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<td>Magnet Warning and Guidance System</td>
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<td>Pavement Marking Materials</td>
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<td>Technology Transfer Program Support</td>
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<td>Native LTAP</td>
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<td>AASHTO TRAC</td>
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<tr>
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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), Bureau of Indian Affairs (BIA), 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 contact with the national and international transportation research community to obtain research findings that may have application in Alaska. The research staff provides research results to appropriate department staff, local agencies, and the public through publications, training, and other means. Research staff also helps to implement research findings.

The RTT program includes the department’s LTAP, also known as the Technology Transfer (T2) Program, the Native Local Technical Assistance Program (NLTAP), 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). 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, and
- to ensure the improved procedures, techniques, materials, and equipment are implemented within the department and in local communities.

Further program goals are to assist the department staff and other transportation professionals in their efforts to:

- 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 on the DOT&PF web site by going to the Research page, or doing a library search. The web address for Research and Technology Transfer is: http://www.dot.state.ak.us/external/state_wide/t2/index.html. 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.
## FY 99/00 Research Work Program

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

<table>
<thead>
<tr>
<th>Project Number</th>
<th>Work Item</th>
<th>FY 99 Amount</th>
<th>FY 00 Amount</th>
<th>Increase or (Decrease) this revision</th>
<th>Total 99-00 Amount</th>
<th>Estimated Completion Date</th>
<th>Page</th>
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**Part A Totals**

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**State Funds in Part A**

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* 100% FHWA funds
** 50% FHWA funds, 50% BIA funds
*** 50% FHWA funds, 50% LTAP
**** Funds are not from the research program

### PART B: COMPLETION OF EXISTING STUDIES

<table>
<thead>
<tr>
<th>Project Number</th>
<th>Work Item</th>
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<th>FY 00 Amount</th>
<th>Increase or (Decrease) this revision</th>
<th>Total 99-00 Amount</th>
<th>Estimated Completion Date</th>
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**Part B Totals**

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**Federal Funds in Part B**

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**State Funds in Part B**

|                  | $56,200    | $3,461     | ($7,844)    | $51,817     |
### PART C: NEW STUDIES

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<td>Evaluation of Remote Control Equipment</td>
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<td>$35,000</td>
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#### Part C Totals
- Federal Funds in Part C: $486,560 $667,444 ($29,608) $1,124,396
- State Funds in Part C: $121,640 $166,861 ($7,402) $281,099

#### Work Plan Total (Parts A, B, & C)
- Federal Funds in Parts A, B, & C: $1,534,400 $1,612,571 $30,522 $3,177,492
- State Funds in Parts A, B, & C: $400,600 $386,522 $1,880 $789,003
Research and Technology Transfer Staff

Clint Adler, P.E., Research Engineer ............................................. 451-5321
Billy Connor, P.E., Research Manager .......................................... 451-5479
Linda Gavin, Administrative Clerk ............................................. 451-5320
Simon Howell, Training Specialist ............................................. 451-5284
Sharon McLeod-Everette, SR/WA, LTAP Manager ....................... 451-5323
Steve Saboundjian, P.E., Implementation Engineer ....................... 451-5322

Fax .............................................................................................. 451-5340

Research Advisory Board

Voting Members
  Thomas Brigham, Statewide Planning Director ......................... 465-4070
  Boyd Brownfield, P.E., Deputy Commissioner ......................... 465-6973
  George Capacci, Director, Southeast Ferry Operations ............... 465-3959
  Tamar diFranco, P.E., Deputy Director, Design &
    Engineering Services ............................................................. 465-6956
  Robert Doll, Director, Southeast Region .................................. 465-1763
  Michael Downing, P.E., Director, Design &
    Engineering Services, Chair .................................................. 465-6948
  David Eberle, P.E., Director, Southcentral Region ..................... 269-0780
  Gary Hayden, P.E., Southeast Operations Director .................... 465-1774
  Frank Richards, P.E., Statewide Maintenance Engineer .............. 465-3906
  Ralph Swarthout, P.E., Northern Region Director ..................... 451-2211

Non-Voting Members
  Billy Connor, P.E., Secretary .................................................. 451-5479
  Drew Sielbach, P.E., FHWA ..................................................... 586-7544
Research Administration

Project Manager: Billy Connor
Cost: FY99 $194,800; FY00 $190,000
Completion Date: Project is renewed annually

The budget for Research Administration is based on the anticipated cost of operating the research program. This account provides for:

- 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, and
- miscellaneous expenses such as supplies, office equipment and related maintenance contracts, etc.
TRB Dues

Project Number: 99-07
Estimated Completion Date: Project is renewed annually
Estimated Cost: $57,000
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.
NCHRP Program Support

Project Number: 99-08
Estimated Completion Date: Project is renewed annually
Estimated Cost: $354,482
Project Manager: Billy Connor

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 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 fifty 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.
Implementation of Completed Research

Project Number: 99-02
Estimated Completion Date: Project is renewed annually
Estimated Cost: $188,559
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 the department’s efforts to implement research results.

In addition to implementing research results from DOT&PF’s research program, the implementation engineer 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 should 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, a 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
Research Response Program

Project Number: 99-03
Estimated Completion Date: Project is renewed annually
Estimated Cost: $101,000
Project Manager: Billy Connor

Project Description

Throughout the year, research ideas arise that require immediate response because of an urgent need, or to handle activities that don’t require a full blown research project. This program funds these projects, as follows.

- Landslide Monitoring System
  - Project Manager: Dave McCaleb
  - Funding: 20,000

- Experimental Delineator Panels
  - Project Manager: Kurt Smith
  - Funding: 2,600

- Advantages and Disadvantages of Chip Seals on New Pavement
  - Project Manager: Tom Moses
  - Complete
  - Funding: 3,000

- Updating AKOD and AKPAVE Statewide
  - Project Manager: Eric Johnson/Research Staff
  - Complete
  - Funding: 12,000

- Evaluating Overruns on Construction Projects Statewide
  - Project Manager: Mike Downing
  - Complete
  - Funding: 3,000

- Evaluating Thermal Camera for Thermal Segregation Statewide and Northern
  - Project Manager: John Ryer and Eric Johnson
  - Complete
  - Funding: 14,000

- Rural Governance Support Statewide
  - Project Manager: Boyd Brownfield
  - Complete
  - Funding: 4,750

- Bridge Cap Presentation Statewide
  - Project Manager: Richard Pratt
  - Complete
  - Funding: 12,200

- AASHTO Dues Statewide
  - Project Manager: Mike Downing
  - Complete
  - Funding: 11,700

- Travel Statewide for AASHTO TRAC training
  - Project Manager: Dennis Poshard
  - Complete
  - Funding: 2,600

- Asphalt Surfacing of Timber Decks Statewide
  - Project Manager: Steve Bradford/Richard Pratt
  - Complete
  - Funding: 10,000

- Evaluate Non-Nuclear Density Gauge Statewide
  - Project Manager: Billy Connor and Eric Johnson
  - Complete
  - Funding: 13,000

- Experimental Insulated Asphalt Truck Northern
  - Project Manager: Joel Craft
  - Complete
  - Funding: 2,400

Available Project Reports

Interim: None
Final: None

(Occasionally, a short report may be done if the project warrants.)
Pooled Fund Studies

Project Number: 99-04
Estimated Completion Date: Project is renewed annually
Estimated Cost: FY99 $30,000; FY00 $74,000
Project Manager: Steve Saboundjian

Project Description
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, 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.

