site maintenance and fuel delivery by helicopter.

Recent developments in power source technologies promise greater reliability yet remain untested and unproven in coastal Alaska alpine environments. It is unknown if AKDOT&PF can develop and deploy these new power source technologies cost effectively in coastal, Alaska alpine environments.

Research Objectives
The goals of this study are to:
1. Identify a cost-effective power generation system for remote, alpine RWIS sites that will provide reliable operation on a one year or longer maintenance cycle in coastal Alaska alpine environments.
2. Identify barriers to cost effective implementation and suggest techniques or additional research to overcome implementation barriers.

Project Status
AKDOT&PF is working to identify and test a promising power source at a coastal RWIS site in the Chugach Mountains near Valdez. We are hoping to install the experimental equipment during the winter of 2001–2002.

Available Reports
Interim: n/a
Final: At project end
Magnet Snowplow Guidance System
(Experimental Feature)

Problem Statement

Today, snowplow operators, with the limited visibility caused by winter conditions, often don’t know their exact location in the roadway. They have to drive at speeds great enough to effectively remove snow, while remaining alert for roadside obstacles and obstructions. Low visibility and the absence of distinct cues that delineate the road decrease the snowplow’s speed and efficiency. Some of Alaska’s mountain passes receive more than 14 meters (45 feet) of annual snowfall and suffer whiteout conditions. Consequently, snowplow operators use the guardrail for guidance by riding with the snowplow blade snugged up against the guardrail. That practice makes clearing the snow from the roadway take more time and wreaks expensive havoc on the guardrail. Maintenance and Operations forces have to replace a lot of guardrail each summer, only to ruin it again over the course of the winter.

One new intelligent transportation system product is a magnetic guidance system (MGS) for vehicles. The MGS is a series of magnetic markers or a magnetic strip that serve as a roadway reference, plus vehicle-borne sensing and processing units that obtain information from the roadway magnetic reference.

The department installed a MGS from 3M Inc. (3M Lane Awareness System) in a road rehabilitation project in Thompson Pass on the Richardson Highway near Valdez. Thompson Pass has guardrail, some of the highest snowfall in the state, blowing conditions, and low visibility.

Research Objectives

• Evaluate the 3M Lane Awareness system in an Alaska coastal mountain pass. The magnetic guidance system should help the operator stay on track, avoid the guardrail, and not veer into the oncoming traffic lanes.
• Safe guidance for snowplows moving up and down a winding mountain pass.
• Reduce snowplow damage to guardrail.

Expected Implementation

If the 3M Lane Awareness System proves reliable and functional, its use will be considered throughout the state.

Project Status

AKDOT&PF installed magnetic tape in three lanes (two climbing and one descending) of the Richardson Highway in Thompson Pass and retrofitted two Freightliner and two rotary snowplows with the magnetic sensing and operator interface equipment. Department maintenance personnel will evaluate the Lane Awareness System during the 2002–2003 winter season.

Available Reports

Interim: n/a
Final: At project end
Evaluation of Overheight Warning Devices

Project Number: 01-13
Estimated Completion Date: 12/31/02
Estimated Cost: $25,000

Project Manager: Clint Adler
Technical Advisory Committee:
Scott Thomas, Southcentral Region Traffic Engineer
Kurt Smith, Statewide Traffic Engineer
Walt Luebke, Southcentral region M&O

Problem Statement
Overheight loads strike bridges throughout Alaska and especially in the Anchorage Bowl and along the Glenn Highway. AKDOT&PF wants to identify potential mitigation options. Unfortunately, little information currently exists regarding potential solutions, especially measures of effectiveness and costs.

AKDOT&PF does not currently know how existing and promising new technologies will perform under Alaska weather conditions such as wind, cold, snow, fog, and low sun angles. These conditions have interfered with and failed devices used in other states under similar if not less challenging conditions.

Research Objectives
The ultimate goal of this study is to provide Alaska DOT&PF with a comprehensive synthesis of the state-of-the-practice in oversize vehicle warning devices to help the AKDOT&PF develop a new methodology for reducing these vehicles collisions with bridges. The study will:
1. Identify state-of-the-practice in oversize vehicle warning devices and approaches for reducing oversize vehicle collisions with bridges.
2. Synthesize existing performance measures for the oversize vehicle warning devices.
3. Analyze additional available data to further assess the performance characteristics for the oversize vehicle warning devices.
4. Create a tabulation of the state-of-the-practice solutions, their performance and their costs.

Project Status
University researchers conducted a literature review and surveyed other state DOTs. A final report will be available by the end of 2002.

Available Reports
Interim: n/a
Final: At project end
We want to quantify the reduction in road closure time and reduced worker exposure to hazardous conditions that result from using the TAMER technology. As an additional goal, this research will document ways to optimize remote-controlled avalanche cleanup operations under conditions of extreme cold and extended hours of darkness.

Expected Implementation
AKDOT&PF will use the results of this study to focus future efforts on the identification and design of BMPs for road-related snow storage areas throughout Alaska.

Project Status
The department retrofitted a single 2000 Case 921C loader with the TAMER equipment during the summer of 2001. Due to low snowfall during the winter of 2001–2002, the system was not put to the test. Department maintenance workers and equipment operators will evaluate the equipment on avalanche cleanup operations during the upcoming winter.

Available Reports
Interim: n/a
Final: At project end
Optimization of Magnesium Chloride Use

Project Number: 01-10
Estimated Completion Date: 9/30/03
Estimated Cost: $100,000

Project Manager: Clint Adler
Technical Advisory Committee:
Gary Hayden, Southeast Region M&O
Greg Patz, Southeast Region M&O

Problem Statement
AKDOT&PF uses liquid magnesium chloride (MgCl) and other chemicals to keep roads bare and wet. The timing of application and application rate of deicing and anti-icing chemicals is largely determined by subjective judgment in response to many dynamic variables. Increased road maintenance needs in conjunction with stable or declining maintenance budgets have emphasized the need to optimize the cost effectiveness of anti-icing and deicing activities. AKDOT&PF believes that using subjective judgment complemented with road weather information systems (RWIS) and other intelligent transportation systems (ITS) may lead to the most cost-effective use of anti-icing and deicing chemicals.

Research Objectives
This study will explore the use of ITS technologies in optimizing the use of anti-icing and de-icing chemicals in Alaska’s coastal maritime climates. The study will expand upon the use of global positioning systems (GPS) and various vehicle-mounted road condition sensors to enhance anti-icing and deicing decision-making. The ultimate goal is to help maintenance crews make better decisions on the timing and quantity of chemical application.

Project Status
GPS equipment, road condition sensors, and data logging equipment have been installed on AKDOT&PF anti-icing equipment. During the 2002–2003 winter months, AKDOT&PF researchers will gather and analyze data to evaluate the effectiveness of and optimize anti-icing operations. Preliminary findings should be ready by April 2003.

Available Reports
Interim: n/a
Final: At project end
Application of GPS and Vehicle Detection System

Project Number: 01-41 (00-06 previously)
Estimated Completion Date: Completed
Estimated Cost: $100,000

Problem Statement

Maintenance operations performed during winter months are inherently dangerous to maintenance equipment operators and the motoring public. In Alaska’s northern latitudes, workers perform these operations mostly in the dark and under low visibility conditions. Blowing and drifting snow can obscure obstacles and reduce visibility even further, creating a high potential for accidents. In some instances, conditions reduce visibility to such a degree that snow removal operations are postponed. This delay is often more costly in time and effort.

Furthermore, during limited or zero visibility conditions, operators who are familiar with the area frequently navigate by using scarce visual cues and sometimes by feel. Operating under these conditions—plus monitoring the application of sand and gravel, communicating with a dispatcher, and keeping the vehicle in the roadway while avoiding obstacles—can bring about extreme driver stress and fatigue.

Technology exists to mitigate these highway maintenance problems. Global positioning systems (GPS) with integrated communications and moving map technology can display valuable reference information for the operator and the base station: automatic reporting of vehicle location information to a base station along with the vehicle’s speed, time, and status.

Collision avoidance radar systems (CARS) offer additional safeguards. They can detect buried obstacles in the field of view, calculate closure speed, and provide audible and visual warnings.

Research Objectives:

- Expose Maintenance and Operations supervisors and operators to existing technologies that increase situational awareness and safety.
- Provide the operator with a vehicle positioning system capable of automatic reporting and moving map display.
- Evaluate the safety and productivity benefits against the cost to employ this technology.

Project Status

We outfitted a snowplow in Anchorage with the GPS for winter 2000. However, the distance was too great to allow us to effectively evaluate the technology. The GPS is now reinstalled in a Fairbanks snowplow.

We also modified the project, dropping CARS because the vendor had previous commitments and couldn’t meet the project schedule.

Data gathering and evaluation has been completed. We expect to have the data analyzed and a report finalized by the end of December 2002.

Available Reports

Interim: n/a
Final: At project end
Water Drainage from Thaw Basins

Project Number: 01-23 (01-47 previously)
Estimated Completion Date: 9/30/03
Estimated Cost: $50,000

Problem Statement

Embankment construction on top of frozen soil disturbs the ground thermal regime and results in accumulation of water below the embankment toes, producing thaw basins. This triggers side-slope instability and embankment settlement. Water should therefore be diverted and removed from below the embankment in order to maintain the integrity of the earth structure. The possibility of using, for instance, gravel columns, geosynthetics, or an innovative ditch construction method will be explored. Design criteria will be developed for use by AKDOT&PF engineers. The final product of this research will be in the form of drainage-related design criteria that will be added to our current embankment design criteria.

Problem Objectives

The main objective of this study is to find innovative technique(s) to divert and remove accumulated water at embankment toes. Other objectives include reduction in embankment maintenance costs and increase in safety for the travelling public due to the elimination of wide-open longitudinal cracks along the embankments.

Project Status

An RFP will be put out to carry out the research (Oct. 2002).

