RESEARCH DEVELOPMENT AND TECHNOLOGY TRANSFER

ANNUAL REPORT FEDERAL FISCAL YEAR 2017

ALASKA DEPARTMENT OF TRANSPORTATION & PUBLIC FACILITIES
The Research Development and Technology Transfer (RD&T2) Section, within the Division of Design and Engineering Services of the Alaska Department of Transportation & Public Facilities (DOT&PF), provides research management, maintains an online library, provides technical assistance, training, and technology implementation services to DOT&PF, local transportation agencies, and their partners.

RD&T2 provides services largely through the collaborative relationships and financial support from the Federal Highway Administration. By leveraging resources and developing partnerships with a variety of transportation organizations, professionals and universities, RD&T2 taps into a vast network of expertise and eliminates duplication of effort. RD&T2 also provides an avenue for multidisciplinary support from a network of state agencies.

This is a report of the research, development, and technology transfer activities carried out by the DOT&PF and its partners. This report covers federal fiscal year 2017, beginning October 1, 2016, and ending September 30, 2017.

For additional information, contact:
Carolyn Morehouse, P.E.
Chief of Research, Development, & Technology Transfer

Division of Statewide Design & Engineering Services
Alaska Department of Transportation & Public Facilities
P.O. Box 112500
3132 Channel Drive
Juneau, Alaska 99811-2500
(907) 465-8140
carolyn.morehouse@alaska.gov

Editorial/Writing: Carolyn Morehouse, Anna Bosin, Jim Horn, Janelle White, David Waldo, Barry Benko
DOT&PF Research, Development & Technology Transfer Section

Website: Simon Howell

http://www.dot.state.ak.us/stwddes/research/
TABLE OF CONTENTS

Federal Fiscal Year RD&T2 Summary .................................................................................................................. 1
Projects Started in FFY2017 ............................................................................................................................. 4
Active Projects Started Prior to FFY2017 ........................................................................................................... 6
Projects Completed in FFY2017 ....................................................................................................................... 9
Administration & Policy ................................................................................................................................. 11
Bridges & Structures ..................................................................................................................................... 12
Environmental .................................................................................................................................................. 18
Geotechnical .................................................................................................................................................... 20
Hydrology and Hydraulics ............................................................................................................................... 24
Maintenance ...................................................................................................................................................... 25
Materials & Construction ............................................................................................................................... 27
Safety & Traffic ................................................................................................................................................ 33
Supplemental Research & Technology Program ............................................................................................. 38
Alaska Technology Transfer ........................................................................................................................... 41
FEDERAL FISCAL YEAR RD&T2 SUMMARY

RD&T2 received funding from the Federal Highway Administration’s (FHWA) State Planning and Research Program (SP&R), Local Technical Assistance Program (LTAP), Surface Transportation Program (STP), and state matching funds (SM). Additionally, RD&T2 leverages funding with the Alaska University Transportation Center (AUTC), Pacific NW Transportation Consortium (PAC Trans) and the FHWA’s Transportation Pooled Fund Program. There are other State Transportation Projects that have some research elements. These projects are not included in the fiscal summary.

<table>
<thead>
<tr>
<th>Funding Sources</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revenues</strong></td>
<td></td>
</tr>
<tr>
<td>SP&amp;R Program Funds (STIP ID#6451)</td>
<td>$ 2,200,000</td>
</tr>
<tr>
<td>NHI Funds (STIP ID#6452)</td>
<td>$ 350,000</td>
</tr>
<tr>
<td>State Funds (outside of match $)</td>
<td>$ 0</td>
</tr>
<tr>
<td>Local Technical Assistance Program</td>
<td>$ 300,000</td>
</tr>
<tr>
<td>Reinvested Project Closures or AC</td>
<td>$ 654,123</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$ 3,504,123</strong></td>
</tr>
<tr>
<td><strong>Expenditures &amp; Obligations</strong></td>
<td></td>
</tr>
<tr>
<td>NCHRP Dues</td>
<td>$ 351,999</td>
</tr>
<tr>
<td>TRB Core Services</td>
<td>$ 113,124</td>
</tr>
<tr>
<td>Pooled Fund Studies</td>
<td>$ 70,000</td>
</tr>
<tr>
<td>NHI/ LTAP</td>
<td>$ 500,000</td>
</tr>
<tr>
<td>T2 SP&amp;R Match</td>
<td>$ 150,000</td>
</tr>
<tr>
<td>Research Project (old projects increases)</td>
<td>$ 145,000</td>
</tr>
<tr>
<td>Research Project Programming (New Obligations)</td>
<td>$ 2,174,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$ 3,504,123</strong></td>
</tr>
</tbody>
</table>
Research Funding Distribution in FFY17 (new projects, annual dues and project increases)

<table>
<thead>
<tr>
<th>Research Funding Category</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration &amp; Policy</td>
<td>$475,000</td>
</tr>
<tr>
<td>Bridges &amp; Structures</td>
<td>$465,000</td>
</tr>
<tr>
<td>Environmental</td>
<td>$90,000</td>
</tr>
<tr>
<td>Geotechnical &amp; Foundations</td>
<td>$0</td>
</tr>
<tr>
<td>Hydraulics &amp; Hydrology</td>
<td>$30,000</td>
</tr>
<tr>
<td>Maintenance &amp; Operations</td>
<td>$0</td>
</tr>
<tr>
<td>Materials &amp; Construction</td>
<td>$230,000</td>
</tr>
<tr>
<td>Pooled Fund Studies</td>
<td>$70,000</td>
</tr>
<tr>
<td>Safety &amp; Traffic</td>
<td>$279,000</td>
</tr>
<tr>
<td>Training &amp; Tech Transfer</td>
<td>$750,000</td>
</tr>
<tr>
<td>TRB &amp; NCHRP Contributions</td>
<td>$465,123</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>$2,854,123</strong></td>
</tr>
</tbody>
</table>

![Pie chart showing the distribution of research funding by category. The largest categories are Administration & Policy (24%), Safety & Traffic (19%), and Pooled Fund (13%). Other categories contribute smaller percentages.]
### ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOT&amp;PF</td>
<td>Alaska State Department of Transportation &amp; Public Facilities</td>
<td>PacTrans</td>
<td>Pacific Northwest Transportation Consortium</td>
</tr>
<tr>
<td>AUTC</td>
<td>Alaska University Transportation Center</td>
<td>RD&amp;T2</td>
<td>Research, Development &amp; Technology Transfer</td>
</tr>
<tr>
<td>CRREL</td>
<td>Cold Regions Research &amp; Engineering Laboratory</td>
<td>SHRP</td>
<td>Strategic Highway Research Program 2</td>
</tr>
<tr>
<td>FHWA</td>
<td>Federal Highway Administration</td>
<td>SP&amp;R</td>
<td>(FHWA) State Planning &amp; Research</td>
</tr>
<tr>
<td>GF</td>
<td>General Fund (State of Alaska)</td>
<td>STIP</td>
<td>Statewide Transportation Improvement Program</td>
</tr>
<tr>
<td>LTAP</td>
<td>Local Technology Assistance Program</td>
<td>STP</td>
<td>(FHWA) Surface Transportation Program</td>
</tr>
<tr>
<td>M&amp;O</td>
<td>Maintenance &amp; Operations</td>
<td>TRB</td>
<td>Transportation Research Board</td>
</tr>
<tr>
<td>MSU</td>
<td>Montana State University</td>
<td>UAA</td>
<td>University of Alaska Anchorage</td>
</tr>
<tr>
<td>NCHRP</td>
<td>The National Cooperative Highway Research Program</td>
<td>UAF</td>
<td>University of Alaska Fairbanks</td>
</tr>
<tr>
<td>NCSU</td>
<td>North Carolina State University</td>
<td>UofI</td>
<td>University of Idaho</td>
</tr>
<tr>
<td>NHI</td>
<td>National Highway Institute</td>
<td>WTI</td>
<td>Western Transportation Institute</td>
</tr>
</tbody>
</table>
# PROJECTS STARTED IN FFY2017