Current Pooled Fund Studies

<table>
<thead>
<tr>
<th>Project</th>
<th>Lead State</th>
<th>Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavement Marking Life Cycle</td>
<td>Utah DOT</td>
<td>$20,000</td>
</tr>
<tr>
<td>Development of Advanced Rotary Plow (ARO)</td>
<td>California</td>
<td>$10,000</td>
</tr>
<tr>
<td>for Snow Removal Operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pavement Subgrade Performance Study</td>
<td>New York</td>
<td>$10,000</td>
</tr>
<tr>
<td>Design Standards for Rock Fallout Areas</td>
<td>Oregon</td>
<td>$10,000</td>
</tr>
<tr>
<td>Wiremesh and Cablemesh Slope Protection</td>
<td>Washington</td>
<td>$10,000</td>
</tr>
<tr>
<td>Strength and Deformation of Mechanically</td>
<td>Washington</td>
<td>$20,000</td>
</tr>
<tr>
<td>Stabilized Earth Walls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHRP Implementation Asphalt Equipment</td>
<td>FHWA</td>
<td>$44,000</td>
</tr>
</tbody>
</table>
Project Description

This program allows us to use federal highway construction funds 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 to monitor 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 with an evaluation of its success, along with recommendations for its use in the future. Experimental features can be a new process or a technique for using conventional materials and equipment.

The department supports 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.

Statewide Research staff assist department staff to develop 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 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: Improve the safety of the bridge deck and reduce maintenance costs.

- **AK 99–01**: Vegetated Slope Stabilization Comparison Test, IM-OA1-5(9) Glenn Highway, Moose Creek to Sutton
  Purpose: Evaluate the effectiveness of several revegetation techniques on a cut slope in the project to determine which treatment method will best improve slope stabilization in a cost effective manner.
  Anticipated Benefits: Improve the state’s permanent slope stabilization specifications and practices and reduce maintenance costs associated with slope stabilization failures.

Experimental Features Evaluations

- **Project Number**: 99-05
- **Estimated Completion Date**: Project is renewed annually
- **Estimated Cost**: $36,654
- **Project Manager**: Clint Adler
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 highfloat surface treatment over a bridge deck waterproofing membrane.

Anticipated Benefits: Protect the reinforcing steel in the prestressed concrete girders (in a rural area where the traditional hot asphalt concrete overlay is not available), provide a safe driving surface on the bridge deck, and reduce maintenance costs associated with rural bridge deck driving surface failures.

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: Protect the passing traffic and the roadway structure and provide a safe means for the maintenance personnel to remove the slide debris.
Applications of GPS and Vehicle Detection

Project Number: 00-06
Estimated Completion Date: 9/31/01
Estimated Cost: $40,000
Project Manager: Simon Howell

Project Description
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.

Project 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 are currently negotiating contracts with GPS and CARS vendors. We expect to outfit the GPS system by mid-November 2000, followed by the CARS system by January 2001.

Available Project Reports
Interim:
Final:
Bridge Rail and Transitions to Guardrail

Project Number: 94-07
Completion Date: 12/31/99
Estimated Cost: $40,000
Project Manager: Billy Connor

Project Description
Currently approved bridge rail transitions to W-Beam guard-railing consist of Thrie-Beam segment and smaller post spacing. This provides increased stiffness at the transition point. The Thrie-Beaming railing and the added posts both create an efficient snow fence, causing drifts in the driving lanes in windy snow areas. Curbs on bridges increase the snow-drifting problem. Because of the drifting, frequent maintenance is required to provide safe driving conditions. A more open rail system is needed to minimize the snow drifting hazards at such locations.

Alaska has many side-mounted two-tube bridge railings in service, but these have not been crash tested. FHWA lists several tested and approved railings and rail transition configurations that could be modified, adapted, and tested for use on Alaskan structures.

Project Objectives
◆ Develop and crash test new design details for bridge railing and end guardrail transitions with the least possible tendency to accumulate drifting snow.
◆ Provide acceptable crash resistance to required vehicle types.

Status of Research
The project is complete.

Available Project Reports
Interim: n/a
Final: NCHRP Report 350 Test 4-10
NCHRP Report 350 Test 4-11
NCHRP Report 350 Test 4-12
NCHRP Report 350 Test 4-21
NCHRP Report 350 Test 4-22
Project Number: 97-14
Completion Date: 8/31/00
Estimated Cost: FY 99 $20,000
total project $135,000
Project Manager: Rich Pratt

Project Description
Concrete-filled steel pipe columns support most of the multi-span bridges that DOT&PF and its consultants design. These columns are the primary support for both normal vertical loads and for the relatively large horizontal loads associated with earthquakes. AASHTO specifications recommend this type of column in highly seismic areas because of its toughness. The code, however, does not provide detailed information on the interaction between the concrete fill and steel pipe, nor does it address the appropriate column-to-cap connection. These gaps in the specifications mean that we can’t predict with certainty AASHTO’s claim that the column should fail before the cap.

University of California San Diego researchers investigated a full-scale bridge bent, consisting of three cast-in-place steel shell columns that were designed using research findings to ensure a ductile performance under seismic loadings.

Specific investigation tasks included (1) column longitudinal reinforcement ratio, (2) straight bar anchorage of the column longitudinal reinforcement into the beam/column joints, (3) terminating the column steel shells below the cap beam, (4) flexural design of the cap beam to sustain maximum feasible input movements from the columns, (5) shear design of the cap beam, (6) design of the cap beam/column joints, and (7) use test results to validate the procedure for seismic design of reinforced concrete bridge bents with multiple column cast-in-place steel shells.

Project Objectives
Confirm design assumptions in seismic design. These concrete-filled steel pipe columns and the caps are critical to the bridge’s lateral strength system. Alaska has many areas subject to seismic activity and DOT&PF has many bridges in those areas.

Project Status
Complete. Experimental results indicated that the test unit responded in a ductile manner with column movement capacities developing in preselected hinges, and the ultimate displacement capacity was characterized by low cycle fatigue fracture of the column’s longitudinal reinforcement. This was a satisfactory match with the theoretically predicted failure mode. No joint failure occurred, which ensured that we could develop the column ultimate movement capacities.

In implementation activity, the researchers compared our former seismic design practice with the new design by applying the information to the Knik River Overflow Bridge, north of Anchorage. We then held a seminar to explain the project and the resulting design changes. The seismic design is on DOT&PF’s Bridge Design section’s web page at ftp://ftp.dot.state.ak.us/pub/des/bridge/akbrjnt.pdf. All the data from this research activity is also located on Bridge Design’s page at ftp://ftp.dot.state.ak.us/pub/nres/Research%20Reports/FHWA-AK-RD-99-02.PDF.