Available Reports

Interim: n/a
Final: At project end
**Problem Statement**

Throughout Alaska’s road system, there are damaged sections of guardrail. FHWA has asked AKDOT&PF to fix these problems. The department must choose guardrail components that are both FHWA-acceptable and robust enough to withstand normal maintenance wintertime operations. Properly selected components will save millions of dollars over the years. Many new terminals will be installed each year, so the results of this study are critical and needed soon.

Researchers will evaluate new guardrail end section components that are currently installed, or that will be installed as part of this project, along roads in heavy-snow areas of Alaska. It is important to determine how well various components withstand loads generated during actual snow plowing and blowing operations. High pressures generated when snow is pushed against rail sections and terminals (not direct plow-to-guardrail contact) destroy guardrail components. For example, one of the newer FHWA-approved end sections appears not to hold up well during snow plowing. The SRT-350 was designated in 1995 as one of only two acceptable two-beam terminals (more have been added since then), and many were installed in Alaska. The SRT-350s have not held up well; many reportedly were damaged as snowplows pushed snow against them. All SRT-350s recently installed in Turnagain Pass were damaged after a single winter.

**Research Objectives**

- Find the sturdiest and most robust product.
- Determine if guardrail end sections can be made more visible to plow operators.

**Project Status**

A review of the guardrail end section damage indicates all of the damage was due to plow contact with the rail. While maintenance personnel indicated that there were cases where the damage was due to snow forces while plowing, the investigators could not find any cases to prove this statement. We sent a survey to northern tier states asking about their experience. The only state to indicate a problem with damage due to snow forces was Washington. An effort is ongoing to identify which end terminals are most appropriate for Alaska.

**Available Reports**

Interim: FHWA-AK-RD-00-04, Available online at http://www.dot.state.ak.us/stwddes/research/assets/pdf/fhwa_ak_rd_00_04.pdf

Final: FHWA-AK-RD-02-05, available online at http://www.dot.state.ak.us/stwddes/research/assets/pdf/fhwa_ak_rd_02_05.pdf
Problem Statement
The Alaska Marine Highway System (AHMS) is in the final stages of a major design/build procurement of the first high-speed (>30 knots) vehicle/passenger vessels built in the United States. While similar vessels operate around the world, this class of vessels will be new to Alaska. One of the challenges encountered in introducing high-speed ferries (particularly Washington State Ferries, BC Ferry Corp.) has been with the perceived high wake wash associated with a high-speed vessel. “Data free analysis” about the impacts of this wake wash on boating safety and beach erosion erodes community support for this innovative transportation system. Lack of public and legislative support may hinder the goals of the Southeast Alaska Transportation Plan and the Prince William Sound Transportation Plan for marine transportation improvements.

Research Objectives
This research project will provide:
• a quantitative prediction of the magnitude of wake wash that the new AMHS high-speed ferries will generate
• a quantitative comparison of the magnitude of the predicted wake wash generated by the new AMHS high-speed ferries with other vessels of similar hull form and size. (Optionally, researchers may extend the comparison to currently operating AMHS ferries by measuring their wake wash.)
• a prediction of the impact and acceptability of the expected high-speed ferry wake wash on the proposed route of the new fast ferries

Project Status
Stumbo Associates of Washington has performed a focused literature search and has taken wake measurements on existing AMHS ferries.

Available Reports
Alaska Soil Stabilization Design Guide

Project Number: 00-11
Estimated Completion Date: Completed
Estimated Cost: $75,000

Project Manager: Steve Saboundjian
Technical Advisory Committee:
Billy Connor, Steve Saboundjian

Problem Statement
This manual would be an ideal designer's tool for evaluating options and costs of soil stabilization, particularly in areas of Alaska where only poor-quality aggregates are readily available. Barging in the base course and surfacing materials can elevate costs to more than $100 per cubic yard. There are instances where locally available materials, properly stabilized, might be obtained at 75% or less of the imported cost. In less extreme cases, a mildly degradable base course might benefit from adding a small dose of stabilizer to achieve a much longer pavement design life—at a nominal cost.

Research Objectives
• Review the existing voluminous body of literature.
• Distill the literature review into a compendium of methods most applicable for treating Alaska materials.
• Compile the data into a definitive soil stabilization reference and a design guide. The reference will provide quick access to stabilization types, mix design methods to determine the correct amount of stabilizer, and techniques useful for common Alaska materials.
• Researchers envision the design guide to include summaries, tables, and graphical devices such as decision trees.

Project Status
Complete.

Available Reports
Problem Statement
Rutting of asphalt concrete pavements is a common problem in Alaska, especially in urban areas where studded-tire traffic volumes are high. Rutting can become severe enough that water is actually collected and channeled parallel to the centerline for a considerable distance. These “troughs” become long enough to cause drastic loss of vehicle control. With rutting deeper than 1 inch, the driver actually has to use considerable steering effort, as the vehicle tends to wander in and out of the wheelpaths.

DOT&PF spends an estimated $5 million annually on rut repairs, an average of $1,650 per paved mile per year. Current budget concerns coupled with the need to retain safety and driver satisfaction requires continued, constant attention to rut repairs but with an emphasis on minimizing costs. Studded-tire abrasion is the predominate rut producing mechanism, especially in urban areas. There are various methods and techniques to repair ruts. However, the economics and cost-effectiveness of repairing such damage requires special emphasis.

Research Objectives
The aim of the research project is to comb existing literature (from transportation agencies and contractor resources) to determine the most cost-effective rut repair methods and materials that can be adapted for DOT&PF use. The objectives of this research are to be achieved through the following tasks:
1. Collection of information on cost-effective rut repair methods that are applicable for use by the AKDOT&PF. The objective is to do a general form of literature search, i.e., to collect information from available sources as opposed to conducting field and/or laboratory studies.
3. Providing recommendations concerning the most practical and cost-effective rut repair techniques for use in Alaska.

Available Reports
Interim: n/a
High Temperatures of Alaska Pavements

Project Number: 99-13
Estimated Completion Date: 9/30/03
Estimated cost: $10,000

Project Manager: Steve Saboundjian
Technical Advisory Committee: Steve Saboundjian, Billy Connor

Problem Statement
Under a previous research study, AKDOT&PF developed a database of air temperatures around the state to investigate low-temperature effects on polymer AC pavements. High-temperature data still needs to be processed to develop mathematical relationships between air and pavement surface temperatures. The Superpave design system, developed as part of the SHRP asphalt research program, requires that these high end temperatures be known to satisfy given performance requirements. Processing of the existing high-temperature data will allow the design engineer to confidently specify the correct Superpave asphalt binder, which will lead to improved pavement performance and reduced maintenance costs.

Research Objectives
• Develop design pavement surface temperatures on the high end to satisfy the Superpave design method requirements for developing accurate asphalt binder specifications.

Project Status
Research & T2 has analyzed data (from the last two years obtained from AKDOT&PF Highway Data Management. Some more is expected from the previous years, to extract high temperature data and develop air/pavement high temperature correlations.

Available Reports
Interim: n/a
Final: At project end
Implementation of Asphalt Mix Designs

Project Number: 99-15
Estimated Completion Date: 12/31/02
Estimated cost: $20,000

Project Manager: Steve Saboundjian
Technical Advisory Committee: Steve Saboundjian, Billy Connor

Problem Statement
The department currently makes high-cost asphalt-paving decisions based on short-term contractor risk analysis during the project bidding phase. These decisions often result in less than optimum asphalt performance, and in occasional pavement failures. There is a need to compile a library of past asphalt mix designs, and if possible, correlate them to pavement performance attributes. The successful mix designs for a given route or locale could then be used to define future project specifications. Correlating mix designs with performance would allow the pavement engineers to implement the most cost-effective asphalt aggregate gradations.

Research Objectives
• Determine and recommend which pavement aggregate gradations will result in the most successful pavement for each locality.
• Implement the most cost-effective asphalt aggregate gradations.
• End up with higher quality pavement, a more uniform bidding platform, and lower maintenance costs.

Project Status
We obtained historical asphalt mix designs, then correlated the mix designs to existing pavement performance data and with material source location. We identified four candidate aggregate gradations. Using these gradations, the AKDOT&PF Materials Lab completed Marshall mix designs and obtained pertinent mix data. Results will be included in a final report.

Available Reports
Interim: n/a
Final: At project end
Cost-effectiveness of Hard Aggregate Sources

Project Number: 01-13
Estimated Completion Date: 11/02
Estimated cost: $20,000

Project Manager: Steve Saboundjian
Technical Advisory Committee: Bruce Brunette, Billy Connor, Steve Saboundjian

Problem Statement
Pavement wear due to studded tires results in accelerated pavement damage. Therefore, the use of high-quality aggregates is crucial to the long-term performance of hot-mix asphalt concrete (HMA) pavements. Research has shown that the use of high-quality, hard aggregates can reduce the surface deterioration caused by studded tires. Very few Alaska aggregate sources have been located that have the required high quality. Since it is not feasible to eliminate the use of studded tires at this time, an alternative solution is to use aggregates with increased hardness in surface courses. The problem is to quantify the cost-effectiveness of transporting harder aggregates to project locations. Therefore, the economic benefit of transporting aggregates, in terms of pavement performance, must be evaluated.

Research Objectives
The primary objective of the study was to evaluate the economic feasibility of transporting high-quality aggregate for use in HMA surfacing. A secondary objective was to provide the department with a method of performing the benefit/cost analysis so that it can be used for future aggregate movement studies into other areas of the state. The project scope developed to achieve these objectives contained the following two items:
1. Determine the benefit-to-cost ratio of the improved aggregate based on pavement performance comparisons.
2. Develop and implement a methodology that identifies the allowable aggregate cost increase for enhanced performance.

Project Status
Final report was submitted by the contractor (QES Inc.) and is being reviewed by the TAC members.