11 New projects in FFY2017 using SP&R funds, LTAP and State match:

<table>
<thead>
<tr>
<th>Title</th>
<th>FHWA Project #</th>
<th>Category</th>
<th>Federal $</th>
<th>State $</th>
<th>Total $</th>
<th>Project Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology Transfer Program CY2017 (LTAP)</td>
<td>LTAP040</td>
<td>Training &amp; Tech Transfer</td>
<td>270,000</td>
<td>30,000</td>
<td>300,000</td>
<td></td>
</tr>
<tr>
<td>National Highway Institute (NHI) CY2017</td>
<td>2017001</td>
<td>Training &amp; Tech Transfer</td>
<td>350,000</td>
<td>0</td>
<td>350,000</td>
<td></td>
</tr>
<tr>
<td>FFY17/18 Research Administration</td>
<td>HFWHY00075</td>
<td>Admin &amp; Policy</td>
<td>380,000</td>
<td>95,000</td>
<td>475,000</td>
<td></td>
</tr>
<tr>
<td>Deployment FFY16/18</td>
<td>4000164</td>
<td>Training &amp; Tech Transfer</td>
<td>80,000</td>
<td>20,000</td>
<td>100,000</td>
<td></td>
</tr>
<tr>
<td>Examination of the Variability in Grout Cube Specimen Test Results</td>
<td>4000173</td>
<td>Bridges &amp; Structures</td>
<td>80,000</td>
<td>20,000</td>
<td>100,000</td>
<td></td>
</tr>
<tr>
<td>Pre-stressed Losses in Decked Bulb Tee Girders</td>
<td>4000178</td>
<td>Bridges &amp; Structures</td>
<td>280,000</td>
<td>70,000</td>
<td>350,000</td>
<td></td>
</tr>
<tr>
<td>NHS Innovative Pavement Design Research for Pavement Management System</td>
<td>4000174</td>
<td>Materials</td>
<td>120,000</td>
<td>30,000</td>
<td>150,000</td>
<td></td>
</tr>
<tr>
<td>High Abrasion-Resistant and Long-Lasting Concrete</td>
<td>4000177</td>
<td>Materials</td>
<td>56,000</td>
<td>14,000</td>
<td>70,000</td>
<td></td>
</tr>
<tr>
<td>Laboratory and Field Evaluation of Modified Asphalt Binder in Alaskan Pavements</td>
<td>4000176</td>
<td>Materials</td>
<td>68,000</td>
<td>7,000</td>
<td>75,000</td>
<td></td>
</tr>
<tr>
<td>Survey and Economic Analysis of Pavement Impacts from Studded Tire Use in Alaska</td>
<td>4000175</td>
<td>Traffic &amp; Safety</td>
<td>60,000</td>
<td>15,000</td>
<td>75,000</td>
<td></td>
</tr>
<tr>
<td>Safety Evaluation of Off-Highway Vehicle Use in Alaska</td>
<td>4000180</td>
<td>Traffic &amp; Safety</td>
<td>83,200</td>
<td>20,800</td>
<td>104,000</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2,174,000</td>
<td></td>
</tr>
</tbody>
</table>
6 Pooled Funded projects in FFY2017 using 100% Federal SP&R Funds (no State funds):

<table>
<thead>
<tr>
<th>Title</th>
<th>FHWA Project #</th>
<th>Category</th>
<th>Total Current Project Funding (100% federal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhancement to the Intelligent Construction Data Management System (Veta) and Implementation</td>
<td>TPF-5(334)</td>
<td>ITS</td>
<td>$10,000</td>
</tr>
<tr>
<td>Roadside Safety Research for MASH Implementation.</td>
<td>TPF-5(343)</td>
<td>Safety</td>
<td>$25,000</td>
</tr>
<tr>
<td>Clear Roads II</td>
<td>TPF-5(353)</td>
<td>Traffic &amp; Safety</td>
<td>$15,000</td>
</tr>
<tr>
<td>Wildlife Vehicle Collision Reduction and Habitat Connectivity</td>
<td>TPF-5(358)</td>
<td>Environmental</td>
<td>$20,000</td>
</tr>
<tr>
<td>NCHRP Dues ALASKA</td>
<td>TPF-5(298)</td>
<td>National Dues</td>
<td>$351,999</td>
</tr>
<tr>
<td>TRB Core Program Services for a Highway RD&amp;T Program – Federal FY 2017/TRB FY 2018</td>
<td>TPF-5(360)</td>
<td>National Dues</td>
<td>$113,124</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td></td>
<td><strong>$535,123</strong></td>
</tr>
<tr>
<td><strong>Minus Dues</strong></td>
<td></td>
<td></td>
<td><strong>$465,123</strong></td>
</tr>
<tr>
<td><strong>Pooled Fund Research Only</strong></td>
<td></td>
<td></td>
<td><strong>$70,000</strong></td>
</tr>
</tbody>
</table>

4 Projects Started Before FFY2017 with Funding Increases in FFY 2017:

<table>
<thead>
<tr>
<th>Title</th>
<th>FHWA Project #</th>
<th>Category</th>
<th>Federal $</th>
<th>State $</th>
<th>Total $ Project Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underwater Pile Driving Noise Study Phase 11</td>
<td>4000(135)</td>
<td>Environmental</td>
<td>72,000</td>
<td>18,000</td>
<td>90,000</td>
</tr>
<tr>
<td>Seismic Load Path Effects in RC Bridge Columns</td>
<td>4000(134)</td>
<td>Bridges&amp; Structures</td>
<td>12,000</td>
<td>3,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Optimizing Highway Patrol Investment Levels</td>
<td>4000(132)</td>
<td>Traffic&amp; Safety</td>
<td>80,000</td>
<td>20,000</td>
<td>100,000</td>
</tr>
<tr>
<td>Developing Guidelines for 2 D Model review and acceptance</td>
<td>4000(153)</td>
<td>Hydraulics</td>
<td>24,000</td>
<td>6,000</td>
<td>30,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>$145,000</strong></td>
</tr>
</tbody>
</table>
# ACTIVE PROJECTS STARTED PRIOR TO FFY2017 INCREASES

11 Active projects started in FFY2016 using SP&R funds:

<table>
<thead>
<tr>
<th>Title</th>
<th>FHWA Project #</th>
<th>Category</th>
<th>Federal $</th>
<th>State $</th>
<th>Total $ Project Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology Transfer Program CY2016 (LTAP)</td>
<td>LTAP039</td>
<td>Training &amp; Tech Transfer</td>
<td>270,000</td>
<td>30,000</td>
<td>300,000</td>
</tr>
<tr>
<td>National Highway Institute (NHI) CY2016</td>
<td>2016001</td>
<td>Training &amp; Tech Transfer</td>
<td>350,000</td>
<td>0</td>
<td>350,000</td>
</tr>
<tr>
<td>Pile Length Determination at Unknown Bridge Foundations</td>
<td>000S875</td>
<td>Bridges &amp; Structures</td>
<td>80,000</td>
<td>20,000</td>
<td>100,000</td>
</tr>
<tr>
<td>High Friction Surface Treatment (HFST) Material Monitoring-Experimental Feature</td>
<td>000S882</td>
<td>Materials</td>
<td>124,000</td>
<td>31,000</td>
<td>155,000</td>
</tr>
<tr>
<td>Durability of Grouted Shear Stud Connections at Low Temperatures</td>
<td>4000162</td>
<td>Bridges &amp; Structures</td>
<td>201,600</td>
<td>50,400</td>
<td>252,000</td>
</tr>
<tr>
<td>Transverse Seismic Design of Bridges with Pre-Cast Deck/Girder Elements</td>
<td>4000161</td>
<td>Bridges &amp; Structures</td>
<td>201,600</td>
<td>50,400</td>
<td>252,000</td>
</tr>
<tr>
<td>Deployment FFY16/18</td>
<td>4000164</td>
<td>Training &amp; Tech Transfer</td>
<td>80,000</td>
<td>20,000</td>
<td>100,000</td>
</tr>
<tr>
<td>Steel Fiber Rubberized Concrete Material Monitoring Experimental Feature</td>
<td>4000165</td>
<td>Materials</td>
<td>36,000</td>
<td>9,000</td>
<td>45,000</td>
</tr>
<tr>
<td>AASHTO MASH Compliant Two-Tube Metal Bridge Rail</td>
<td>4000169</td>
<td>Bridges &amp; Structures</td>
<td>465,600</td>
<td>66,400</td>
<td>532,000*</td>
</tr>
<tr>
<td>Catastrophic Icefall Hazard Assessment, Avoidance Procedures, and Mitigation Strategies Phase 2</td>
<td>4000168</td>
<td>Maintenance</td>
<td>128,000</td>
<td>32,000</td>
<td>160,000</td>
</tr>
<tr>
<td>Bald Eagle Nesting During Construction Research</td>
<td>4000167</td>
<td>Environmental</td>
<td>144,000</td>
<td>36,000</td>
<td>180,000</td>
</tr>
</tbody>
</table>

*$200,000 Participation from South Dakota DOT
5 Active projects started in FFY2015 using SP&R funds:

<table>
<thead>
<tr>
<th>Title</th>
<th>DOT&amp;PF Project #</th>
<th>Category</th>
<th>Federal $</th>
<th>State $</th>
<th>Total Current Project Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency and Potential Severity of Red Light Running in Anchorage2</td>
<td>76293</td>
<td>Safety</td>
<td>$96,000</td>
<td>$24,000</td>
<td>$120,000</td>
</tr>
<tr>
<td>Geotechnical Asset Management Thru Thermal Modeling-Dalton Hwy</td>
<td>64230</td>
<td>Geotechnical</td>
<td>$100,400</td>
<td>$25,100</td>
<td>$125,500</td>
</tr>
<tr>
<td>Dust Control Product Mix Design &amp; Quality</td>
<td>76307</td>
<td>Materials &amp; Construction</td>
<td>$115,200</td>
<td>$28,800</td>
<td>$144,000</td>
</tr>
<tr>
<td>Use of Steel Fiber Reinforced Rubberized Concrete in Cold Regions</td>
<td>76319</td>
<td>Materials &amp; Construction</td>
<td>$72,000</td>
<td>$18,000</td>
<td>$90,000</td>
</tr>
<tr>
<td>Developing Guidelines for 2-Dimensional Model Review</td>
<td>76289</td>
<td>Hydraulics &amp; Hydrology</td>
<td>$48,000</td>
<td>$12,000</td>
<td>$60,000</td>
</tr>
</tbody>
</table>

7 Active research projects started in FFY2014:

<table>
<thead>
<tr>
<th>Title</th>
<th>T2 Project #</th>
<th>DOT&amp;PF Project #</th>
<th>Category</th>
<th>Total Current Project Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Feature Spray Applied MMA Bridge Deck Waterproofing Membrane</td>
<td>T2-14-06</td>
<td>64317</td>
<td>Bridges &amp; Structures</td>
<td>$29,000</td>
</tr>
<tr>
<td>Experimental Feature Wavetronic Radar Detection through Experimental Features</td>
<td>T2-14-07</td>
<td>64321</td>
<td>Safety &amp; Traffic</td>
<td>$35,000</td>
</tr>
<tr>
<td>Seismic Load Path Effects in RC Bridge Columns</td>
<td>T2-14-09</td>
<td>64203</td>
<td>Bridges &amp; Structures</td>
<td>$365,000</td>
</tr>
<tr>
<td>Geotechnical Asset Management Thermal Modeling</td>
<td>T2-14-11</td>
<td>64230</td>
<td>Geotechnical &amp; Foundations</td>
<td>$145,000</td>
</tr>
<tr>
<td>Modeling Passing Lane Behavior on Two Lane Highways</td>
<td>T2-14-16</td>
<td>83980</td>
<td>Safety &amp; Traffic</td>
<td>$340,000</td>
</tr>
<tr>
<td>Seismic Repair of Reinforced Concrete Bridge Substructures</td>
<td>T2-14-17</td>
<td>83974</td>
<td>Bridges &amp; Structures</td>
<td>$240,000 +40,000</td>
</tr>
<tr>
<td>AASHTOWare Investigation</td>
<td>T2-14-18</td>
<td>83988</td>
<td>Administration &amp; Policy</td>
<td>$350,000</td>
</tr>
</tbody>
</table>
### 6 Active projects started in FFY2013 using SP&R funds:

<table>
<thead>
<tr>
<th>Title</th>
<th>DOT&amp;PF Project #</th>
<th>Category</th>
<th>Total Current Project Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid Technology Transfer</td>
<td>T2-13-06</td>
<td>Technology Transfer Training</td>
<td>$190,000 (State)+ $185,000 (State)</td>
</tr>
<tr>
<td>Unstable Slope Management - Phase II</td>
<td>T2-13-08</td>
<td>Geotechnical and Foundations</td>
<td>$1,700,000 (STIP)</td>
</tr>
<tr>
<td>Experimental Feature Tencati Wicking Fabric Design</td>
<td>T2-13-10</td>
<td>Materials &amp; Construction</td>
<td>$30,000 (SP&amp;R)</td>
</tr>
<tr>
<td>Optimizing Highway Patrol Investment Levels</td>
<td>T2-13-16</td>
<td>Safety &amp; Traffic</td>
<td>$270,000 (SP&amp;R)</td>
</tr>
<tr>
<td>Geotechnical Asset Management - Stage II</td>
<td>T2-13-18</td>
<td>Geotechnical and Foundations</td>
<td>$80,000 STIP</td>
</tr>
<tr>
<td>Experimental Feature: Polyester Concrete For Approach Slabs</td>
<td>T2-13-19</td>
<td>Materials &amp; Construction</td>
<td>$51,000 (SP&amp;R)</td>
</tr>
</tbody>
</table>

### 2 Active research projects started FFY2010 - FFY2012:

<table>
<thead>
<tr>
<th>Title</th>
<th>DOT&amp;PF Project #</th>
<th>Category</th>
<th>Total Current Project Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geotechnical Asset Management Program</td>
<td>T2-12-21</td>
<td>Geotechnical &amp; Foundations</td>
<td>$1,933,055 (STIP)</td>
</tr>
<tr>
<td>Phase II: Development of an Unstable Slope Management Program Research</td>
<td>T2-10-04</td>
<td>Geotechnical &amp; Foundations</td>
<td>$600,000 (STIP)</td>
</tr>
</tbody>
</table>
## PROJECTS COMPLETED IN FFY2017 - PENDING FINANCIAL CLOSURE

14 Projects completed in FFY2017:

<table>
<thead>
<tr>
<th>Title</th>
<th>DOT&amp;PF Project #</th>
<th>Category</th>
<th>Total Project Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underwater Pile Driving Noise Study</td>
<td>Z642360000</td>
<td>Environmental</td>
<td>$321,379.05</td>
</tr>
<tr>
<td>Pile Extension Pier Pushover Software</td>
<td>Z762870000</td>
<td>Bridges &amp; Structures</td>
<td>$72,000</td>
</tr>
<tr>
<td>Paperless NEPA (canceled in 2017)</td>
<td>HFHWY00007</td>
<td>Environmental</td>
<td>$17,641.52</td>
</tr>
<tr>
<td>Reinforced Concrete Filled Pipe Piles in Soils</td>
<td>Z627250000</td>
<td>Bridges &amp; Structures</td>
<td>$164,896.13</td>
</tr>
<tr>
<td>Characterization of AK Hot Mix Asphalt Containing Reclaimed Asphalt Pavement</td>
<td>Z642340000</td>
<td>Materials</td>
<td>$155,000</td>
</tr>
<tr>
<td>Field Evaluation of Precut Thermal Cracks</td>
<td>HFHWY00004</td>
<td>Materials</td>
<td>$72,000</td>
</tr>
<tr>
<td>Value of Depressed Medians on Divided Highways in Alaska</td>
<td>Z630390000</td>
<td>Traffic and Safety</td>
<td>$150,000</td>
</tr>
<tr>
<td>Evaluate Presawn Transverse Thermal Cracks</td>
<td>Z630310000</td>
<td>Materials</td>
<td>$57,748.82</td>
</tr>
<tr>
<td>Improving Quality</td>
<td>Z605410000</td>
<td>Administration</td>
<td>$40,0000</td>
</tr>
<tr>
<td>Plastic Strain Limits for Reinforced Concrete</td>
<td>Z608550000</td>
<td>Materials</td>
<td>$303,718.43</td>
</tr>
<tr>
<td>RWIS Power Sources-Phase 2</td>
<td>HFHWY00006</td>
<td>Administration</td>
<td>$52,354.37</td>
</tr>
<tr>
<td>Catastrophic Icefall Hazard Assessment-Literature Review</td>
<td>Z763170000</td>
<td>Maintenance</td>
<td>$50,000</td>
</tr>
<tr>
<td>Wicking Fabric Design Specification</td>
<td>Z630410000</td>
<td>Materials &amp; Construction</td>
<td>$125,000</td>
</tr>
<tr>
<td>Maintenance Decision Support System (MDSS)</td>
<td>T2-12-1380839</td>
<td>Maintenance &amp; Operations</td>
<td>$225,000 (SP&amp;R) +26,585 (State)</td>
</tr>
</tbody>
</table>
FFY17 Project
ADMINISTRATION & POLICY

PREDICTIVE PAVEMENT MODELING
Principal Investigator: APTech, Inc.
Funding: $60,000
Project Manager: Carolyn Morehouse, P.E.
Estimated Completion: December 31, 2018

This project also includes hiring APTech to develop and calibrate performance prediction models for statewide pavement management that consider Alaska conditions and pavement/treatment types.