Available Project Reports

Culvert Design for Juvenile Salmon

Project Number: 96-05  
Estimated Completion Date: 9/31/00  
Estimated Cost: $101,000  
Project Manager: Billy Connor

Project Description
FISHPASS, a computer program for culvert design to allow passage of spawning grayling, was cooperatively developed by DOT&PF, ADF&G, and UAF through previous research projects. We have used FISHPASS to design culverts for projects in interior and northern Alaska. Results include significantly reduced time to acquire permits and savings in project cost. FISHPASS has not been feasible in Southcentral and Southeast Alaska, where juvenile salmon—particularly coho and Chinook—are the most critical design fish species.

The concern is that inadequate culvert designs may prevent juvenile coho that spend two to three years in freshwater streams before returning to the ocean from reaching suitable upstream habitat. These juvenile fish may have spawned downstream of the culvert or may have moved downstream during the winter months.

Project Objectives
- Determine the swimming capabilities of juvenile coho salmon.
- Upgrade the FISHPASS program developed by DOT&PF Research in January 1991.
- Develop new culvert design methodologies for fish passage where juvenile salmon are the critical species.

Project Status
DOT&PF Research signed an agreement with UAF for their part of the work in late June 2000 and established an agreement with Alaska Department of Fish and Game for their assistance at about the same time.

Researchers undertook two major field excursions during the summer of 1997: to Beaver Creek on the Kenai Peninsula on the Kenai-Soldotna Cutoff Road, and to No-Name Creek on Prince of Wales Island at the headwaters of Klawock Lake.

Researchers wanted to observe juvenile coho salmon behavior in culverts at existing road crossings. These two sites were chosen for the abundance of juvenile salmon in the system and for existing culverts that would prove challenging for the juveniles.

Three methods for confirming juvenile fish passage through culverts were successful at Beaver Creek. This was due to the large population of juvenile cohos there. Researchers could trap and dye large numbers of juveniles, then observe them and videotape them.

At No-Name Creek, lighting in the culvert was poor due to large trees at each end of the culvert. The number of juvenile fish at this site was substantially lower than at Beaver Creek.

Of the flow conditions existing at the time of our visits to the two culverts, Beaver Creek had the tougher hydraulic conditions for juvenile fish swimming upstream. This was especially true at the culvert inlet, where super-critical flow conditions existed.

Available Project Reports
Interim: n/a  
Final: FHWA-AK-RD-00-03  
Draft report, being reviewed
Design Discharge for Juvenile Salmon

Project Number: 00-05
Estimated Completion Date: 9/31/02
Estimated Cost: $60,000
Project Manager: Billy Connor

Project Description
The Alaska Department of Fish and Game uses criteria specifically for Arctic grayling to determine stream discharges that are then used 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 anticipate doing this project jointly with other states that experience similar situations with regard to fish passage and water velocities.

Project 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 project. We anticipate building a flume capable of testing culverts to determine flow at the culvert walls and at the inlet and outlet of the pipe.

Available Project Reports
Interim: n/a
Final: At project end
Double Fines in Work Zones

Project Number: 99-18
Completion Date: 6/30/00
Estimated Cost: $30,000
Project Manager: Billy Connor

Project Description
“Get the Picture.” “Listen to the signs.” It’s a new campaign from the Federal Highway Administration and the Alaska Department of Transportation to increase work zone safety and make motorists aware of new double fines legislation. Beginning July 1, 1999, “Jack Hammer,” an animated character that tells people what signs would say if they could speak, starred in television and radio ads. The campaign encourages motorists to “Listen to the Signs” in work zones and to begin reacting to the information provided as soon as they see them. About 25,000 serious injuries occur nationally in work zones every year. Reacting to the signs will help reduce the number of accidents. But signs alone can’t prevent disaster. That’s why fines will now be double for all traffic violations occurring in Alaska’s work zones.

Project Objectives
- Implement Senate Bill 304, passed in 1998. Senate Bill 304 reads, in part, “the scheduled amount of bail or fine, as applicable, for a motor vehicle or traffic offense that is committed in a highway work zone shall be double the amount of the bail or fine for the offense if it had not been committed in a highway work zone.”
- Increase public awareness of construction work zones and the need for worker safety.

Project Status
The project is complete. We developed and implemented an ad campaign including public service announcements on radio and television. We also distributed posters, bumper stickers, post cards, and brochures. DOT&PF developed and implemented the signing criteria for double fines in work zones.

Available Project Reports
None. However, media activity continues each construction season, and remaining posters, bumper stickers, post cards, and brochures are distributed at the Tanana Valley and Alaska State fairs each autumn.
Enhancing Estimating Procedures

Project Number: 00-04
Estimated Completion Date: 9/31/02
Estimated Cost: $100,000
Project Manager: Billy Connor

Project Description
Data from bid packages have been collected over many years throughout the department. While each region has written software to use the data, none of the regions believe the data is used to its full potential. 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.

Project 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 estimate change order costs during the construction phase.

Project Status
A review of department needs indicates the problem is two-fold. First, standards need to be set to reflect the accuracy needed for each phase of a project. This includes the planning, preconstruction, and construction phases. Second, the methodology of obtaining these estimates is an issue that needs to be resolved. Several options exist, including using the Bid Tabs information or using a base bid with adjustments for location, complexity, bidding climate, and other criteria.

Available Project Reports
Interim: n/a
Final: Anticipated at the end of the project; expect a software product.
Pavement System Drainage Needs

Project Number: 93-11
Completion Date: 09/31/00
Estimated Cost: FY00 $6,000; total project $85,000
Project Manager: Billy Connor

Project Description
The proposed work was to assess the need for pavement longitudinal drains and/or permeable base courses. The suggested method of study was to measure moisture using Time Domain Reflectometer technology and strength using falling weight deflectometer measurements at several sites over a period of at least a year at a cost of $25,000 to $100,000.

This was a study of a large number of field sites, including recently built road sections with open graded bases. We examined drainage needs during both spring breakup and summer, and used data loggers to gather more data than would have been possible with technician site visits. Study results should help identify conditions where pavement drainage systems are warranted and recommend types of systems for each condition. Designers will use this information to build longer lasting, more cost effective pavements.

Project Status
Complete.

Available Project Reports
Interim: n/a
Final: INE-TRC-99-09/
         FHWA-AK-RD-99-03
Permafrost Stabilization

Project Number: 93-06
Completion Date: 09/31/99
Estimated Cost: FY00 $6,000; total project $15,500
Project Manager: Billy Connor

Project Description
Thawing permafrost soils are a primary cause of failures and subsequent road damage. They are also a major maintenance cost in central Alaska. The DOT&PF has incorporated many design features in road construction projects intended to control this damage.

Permafrost damage and thermal changes occur over many years. Long-term monitoring is the only way to measure the benefits of various permafrost control features. Thirteen movement and/or temperature monitoring sites were in place when the department’s Research Section was closed in 1991. That monitoring activity, however, was almost exclusively of surface movements. There is little empirical data of subsurface movements. This means remedial measures must be designed based on assumed embankment failure mechanisms.