Available Reports
Reducing Thermal Segregation

Project Number: 00-03
Estimated Completion Date: 9/30/03
Estimated cost: $100,000

Project Manager: Billy Connor
Technical Advisory Committee: TBD

Problem Statement
Thermal segregation reduces pavement life in various ways. One of the better known ways is inconsistent compaction. Uncompacted pavement results in rutting, raveling, and fatigue cracking. Other ways include hot mix temperatures that are either too hot or too cold, placing loads from the hot plant improperly into the haul truck box, allowing the windrow of dumped hot mix to get too long in front of the paver, and allowing the hot mix to stay in the dump box too long.

Until recently, it has been difficult to measure thermal segregation because the measuring and identification technology didn't exist. Also, from outward appearances, thermal segregation mimics conventional segregation, so everyone involved in the paving process has misunderstood segregation problems. Recent work with an infrared camera (also called a thermal camera) in Alaska, Louisiana, Texas, Washington, and other states is showing the severity of thermal segregation.

Research Objectives
- Educate department personnel and contractors about thermal segregation and help them reduce the problem.
- Correct problems that we didn’t know about by learning where thermal segregation is likely to occur and what its causes are.

We think that education about thermal segregation, combined with the department’s existing Quality Level Assurance (QLA) specification, will be enough to reduce thermal segregation in Alaska.

Project Status
Alaska DOT&PF now has an infrared camera, which looks much like a video camera, that shows where heat loss occurs. Accompanying software translates the information acquired pictorially into graphs and plots of temperatures. The software will convert a colored shot of the paving mat (the colors depict varying temperatures across the mat) behind the paver into a graphic with specific temperatures noted numerically across the picture.

Researchers visited nine projects in 2000 and ten more in 2001, covering all three regions. Initially, most of the projects showed thermal segregation. As contractors become more familiar with thermal segregation and its causes, we see a reduction in thermal segregation. The most common cause of thermal segregation is allowing too much asphalt to be placed in windrows in front of the laydown machine. We suggest that we limit the length of the windrow to one truck.

We also found that areas showing thermal segregation also fail density testing. This causes premature pavement failure, which translates into contractors losing money on their construction contracts under the QLA specification.

Available Reports
Interim: n/a
Final: At project end
Light Weight Aggregate Feasibility Study for Alaska (RNS-02-08)

Project Number: 01-49
Estimated Completion Date: 11/30/02
Estimated Cost: $10,000

Project Manager: Steve Saboundjian
Technical Advisory Committee: Steve Saboundjian, Ron Brooks

Problem Statement
Argillitic shale and mudstone are readily available in many locations in Alaska. These natural materials might be suitable for the manufacture of Light Weight Aggregate (LWA) products meeting Alaska materials specifications. LWA is produced by the rotary kiln process where mined shale or mudstone is fired in excess of 2000°C. The material is then processed to precise gradations.

LWA products can be used in embankments, base courses, hot-mix asphalt and concrete. Compared to conventional aggregates, LWA products are lighter, have better insulating qualities, are more durable, have a higher abrasion resistance, and are less susceptible to freeze/thaw action. Embankments constructed with LWA are expected to undergo less thaw-related settlement, hence increasing their useful life and reducing maintenance costs.

LWA is routinely used in the Lower 48 and Scandinavian countries. It might be optimal for Alaska conditions, especially due to the abundance of raw material sources.

Research Objectives
This study will review the literature and determine the cost-effectiveness of manufacturing and using this material in Alaska.

Project Status
Project complete, see final report.

Available Reports
Corrosion Resistant Concrete Reinforcement
(RNS-02-43)

Project Number: 01-52
Estimated Completion Date: 9/30/03
Estimated Cost: $15,000

Project Manager: Steve Saboundjian
Technical Advisory Committee: George Imbsen

Problem Statement
Corrosion of reinforcing steel due to deicing salts and marine exposure contaminates concrete with corrosive chloride ions. This leads to cracking and spalling of concrete and presents a costly ongoing maintenance demand and runs the possibility of public safety situations.

AKDOT&PF wants to compare the corrosive resistance of ordinary black reinforcing steel bar relative to epoxy coated rebar, stainless steel cladded rebar, and MMFX steel. Since temperature plays a significant role in the corrosion rate of steel, the work will be done in an Alaska environment.

Research Objectives
Improvements, if any, in service life will be determined and used to generate comparative life-cycle costs. If significant life-cycle cost improvements are realized, these materials could be incorporated into Alaska’s Standard Design Specifications.

Project Status
A workplan is being prepared by the Bridge section to initiate this project.

Available Reports
Interim: n/a
Final: At project end
Culvert Extensions (RNS-02-09)

Project Number: 01-50
Estimated Completion Date: 9/30/03
Estimated Cost: $20,000

Project Manager: Clint Adler
Technical Advisory Committee: TBD

Problem Statement
Culvert extensions are now only allowed with annular or dimple bands. If the culvert has a spiral end, the contractor must excavate until an annular joint is found. Also, the necessity of excavation around the end to allow the installation of exterior bands causes settling problems. A method to allow extensions using interior connections would be preferable in some situations. Also, the pull-out resistance of these bands is a concern. Too many failures have been reported. Manufacturers do not seem to realize this. A research study might find a solution.

Research Objectives
Various solutions will be evaluated as experimental features on construction or maintenance projects. Guidance for implementing successful designs will be developed.

Project Status
Researchers have performed preliminary literature search and have queried local vendors for information.

Available Reports
Interim: n/a
Final: At project end

Materials and Construction
Alaska Pavement Material Issues (RNS-02-01)

Project Number: 01-33
Estimated Completion Date: 9/30/03
Estimated Cost: $100,000

Project Manager: Steve Saboundjian & Billy Connor
Technical Advisory Committee: Materials sections of the three regions

Objectives

It was decided to split the funding for this work into several studies of interest to the department. Task groups were formed to develop a workplan and a budget for each of the following studies:

- Superpave mix design: An attempt to move from Marshall mix design to Superpave. The study will use the Southeast Region’s experience in Superpave. Chair: Newt Bingham; $35,000.
- Density of hot-mix asphalt cores: To understand and reduce the variability in measured density of waxed-coated cores. Analyze the variability in density recorded by the regions and recommend a new test method/equipment. Chair: Maureen Lee; $17,000
- PRALL test: Evaluating this Scandinavian test for testing mixes for studded-tire wear. Purchase of equipment and evaluation of Alaska mixes. Chair: Bruce Brunette; $28,000.
- Tube suction test: a Scandinavian device, called Percometer, has been ordered. It evaluates the moisture-susceptibility of base course aggregates by measuring the dielectric constant of the material. An attempt to correlate test results to field performance. Chair: Steve Saboundjian, $20,000.

Available Reports
Interim: n/a
Final: At project end
Use of Modified Asphalts (RNS-02-34)

Project Number: 01-54
Estimated Completion Date: 9/30/03
Estimated Cost: $40,000

Project Manager: Billy Connor &
Steve Saboundjian
Technical Advisory Committee: TBD

Problem Statement
AKDOT&PF receives regular criticism from industry for not having a uniform policy on the selection of the asphalt cement grading or the use of modified asphalts. To date, no review of the performance of modified asphalt has taken place. Consequently, we cannot evaluate the advantages or disadvantages of modified asphalts. Documented benefits of using modifiers include reduced rutting, increased fatigue life, and reduced thermal cracking. All of these increase the life of the pavement and reduce the cost of surface maintenance.

Industry is calling for a uniform policy concerning the use of modifiers. In the absence of such a policy, industry does not know whether to invest in equipment to efficiently place these materials. AKDOT&PF designers must be given guidance concerning when and where to use modifiers. Research &T2 has on several occasions been asked to review the use of modified asphalt on projects. The response is based primarily on our observations of constructed projects.

Research Objectives
The goals of this project are:
• to determine where the inclusion of modifiers in HMA is cost-effective,
• to modify present asphalt cement specifications to include modifiers, and
• to develop a statewide policy for the use of modified asphalts.

Project Status
An RFP will be put out to carry out the study (Oct 2002).

Available Reports
Interim: n/a
Final: At project end
Using Geophysical Methods in Pits

Project Number: 01-30 (00-07 previously)
Estimated Completion Date: 11/30/02
Estimated Cost: $60,000

Project Manager: Steve Saboundjian
Technical Advisory Committee:
Diana Solie, Dave Stanley

Problem Statement
Today, AKDOT&PF uses seismic methods to determine the volume of usable materials in a potential source borrow pit. Geologists estimate the volume of usable material by interpreting drill logs taken throughout the area. However, experience shows that estimated volumes differ significantly from available materials when the subsurface geology is complex. There is a critical need to further evaluate and develop the seismic method and to develop methods that extrapolate the geology from a drill log to the surrounding area to better define borrow source material type(s) and volume.

Geophysical methods can quickly and accurately extrapolate the geology from drill logs to nearby areas within a borrow source. The accuracy in determining material volume should increase, and the number of test drill holes needed to define borrow source volume should decrease.

Research Objectives
Researchers will correlate three primary techniques with the geology from drill logs in a potential borrow source area and use those techniques to (1) estimate the subsurface geology in the surrounding area, and (2) predict the volume of usable material. Seismic wave refraction, ground penetrating radar, and three types of ground resistivity geophysical measurements will be used in the correlation.

Project Status
Almost complete.

Available Reports
Interim: n/a
Development and Validation of Urban Rutting Models

Problem Statement

Rutting of asphalt pavements is a primary mode of distress for our urban roadways. The combined effect of permanent deformation and studded-tire wear creates hazardous driving conditions. In the past, AKDOT&PF collected rut depth measurements on high-speed, high-volume roads (e.g., Seward and Glenn Highways) and developed models and curves to relate rut depth to number of vehicle passes (i.e., studded tire applications). This was done for SMA (stone mastic asphalt) and Type 2 mixes in the Anchorage area.