Benefits to State: The updated model will allow for improvement in predictive capability of pavement conditions on state roads.

83988 AASHTOWARE INVESTIGATION
Principal Investigator:
Funding: $350,000 SP&R
Project Manager: Carolyn Morehouse, P.E.
Completed December 2017

AASHTOWare Preconstruction is a software package designed for transportation agencies. The software allows for automating processes during the planning, design and construction of a project. This project will test and evaluate AASHTOWare modules to determine if DOT&PF should implement statewide. Investigation will use project information from each region to evaluate pros and cons for a transition to AASHTOWare from current systems.

Benefits to the State: DOT&PF can reduce data entry time by connecting systems for reporting. Data can be entered once during the life of a project and used in different modules. AASHTOWare has been used in other states to connect to IRIS (DOT&PF Financial software) and it can replace a current database.
BRIDGES & STRUCTURES

T2-13-11 REINFORCED CONCRETE FILLED PIPES IN SOILS
Principal Investigator: Billy Connor, P.E. & Dr. Mervyn J. Kowalsky (NCSU, UAF & AUTC)
Funding: $330,000 (SP&R)
Project Manager: Janelle White
Completed December 2016
Final Report Published July 2017
http://www.dot.state.ak.us/stwddes/research/assets/pdf/4000-127.pdf

The use of reinforced concrete filled steel pipe piles is common in Alaska and is gaining acceptance across the nation. It is often a preferred support system for bridges as these piles provide good seismic performance and can be driven rather than drilled, resulting in reduced construction cost and environmental impacts. This project supplements the T2-08-02 Plastic Strain Limits by conducting large scale testing of reinforced concrete filled pipe piles in soil media and structural analysis. The project will evaluate the impact of relative soil-pile stiffness on pipe pile strain limits, plastic hinge length and deformation characteristics.

Benefits to the State: This research will provide experimental validation of proposed models for concrete filled steel tubes forming pipe-soil systems, allowing bridge engineers in Alaska and nationwide improved confidence in the structural analysis and use of these cost effective bridge support systems.

T2-14-06 EXPERIMENTAL FEATURE: SPRAY APPLIED MMA BRIDGE DECK WATERPROOFING MEMBRANE
Principal Investigator: Richard Pratt, P.E., Chief Bridge Engineer, Statewide
Funding: $29,000 (SP&R)
Project Manager: Carolyn Morehouse, P.E.
Completed December 2017

This experimental feature evaluates spray applied methyl methacrylate (MMA) waterproofing membrane on the new bridge deck of the Phelan Creek Bridge under the Richardson Highway MP 201 Phelan Creek Bridge Replacement project. The post construction report submitted to FHWA in Dec 2014 evaluated bid cost, constructability, and effectiveness of the MMA membrane system compared to the currently used mastic asphalt membrane.

The MMA system provides a seamless membrane that readily accommodates variations in surface profile. It can be applied with temperatures as low as 32°F. The resins do not react with moisture. Consequently, it can be applied as long as the surface is “surface dry” and above the dew point. The system is applied in two contrasting color coded coats, which reduces flaws and improves quality control. The system features rapid installation. It is cured and load resistant within 1 hour. The MMA system has been successfully incorporated on many bridge decks around the world. Many locations have similar conditions and climates as Alaska. The durability of the system is further evidenced through its use on railway bridges where the ballast directly bears on the MMA membrane without failure.

Benefits to the State: If the MMA membrane performs as planned, it could save millions in traffic control costs and impacts to the traveling public on future bridge deck projects due to its shortened cure time, even when compared to the higher unit cost for the
membrane. It also has potential to significantly save on bridge life cycle costs if it provides better deck coverage and longer lasting waterproofing than current methods.

**T2-14-09 SEISMIC LOAD PATH EFFECTS IN RC BRIDGE COLUMNS**
Principal Investigator: Billy Connor, P.E., Dr. Mervyn J. Kowalsky & Dr. James M Nau (NCSU, UAF & AUTC)
Funding: $365,000 (SP&R)
Project Manager: Janelle White
Completed May 2017

The project studies the impact of multi-directional loading which could lead to adjustments in unidirectional strain limits proposed for seismic design on reinforced concrete bridge columns. The project includes a literature research, load path testing and analysis, model calibration and investigation of load path effects of wall piers.

**Benefits to the State:**
Revisions to wall pier design for the existing model. The research will account for out of plane displacement which can be used to determine minimum wall pier thickness requirements for given in plane and out of plane deformation demands.

**T2-14-17 SEISMIC REPAIR OF REINFORCED CONCRETE BRIDGE SUBSTRUCTURES**
Principal Investigator: Rudolf Seracino, Mervyn Kowalsky, and James M. Nau
Funding: $280,000 (SP&R)
Project Manager: Janelle White
Estimated Completion: May 2018

The objective of this research is to develop a rapidly deployable post-earthquake repair technique for typical Alaska bridges that could provide extensive economic benefits by saving bridges that would otherwise be demolished after an earthquake.

Bridge column repair has been studied for some time with several established techniques for repair for shear and confinement critical columns. However, there is little data available on repair of columns that are otherwise designed to modern standards. Similarly, there is little data available on developing an understanding of when repair is truly needed, and when repair is truly no longer feasible.
Benefits to the State: The bridge design engineer will have access to pre-qualified repair techniques that could be rapidly deployed according to the damage level observed after an earthquake. The cost savings to the State of Alaska will be significant when bridges that would otherwise need to be replaced can be repaired. Further, the indirect economic and social impacts of not rapidly returning a bridge to service following an extreme event will be many times greater than the direct replacement cost, particularly considering the lack of redundancy in the Alaskan road transportation network.

76287 PILE EXTENSION PIER PUSHOVER SOFTWARE
Principal Investigator: Michael Scott (Oregon State University)
Funding: $72,000 (SP&R)
Project Manager: Janelle White
Completed December 2016

The objective of this research is to revise version 1.0 of the pushover software. Version 1.0 of the software requires a number of fixes, enhancements, and increased functionality in order to expand its range of application, increase productivity and reduce design and construction costs.

Benefits to the State: Increased functionality for design activities. By combining previously disparate analysis components in a single package, the software has proven, since its adoption by AKDOT&PF bridge engineers, to save time and money in the analysis and design of Cast In Shell Steel bridge bents.

000S875 PILE LENGTH DETERMINATION AT UNKNOWN BRIDGE FOUNDATIONS
Principal Investigator: Murthy Guddati (NC State University)
Funding: $261,230
Project Manager: Janelle White
Estimated Completion: September 2018

The objective of this research is to develop and implement a non-destructive testing technique to determine the length of piles supporting bridge substructures.

Benefits to the State: The field testing would lead to EDAR replacing the expensive borehole testing to estimate the length of the piles leading AKDOT&PF to reduce current operational costs and perhaps facilitate more frequent testing leading to improved safety and reduced maintenance costs.
4000(162) DURABILITY OF GROUTED SHEAR STUD CONNECTIONS AT LOW TEMPERATURES

Principal Investigator: James Nau (NC State University)
Funding: $252,000 (SP&R)
Project Manager: Janelle White
Estimated Completion: May 2019

The objective of this work is to optimize grout properties through material testing. The project will use weathered and un-weathered full size connection specimens to develop recommendations to maximize the durability of the shear stud connection. The behavior of full-scale connection subassemblies in as-built un-weathered condition and in weathered condition following freeze-thaw cycles characteristic of expected field conditions will be evaluated at temperatures as low as -40°C.

Benefits to the State: Bridge design engineers will gain knowledge on the durability of the grouted shear stud connection with regard to freeze-thaw resistance, and an understanding of connection performance at low temperatures typical in Alaska. The performance under simulated field conditions is essential in developing confidence in the design of this new alternate connection.

Figure 1: Grouted Shear Stud Connection

4000(161) TRANSVERSE SEISMIC DESIGN OF BRIDGES WITH PIER CAST DECK GIRDER

Principal Investigator: Mervyn Kowalsky (NC State University)
Funding: $252,000 (SP&R)
Project Manager: Janelle White
Estimated Completion: May 2019

The objective of this research is to develop guidelines for the modeling and design of the longitudinal joints between precast girders under transverse seismic response. A bridge structure utilizing these connections was recently damaged in Alaska by an ice-flow event. The impact of the ice resulted in approximately one foot of lateral displacement of one column, while other columns did not deform. As a consequence, the bridge superstructure was deformed laterally between bents which resulted in minor damage to the grouted shear connections. Examination of this real life case study will be helpful in the development of the research plan for this project.