Researchers instrumented two Goldstream Road embankments with surface and subsurface sensors in the autumn of 1994 and spring of 1995 as part of a road reconstruction project. We chose Goldstream Road because it has experienced severe permafrost-related distress for many years. Ground movement and temperature data have been collected from the sensors since then. Data was also collected at an existing site at Bonanza Creek on the Parks Highway. The Bonanza Creek site was already instrumented with temperature measuring devices and vertical slope indicator casings.

Project Objectives
- Determine embankment failure mechanisms.
- Provide data to designers for designing road embankments on permafrost terrain.

Project Status
Complete

Available Project Reports
Interim: n/a
Final: INE-TRC-99-10/
FHWA-AK-RD-99-05
Polymer Modified Asphalt Emissions From Alaskan Hot Plants

Project Number: 99-14  
Estimated Completion Date: 09/31/00  
Estimated Cost: $20,000  
Project Manager: Steve Saboundjian

Project Description

We know that polymer modified asphalt (PMA) is cost effective for controlling asphalt rutting, cracking, and premature aging. However, the Clean Air Act has brought increased scrutiny of asphalt plant emissions by EPA and DEC. Several AGC paving contractors state that their asphalt plants cannot meet air quality emissions requirements when manufacturing PMA. A recent laboratory study indicates that emissions may be a function of elevated PMA mixing temperatures, the type of polymer used, and/or the amount of volatiles in the base asphalts. The department will not be able to continue the beneficial use of PMAs if the asphalt plant emissions cannot be brought into compliance.

Project Objectives

- Provide enough information on PMAs to determine which combinations of polymers and base asphalts should be used to meet the requirements of the Clean Air Act.
- The information will be obtained through literature search and manufacturer survey. If this information proves adequate, a final report will be prepared with specification recommendations.

Project Status

The contractor collected data from different local sources.

Available Project Report

Interim:  Due by September 30, 2000  
Final:  Due by December 31, 2000
Reducing Thermal Segregation

Project Number: 00-03
Estimated Completion Date: 09/31/01
Estimated Cost: $100,000
Project Manager: Billy Connor

Project Description
Thermal segregation reduces pavement life in various ways. One of the better known ways is through 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 in 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.

Project 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. For example, 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, covering all three regions. Initially, most of the projects showed thermal segregation. As contractors become 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.

Available Project Reports
Interim: n/a
Final:
Project Description
Throughout Alaska’s road system, there are damaged sections of guardrail. FHWA has asked Alaska DOT&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.

Project 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 Project Reports
Interim: FHWA-AK-RD-00-04
Final:
Stabilized Base Under Asphalt Surface

Project Number: 97-15
Estimated Completion Date: 09/31/00
Estimated Cost: $5,000
Project Manager: Steve Saboundjian

Project Description

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 aren’t reasonably available. The stabilized subbase test section abuts a normally constructed control section. Except for rotomilling 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 performance of the pavement, and collecting Falling Weight Deflectometer deflection data.

Project Objectives

‣ Determine the structural capacity of the pavement structure in terms of equivalent single axle loads to failure.
‣ Determine if the structural performance of a roadway with an asphalt surface treatment can be significantly improved using a low-cost soil-stabilizing additive.

Project Status

The construction project including the test area was completed in 1996. A visual inspection of the research site was done on April 23, 1997, and the condition was like new. A single thermal crack was visible at that time.

According to the analysis of deflection data taken in spring 1997, the EMC2 section appears to be a problem. Initially, the prognosis for the EMC2 section is for relatively early failure. However, it is too early to tell if the substantial structural differences within the research sections translate into visually observable performance differences. The EMC2 may have actually softened the subbase structure. It is also possible that the control section contains undisturbed sublayers of asphalt concrete, which could act as subgrade reinforcement, actually strengthening the section. This theory could be explored by drilling exploratory holes at the site. It is possible that future findings may change this initial analysis.

Available Project Reports

Interim: n/a
Final: At project end
Stream Flow Modeling

Project Number: 99-19  
Estimated Completion Date: 09/31/02  
Estimated Cost: $88,000  
Project Manager: Billy Connor

Project Description
See 00-09 Verification of Roughness Coefficients, page 35.

Project Objectives
See Verification of Roughness Coefficients

Project Status
Complete. Verification of Roughness Coefficients is the follow-on project, continuing the work begun under Stream Flow Modeling.

Available Project Reports
Interim: None; will be done with Verification of Roughness Coefficients
Final: None; will be done with Verification of Roughness Coefficients
AMHS Marketing and Tariff Study

Project Number: 99-17
Estimated Completion Date: 9/31/00
Estimated Cost: $307,000
Project Manager: Clint Adler

Project Description

This research project is designed to discover and understand trends and preferences of current and potential Alaska Marine Highway System riders. From the information gathered, we expect to determine how best to market the services that the Alaska Marine Highway System provides and to increase ridership and revenues.

Project Objectives

The desired goal is to understand current market and economic trends and conditions as well as internal business practices and policies so that the Alaska Marine Highway System can become more self-sustaining. When completed, the project will define:

- user profiles and preferences;
- transportation alternatives;
- AMHS financial, business, and political practices;
- future traffic volume; and
- a marketing and pricing plan

Project Status

Complete. The contractor submitted the final report to AMHS staff for review. It has not yet been submitted to Research staff. The report includes recommendations made for adjustments to system pricing and marketing policies. It also provides a 10-year database of traffic information for the AMHS.

Available Project Reports

Interim: FHWA-AK-RD-00-02A
        FHWA-AK-RD-00-02B
Final: With AMHS staff for review
Best Management Practice for Snow Storage Areas

Project Number: 99-12
Estimated Completion Date: 9/31/01
Estimated Cost: $20,000
Project Manager: Clint Adler

Project Description
Environmental regulatory agencies have expressed concern about the potential water quality impacts of snow storage areas where snow collected from streets and roadways is stored and melts in the spring. The snow may contain petroleum products, anti-icing chemicals, and other substances. The springtime melting at the snow storage sites may potentially release these pollutants to nearby surface water and ground water.

Project Objectives
This research will:
1. identify potential water quality impacts from snowmelt at snow storage areas,
2. identify regulatory water quality requirements and concerns associated with snow storage areas,
3. identify ways to mitigate any identified deleterious impacts that snow storage has on water quality, and
4. develop an economical best management practice (BMP) for snow storage to alleviate the water quality concerns.

Project Status
Researchers conducted a preliminary literature search to define what is known about water quality impacts of snow storage areas in Alaska. Regulatory agencies are helping to identify specific regulatory concerns and requirements for water quality at snow storage areas.

Water quality data from snow storage areas has been collected in the Fairbanks and Anchorage areas. The data collected to date suggests insignificant potential for adverse impacts to surface water and ground water quality with existing snowmelt runoff control practices. We are currently clarifying and identifying regulatory concerns and/or requirements for snowmelt before we develop a best management practice for snow storage areas.