Research Objectives

In this study, it is proposed to develop models and curves to relate rut depth versus studded tire applications for different mix types for urban roads (especially in Anchorage and Juneau) where vehicle speed is lower and driving habits are different (e.g., frequent change of lane). The model and curves to be developed in this study would help predict the number of vehicle passes to reach the maximum acceptable amount of rutting and consequently pavement life. This will enable us to adequately program pavement rehabilitation and to determine which sections should be candidates for rehabilitation and when.

Project Status

The Central Region developed correlations between traffic and rut depth. Some more measurements are expected over the next year.

Available Reports

Interim: n/a
Final: At project end
High-Float Surfacing for Gravel Roads

Project Number: 01-18 (01-28 previously)
Estimated Completion Date: 9/30/03
Estimated Cost: $50,000

Project Manager: Steve Saboundjian
Technical Advisory Committee:
Steve Saboundjian, Billy Connor

Problem Statement
High-float (HF) surfacing is increasingly being used to surface gravel roads in Alaska. Various material sources and gradations have been used to construct HF jobs with varying success. Specifications have been modified to produce a more durable product. However, many questions remain unanswered. These pertain to:

• the aggregate gradation, maximum size, amount of fines, moisture content, rate of application, compatibility with the high float used
• HF emulsion specifications: minimum and/or maximum limit values
• ambient and base temperatures and the cutoff date for paving in different regions of the state
• optimal distances between HF distributor, aggregate spreader and compaction equipment
• traffic control and speed after application of the surface treatment
• aggregate sweeping intensity and frequency

Research Objectives
This project aims at collecting information related to the variables enumerated above from past, present, and near-future projects. This information will be used to determine the optimal materials and construction conditions for a successful and durable high-float surface treatment.

Project Status
Frank Ganley (NR) has taken the lead in this project as part of his MS thesis. Raveling and bleeding seem to be the main distresses for HF surfacings. The study will also attempt to develop a mix design method for these materials.

Available Reports
Interim: n/a
Final: At project end
Pavement Enhancement to Eliminate Spring-Thaw Load Restrictions

Project Number: 01-09 (01-01 previously)
Estimated Completion Date: 9/30/03
Estimated Cost: $50,000

Project Manager: Steve Saboundjian
Technical Advisory Committee:
Billy Connor, Mike SanAngelo, Newt Bingham

Problem Statement
Current springtime load-restriction policy and practice results in delaying implementation of the load restrictions until it has warmed up and the pavement has started to thaw. The required 48-hour notice prior to implementing load restrictions encourages trucks to haul as much freight as possible during this period when the pavement is at its weakest and most vulnerable condition. The risk of damaging pavements due to the timing of load-restriction implementation is a concern. Currently, load restrictions are needed for part of the road system. For example, about 50 miles of the Parks Highway are most vulnerable to spring-thaw damage. By reinforcing these pavement sections, load-restrictions will be eliminated all together and maintenance costs will be minimized. Also, the cost of freight transportation would decrease and result in savings to the public.

Research Objectives
The objective of this project is to study the cost-effectiveness of building pavements that do not require load restrictions. Reinforcing existing pavements through stabilized bases and/or thicker layers should be able to enhance the load-bearing capacity of these pavements during the spring thaw season.

Project Status
With the recent adoption of the stabilized base course policy, most of our roadways will be strengthened by the use of better performing materials. The incentive to use load restrictions will diminish. Therefore the TAC might shift the focus of the project towards stabilized material characterization.

Available Reports
Interim: n/a
Final: At project end
Update and Enhancement of Alaska Engineering Atlas (Pooled Fund with U of A and CRREL)

Project Number: 01-57  
Estimated Completion Date: 9/30/02  
Estimated Cost: $50,000

Project Manager: Clint Adler  
Technical Advisory Committee: TBD

Problem Statement
Existing environmental and engineering atlases of Alaska are over 20 years old. Since these atlases were developed, much more information has become available through ground-based measurements and satellite remote sensing. A consensus of engineers, scientists, and public agency representatives at engineering workshops in January 2000, June 2000, and January 2001 strongly called for an update of the old atlases.

All AKDOT&PF operations benefit from increased availability of information and meaningful tools for analyzing it. Currently planners, designers, construction engineers, and maintenance personnel have access to outdated and/or dispersed Alaska environmental data with few analytical tools.

Research Objectives
The University of Alaska (UA) and the Cold Regions Research and Engineering Laboratory (CRREL) will compile and publish a GIS-based “Alaska Engineering Design Information System” (AEDIS). The AEDIS will be Web accessible, consisting of a broad array of geospatial environmental data and a toolkit for engineers. The toolkit will include algorithms to determine engineering derivatives from environmental data for direct application to solving practical problems.

The atlas will provide access to both environmental data and engineering tools that will allow planners, designers, builders, and operators of Alaska infrastructure systems to estimate geotechnical conditions for building sites and transportation corridors, select optimum transportation routes, design constructed works, and to program facility maintenance, repair, and replacement.

Project Status
UA and CRREL anticipate completion of the AEDIS around 2006. They continue to seek funding from federal and state agencies, regional corporations, and private industry. The U.S. Department of Defense has provided significant funding to begin this effort in 2001.

AEDIS has made its debut on the Internet featuring spatial presentation of climatological data. Eventually it will consist of semiautonomous modules based on engineering disciplinary areas. Specialists will guide the development of the disciplinary modules including data assimilation and engineering derivatives.

The specialists will be drawn from UA, CRREL, other public agencies, and the private sector. CRREL anticipates that after the first year, the atlas will contain climatological data, and the protocols for inputting AKDOT&PF data and making it web-available will be established. Input of AKDOT&PF data will begin once the protocols for data storage are established and will continue throughout the project.

Available Reports
None to date.

See project Internet site, https://m2.crrel.usace.army.mil/aedis/frames_pc.html
Development of Pavement Design Manual

Estimated Completion Date: 3/30/2003
Estimated Cost: 110,000

Project Manager: Billy Connor

Pavement design procedures continue to evolve, consequently this project was established to revise the pavement design software and for the first time prepare a pavement design manual. Both the manual and software will work in concert. Two design procedures are incorporated: the mechanistic and the excess fines methods. Both include new and overlay design. The manual provides the designer with assistance with materials properties.
Warrant System Background

The Warrant System is for use in activities leading to the development and execution of construction projects. Under the warrant system, tiered levels of authority and responsibility identify experience and training requirements as is required for certification at each of the six (6) levels.

Training needs

The AKDOT&PF warrant system training will be incorporated into T2’s training calendars for the next two calendar years in the following format:

Level I

Alaska Procurement Rules & Regulations: Training will address Alaska procurement rules and regulations, departmental policies and procedures, code of ethics, mandatory and nonmandatory procurement restrictions, exemptions and transfer of responsibility, basic purchasing and solicitation, Alaska preference, professional versus nonprofessional services, solicitations, evaluation of response, documentation, and protest procedures.

Level II

Contract administration: Training will address administering contracts under the Alaska procurement rules and regulations, departmental policies and procedures, to enforce performance, quality, warranty as well as other contract terms.

Level III

Negotiation: Training will emphasize communications skills necessary for successful contract negotiations.

Level IV

Contract Law I: A comprehensive training course that covers a range of legal issues that frequently arise in State of Alaska contracting.

Level V

Contracting by Negotiation: Training will provide an industry overview of negotiated type contracts such as Design/Build, Best Value, Single Source, and Professional Services Agreements.

Level VI

Contract Law I: Training will address the general principles of state contract law, describe the statutory and administrative control of funds, explain socioeconomic policies associated with small businesses and labor standards (i.e. Davis Bacon, DBE, ADA), discuss contract formation issues and the bid process, and describe legal considerations associated with post award contract administration, claims, and terminations.
Evaluation of LiDAR as a Data Acquisition Technique in Alaska

Federal Project Number: 01-03 (Research Response Program)
Estimated Completion Date: June 2003
Estimated Cost: $20,000

Project Manager: Clint Adler
Technical Advisory Committee: Scott Sextion, Northern Region Right-of-Way
Principal Investigator: Mike Lee, Northern Region Construction

Problem Statement
LiDAR (Light Direction and Ranging) is a relatively new airborne survey technique that could be of great benefit to the Alaska Department of Transportation and Public Facilities (AKDOT&PF) in collecting terrain data for use in road design. We don't know how well a LiDAR system will perform in obtaining ground terrain data in Alaska due to the following factors:

- Errors propagated by the global positioning system (GPS) at this latitude
- The effect of ground cover, i.e., trees, brush, grass
- Variations in the gravitational field which have not been well researched in Alaska
- The computer algorithms of the LiDAR system

Besides these potential systematic errors, an evaluation must be made of the practical aspects of processing the huge amounts of data generated, the amount of on-the-ground field checking required, and the specifics of how the data should be delivered to reduce errors in the data set to a manageable level. If the parameters of LiDAR data acquisition can be determined, potentially large cost and time savings could result, especially in the design of long rural projects.

Research Objectives
This study is expected to resolve the following questions on LiDAR:

- The horizontal and vertical accuracy of the LiDAR system in typical applications
- The ability of LiDAR to model steep or forested terrain
- The reliability of computer algorithms used in data processing
- The ability of the data processing software to output the data in more dense or less dense patterns, depending on the user's preference for detail in certain areas
- How well AKDOT&PF computers can process the finished digital terrain models (DTM), as these files can be quite large
- Since the LiDAR system does not collect breaklines, how well these breaklines can be inferred by the computer algorithm, the data density or with the aid of aerial photos
- The effect of latitude on the GPS readings
- What post-flight checks of the system should be required to be performed before the airplane leaves the area
- The ability of the system to adjust the final digital terrain models given additional independent ground survey data
- The cost effectiveness of LiDAR vs. traditional DTMs

Project Status
Aerial LiDAR surveys were flown on three small interior Alaskan projects during the summer of 2002. Data analysis is currently underway.