Benefits to the State: Bridge design engineers will be able to confidently predict lateral displacement profiles for these bridges, which is an essential component of the AASHTO seismic design and DDBD process. The existing practice of the AKDOT will either be verified by full scale data, or revised to ensure that damage in the deck does not occur under moderate to large earthquakes. Correlation of experimental data obtained as part of this research to field case studies of previously damaged bridges will also be possible.
4000(169) TWO-TUBE METAL BRIDGE RAIL
COMPLIANCE TESTING
Principal Investigator: William Williams (Texas A&M Transportation Institute)
Funding: $532,000 (SP&R)
Project Manager: Janelle White
Estimated Completion: December 2019

The objective is to test the current bridge rail to the "new" AASHTO MASH level 4 requirements so that the Department may continue to use the current two-tube railing on FHWA funded projects. The safety of a TL-4 will increase as a result of compliance with the new AASHTO standard. The FHWA requires that crash-tested bridge rail be used on the NHS. Without an approved TL-4 bridge rail, the Department may risk losing federal funds.

Benefits to the State: The new railing will be incorporated into new bridge designs as soon as it has been accepted by the FHWA. New standard drawings will be prepared and the Alaska Bridge and Structures Manual will be updated accordingly.
4000(173) EXAMINATION OF THE VARIABILITY IN GROUT CUBE SPECIMEN TESTING RESULTS
Principal Investigator: Jenny Liu (UAF)
Funding: $100,000 (SP&R)
Project Manager: Janelle White
Estimated Completion: December 2018

High Strength, non-shrink grout has been used to fill the longitudinal keyway joints between girders during the precast, pre-stressed decked bulb tee girder type bridges. The goal is to research the reason for variability in test results by reviewing different materials, the sampling method, quantity of water, and experience of lab technicians and construction field staff.

Benefits to the State: Develop a construction specification or lab testing method which will produce consistent testing results for grout in keyway joints on bridges.

4000(178) PRE-STRESSED LOSSES IN DECKED BULB TEE GIRDERS
Principal Investigator: Il-Sang Ahn (UAF)
Funding: $350,000 (SP&R)
Project Manager: Janelle White
Estimated Completion: December 2023

The AASHTO LRFD Bridge Design Specifications provides guidance for the calculation of pre-stress losses in precast concrete beams. Changes in 2007, of the AASHTO code results in inconsistent pre-stress loss predictions for decked bulb-tee girders such as those used by the Department. The simplified procedure for pre-stress loss prediction results in much less loss than that predicted from the previous versions of the AASHTO codes and are less than that resulting from the "refined" method of the current code.

The objective of this project is to conduct a five year study of decked bulb-tee girders could be used to measure the pre-stress losses of actual girders. The results may be used for designing future girders allowing for fewer girder lines and longer bridge spans.

Benefits to the State: Better design predictions for long-term pre-stress losses may result in longer spans, fewer girder lines or shallower girders. Saving one girder line would save the Department about $75k per span (~5% of bridge cost) for the typical highway bridge. More accurate per-stress loss values would result in more accurate girder strength predictions.

Each bridge would be designed using this refined method for the calculation of pre-stress losses in precast concrete beams. The research findings would be included in the Department’s Bridge and Structures Manual and possible in the AASHTO LRFD Bridge Design Specifications.
ENVIRONMENTAL

T2-14-13 UNDERWATER PILE DRIVING NOISE STUDY
Principal Investigator: Melanie Austin, JASCO Inc.
Funding: $65,000 FFY 2014 & $130,000 FFY 2015 & $90,000 FFY 2017
Manager: Janelle White
Champion: Taylor Horne
Completed December 2016

Pile installation activities can exceed levels deemed harmful to species protected under the Endangered Species Act and the Marine Mammal Protection Act. For FFY14 conduct literature review, develop an auditory test pile program approved by NOAA, NMFS and DOT&PF. For FFY15 conduct acoustic monitoring for pile installation to determine the hazard area for behavioral harassment. Date gathered from the auditory program will provide scientifically based observations pertinent to DOT&PF pile installation projects.

Benefits to the State: Coordination of DOT&PF, NOAA and NMFS to collect actual underwater pile driving and background noise levels which are applicable to current and future marine mammal protection requirements

76283 PAPERLESS NEPA
Champion: Taylor Horne, Statewide Environmental Manager
Principle Investigator: TBD
Funding: $120,000 (SP&R)
Project Manager: Carolyn Morehouse, P.E.
Project Cancelled: 2017

Many states have comprehensive environmental approval and tracking systems. Alaska DOT has no system for tracking, securing and archiving environmental approvals and documents. The research objective is to coordinate with stakeholders and perform a literature search recommendation report for a paperless NEPA system. The system would be implemented by using a STIP project.

Benefits to the State: Reduction in time needed to complete environmental documents during project development. Reduce the potential for errors. Secure document approval hierarchy. Produce smart forms to reduce time and effort developing environmental documents.
4000(167) BALD EAGLE NESTING DURING CONSTRUCTION
Champion: Taylor Horne, Statewide Environmental Manager
Principle Investigator: Jordan Muir, USFWS
Funding: $180,000 (SP&R)
Project Manager: Janelle White
Estimated Completion: Spring 2019

Collect field data on DOT&PF projects. Compare nest occupancy, productivity, and fidelity between impact and control nests. If significantly different, determine at what distance impacts occur. If not significantly different, USFWS may recommend DOT&PF not obtain Bald Eagle permits for certain activities.

Benefits to the State: Discuss and implement policy modifications with USFWS based on findings. Use information to determine if USFWS Eagle Take Permit is recommended for DOT&PF road maintenance activities. If permit is recommended, use information to determine at what distance permit needed.
GEOTECHNICAL

T2-10-04 PHASE II: DEVELOPMENT OF AN UNSTABLE SLOPE MANAGEMENT PROGRAM
Principal Investigator: Lawrence Pierson, Landslide Technology, Inc., & Peter Hardcastle, R&M Consultants, Inc.
Funding: $1,150,000 (STP) total funding $4,000,000
Project Manager: Barry Benko, C.P.G.
Completed July 2017 (see project continuation T2-13-08 Phase II)

This project built upon a preceding project (FHWA-AK-RD-09-04, Unstable Slope Management Program, Phase I) that established structural guidelines for the USMP in DOT&PF. This (Phase II) project initiated inventory population efforts, identified a “Top 100” list of unstable slopes, and created a webpage portal to the data.

By the end of FFY17, the USMP inventory comprised 1,003 rock slopes and 633 unstable soil slopes and embankments.

Research and development for a fully functional, transportation asset management-compatible USMP is being completed under a companion project (R,D&T2 Project No. T2-13-08). Under that project, investigators are refining the ratings system and incorporating asset management features into the USMP.

Benefits to the State:
The USMP, now part of the overall Geotechnical Asset Management Program, focuses on one class of geotechnical assets: soil and rock slopes. With this knowledge base represented in the USMP, the Department can move ahead to monitoring slope condition over time and managing these assets on a lifecycle cost basis to optimize performance in support of our transportation system.

T2-12-21 GEOTECHNICAL ASSET MANAGEMENT
Principal Investigator: Various
Funding: $1,933,055 Research out of $2,700,000 (STIP)
Project Manager: Barry Benko, C.P.G.
Estimated Completion: December 2018

This effort will create Geotechnical Asset Management (GAM) program architecture, research and development measures, methods for predicting future performance of assets, analysis methods, create inventory and condition survey for assets, monitor performance of assets over time and provide decision-making support to agency management on maintenance, repair and rehabilitation alternatives.

Significant progress was made in FFY17, including:

- Updated GAM Plan, prepared as an adjunct to the Department’s Transportation Asset Management (TAM) plan.
• Completion of draft-final report detailing the technical components of the GAM program development research.

• Researchers determined estimated risk exposure with respect to safety, mobility, and direct maintenance from the individual geotechnical assets captured in existing asset inventories. Risk was expressed in dollar cost basis and with level of risk grade.

Using the Geotechnical Event Tracker tool (see sister-project, T2-13-08), researchers aggregated risk scores to determine risk on a per-one-mile NHS highway segment basis.

Reported results of a GAM pilot study for Tongass Highway, which established a Corridor Health Index, incorporating geotechnical and core assets into a single metric describing transportation corridor performance;

Consolidated and migrated geotechnical asset data to the Department’s Transportation GIS (TGIS) ArcGIS Online (AGOL) website, enabling common access to data viewing features and for data management by authorized stewards.