Available Reports
Interim: At project midpoint
Final: At project end
Evaluation of Remote Control Equipment

Project Number: 00-12
Estimated Completion Date: 09/31/02
Estimated Cost: $110,000
Project Manager: Clint Adler

Project Description
We will install the Teleoperated and Automated Maintenance Equipment Robotics (TAMER) remote control equipment on a single 2000 Case 921C loader and put it to the test at Alaskan avalanche cleanup operations at Thompson Pass, near Valdez. Here, annual snowfalls cause avalanches that frequently exceed 14 meters (45 feet) and commonly close the Richardson Highway. There are merely six hours of daylight during the darkest of the winter months, which means cleanup activities happen during times of very low visibility.

Researchers will share results from this study with Alaska and other state maintenance crews that perform work in avalanche areas. Ideally, the information gathered will guide future winter maintenance equipment procurement and operation decisions.

Project Objectives
- Define and quantify any process and safety improvements achieved by employing TAMER on avalanche cleanup operations in Alaska.
- Quantify the reduction in road closure time and reduced worker exposure to hazardous conditions that result from using the TAMER technology.
- Document ways to optimize remote controlled avalanche cleanup operations under conditions of extreme cold and extended hours of darkness.

Project Status
The TAMER equipment is purchased and is currently being installed on the loader. We expect delivery of the retrofitted loader to Valdez in mid-November 2000. Workers will evaluate the equipment during the following two winters.

Available Project Reports
Interim: At project midpoint
Final: At project end
Gravel to Pavement Roads Impact

Project Number: 00-02
Estimated Completion Date: 09/31/02
Estimated Cost: $40,000
Project Manager: Clint Adler

Project Description
Currently, there is little documentation of the socioeconomic and environmental effects of paving gravel roads in Alaska, so the Alaska Department of Transportation and Public Facilities is unable to respond appropriately to questions on the direct and indirect effects of paving gravel roads. For example, What are the effects on traffic, tourism, and land use? The inability to address these questions has affected several projects. As the department increasingly seeks to pave gravel roads to reduce maintenance costs and improve driveability, the public, special interest groups, and other agencies will continue to ask these questions.

Project Objectives
- Document the qualitative and quantitative effects of paving gravel roads on traffic, tourism, land use, the environment, and maintenance costs.
- Help project staff to answer questions about secondary impacts and environmental considerations of paving gravel roads.
- Reducing or eliminate project delays caused by the previous lack of information.

Project Status
Research will begin in October 2000.

Available Project Reports
Interim: At project midpoint
Final: At project end
Magnet Warning and Guidance System

Project Number: 00-01
Estimated Completion Date: 09/31/02
Estimated Cost: $80,000
Project Manager: Clint Adler

Project Description

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 driving 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 that serve as a roadway reference, plus vehicle-borne sensing and processing units that obtain information from the markers. Simple permanent magnets, installed in the roadway about 1.2 meters apart, indicate the desired travel path. Alternating the magnetic polarities of the markers (north up vs. south up) creates a binary code that indicates roadway characteristics. Magnetic sensors, mounted under the front and rear bumpers of a vehicle, measure the magnetic fields on three axes. A Pentium computer processes the magnetic field data to derive precise vehicle position.

We chose a road rehabilitation project in Thompson Pass on the Richardson Highway as the site to install the MGS. Thompson Pass has guardrail, some of the highest snowfall in the state, blowing conditions, and low visibility.

Project Objectives

- Help the operator stay on track, avoid the guardrail, and not veer into the oncoming traffic lanes.

Project Status

California’s highway agency, CalTrans, tried the MGS on Interstate 80 near Donner Summit, installing it on an existing road. Alaska attempted magnet installation in a 14-mile road rehabilitation project in Thompson Pass during the summer of 2000 by drilling holes for the magnets in the rotomilled asphalt-treated base, which was subsequently paved over with asphalt. This is a different process that hasn’t been tried anywhere else. The method proved impractical in the field, so Alaska attempted to install the magnets similarly to CalTrans’ approach. Concerns about sealant performance in the magnet holes in Alaska’s extreme coastal winter environment lead to the decision to monitor several sealants in a limited (less than 90 magnets) installation over the course of this winter.

Available Project Reports

Interim: At project midpoint
Final: At project end
Pavement Marking Materials

Project Number: 96-6
Estimated Completion Date: 09/31/01
Estimated Cost: $100,000
Project Manager: Clint Adler

Project Description
The project evaluates pavement marking materials for durability, reflectivity, and cost effectiveness. The evaluation includes materials that are effective during both maintenance activities and new construction.

We installed paints on two test decks, one in Northern Region and the other in Central Region. The Northern Region deck is on the westbound lanes of the Mitchell Expressway between Lathrop Street and Peger Road. It was installed in August of 1999. The Central Region deck, installed in September 1998, is on the northbound lanes of the Glenn Highway at about Mile 28.

The jury is still out on how to handle medium-to-low-volume roads paved with hot asphalt treatments.

Available Project Reports
Final: At project end

We installed paints on two test decks, one in Northern Region and the other in Central Region. The Northern Region deck is on the westbound lanes of the Mitchell Expressway between Lathrop Street and Peger Road. It was installed in August of 1999. The Central Region deck, installed in September 1998, is on the northbound lanes of the Glenn Highway at about Mile 28.

Retroreflectivity continues to be gathered at the two test decks and at in-service sites. So far, we’ve learned that:

- Durable pavement markings are superior to paint.
- Retroreflectivity of the methyl methacrylate durable pavement markings decreases rapidly in the first year in heavy traffic areas. In these areas, retroreflectivity has decreased to less than 100 millicandellas after two years.
- 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.
- The jury is still out on how to handle medium-to-low-volume roads paved with hot asphalt treatments.
Project Description
The statewide revegetation project will address aspects of revegetating highway and airport construction and maintenance projects in Alaska.

Project Objectives
- Establish site-specific recommendations and specifications based on current knowledge about seeds and plants and their growing requirements, including information from the University of Alaska’s Plant Materials Center in Palmer.
- Create a manual of practice that will comply with erosion and pollution control regulatory mandates:
  1. Provide practical guidance for stabilizing and revegetating soils that are disturbed or exposed during project development, construction, and maintenance activities,
  2. Give standardized recommendations and methods for establishing permanent, living vegetative cover.
  3. Include recommendations specific to the different geographical growing regions in Alaska.

Project Status
Complete.

Available Project Reports
None. Research results are being incorporated into Alaska Department of Transportation Hydraulics Manual, specifically Chapter 15, Surface Water Environment; Chapter 16, Erosion and Sediment, and Chapter 17, Bank Protection.
Verification of Roughness Coefficients

Project Number: 00-09
Estimated Completion Date: 09/31/02
Estimated Cost: $88,000
Project Manager: Clint Adler

Project Description
This project continues the work done under 99-19, Stream Flow Modeling (page 27). Both projects are aimed at figuring out flood heights and the volume of water during spring runoff and flood conditions. The end result of high velocity and volume is that culverts and bridges wash out, or so much scour happens that eventually culvert and bridge installations have to be restabilized. The idea is to prevent or reduce washouts and scour in the first place. We start with field data based on our conditions, which are admittedly different from much of the rest of the United States. Roughness coefficients were developed in Lower ‘48, mostly in the southeastern United States, where there are few large cross-sections of steeper streams to observe. Alaska has cascading-flow and boulder-cobble streams, particularly in the southeast and southcentral areas, as well as on the Dalton Highway up to Atigun Pass. To date, Alaskan 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.