Available Reports

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<td>Interim</td>
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Materials and Construction
Evaluation of Pavement Blisters for Southeast Region, Alaska DOT&PF

Federal Project Number: 01-03 (Research Response Program)
Estimated Completion Date: complete
Estimated Cost: $5000

Problem Statement
In the fall of 2001, pavement blisters were observed in the overlay on Egan Drive in Juneau. The asphalt concrete overlay was constructed in the fall of 2000, under project number 67819. It was one of several streets paved under the Juneau area-wide Paving Project. It used a PG 64-28 binder and a coarse aggregate (~70% retained on the #8 sieve, 100% crushed coarse and fine aggregate).

ADOT&PF retained the services of Prof. R. Gary Hicks to investigate this unusual distress and to suggest recommendations in order to prevent this problem in future projects.

Findings
Based on several conversations with Bruce Brunette, PE (Southeast Materials Engineer), a review of project information and a report by James Lai titled “Investigation of Causes of Blistering of Asphalt Layers”, Prof. Hicks evaluated the pavement distress observed on Egan Drive and found that:

1. Causes of blisters can be attributed to entrapment of moisture below the overlay, which affects the bond between the overlay and the layer below.
2. Placement of a thin overlay over the existing pavement would permit the gas pressures from the moisture to lift the overlay off the existing pavement. With the modified asphalt (3.2% SBS), the overlay pavement was reportedly less permeable than prior material, plus the modifier is more elastic, allowing the overlay to hold a deformed shape before bursting. ADOT & PF measured very low air voids (0.5 to 1%) in the overlay mix where the blisters were located. This suggested that the surface layer was more impermeable than past mixes used which contributes to the occurrence of blistering.
3. High pavement temperature (> 100 F) and temperature changes between day and night result in gas pressures build up within the pavement. Construction was completed in late September/early October.

Recommendations
Based on the above findings, the following recommendations were suggested to prevent this problem in future projects:

1. Insure a good bond exists and water is not trapped between successive layers of asphalt
2. Consider modifying the maximum compaction level to increase final voids in the mix. Currently the maximum is set at 98% of Rice density, with target density of 94% of Rice. ADOT & PF should consider reducing the maximum to 97%, which would increase air voids to 3% and reduce the chances of future blisters.
3. Other gradations in the surface mix would likely reduce the chances for blister to occur. (e.g. use of an Open-Grade Friction Course mix might provide enough void structure to minimize the chance of blistering).

Implementation
The effects of blisters that have developed along the project have been mitigated by drilling small holes through the blister to relieve the build up of gases in the pavement. After extraordinary effort on the part of ADOT&PF, all the blisters were down by Oct.2001. In the end there were 1700 to 2500 blisters, almost exclusively in the northbound lanes. The exact reason for the blisters only in the NB lanes is still not clear.
Enhancing Estimating Procedures

Project Number: 00-04
Estimated Cost: $100,000
Est. Completion Date: 9/30/03

Project Manager: Billy Connor
Technical Advisory Committee: N/A

Problem Statement
AKDOT&PF has collected data from bid packages for many years. While each region has written software to use the data, none of the regions believe the data is used to its full potential. A review of department needs indicated a two-fold problem: there are no standards to assure the estimates required for each project phase (planning, preconstruction, and construction) are accurate, and various methodologies are used.

By centralizing the data and analysis, the data could be used to better prepare an engineer’s estimate and to assist construction in estimating the cost of change orders.

Research Objectives
- Centralize the historical data collection and analysis from completed bid packages.
- Develop a common software to standardize engineers’ estimate preparation during the design phase and when estimating change order costs during the construction phase.

Project Status
We executed a contract with Elieff and Associates to rewrite the current BidTabs program. The software will be available by the end of October 2002. Elieff and Associates will be retained for product support through the end of September 2003.

Available Reports
Interim: n/a
Final: Anticipated at the end of the project; expect a software product.
Traffic and Safety

Pavement Marking Materials

Project Number: 96-6/01-32
Estimated Completion Date: Completed
Estimated cost: $100,000/20,000

Project Manager: Clint Adler
Technical Advisory Committee:
Kurt Smith, Statewide Traffic Engineer
Frank Richards, Statewide Maintenance Engineer Al Fletcher, FHWA Alaska Division

Problem Statement
The project evaluates pavement marking materials for durability, reflectivity, and cost effectiveness.
The evaluation includes exploring the effectiveness and economy of materials applied under maintenance activities and new construction.

AKDOT&PF Research staff installed durable striping materials on two test decks and evaluated several materials as they wear on various Alaska roads. Materials of interest include methyl methacrylate (MMA) in extruded and sprayed applications, various thermoplastics in torch-down applications, and water-based acrylic paint.

Research Objectives
- Provide performance information for use in the development of department policy for traffic markings, and possibly a warranty specification.
- Guide the selection of more durable and cost-effective pavement marking materials to reduce maintenance costs and improve roadway safety.

Project Status
The Research Section released an interim report in March, 2000. The durable stripes on the two test decks haven’t worn away as quickly as researchers originally anticipated. Research has focused on quantitative retroreflectivity data and qualitative durability observations.

So far, we’ve learned that:
- Durable pavement markings are far superior to paint in terms of maintaining retroreflectivity and presence over the course of an Alaska winter.
- Retroreflectivity of the durable pavement markings decreases rapidly in the first year in heavy traffic areas. In these areas retroreflectivity has decreased to less than 100 millicandels after two years. The dramatic losses in retroreflectivity are likely due to studded tires and snowplows.
- Durable pavement markings are cost-effective for high volume roads.
- Durable pavement markings are probably not cost-effective for low-volume roads paved with bituminous surface treatments or high float surfacing, because the paint may well out-last the road surface.

Based on the research findings, the Department developed an interim pavement marking selection matrix.

Available Reports
Final: A preliminary final draft is available. Contact Clint Adler at 907-451-5321. Final report expected by December 2002
Evaluation of Effectiveness of Rumble Strips in Alaska

Project Number: 01-11/01-47
Estimated Completion Date: 9/30/03
Estimated Cost: $30,000/$30,000

Project Manager: Clint Adler
Technical Advisory Committee:
Kurt Smith, Statewide Traffic Engineer
Scott Thomas, Southcentral Region Traffic Engineer

Problem Statement
AKDOT&PF lacked quantitative information on effective designs and configurations for rumble strips in Alaska. While available information suggests that rumble strips significantly reduce run-off-the-road accidents and enhance lane delineation, national and state standards for rumble strip application and configuration either do not exist or do not address safety and environmental issues comprehensively. In particular, quantitative information on external noise impacts and effects on motorists in Alaska conditions is largely unavailable. AKDOT&PF designers must often gather this information from widely dispersed sources that are generally lacking in application criteria and information on potential adverse effects in Alaska conditions.

Research Objectives
The objectives of this study are to generally document ongoing national research and Alaska’s experience with rumble strips. Alaska has installed several rumble strip configurations, including milled, rolled, shoulder, centerline, continuous, and discontinuous rumble strips with various widths and spacing. The study aims to characterize Alaska’s experiences with these rumble strips in terms of four main topics:
1. Effectiveness—This includes the amount of vibration and noise and the ability to perform well in adverse weather conditions.
2. Adverse Effects on the traveling public—This includes impacts to motorists and bicyclists.
3. Adverse Effects on the AKDOT&PF—This includes potential impacts to maintenance operations.
4. Adverse Effects on the Environment—This includes undesirable generation of noise and solid waste.

Findings of this research may be used to refine design and installation policy for the AKDOT&PF and will identify future research needs.

Project Status
Research staff gathered data and conducted field observations during the first half of 2001 and presented preliminary findings to AKDOT&PF traffic engineers. Based on this and the research of other states, AKDOT&PF issued rumble strip policy in May 2001.

Research staff gathered data and conducted field observations during the first half of 2001 and presented preliminary findings to AKDOT&PF traffic engineers. Based on this and the research of other states, AKDOT&PF issued rumble strip policy in May 2001.

In addition to these in-house efforts, we intend to support a proposed pooled fund study to examine the amount of noise required for effectively alerting inattentive drivers.

Available Reports
Interim: N/A
Final: Final report should be available during the first quarter 2003.
Evaluation of Detectable Warnings in Alaska

Federal Project Number: 01-03 (Research Response Program)
Estimated Completion Date: July, 2003
Estimated Cost: $20,000

Project Manager: Clint Adler
Technical Advisory Committee:
Kurt Smith, State Traffic Engineer
Principal Investigator:
Kim Phillips, AkDOT&PF Research & Technology Transfer

Problem Statement
AKDOT&PF does not have quantitative information on the performance of detectable warnings in cold weather climates on asphalt concrete (AC) and Portland cement concrete (PCC) surfaces.

Persons who are visually challenged require cues to differentiate between pedestrian ways and vehicle pathways that are not clearly delineated. On July 26, 1991, the Americans with Disabilities Act Accessible Guideline (ADAAG) mandated installation of detectable warnings in these areas. Due to the lack of information on the performance of detectable warnings, the Justice Department suspended these requirements for curb ramps and hazardous vehicle areas until July 26, 2001. FHWA released a memorandum on May 6, 2002, stating that they are enforcing these requirements as published in the ADAAG standards.

All new construction and alterations of existing facilities where curb ramps or hazardous vehicle areas exist require detectable warnings. Curb ramps and hazardous vehicle areas must have a continuous 24-inch wide boundary inset with detectable warnings marking the edge of the pedestrian pathway.

Some information on the performance of detectable warnings is available for concrete surfaces. However, no information is available on the performance of detectable warnings on asphalt surfaces in cold climates. Research must be conducted to establish a product database that will promote the effective and efficient use of limited construction funding.

Research Objectives
The objective for this project is to evaluate performance of various detectable warning systems in cold climate conditions when installed in asphalt concrete and Portland cement concrete. The goal of this project is to establish a product database and suitable performance standards for detectable warning systems for use in Alaska (many manufacturers have warranties of between two to five years when installed by certified contractor).