Benefits to the State: The GAM program is an important element of the overall implementation of best TAM practices for DOT&PF. The GAM program defines the role that geotechnical assets take in both primary roles like rock slopes, and in supporting roles such as embankments supporting pavement structure. The research for this project will take the Department many steps forward in understanding the characteristics of geotechnical assets as to the length of service life, condition during service, appropriate service levels and performance measures, incorporation of risk management, determination of life cycle costs, identification of critical data elements required, and development of the means to store and use the data in support of a decision-support framework for managing our transportation system.

T2-13-08 UNSTABLE SLOPE MANAGEMENT – STAGE II
Principal Investigator: Darren Beckstrand, Landslide Technology
Funding: $1,700,000 (STIP)
Project Manager: Barry Benko, C.P.G.
Estimated Completion: December 2018

This effort will complete the development of the Unstable Slope Management Program (USMP), initiated in 2009 and featuring a baseline inventory effort that commenced in 2010 (see R, D&T2 Project T2-10-04.

Under the scope for this research project, investigators will finish incorporating asset management elements into the USMP in the areas of service life prediction, establishing service levels and performance measures and initiating development of analysis tools to determine life cycle cost of slopes in support of decision-making for transportation corridors. This research project is closely paired with associated projects T2-12-21 Geotechnical Asset Management and T2-13-18 Geotechnical Asset Management - Stage II.

Investigators finished the architecture of the USMP database system in FFY2017, and used it to establish the master database for management of all the asset classes targeted in the Alaska DOT&PF GAM Program: rock slopes, unstable soil slopes & embankments, retaining walls, and material sites.

Benefits to the State: Unstable slopes along the State’s routes present critical risks to safety and mobility in the transportation system. This research effort will enable the realization of sound asset management, resulting in the most economic allocation of resources to unstable slopes.
T2-13-18 GEOTECHNICAL ASSET MANAGEMENT - STAGE II
Principal Investigator: Various
Funding: $80,000, (Other STIP project)
Project Manager: Barry Benko, C.P.G
Estimated Completion: December 2018

The project supports four research contracts for developing Geotechnical Asset Management (GAM) concepts for Alaska DOT&PF: GAM plan development; a risk management framework for GAM; service life, service level, performance measures and condition indices; and life cycle cost analysis for geotechnical assets.

FHWA is participating in funding these GAM related research projects through an Infrastructure Research & Technology (IRT) program allocation to research and develop Geotechnical Asset Management principles and practices for eventual deployment in Alaska and other state or local government transportation agencies. An important aspect of the project is that the findings and deliverables are extended to an audience beyond DOT&PF.

Deliverables will include:
- An executive level summary,
- Individual graphics suitable for use in FHWA publications and pamphlets,
- PowerPoint presentation slides,

Other deliverables that may be developed during the course of the work and the execution of the project’s Communication Plan.

In FFY17, the Department and researchers produced an informational video that showcases the results from the four GAM research contracts. The remainder of the final reports from the principal investigators (to be released in FFY18) will supplement the numerous deliverable products created during the course of GAM research conducted in Alaska.

Benefits to the State:
This project brings the participation of FHWA – including funding and a technical advisory role – to development of GAM for the State.

64230 GEOTECHNICAL ASSET MANAGEMENT THROUGH THERMAL MODELING - DALTON HWY - EXPERIMENTAL FEATURE
Principal Investigator: Steve McGroarty and Jeff Currey
Funding: $145,000
Manager: Anna Bosin, P.E.
Estimated Completion: December 2019

Road embankments constructed on permafrost must be thermally stable in order to minimize long-term maintenance costs. Past thermal modeling studies have determined that the most critical model input parameters are soil surface temperatures. Typically, site-specific soil temperatures are not available and are estimated using air temperature records and a modifying n-factor. Material type, vegetation cover, and snow cover all affect n-factors and need additional site-specific studies under Alaskan conditions. Leveraging an upcoming reconstruction project on the Dalton Hwy MP 0-9, before and after temperature data will be collected with thermal monitoring instrumentation to study performance of Air Convection Embankment. Will also determine site-specific thermal model n-factors for future thermal modeling, and develop relationship between snow depth and winter n-factors. Results will be used to improve thermal models.

Benefits to the State:
This project will help refine thermal modeling to design future embankments constructed, or existing embankments reconstructed, on permafrost to facilitate design of the least expensive thermally stable embankment. This will reduce maintenance.
4000172 EXPERIMENTAL FEATURE: CONSTRUCTION OF AN AIR CONVECTION EMBANKMENT (ACE) WITH NON-ANGULAR ACE FILL

Principal Investigator: Steve McGroarty, NR Materials Engineer
Funding: $33,000 (SP&R)
DOT&PF Project Manager: Dave Waldo
Estimated Completion: March 31, 2020

This experimental feature will test the constructability and effectiveness of an ACE with non-angular ACE fill (rounded or cobbles). Using the non-angular material, we will test both a traditional ACE cross section and an insulated conventional embankment with ACE shoulder treatment on a section of the Alaska Highway MP 1354-1364, known to have differential settlement due to permafrost thaw.

Benefits to the State: ACE embankments have historically been constructed with angular riprap like material, which is not available along many Alaskan road segments. Use of non-angular fill could significantly reduce the cost of ACE applications.
HYDROLOGY AND HYDRAULICS

HFHWY00009 PILE LENGTH DETERMINATION AT UNKNOWN BRIDGE FOUNDATIONS
Principal Investigator: Murthy Guddati (North Carolina State University)
Funding: $220,000 (NHPP)
Project Manager: Janelle White
Estimated Completion: October 2018

NCSU has recently developed laboratory methods of instrumentation, testing and data processing for estimating pile lengths (named Effective Dispersion Analysis of Reflections – EDAR). It is anticipated that EDAR will first be adapted and calibrated at a sample group of control bridges with known pile lengths. Based on these results, EDAR will be applied to bridges with unknown pile lengths. The primary focus of the current project will be concrete-filled steel pipe piles.

Benefits to the State: The field testing could lead to replacement of borehole testing for pile length estimating. There is potential for reduced operational costs and perhaps more frequent testing, leading to improved safety and reduced maintenance costs.

76289 DEVELOPING GUIDELINES FOR 2-DIMENSIONAL MODEL REVIEW AND ACCEPTANCE
Principal Investigator: Horacio Toniolo, (UAF)
Funding: $60,000 (SP&R)
Project Manager: Janelle White
Estimated Completion: January 2018

The research team from UAF will use SRH-2D, RAS-2D and IRIC to model two projects. The primary numerical models will be used in two different morphological settings: moderate and significant contractions. Results between the various models will be compared. Guidelines for preferred model will be prepared.

Benefits to the State: Guidelines will be prepared which will define what is “acceptable” or “comparable” when reviewing 2-D modeling results.
MAINTENANCE

76317 CATASTROPHIC ICEFALL HAZARD ASSESSMENT
(LITERATURE REVIEW ONLY)
Principal Investigator: David Scapato (Scarptec Inc.)
Funding: $50,000 (SP&R)
Project Manager: Anna Bosin, P.E.
Completed February 2016

This is the first phase for Scarptec to review DOT&PF historical icefall documentation from events at 7 locations within DOT&PF highway ROW and complete a literature review of national and international practices and products. Lastly, the Contractor will conduct a web-based meeting to the Department staff that describes the project, results, and recommendations for implementation.

Benefits to the State: Icefall on roads can be dangerous to drivers. There is currently no national recommendations for ice fall mitigation near highways. More guidance is needed for the DOT&PF to effectively react when ice forms on slopes adjacent to the traveling public. This is the first stage to combine all the research to date to determine if further research is this area is needed.

CATASTROPHIC ICEFALL HAZARD ASSESSMENT,
AVOIDANCE PROCEDURES, AND MITIGATION
STRATEGIES PHASE 2
Principal Investigator: David Scapato (Scarptec Inc.)
Funding: $160,000 (SP&R)
Project Manager: Anna Bosin, P.E.
Estimated Completion: June 2019

This is the second phase that follows the above Literature Review phase. Scarptec Inc. will visit the 7 predetermined sites to evaluate geometry, risk, contributing factors, and mitigation strategies. Mitigation strategies will include M&O activities as well as short and long-term permanent solutions with planning level estimates for the Department to consider for each site.

Benefits to the State: A tiered approach to mitigation for 7 sites along NHS routes in Alaska that need specialized ice fall mitigation strategies which take into account risk to the traveling public.