Developing and improving Alaska’s roads means designing bridges or culverts for our many stream crossings. There is very limited hydrologic data to use for hydraulics, which means that designers typically have to estimate streamflow and scour computations. A critical parameter for modeling flood flows is channel roughness. Accurately knowing roughness (friction) coefficients will improve streamflow modeling.

Southeast Alaska presented good research opportunities this past year, with higher than normal stream flows. This allowed stream flow modeling researchers to do some calibration and verification of channel roughness.

Project Objectives
- Derive better flood heights and stream volumes.
- Design more cost-effective bridges and culverts based on being better able to predict what the water flow will do, especially during spring runoff and flood conditions.
- For new construction, we will be able to put bridges and culverts in places with reduced scour.
- Ideally, we’ll be able to greatly reduce the number of washouts that occur, especially in the mountainous areas of the state.

Project Status
Research on this project will begin in October 2000. Initial results from stream flow modeling tell us that we need higher estimates of roughness coefficients on steep streams. There is existing literature on channel roughness, and researchers are finding informally that, if one follows the national literature recommendations for roughness, Alaskan designers are underestimating the roughness and underestimating flood heights. The research continuing under this Verification of Roughness Coefficients project may yet provide recommendations on how much higher to estimate. Additional data will be gathered and a final report with recommendations will be developed.

Available Project Reports
- Interim: n/a
- Final: At project end, with recommendations

Also see 99-19 Stream Flow Modeling, page 27.
Air-Cooled Embankment Design

Project Number: 95-08
Estimated Completion Date: 12/31/00
Estimated Cost: $20,000
Project Manager: Steve Saboundjian

Project Description
Using an Air-Cooled Embankment (ACE) to remove heat from the roadway during the winter months has proven effective both theoretically and in the laboratory. This project evaluates an ACE Experimental Feature built as part of a new alignment of Chena Ridge Road in Fairbanks in 1996. The construction required the ACE to be built in the fall or winter to minimize thawing of the permafrost beneath the roadway.

The ACE uses coarse rock to create a convection cell. The warm ground (about –2°C) heats air, which rises to the cold surface of the road where it is cooled. The cold air then falls to the bottom of the ACE, completing the cycle.

Project Objectives
- Halt or significantly retard the thaw of unstable permafrost beneath the roadway.
- Increase the life span of Alaska roads in permafrost-susceptible areas.

Project Status
Researchers built the ACE in the fall of 1996, except for the base course and paving, which were completed the next summer. They completed instrumentation in the fall of 1996 and began data recording that November. The research contractor (UAF) will:
- use computer modeling to investigate the thermal benefits of different embankment geometrics, materials, and slope coverings;
- test the air transfer and thermal properties of candidate embankment materials;
- develop embankment design recommendations and instrumentation plans for field demonstration; and
- monitor and evaluate air-cooled embankment performance for three years after construction.

There was some breakdown of the rock during air-cooled embankment construction, generating some finer material that probably reduces permeability below anticipated values. A small percentage of the thermistors have malfunctioned. Preliminary data indicates, however, that the air-cooled embankment is functioning effectively and largely as planned to chill subsoils in winter. The winter data indicates the air-cooled embankment section is much warmer than anticipated.

We received a draft report on air-cooled embankment design, construction, and initial data readings in October 1999. We anticipate that a final version of that interim report will be published in November 2000. Monitoring continues through the summer of 2000, and we anticipate publishing the final report in December 2000.

continued . . .
Available Project Reports

Interim:


Final: Due at project completion
Alaskan Soil Stabilization Manual

Project Number: 00-11
Estimated Completion Date: 9/30/01
Estimated Cost: $46,800
Project Manager: Steve Saboundjian

Project Description
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.

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

Project Status
Research contracted with Gary Hicks, professor emeritus of Oregon State University, to develop the manual. To date, he has prepared a survey of stabilization methods used in Alaska, which we have distributed to appropriate DOT&PF staff. A literature search identifying stabilization techniques is complete.

Available Project Reports
Interim: Survey of Stabilization Methods (limited distribution)
Final: Anticipated at project end
Eliminating Longitudinal Cracking

Project Number: 00-08
Estimated Completion Date: 09/30/02
Estimated Cost: $40,000
Project Manager: Steve Saboundjian

Project Description
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.

This research examines a new technique to cool embankment side slopes, with the goal of avoiding accelerated thaw and longitudinal cracking. The technique involves the use of a layer of poorly graded 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.

Project Objectives
If the technique proves viable, this project could offer a cost-effective method to avoid longitudinal cracking, improving safety and reducing maintenance.

Project Status
The project is just now beginning.

Available Project Reports
Final: At project end
High Temperatures of Alaskan Asphalt Pavements

Project Number: 99-13
Estimated Completion Date: 9/30/01
Estimated Cost: $10,000
Project Manager: Steve Saboundjian

Project Description
Under a previous research study, DOT&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.

Project Objectives
- Develop design pavement surface temperatures on the high end to satisfy the Superpave design method requirements for developing accurate asphalt binder specifications.
- Process existing computer database files for high temperatures, plotting air and pavement temperatures for approximately 20 sites around the state.
- Use the mathematical relationships between air and pavement surface temperatures to derive the design pavement temperatures.

Project Status
DOT&PF’s highway data manager has sent air and pavement temperature data files to Research. Researchers will extract high temperature data from these files, which will enable us to develop air/pavement high temperature correlations.

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

Project Number: 99-15
Estimated Completion Date: 09/31/01
Estimated Cost: $20,000
Project Manager: Steve Saboundjian

Project Description
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.

Project 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 material source location. We identified four candidate aggregate gradations. Using these gradations, the DOT&PF Materials Lab completed Marshall mix designs and obtained pertinent mix data. A final report is due in the near future.

Available Project Reports
Interim: 
Final: At project end
Stabilized Sandy Gravel Surfacing in Cold Climates

Project Number: 99-16
Estimated Completion Date: 09/30/02
Estimated Cost: $40,000
Project Manager: Steve Saboundjian

Project Description
This project investigates the feasibility of using on-site gravelly materials together with a combination of stabilization products and closely controlled moisture contents. This will provide local-source surfacing on large rural construction projects in cold climates.

Rural areas have limited on-site sources of either marginally clean sand and gravel or only silt. These on-site materials lack either the fines or coarse aggregates suitable for surface material. Thus, many rural construction projects incur high surfacing costs due to the expense of barging materials in. Successful warmer-climate work to stabilize these types of soils by using various products on the market indicates that similar success could be achieved in cold weather.

Cold-climate projects already constructed have used some of these materials, but we have not evaluated the performance. Visits to these projects will analyze site surfacing materials performance such as material strength properties, moisture content, and other relevant properties.

Project Objectives
- Develop recommended techniques to improve cold-climate stabilization.

Project Status
Research signed a contract with Gary Hicks, professor emeritus at Oregon State University.