Project Status
Researchers will monitor various installations from fall of 2002 to summer 2004 to evaluate performance of detectable warnings subjected to extreme winter conditions.

Available Reports
Interim n/a
Final At project end
Pooled Fund Studies

Project Number: 01-04
Estimated Completion Date: Project is renewed annually
Estimated Cost: FY02 $55,000; FY01 $15,000; FY00 $74,000; FY99 $30,000

Coordinator: Steve Saboundjian

Problem Statement
The department may participate in pooled fund studies, in which resources from several states or other government agencies, universities, and/or industry sources are combined to support a single research effort. Contributions to such cooperative studies, if they have been approved by the FHWA as part of their national or regional Pooled Fund Study Program, are 100% federally funded. As such, they do not require the 20% in-state matching funds common to other SPR-funded research activities. Proposals for participation in Pooled Fund Studies must come to DOT&PF’s research advisory board for approval. The research manager coordinates nominations for Pooled Fund Studies. Problem statements and statements are at http://www.fhrc.gov/site/active.htm.

Dues Paid From Pooled Fund Studies Project
• AASHTO’s National Transportation Product Evaluation Program $5,000
Current Pooled Fund Studies

Pavement Marking Life Cycle (Pooled Fund)

- Project Number: FHWA Proj. No. SPR-3(094)
- Lead State: Utah
- Estimated Completion Date: 3/31/04
- AKDOT&PF Contribution: $20,000

Problem Statement
Utah Department of Transportation (UDOT) is managing a pooled fund research study that is leveraging resources from nine state departments of transportation and the Federal Highway Administration. UDOT desires to establish a contract with a qualified firm to (1) collect, compile, and analyze pavement marking retroreflectivity data, and (2) use that data to develop service life performance curves of retroreflectivity vs. time for selected durable pavement marking materials.

Research Objectives
The objective of this study is to develop service life performance curves of retroreflectivity vs. time for selected durable pavement marking materials based upon data collected periodically on various highways in nine states.

Project Status
Utah executed a contract for data collection in each of the nine participating states. Data collection began in the spring of 2002 and will last for four years.

Available Reports
- Interim: n/a
- Final: At project end
Fish Passage Capability Through Modified Culverts: Flume Research Study (Pooled Fund)

Project Number: FHWA Proj. No. SPR-3(096)
Lead State: Washington
Estimated Completion Date: 9/30/03
AKDOT&PF Contribution: $60,000

Problem Statement
The Alaska Department of Fish and Game uses criteria specifically for arctic grayling to determine stream discharges that hydraulic engineers then use to design culverts for fish passage. While this application is certainly appropriate where arctic grayling exist, blind application of designs developed for grayling results in potentially inappropriate designs for other species. This can be both costly and inefficient.

We know that juvenile salmon use the boundary layer along the culvert walls to pass through the culvert. Unfortunately, a lack of understanding exists about the velocities of the flow near the culvert walls. Culvert inlets represent a major barrier to fish passage. Researchers will investigate methods to remove this barrier.

We are conducting this project jointly with other states experiencing similar situations with regard to fish passage and water velocities.

Research Objectives
- Better understand how inlet and culvert velocities affect swimming of specific fish species.
- Develop reasonable criteria to determine design discharges to more closely match geography and fish species.
- Culvert installations that are neither over- nor under-designed.

Project Status
Discussions with the states of Oregon and Washington are ongoing to develop a joint pooled fund project. We anticipate building a flume capable of testing culverts to determine flow characteristics and swimming capabilities of juvenile salmonids at the culvert walls and at the inlet and outlet of the pipe.

Available Reports
Interim: n/a
Final: At project end
Alternate Avalanche Ammunition (Pooled Fund)

Project Number: FHWA Proj. No. SPR-3(102)
Lead State: Utah
Estimated Completion Date: 9/30/03
AKDOT&PF Contribution: $30,000

AKDOT&PF Technical Contact: Gary Hayden

Problem Statement
Disruption of highway corridors for avalanche control is costly. Additionally, ammunition for artillery, though extremely effective, is not ideal for avalanche control work due to the resultant shrapnel and shockwave pattern. Critical issues involving public safety have arisen with regard to the use of artillery ammunition.

Research Objectives
AKDOT&PF has partnered with UDOT and WYDOT to contract with an explosives technology company to develop an accurate and reliable short range weapon along with a new projectile for artillery which would be non shrapnel producing and with an emphasis on dud reduction and location. There is an additional need to develop hand-placed shaped charges, evaluate the use of shock tube applications, and explore alternative explosive compositions.

The resultant products will be marketed in normal fashion. Alaska DOT&PF will not be charged royalty fees and should be able to procure through standard procedures.

Available Reports
Interim: n/a
Final: At project end
Animal-Vehicle Crash Mitigation Using Advanced Technologies (Pooled Fund)

Project Number: FHWA Proj. No. SPR-3(076)
Lead State: Oregon
Estimated Completion Date: 9/30/03  AKDOT&PF Contribution: $50,000

AKDOT&PF Technical Contact:
Clint Adler & Scott Thomas

Problem Statement
According to 1994 AKDOT&PF research, about 500 moose-vehicle collisions occur on Alaska roadways annually, amounting to >20% of all motor vehicle accidents that occur on rural roads. Drivers may become desensitized to static moose crossing signs. Few quantified studies exist on the effectiveness of technologies to detect roadside animals that then warn drivers dynamically of wildlife near the road.

Research Objectives
This project demonstrates and evaluates the effectiveness, costs, and benefits of some advanced technologies for warning drivers of the presence of animals near roadways.

A final report and personal presentation summarizing system costs, measured benefits, issues and limitations will be given to contributing agencies. This information can be used by AKDOT&PF to determine appropriate application of this technology.

Status
Researchers installed experimental systems in Montana and Pennsylvania in the fall of 2002. Preliminary results should be available by the spring of 2003.

Available Reports
 Interim: n/a  
Final: At project end
Pavement Subgrade Performance Study

Project Number: FHWA Proj. No. TPF-5(013)
Lead State: Pennsylvania
Established: 06/01
Estimated Completion Date: 02/04
AKDOT&PF Contribution: $20,000
AKDOT&PF Technical Contact: Steve Saboundjian

Research Objectives
The objectives of the study are to develop an improved mechanistic subgrade failure criterion for pavements; to evaluate the effect of environment (seasonal variability) on resilient material properties.

Status
Ongoing. Six of the 12 test sections of pavement are complete. Two test sections are being constructed. Testing of these test sections is expected to begin in early October 2002.

Effects of Multiple Freeze-Thaw Cycles vs Deep Frost Penetration on Pavement Performance (Pooled Fund)

Project Number: FHWA Proj. No. SPR-2 (208)
Lead State: New York; work conducted at CRREL.
Established: 02/01
Estimated Completion Date: 02/04
AKDOT&PF Contribution: $10,000
AKDOT&PF Technical Contact: Steve Saboundjian

Research Objectives
To determine the relative importance of deep-freezing versus multiple shallow freezes on the performance of flexible pavements.

Status
Study panel met during TRB in January 2002. Project statement is being defined now in conjunction with the development of a task order contract.

AASHTO Product Evaluation

Estimated Completion Date: project is renewed annually
Estimated Cost: $5,000
Project Manager: Billy Connor

AKDOT&PF Research participates in the National Transpiration Product Evaluation Program (NTPEP). The NTPEP pools contributions from across the country to evaluate new technologies or practices. The following are examples applicable to Alaska:

- Pavement Marking Material
- Sign Sheeting Material
- Raised Pavement Markers & Adhesives
- Flexible Delineator & Workzone Channelizers (Drums)
- Portable Changeable Message Signs/Arrow Panels
- Geotextiles, Geocomposite Drains, Geogrids
- Structural Steel Coating Systems
- HDPE and PVC Thermoplastic Pipe
- Rolled Erosion Control Products
- Joint Sealers (for Concrete Pavements)
- Bridge Deck Sealers
- Chemical Deicers
- Reinforcing Steel (Rebar)
Computer-based Self-operating Training System on Anti-icing/Road Weather Information

**Project Number:** FHWA Proj. No. TPF-5 (009) and SPR-3 (104)  
**Lead State:** Iowa  
**Established:** 12/00  
**Estimated Completion Date:** 2/04  
**AKDOT&PF Contribution:** $30,000  
**AKDOT&PF Technical Contact:** Gary Hayden

**Research Objectives**

Anti-icing and road weather information systems (AI/RWIS) are relatively new tools that improve the efficiency of winter storm maintenance and as a result improve highway safety. Because these are new concepts, standard training programs for all levels of AI/RWIS users are not yet available. This project will coordinate and leverage several individual training and educational initiatives into one consistent training program for AI/RWIS.

**Status**

Development of the software package started in the fall of 2001 and is progressing (2/02).

REPORT: Supporting Joint State Cooperation in Developing and Operating Traveler Information Systems (Pooled Fund)

**Project Number:** FHWA Proj. No. SPR-3(079)  
**Lead State:** Iowa  
**Established:** n/a  
**Estimated Completion Date:** 11/02  
**AKDOT&PF Contribution:** R&T2 did not contribute funds; funds are from ITS  
**AKDOT&PF Technical Contact:** Jill Sullivan, AKDOT ITS Coordinator (465-8592)

**Objectives**

To promote the deployment of road condition reporting systems and road weather prediction systems. REPORT will contribute to a nationwide, interoperable weather and road condition data collection, fusion, and forecast system.