Photo: Seward Highway MP 113.2 crash caused by icefall April 6th, 2012.
T2-12-13 MAINTENANCE DECISION SUPPORT SYSTEM (MDSS)
Principal Investigator: Billy Connor, P.E. (UAF & AUTC) in Partnership with the National Center for Atmospheric Research (NCAR)
Funding: $225,000 (Planning SP&R) + 26,585 FFY15 (State)
Project Manager: Ocie Adams
Completed 2015 (Closure paperwork sent November 2016)

The project evaluated and refined a software system to help roadway maintenance personnel optimize their snow and ice control operations. The system analyzed historical weather conditions and forecast data and prescribed optimal strategies for plowing snow and applying anti-icing treatments to roadways based on weather and pavement condition observation and forecasts. The DOT&PF’s Fairbanks maintenance district piloted the technology along roadway corridors with various weather microclimates in an effort to fine tune the predictive capabilities of the software and data collection system.

Benefits to the State: By improving weather and roadway condition assessment during winter storms and then optimizing snow and ice control efforts, DOT&PF and local transportation agencies should be able to provide safer road conditions while minimizing costs. Additionally, minimizing the use of deicing and anti-icing agents promises environmental benefits and reduced impacts to roadway users.
Deliverable: web-based only Fairbanks pilot. This project has already saved Maintenance money. A larger project is being funded out of HSIP for the Kenai area.
MATERIALS & CONSTRUCTION

76291 FIELD EVALUATION OF PRECUT TRANSVERSE THERMAL CRACKS
Principal Investigator: Juanyu “Jenny” Liu (UAF – AUTC)
Funding: $72,000 SP&R
DOT&PF Project Manager: Anna Bosin, P.E.
Completed August 2017

This project continues the research on road-width thermal cracks. This project includes monitoring three locations for 2 years.

This research project will monitor and evaluate three locations: 1) Phillips Field Road, Fairbanks; 2) Richardson Highway MP 343-344; and 3) Parks Highway MP 245-252. Contract includes literature review, recording field observations and maps of cracks, cost analysis of the M&O savings for precutting compared with traditional thermal crack M&O, recommendations, and final report with web presentation to staff. Peers from Montana State University and Washington State University will provide support and review.

Benefits to the State: The DOT&PF spends a significant amount of money each year crack-sealing pavements. This project will recommend a presawn crack design and details so Alaska saves pavement preservation dollars each year and contribute to better performance of Alaska’s valuable pavement assets.


2-13-14 WICKING FABRIC DESIGN SPECIFICATION
Principal Investigator: Dr. Xiong Zhang (UAF & AUTC)
Funding: $125,000 (SP&R)
DOT&PF Project Manager: Dave Waldo
Completed May 2016
http://www.dot.state.ak.us/stwddes/research/assets/pdf/4000-130.pdf

H2Ri wicking fabric is a new geotextile manufactured by TenCate Geosynthetics. Which is the same product used in T2-13-10. It contains both a high modulus polypropylene yarn for reinforcement and a nylon wicking yarn which can absorb and transport water for drainage under unsaturated conditions. Therefore the fabric can serve as reinforcement it has the potential to dehydrate the subgrade and base course and consequently improve the performance of pavements.

Summary of conclusions:
- Soil can be dried to around optimum moisture content.
- Silt content appears to reduce the effectiveness slightly
• H2Ri can wick moisture at least 73 ft. No reason to expect considerably more.
• Soil can be dried to around optimum moisture content. Silt content appears to reduce the effectiveness slightly.
• H2Ri not effective in soils containing high organic clays
• Overlap splices not as efficient as desired.
• Dissolved minerals retard rewetting of fibers
• Specifications including wicking tests suggested by Tencate appear appropriate
• H2Ri will move water back into the soil if the exposed ends are placed in water.
• Localized damage to wicking fiber appears not to be a problem.

**Benefits to the State:** Use of this fabric may allow use of low quality, locally available materials to build roads and airport. It has the potential to bring significant savings in construction, maintenance and repair cost for roads in wet, swampy areas and areas of thawing permafrost. When properly used, it has proven to have the ability to wicking the water out of the pavement structure and eliminate the frost have and subsequent thaw weakening.

**T2-13-10 EXPERIMENTAL FEATURE: TENCATE MIRAFI® H2RI WICKING FABRIC**

Principal Investigator: Jeff Currey, NR Materials Engineer
Funding: $30,000 (SP&R)
DOT&PF Project Manager: Dave Waldo
Completed December 2016
http://www.dot.state.ak.us/stwddes/research/assets/pdf/t21310.pdf

The freezing of moisture in the ground can cause heaving. Under roads this can cause damage that leads to increased maintenance costs. DOT&PF partnered with AUTC to research a possible solution. The use of the building fabric, Mirafi Nylon Wicking Fabric, could help prevent saturation of the ground that causes frost heave damage. The fabric is an impermeable much like a rain jacket. When installed properly it keeps much of the moisture out of the material that the road is built on. No moisture, no problem.

The fabric was installed by the Department’s Contractor on the Dalton Highway MP 197-206 Reconstruction project. A post construction report was submitted to FHWA in 2013. Year one was not monitored. Year two results showed the fabric successfully removed water from the embankment. The test section once a maintenance issue is now functioning well.

**Benefits to the State:** The use of construction fabric in building roads in Alaska should extend road life, especially in areas particularly susceptible to frost heaving.

[Photo: Wicking fabric installation at Dalton Highway MP 110.5 Beaver Slide. Photo credit AUTC.]

**76319 –USE OF STEEL FIBER REINFORCED RUBBERIZED CONCRETE IN COLD REGIONS**

Principal Investigator: Osama Abaza
Funding: $90,000 (SP&R)
Project Manager: Anna Bosin
Completed December 2017
Studded tires can cause significant rutting issues in Alaska on asphalt pavement. This project will attempt to use a concrete mix design to preserve the road surface. This project will create material samples and test for rutting resistance, comprehensive strength, friction and freeze/thaw properties. Once the sample has passed these lab tests a test panel will be added to a Central Region Design project for field testing. The Principle investigator will monitor the panel installation and make recommendations for future monitoring.

Benefits to the State: Potential cost savings if this mix design lasts longer than conventional asphalt mix designs.

STEEL FIBER RUBBERIZED CONCRETE MATERIAL MONITORING-EXPERIMENTAL FEATURE
Principal Investigator: Osama Abaza
Funding: $45,000 (SP&R)
Project Manager: Anna Bosin
Estimated Completion: December 2021

Photo: (Steel Fibers and crumb rubber)

This project is the follow on experimental feature monitoring plan to the above mentioned project. The test panel was installed on Abbott Road in Anchorage, AK during summer construction of 2017. The 120’ long section is instrumented to collect stress/strain readings and temperature year-round. Road friction data will be collected annually as well as compared with DOT&PF’s annual Pavement Management System data (Ridability, Rut Depth, and Cracking) to evaluate the overall performance of the slab. The Principle investigator will make recommendations for future implementation based on the 3-year post construction study.

Benefits to the State: Potential cost savings if this mix design lasts longer than conventional asphalt mix designs.

T2-13-19 EXPERIMENTAL FEATURE: POLYESTER CONCRETE APPROACH SLABS
Principal Investigator: Leslie Daugherty, P.E., Bridge Engineer, Statewide
Funding: $51,000 (SP&R)
Project Manager: Carolyn Morehouse, P.E.
Completed December 2017

This experimental feature evaluates polyester concrete for approach slabs on the Parks Highway MP 239-252 Rehabilitation construction project. A post construction report was submitted to FHWA in Dec 2014 that compared structural performance of various types of slabs to include polyester concrete, Class-A concrete, and paved asphalt approaches without a slab. The polyester concrete is high-strength, rapid-setting, and water impermeable. The concrete provides protection from chlorides and other contaminants to help protect the steel reinforcement giving longer life. Superior abrasion and skid resistance allow for a safe and durable driving surface. With a rapid curing time, traffic was allowed to drive on the slab in about 4 hours which was beneficial on the Parks Highway during the middle of summer. Polyester concrete does not crack or delaminate even through extreme freeze/thaw cycles and has a higher compressive strength than conventional concrete. Year on monitoring is complete and a report was submitted to FHWA in Nov 2015.

Polyester concrete use in Alaska has been limited to a bridge deck overlay on the Susitna River Bridge. However, numerous states, such California, Washington, and Nevada, have used this system for bridge deck repairs and overlay projects on major highways. In
states like Washington and California where traffic volume is high and this product has been used for over a decade, results show the concrete is performing as expected with no major signs of wear.

Benefits to the State:
This research will determine if polyester concrete may be a practical, cost saving alternative to traditional concrete methods for approach slab and deck construction. If the polyester concrete performs as planned, it could save millions in traffic control costs and impacts to the traveling public on future bridge retrofit and deck projects.