Available Project Reports
Interim: At project midpoint
Final: At project end
Using Geophysical Methods in Pits

Project Number: 00-07
Estimated Completion Date: 09/30/02
Estimated Cost: $60,000
Project Manager: Steve Saboundjian

Project Description

Today, Alaska DOT&PF uses seismic methods to determine the volume of usable materials in a potential borrow source. 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 material type(s) and volume in a pit.

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.

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 Objectives

- Achieve better defined borrow source material types and more accurate volume estimates.
- Reduce the time and expense involved to establish borrow sources.

Project Status

Just began.

Available Project Reports

Interim: At project midpoint
Final: At project end
Technology Transfer Program Support

Project Number: 99-11
Estimated Completion Date: 12/31/00
CY99 Program Budget: $200,000 CY00 Program Budget: $230,000
Project Manager: Sharon McLeod-Everette

Program Description

The Local Technical Assistance Program (LTAP) is Alaska DOT&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. 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. LTAP operations, goals, and objectives are further defined in the LTAP Handbook.

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 Crowder, 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
Paul Knysh, Program Manager, Yukon Government Transportation ............................ 867-633-7950
Trent Mackey, Service Area Engineer, Fairbanks North Star Borough ......................... 459-1218
Ernie Mueller, Public Works Director, Juneau City and Borough .................................. 780-6888
David Mumford, Municipal Traffic Engineer, Municipality of Anchorage .................... 786-8411
Drew Sielbach, Research/Technology Transfer/Structures Engineer, FHWA ............. 586-7544
Jim Swing, Public Works Director, Mat-Su Borough ...................................................... 745-9801
Ken Vaughan, Roads Engineer, United States Forest Service .................................... 586-7958
Keith Kornelis, Kenai Peninsula Borough ...................................................................... 283-7535
Program Status

Alaska LTAP—Technology Transfer Calendar Year 1999

During CY99, Alaska LTAP offered 39 training sessions, some being multiple presentations in several locations around the state, resulting in 15,669 man-hours of training. For reference, a state employee works 1,950 man-hours in a single year.

Courses were:

- Systematic Development of Informed Consent Plus
- NHI 13207 Urban Drainage Design
- SHRP Superpave Workshop
- NHI 38060 Work Traffic Control for Maintenance Operations on Rural Highways
- Practical Approaches for Effective Erosion and Sediment Control
- Biotechnical Erosion Control for Slopes and Streambanks
- NHI 15121 Administration of FHWA Planning Grants
- Finish Grader Operator
- Intermediate Grader Operator
- ATSSA Worksite Technician and Supervisor
- IRWA 803 Eminent Domain Law Basics for Right of Way Professionals
- IRWA/LTAP Mock Trial
- IRWA 407 Valuation of Contaminated Properties
- IRWA 503 Mobile Home Relocation
- Demo Project 97 Scour Monitoring and Instrumentation
- Selecting and Designing Pavements for Alaska
- FHWA Emergency Relief Program
- Research Implementation: Bridge Column Cap
- Eminent Domain Issues for Agencies
- Americans With Disabilities Act
- Design, Construction, and Maintenance of Safe Roadsides
- Writing—“Plain Language, Please”
- Green End Up
- Power Generation

Other accomplishments include:

- four newsletters produced on a quarterly basis; Better Roads magazine reprinted an article on winter maintenance activities.
- Developed a web page under the DOT&PF web site that describes LTAP and Research activities.
- Posted a training calendar that allows people to register for training on line.
- Reestablished the LTAP Advisory Board, which met in October.
- Contracted operation of the publications part of the T2 library to the Geophysical Institute’s Mather Library, and physically moved the publications there in August 1999.
- Provided promotional materials for the fairs in Palmer and Fairbanks and for the annual WASHTO meeting held in Juneau.
- Assisted DOT&PF to advertise the new double fines in work zones law by designing, printing, and distributing brochures, postcards, bumper stickers, and posters, and by placing an article in the newsletter.
- Participated at the University of Alaska Fairbanks’ Career Fair.
- Assisted the Border Technology Exchange Program by providing a class on selecting and designing pavements for northern climates to Yukon Government Transportation in Whitehorse.
- Prepared a Management Training pilot program for Alaska DOT&PF.
- Hosted the AASHTO TRAC meeting and assisted with training teachers and engineer partners.
- Traveled around the state to gather training needs from local governments and DOT&PF Regions.
Program Status
Alaska LTAP—Technology Transfer Calendar Year 2000

To date during CY00, Alaska LTAP has offered 49 training sessions, some being multiple presentations in many locations around Alaska, including the western coast from St. Mary’s to Kotzebue. This resulted in 19,700.5 man-hours of training. A Management Training pilot program for DOT&PF occurred in Fairbanks. Based on employee reception of the program, and incorporating suggestions from evaluations, future sessions are forthcoming. Approximately 10 more training sessions will be held from October through December. Management training, based on the success of the Fairbanks pilot, is also scheduled in Anchorage later this year. Completed and scheduled training are listed below.

- Geotechnical Integrator Training
- Advanced Highway Capacity Analysis
- NHI 13212 Soils and Foundation Workshop
- NHI 13132 Hot Mix Asphalt Construction
- ASCE: Construction Project Administration and Claims Avoidance
- IRWA 501 Relocation Assistance
- IRWA 502 Business Relocation
- Northwestern University: Traffic Signal Workshop—Traffic Actuated Control
- Intermediate Grader Operator
- Basic Grader Operator
- Finish Grader Operator
- Asphalt Laydown Workshop
- Structural Welding for Bridge Maintenance Crews
- NHI 35005 Highway Program Financing
- National Transit Institute: Coordinating Transportation and Land Use
- Systematic Development of Informed Consent Plus
- Cold Regions Engineering Research Workshop
- Permafrost Workshop
- Trenchless Pipe Rehabilitation Technologies
- Air Quality Training
- Writing Training (some completed, with more scheduled)
- Manager’s Briefing for Writing (some completed, with more scheduled)
- NHI 13619 Intelligent Transportation Systems Software Acquisition (scheduled)
- NEPA and 4(f) Training (scheduled)
- NHI 13613 Using the Intelligent Transportation System Architecture for Deployment—Public Sector (scheduled)
- Management Training (being scheduled, pending a contract with University of Alaska Anchorage)
Staff is on schedule to produce the four quarterly newsletters; two of the four issues are complete and mailed as well as posted on the web. The third is scheduled for publication at the end of September 2000, and the fourth is scheduled for late December. The layout and editing was contracted out for the entire year, with positive results. The web page is updated continually to reflect scheduled activities, and registrations occur either by fax from those with no web access, or on-line from those with web access. LTAP is scheduling an advisory board meeting for late October. The Mather Library has cataloged roughly two thirds of the publications and anticipates completion around the end of calendar year 2000. We are entering the second year of a five-year contract with them for managing the LTAP publications library.