**Status**

Active software development and testing is completed. CARS training occurred in Fairbanks in Oct. 2002.
Experimental Features Projects

Experimental Features Projects

Project Number: 01-05
Estimated Completion Date: Ongoing
Estimated cost: $23,000

Project Manager: Clint Adler

Problem Statement

This program enables federal highway construction funds to be used for promising but unproven materials, methods, and techniques where such use of federal funds would not normally be allowed. Statewide Research coordinates with the Federal Highway Administration’s Experimental Features in Construction Program, which encourages innovations in state highway design and construction. The program provides federal funds for new and unproven features. Funding for each experimental feature is included in the construction project; usually, the feature is designated in the bid schedule as a separate bid item. Funding for monitoring the feature comes from the Experimental Features Program, not from construction dollars. If the experimental feature fails, repair or replacement costs are also eligible for federal aid funds.

There are essentially two criteria for an innovation to qualify as an experimental feature.

First, it must have potential benefits for DOT&PF or the public. Second, use of the feature must be followed up with an evaluation of its success, along with recommendations for its use in the future. Experimental features can be a new process or technique for using conventional materials and equipment.

The department supports use of this program to encourage innovation in highway construction in general and specifically as a means for full-scale demonstrations of concepts developed in the research program. Costs of experimental features and evaluations of those features are typically paid for with construction funding.

Statewide Research staff assist department staff in developing evaluation plans, coordinate program activities with the FHWA, fund evaluation activities that extend beyond the construction phase of a project, and compile and disseminate results.
Active Experimental Feature Projects

AK 98-01. Steel Bridge Deck Surfacing materials: STP-065-2(9) Yukon River Bridge Re-Deck
   Purpose: evaluate the effectiveness of the concrete filled grating as an improved wearing surface on the bridge deck.
   Anticipated benefits: improving the safety of the bridge deck and reducing maintenance costs.
   Available reports: Interim report is available upon request. Evaluation to continue until fall 2003, final report to be completed thereafter.

AK 99–01. Vegetated Slope Stabilization Comparison Test: IM-OA1-5(9) Glenn Highway, Moose Creek to Sutton Highway
   Purpose: evaluate the effectiveness of several revegetation techniques on a cut slope in the project to determine which method will best improve slope stabilization in a cost effective manner.
   Anticipated benefits: improving the state’s permanent slope stabilization specifications and practices and reducing maintenance costs associated with slope stabilization failures.
   Available reports: Construction and interim Reports are available upon request. A final report should be available by the end of 2002.

AK 99-02. Evaluation of Bridge Deck Waterproofing Membrane Under a Highfloat Surface Treatment: STP-080(29) Elliott Highway, Eureka to Baker Creek
   Purpose: evaluate the effectiveness of placing a high-float surface treatment over a bridge deck waterproofing membrane.
   Anticipated benefits: protecting the reinforcing steel in the prestressed concrete girders (in a rural area where the traditional hot asphalt concrete overlay is not available); providing a safe driving surface on the bridge deck; and reducing maintenance costs associated with rural bridge deck driving surface failures.
   Available reports: Interim report is available upon request. Final report should be completed in spring 2003.

AK 99-03. Rockfall Barrier Mitigation Using Steel Bin Walls and Reinforced Concrete: I-OA4-4(5) Parks Highway, Nenana Canyon Erosion
   Purpose: evaluate the effectiveness of placing movable rockfall barrier sections along the slide area.
   Anticipated benefits: protecting the passing traffic and the roadway structure and providing a safe means for the maintenance personnel to remove the slide debris.
   Available reports: First and second year interim reports available upon request. A final report should be available in spring 2003.
AK 01-01 3M Inc. Magnetic Tape Lane Awareness System: STP-071-1(62) MP 14-26 Richardson Highway (Thompson Pass)

See also research project number: 01-37, Magnetic Snowplow Guidance System.

Purpose: evaluate the effectiveness of the 3M Magnetic Tape Lane Awareness System in Alaska’s coastal mountain passes.

Anticipated benefits: reducing guardrail damage, increasing safety for snowplow operators and motorists.

AK 01-02 Design, Simulation, and Monitoring of Ventilated Shoulder Design Features for the Loftus Road Extension: STP-0002(90)

Intersection of Geist and Loftus Road to Tanana Loop, Fairbanks. See also research project: Eliminating Longitudinal Cracking

Purpose: evaluate the effectiveness of insulation, thermosyphons, and air-cooled embankments and bridge abutments in Alaska’s interior region of discontinuous permafrost.

Anticipated benefits: demonstrate new technologies for stabilizing permafrost beneath roadways.
Program Description

The Local Technical Assistance Program (LTAP) is AKDOT&PF’s training and information outreach for local governments. LTAP is a national effort of FHWA. It is designed to serve local units of general purpose and tribal government. FHWA’s national goal is to improve access to new highway, road, and street information and technology for local and tribal governments. LTAP is designed to be flexible, and varies from state to state so that respective transportation needs can be met in the most efficient, cost effective, and responsive manner. As a national group and with FHWA’s input, the LTAP Centers chose the following as their mission statement: “The national Local Technical Assistance Program mission is to foster a safe, efficient, environmentally sound transportation system by improving skills and knowledge of local transportation providers through training, technical assistance, and technology transfer.”

Under LTAP, there are 57 Technology Transfer (T2) Centers established (one in each state, one in Puerto Rico, and six for American Indian tribal governments) to provide training and technical assistance. Alaska LTAP/T2 no longer receives FHWA funds to provide service to Alaska Natives.

Many centers are contracted to universities to operate, while others are operated by the state highway agency. The education and technical assistance activities are accomplished via training and workshops, information dissemination, and technical assistance. The LTAP Handbook further defines LTAP operations, goals, and objectives.

Required Work Products

Annual workplan and budget tasks include:

• publish a quarterly newsletter;
• serve as a clearinghouse for local transportation agencies to obtain publications, video tapes, and other technology resource documents, such as manuals and field guides;
• maintain a comprehensive, up-to-date mailing list of rural and local officials having transportation responsibilities;
• conduct at least 10 training courses per year for local transportation agencies;
• provide information on new and existing technology; and
• perform an annual self-evaluation.
Alaska Advisory Board Members

Billy Connor, Research Manager, DOT&PF, Chair ................................................................. 451-5479
Larry Crouder, City Engineer, City of Fairbanks ................................................................. 459-6741
Jacob Kagak, Municipal Services Director, North Slope Borough ............................. 852-2611
Chris Kepler, Central Region Maintenance Chief, DOT&PF ........................................... 269-0767
Bruce Fulcher, Geotechnical Services Manager, Yukon Government Transportation...... 867-633-7942
Trent Mackey, Service Area Engineer, Fairbanks North Star Borough .......... 459-1218
Joe Buck, Public Works Director, Juneau City and Borough ................................................ 780-6888
Lee Coop, Assistant Traffic Engineer, Municipality of Anchorage ............................... 343-8479
Aaron Weston, Regional Transportation Engineer, U.S. Forest Service ......................... 586-7958
Jim Swing, Public Works Director, Mat-Su Borough .......................................................... 745-9801
Steve Boch, Structures/Research Engineer ................................................................. 586-7427
Keith Kornelis, City of Kenai .................................................................................... 283-7535
Local Technical Assistance Program—
Technology Transfer Calendar Year 2001

During CY01, Alaska LTAP offered 46 training sessions, some being multiple presentations in many locations around Alaska. This resulted in 964 DOT&PF, local government, and other-affiliations employees being trained.

Completed Training

- Writing Skills Workshops
- NHI 13401 Writing Highway Construction Specifications
- NHI 13239 Module 9: Earthquake Engineering
- NHI 13144 Hot Mix Asphalt Production Facilities
- NHI 13145 Hot Mix Asphalt Materials, Characteristics, and Control
- NHI 13053 Bridge Inspection Refresher
- NHI 137020 ITS Procurement
- NHI 380060 Work Zone Traffic Control for Maintenance Operations on Rural Highways
- NHI 137003 ITS Public Private/Partnerships
- NHI 137001 ITS Awareness Seminar
- NHI 361020 Alaska Native Employment Partnership
- Effective Negotiating I
- Human Factors Workshop
- Older Driver’s Workshop
- Writing Skills Workshop
- Rock Slope Stability Workshop
- Stone Mastic Asphalt Workshop
- Fall Protection Training
- Demonstration Project 105—Advanced Transportation Management Technologies
- ATSSA Traffic Control Technician
- ATSSA Traffic Control Supervisor
- Preservation of Asphalt Pavements
- FHWA’s Environmental Justice/Title VI Workshop
- FHWA’s Air Quality Conformity Workshop
- APBP ADA Training
- FHWA Contract Administration Core Curriculum Course
- Soil Stabilization Workshop
- IECA—Phase II: How to Select, Install, and Inspect Construction Site Erosion and Sediment Control BMPs for NPDES Storm Water Permit Compliance (sponsored by IECA—coordinated statewide registration)
- Effective Negotiating I
- Effective Negotiating II
- Snow and Ice Control
- Snow Fence Design & Installation
- Selecting and Designing Pavements for Alaska
Other Activities:

- Helped the state’s ADA Coordinator’s Office advertise ADA Training
- Participated with a booth on highway work zone safety at the Air, Land, & Sea Safety Expo in Juneau
- Provided materials for Central and Northern Region participation at State fairs in Palmer and Fairbanks
- Coordinated DOT&PF participation at UAF’s Spring Career Fair
- Secured Julia Triplehorn to do a presentation on the LTAP/T2 Library for the Northern Region M&O Foreman’s meeting on November 27, 2001; also helped them find a dynamic presenter on leadership skill and development
- Worked with Construction and M&O and safety officers to decipher DOT&PF’s role/liability associated with Mining Safety and Health Administration requirements
- Contracted for a training needs survey for AKDOT&PF
- Produced three quarterly newsletters; the fourth will be produced by December 31; continued to contract for editing and layout services
- Met with FHWA’s national BTEP representative in Juneau
- Continually update the training web page with new training and registrations; update the Research page with new reports
- Did two presentations at the LTAP National Conference and International Symposium: International Exchange: BTEP between Alaska and Canada, and Work Force Issues—Hiring Employees
- LTAP/T2 Publication Library continues to be managed by Mather Library at the Geophysical Institute. Activity: 94 items loaned; 1,871 new items cataloged; 10,231 physical items with barcodes; stored in 481 lineal feet
- Video, CD-ROM, software, and research publications available through online catalog with most publications downloadable in .pdf format—ongoing update and cataloging of new acquisitions
- Hosted the combined LTAP Region 9 and 10 Regional Meeting; physical participants included Idaho, Nevada, California, Hawaii, and the national FHWA LTAP representative; Oregon sent a report
Local Technical Assistance Program—
Technology Transfer Calendar Year 2002

During CY02, Alaska LTAP offered 59 training sessions, some being multiple presentations in many locations around Alaska. This resulted in 1,573 (333 projected) DOT&PF, local government, and other-affiliations employees being trained.

Completed training:

- Writing Skills Workshops
- Heat Straightening Repair for Damaged Steel Bridges
- Train the Trainer
- NHI 132035 Rock Slopes
- NHI 134049 Use of Critical Path Method for Estimating, Scheduling and Timely Completion
- NHI 142007 Highway Traffic Noise
- NHI 130048 Seismic Design & Retrofit of Highway Bridges
- NHI 142005 NEPA & Transportation Decision Making
- NHI 151021 Administration of FHWA Planning Grants
- Traffic Control Technician
- Traffic Control Supervisor
- Flagger Instructor Training
- RS Means Estimating
- Asphalt Paving Seminar
- Effective Roadway Illumination
- Basic Management Reporting
- Warrant Level 1—Alaska Rules and Regulations
- Confined Space Training
- Dreamweaver/Fireworks Web Design Training
- Road Safety Audit Reviews
- Traffic Safety Improvements
- Road Safety Audits & Reviews & Safety Topics
- Road Safety Features and Studies & Improvement Programs
- Safety Improvement Needs
- Ground Improvement Methods
- Fundamentals of Geometric Design
- Infrastructure Asset Management
- Geophysical Workshop
- Trns*port Software Demo
- Trenchless Pipe Technologies
- Invasive Species in Transportation Right of Way
- GASB 34 Accounting Fundamentals for Public Works Agencies and Engineers
- AASHTO Roadside Design Guide
- Risk Management and Tort Liability on the Roadways
- Media Relations Training for State and Local Governments
- Warrant Level 3—Effective Negotiations

continued
- Warrant Level 4—Contract Law
- Warrant Level 6—Advanced Contract Law
- Construction of Pavement Subsurface Drainage Systems

**Other Activities:**
- Provided materials and personnel for Northern Region participation for Tanana Valley State Fair in Fairbanks
- Coordinated AKDOT&PF participation at UAF’s Spring Career Fair
- Produced three quarterly newsletters; the fourth will be produced by December 31
- Continually update the training web page with new training and registrations; update the Research page with new reports
- Coordinated and attended booth at 2002 AASHTO Conference Trade Fair to highlight the T2 library and other DOT & PF activities
- T2 staff participated in the coordination of registration at 2002 ASSHTO Conference in Anchorage
- LTAP/T2 Publication Library continues to be managed by Mather Library at the Geophysical Institute Activity: 90 items loaned; 806 new items cataloged; 11,037 physical items with barcodes
- Assisted with the coordination and planning for the annual Asphalt & Drainage Summit
- Video, CD-ROM, software, and research publications available through online catalog with most publications downloadable in .pdf format—ongoing update and cataloging of new acquisitions
- Assisted in development of statewide safety manual for AKDOT&PF
Program Description

NHI is FHWA’s technical training organization and outreach program to state highway agencies. Created in 1970 by federal legislation, NHI administers training programs reaching over 15,000 state highway agency people each year. It also works with approximately 550 universities nationwide to administer educational programs that attract students to the field of transportation. States receive technical training produced by NHI and taught by NHI contract instructors or FHWA employees. States receive a certain allocation of their annual budget to provide education and training activities under the NHI umbrella. In the past, that funding has come as a percentage allocation from interstate and primary construction funds, or from state planning and research funds.

NHI presents training based on requests by the state highway agency, depending on availability of instructors. The NHI program provides training for DOT&PF employees who are federal-aid eligible; that is, employees who are working on projects funded by FHWA.

NHI provides technical training in the following areas:

- Civil Rights
- Hydraulics
- Planning Structures
- Traffic Engineering
- Environment
- Geotechnics
- Pavements
- Safety
- Construction and Maintenance
- Design and Traffic Operations
- U.S. Transportation Policy

NHI Training at Alaska DOT&PF

AKDOT&PF Research and Technology Transfer houses several training programs and has opted to make all training open to all of its customers rather than limiting participants to training according to program. Because class participants come from local government, DOT&PF, and consultants and contractors, we leverage training dollars by combining funds. NHI funds a pro-rata share of the annual training budget.

Program Status

For a list of training presented to date, including CY01 and CY02, see the LTAP section.
AASHTO TRAC

Project Number: 01-08
Estimated Completion Date: 12/31/02
Estimated Cost: $13,388

Program Description

AASHTO TRAC (Transportation Research Activities Center) is a science, social science, and math education program designed to inspire high school and junior high school students to consider a career in engineering. It is hands-on, interactive, and has students solving real-world problems, connecting them to the working world of transportation. State highway agency engineers partner with classroom teachers to bring real-life, everyday examples of engineering to the students.

Schools receive a computer, a manual, and a suitcase of peripheral devices such as sound meters and force probes, as well as other software and materials for different exercises. Bridge Builder and Sim City are two types of software provided.

A large group of organizations worked together to fund and develop the TRAC Program. Some of the partners are: American Association of State Highway Transportation Officials (AASHTO), Federal Highway Administration, American Road and Transportation Builders Association, American Society of Civil Engineers, Associated General Contractors, National Asphalt Paving Association, National Society of Professional Engineers, the Institute of Transportation Engineers, as well as other national engineering groups.

Participating state departments of transportation fund national TRAC Program operations through annual membership fees set by AASHTO. Possible DOT activities include: hosting programs in participating schools, recruiting mentors, and providing training for the engineers and others mentoring in the classroom, providing AASHTO TRAC module technical training for the participating teachers, and assuring the necessary computers and other peripheral tools and supplies are available.

Alaska DOT&PF’s TRAC Program

Alaska DOT&PF came on line with TRAC in 1996. DOT&PF worked with Department of Education to identify schools and teachers to participate in the program, and we jointly developed a five-year plan. Initially, TRAC National had a goal of adding new schools each year, but revised that three years ago when they realized that more schools did not equal better service. Alaska DOT&PF patterned our activities after theirs. The original goal of adding five new schools each year became adding a new school or two, plus beefing up already participating schools with equipment.

Program Status

Twenty computers are located in participating schools:

- Anchorage area: East Anchorage School Within A School, Chugiak;
- Fairbanks area: West Valley*, Howard Luke Alternative School, North Pole, Randy Smith Middle School;
- Juneau area: Juneau-Douglas*
- Rural areas: Nome Public School and Anvil Mountain Science Academy, Noorvik, Bethel, Barrow, Glennallen, and Homer*

*These schools have more than one computer for participating students.

continued
Teachers tell us that TRAC is having an impact in the classroom. Homer won an international bridge-building contest at the end of its first year with TRAC and reports that students have now gone on to college to pursue a career in engineering, based on the hands-on application provided by the TRAC program. Also, teachers at Glennallen High School and at West Valley High School in Fairbanks indicate that students are expressing an interest in pursuing an engineering curriculum during college.
Border Technology Exchange Program

Project Number: 01-06
Estimated Completion Date: 12/31/02
Estimated Cost: $15,000

Project Manager: Dave Waldo

Project Description
The Border Technology Exchange Program, or BTEP, is an initiative of FHWA's International Programs Branch. It came about because the North American Free Trade Agreement (NAFTA), which expanded potential for trade with border countries, did not address the transportation infrastructure impacts of increased trade. NAFTA also failed to address the aspects of new working relationships required to advance transportation projects and systems under a free trade environment. FHWA designed BTEP to enhance and expand binational working relationships and to create the opportunity for transportation officials to improve the planning, design, construction, and operation of land transportation facilities.

Project Objectives
In Alaska, the BTEP exchange is with the Yukon Government Transportation (YGT) in the Yukon Territory. BTEP formalizes and funds several unofficial ongoing activities, such as sharing design, construction, and/or mitigation techniques on a variety of pavements and asphalts, permafrost, and new structures designs as well as forming new, long-term activities. BTEP provides the opportunity to expand the transportation knowledge base of both countries. Since Alaska DOT&PF and the YGT both work with cold regions engineering problems, both have similar design, construction, and maintenance difficulties and should share problems, solutions, and successes.

Project Status
• BTEP funds Bruce Fulcher’s participation at LTAP advisory board meetings
• Snow fence design course held in Whitehorse in conjunction with Foreman’s conference
• Alaska DOT&PF staff attended the Yukon Transportation Maintenance annual conference in Whitehorse
• Funded Robert Magnuson attendance to the 2002 PNS Snow Conference on behalf of the Yukon Government
• Yukon Government sent a representative to the Infrastructure Asset Management course in Anchorage.
• Provide materials, publications, CDs, videos as requested to Canadian transportation workers.
• AKDOT materials labs in Anchorage and Fairbanks participated in a high-float emulsion sample testing exchange and correlation exercise with labs from the government of Yukon, Saskatchewan Highways in Regina, and Pounder Emulsions (supplier) in Saskatoon.
• One representative of Alaska Statewide Engineering and Design in Fairbanks attended the Transportation Association of Canada Geometric Design course in Whitehorse.
• Four representatives from Yukon’s Transportation and Maintenance Branch attended Alaska Northern Region Foreman’s course in Fairbanks.

Planned Activity:
• Provide transportation related training to Yukon Transportation prior to end of calendar year

Available Project Reports
None