Other activities to date include:

◆ providing promotional materials for the fairs in Palmer and Fairbanks,
◆ organizing DOT&PF’s participation at the University of Alaska Fairbanks’ Career Fair,
◆ assisting headquarters with scheduling participation at career fairs at universities and colleges in the Pacific Northwest,
◆ doing a short presentation on LTAP for the Northern Region Construction Manager’s meeting,
◆ worked with other sections in headquarters to analyze department-wide training,
◆ assisting sections in DOT&PF to schedule meetings, short classes, and conferences, and
Native LTAP

Project Number: 99-10
Estimated Completion Date: 12/31/00
Program Budget: $50,000 annually
Project Manager: Sharon McLeod-Everette

Program Description
In response to ISTEA, FHWA established Tribal Technical Assistance Program T2 Centers with a focus for tribal and Native governments. Because Alaska doesn’t have tribes, the program is known as Native LTAP. The Native LTAP operates on a calendar-year basis, as does LTAP. The structure and mission are the same as the LTAP centers. Activities are very similar to LTAP and maintain the flexibility to meet very basic through sophisticated needs.

Program Status
In late 1999, Alaska DOT&PF received two years’ worth of funding ($100,000) at once, covering 1998 and 1999. Those funds have an expiration date of December 31, 2000. A workplan has been pending since FHWA requested it in late July for $50,000, which is supposed to cover CY00 activities. We anticipate using that funding in 2001 instead.

To date, we have accomplished the following with the 1998/1999 funding:

- Provided travel scholarships for University of Alaska Fairbanks students in an engineering curriculum who are members of the American Indian Science and Engineering Society (AISES) to the annual AISES conference, where they participate in leadership activities and career direction sessions and meet national level firms seeking Native student interns and future employees. University of Alaska Anchorage expressed no interest, despite numerous contacts, and University of Alaska Southeast does not have a student AISES chapter.
- Presented 10 two-day basic grader operator training sessions in Fairbanks and western Alaska, reaching 55 participants from 38 villages.
- Assisted USDOT’s Federal Lands office at FHWA in setting up and presenting a transportation planning session at the Bureau of Indian Affairs’ annual Provider’s Conference in December, 1999; coordinated speakers from state and federal transportation agencies in Alaska.
- Included topics of interest in the LTAP newsletter.
- Loaned library materials, including publications and videos.
- Provided work zone safety and grader operation information to BIA.

Activities planned for the remainder of the year include:

- Travel scholarships for AISES students in an engineering curriculum to attend the annual national AISES conference.
- Newsletter articles.
- Participating at the BIA Provider’s Conference as invited.
- Presenting one or more sessions of NHI 36120, Partnering for Indian Employment in Highway Construction, as re-written for Alaska.
National Highway Institute

Estimated Completion Date: 12/31/00
CY99 Program Funding: $170,000
CY00 Program Funding: $324,700
Project Manager: Sharon McLeod-Everette

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

Alaska DOT&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, training dollars are leveraged 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 CY99 and CY00, and for training scheduled for the remainder of CY00, see the LTAP section.
National Transit Institute

Estimated Completion Date: 12/31/00
CY00 Program Funding: $30,000

Program Description
The Intermodal Surface Transportation Efficiency Act of 1991 established the National Transit Institute (NTI). It began in 1992 at Rutgers, the State University of New Jersey. It is funded through a cooperative agreement with the Federal Transit Administration (FTA). NTI promotes, develops, and delivers training and education programs for the public transit industry. Programs focus on subject areas of critical importance where training does not exist or is limited.

As part of its legislative mandate, NTI provides training in complying with federal regulations free to public employees. NTI works with FTA to identify training needed to assure compliance with federal regulations. NTI develops course content in close cooperation with FTA, state DOT’s, metropolitan planning organizations, and transit agencies. NTI also has training in multi-modal transportation planning, advanced technologies and practices, workplace safety, management development, professional development, and special programs.

NTI Training at Alaska DOT&PF
As with NHI training, we have opted to make all training open to all customers rather than limiting participants to training according to funding program. NTI training dollars are leveraged by combining them with other funds.

Program Status
For a list of training presented to date, see the LTAP section.
AASHTO TRAC

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, 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 works with Department of Education to identify schools and teachers to participate in the program, and we jointly developed a five-year plan, which needs to be reviewed and updated in 2001. Initially, TRAC National had a goal of adding new schools each year, but revised that two 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.

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 in Fairbanks indicate that students are expressing an interest in pursuing an engineering curriculum during college.

Teacher/new school training usually occurs each year in early winter. Tate Jackson, the national AASHTO TRAC manager/national trainer, came to Fairbanks in September 1999 to train new teachers and engineer partners. We also distributed five computers and TRAC PACs to the new and currently participating schools. Training for 2000 will be tabled until the new manuals, interface boxes, calculators and activities are available—possibly until 2001. We do plan, however, to gather teachers for an activity-sharing session, with the goal of creating a transportation exercise workbook geared toward Alaska.

The Future

The National TRAC manager advises us that AASHTO TRAC is currently being revised; new manuals should be available near the end of October, and new peripherals should be available around the end of November (depending on the success of TRAC National negotiating less expensive bulk purchase prices). Revisions and changes follow.
- A group of teachers and engineers rewrote the entire instructor and student course manuals to provide more user-friendly exercises.
- The program continues to offer computers, but is adding Texas Instruments calculators so all students in a given classroom can participate in activities. In the past, only one small group at a time could use the computer for most TRAC activities. One computer per classroom isn’t sufficient for 30 or so students; calculators allow all the students to work on exercises at the same time.
- The program is moving away from Bridge Builder to Model Smart, which allows for testing bridge components as bridge models are being built. The teacher/engineer group wrote 14 new bridge-building exercises for Model Smart.
- TRAC is moving away from the multipurpose Lab Interface Program. Two different interface boxes will soon be available: Computer-Based Lab and Lab Pro, which works with IBM, Mac, and with calculators. TRAC ultimately may go with Lab Pro, providing that in-classroom testing proves it to be as capable as it initially seems to be.
Border Technology Exchange Program

Project Number: 99-09
Completion Date: 09/31/00
Estimated Cost: $50,000
Project Manager: Gary Hogins

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 bi-national 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, formalizing and funding 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
- Alaska DOT&PF maintenance personnel participated in an avalanche course put on by the Canadians.
- Canadians attended the Western Association of State Highway and Transportation Officials annual meeting.
- Canadians attended Alaska DOT&PF’s fall maintenance foreman’s meetings.
- Alaska research staff presented “Selecting and Designing Pavements for Alaska” training in Whitehorse.
- Paul Knysh, an engineering manager with Yukon Government Transportation, attended the LTAP advisory board meeting.
- Canadians attended the AASHTO/TRB Winter Maintenance Committee meeting in Juneau.
- Alaska DOT&PF staff attended a Yukon maintenance and operations conference.
- LTAP presented NHI 38060, Work Zone Traffic Control for Maintenance Operations on Rural Highways, in Whitehorse.

Further activities anticipated for calendar year 2000 include:
- Canadians and Alaskans will reciprocally attend respective maintenance foreman’s meetings.
- Canadians will participate in Alaska DOT&PF training offerings.
- Fund Canadian participation on the LTAP advisory board.
- Provide grader operator training or set the framework for grader operator training for 2001.

Available Project Reports
None