T2-14-12 CHARACTERIZATION OF ALASKA HOT-MIX ASPHALT CONTAINING RECLAIMED ASPHALT PAVEMENT (RAP)
Principal Investigator: Dr. Jenny Liu
Funding: $155,000
Manager: Anna Bosin, P.E.
Completed June 2016

DOT&PF highway construction specification now allows up to 15% RAP in the wearing course of a roadway pavement, and up to 25% RAP in the binder or base course layer(s). The materials engineering properties of these HMA mixes specific to Alaskan materials containing RAP will be properly characterized for use in pavement design software. This project will prepare representative laboratory-mixed specimens using local materials and conduct laboratory performance test to determine the engineering properties of the mixtures. It will update the database of material properties in the “AK Flexible Pavement Design Manual” for use in the pavement design software, and a potential revision of the HMA specification to increase the limit of RAP in HMA.

Benefits to the State: A better understanding of RAP’s engineering properties will improve pavement design and produce more reliable value engineering and life-cycle cost analysis. Increased use of RAP material will decrease construction costs, preserve virgin aggregate resources, and divert materials from the waste stream.

76307 -DUST CONTROL PRODUCT MIX DESIGN
Principal Investigator: David L. Barnes, Ph.D., P.E.
Funding: $144,000 (SP&R)
Project Manager: Dave Waldo
Estimated Completion: December 2018

This project will develop a test method which will aid in the selection of palliatives, establish the mix design for site specific use of dust palliatives and liquid stabilizers, determine surface material requirements for their use, and recommend qualified product lists. Also, establish guidance for designers and a dust palliative construction specification laying out requirements and/or guidance for the various palliatives on the market, the mix design procedure, and other supportive information to support test protocols and design criteria.

Dust columns are located in Northern and Central Region. Split samples have been successfully tested and shown corresponding results. The test method is nearing completion. Beta training videos are available and the specification is drafted. Some further testing is necessary to insure method follows videos and is repeatable.
Designing, constructing and maintaining asphalt roadways is a challenge anywhere, but is especially difficult considering the conditions in Alaska. With long winters and studded tire usage for about two thirds of every year, rutting is a major safety issue. Permafrost conditions can create extreme roughness that is usually beyond typical maintenance remedies to correct. Temperature extremes cause widespread cracking, stretching maintenance resources. The search for innovative methods of design and maintenance continues and requires a method to collect data for analysis and determination of what works best for the least cost.

Benefits to the State: A uniform lab and field testing procedure, as well as mix design procedures, will allow for widespread use of an assortment of dust palliatives and soil stabilizers for multiple transportation applications. This will ultimately reduce life cycle costs of our road system, improve road and runway safety, and improve quality of life and health for residents.

This project provides for innovative design, construction and maintenance data to be collected and placed into the pavement management system database and tracked for performance. With over 15-years of detailed distress data already available and new data collected yearly, the new pavement management system can track and model innovations such as hard aggregate, warm mix asphalt, and use of rubber and polymers in mix designs.

Benefits to State: Selecting mix designs that resist rutting and cracking, and rejecting those that fail will create safer and longer lasting roadways and allow funding previously needed for frequent rehabilitation and maintenance activities to be used elsewhere.

HIGH ABRASION-RESISTANT AND LONG-LASTING CONCRETE
Principal Investigator: Dr. Jenny Liu, UAF
Funding: $112,290 CESTiCC, $60,000 Third Party, $70,000 DOT&PF (SP&R)
Project Manager: Anna Bosin, P.E.
Estimated Completion: December 2020

Rutting in high traffic intersections is a common pavement distress in Anchorage, AK and other high traffic northern states. Studded tire wear abrades the pavement surface in the wheel path and contributes to millions of dollars of road maintenance costs. In Alaska, concreted has had limited implementation in intersections due to previous costs and inflexibility for cold region freeze/thaw cycles. However new additives already in production appear to be more durable and cost-effective. The key is to identify a mix design that can compete as cost-effective with flexible pavement design to reduce the cycles of replacement in intersections where rutting continues to be a problem.

This project includes a Literature Review and survey, Laboratory testing and mix design development, design and specification writing.
for a test section to be installed, life-cycle cost analysis, and recommendations.

**Benefits to the State:** Provide the lowest life-cycle cost paving option for rutted intersections.

**LABORATORY AND FIELD EVALUATION OF MODIFIED ASPHALT BINDER IN ALASKAN PAVEMENTS**

Principal Investigator: Dr. Jenny Liu, UAF
Funding: $85,000 DOT&PF (SP&R), $179,846 CESTiCC, $20,000 Third Party
Project Manager: Jim Horn, P.E.
Estimated Completion: December 2020

Modified Asphalt Binders have been used for some time in DOT&PF pavement design, but mix designs have used varying quantities throughout the state. Enough time has passed post construction to evaluate the effectiveness of those mix designs for the regions and identify any changes that could be more consistently applied for certain conditions. This project will conduct both lab and field evaluation of the performance (i.e. rutting, and low temperature cracking) of various modified asphalt binder and mixes to quantify the performance benefits of the materials.

**Benefits to the State:** This project will aide designers in selecting pavement mix design parameters for certain project conditions for optimal pavement lifecycle performance to minimize maintenance costs.

**HIGH FRICTION SURFACE TREATMENT MONITORING-EXPERIMENTAL FEATURE**

Principal Investigator: DOT&PF
Funding: $155,000 DOT&PF (SP&R)
Project Manager: Anna Bosin, P.E.
Estimated Completion: December 2019

During summer 2016, DOT&PF Central Region constructed 28 High Friction Surface Treatment installations throughout the region as safety countermeasures for various crash contributing factors. The project was funded by the Highway Safety Improvement Program, which will evaluate the material’s safety improvement once there is 3 years of post-construction crash data to compare with the prior 3 years of crash data. The product is relatively new to Alaska and there is limited published data on the wear under harsh northern climates. This project was approved for experimental feature monitoring to evaluate the material wearing over 3 years post-construction. Friction data will be collected for each site annually and the Pavement Management System characteristics will be evaluated (i.e. rut depth, cracking, ridability). The department will then make recommendations on future installation.

**Benefits to the State:**
HFST is approximately $30/SY installed. The Department needs to determine its life-cycle costs separately from the crash benefit to determine the best recommendations for future installation as an effective crash countermeasure.
SAFETY & TRAFFIC

T2-13-15 VALUE OF DEPRESSED MEDIANS ON DIVIDED HIGHWAYS IN ALASKA
Principal Investigator: Dr. Ghulam Bahm (UAA – AUTC)
Funding: $150,000 SP&R
Project Manager: Anna Bosin, P.E.
Completed May 2017

The population of Alaska is steadily increasing, especially in the city of Anchorage. As a result, traffic volume is higher, and the demand to add lanes to existing highways in order to relieve congestion is increasing. In Alaska, an expressway or freeway is a high-speed (≥50 mph), multilane, divided highway with partial access control. These divided highways typically utilize wide medians.

During the Alaskan winter, where snow accumulates in medians from October to April, drivers can lose control of their vehicles in slippery road conditions. Wide medians with heavy snow serve as a refuge to absorb the impact of a crash. However, in order to provide additional through lanes, cater to the needs of higher traffic, and keep traffic congestion to a minimum, these wide medians could be replaced with narrow ones which may reduce the median’s ability to function as a safety cushion. These depressed wide medians also act as snow storage areas, allowing snow to be plowed on both sides of the road. Eliminating these medians will reduce the available snow storage space and require plowing all of the snow to the right, increasing the snow load to one side of the road.

The main objective of this project is to compare the benefits of depressed wide medians (vee-ditch) with other types of medians (narrow medians and no snow storage) in terms of safety, operations and maintenance. This will include analysis of historical crash data along with snow storage observations and vehicle tracking observations after snowfall to evaluate non-crash reported run off the road type incidents. The researchers will compare known high speed urban arterials with narrow medians (no vee-ditches) and no snow storage and additional lanes to improve traffic flow.

Benefits to the State: The results of this research will be valuable in helping Alaska’s highway designers to determining appropriate engineering alternatives to deal with increasing traffic volumes in Anchorage and the surround areas.

Photo: The research team is compiling photos from car mounted GPS equipped video cameras to analyze run off the road events. Photo taken on the Glenn Highway near Eklutna in December 2013 by Scott Thomas, DOT&PF Traffic and Safety Engineer.
T2-13-16 OPTIMIZING HIGHWAY PATROL INVESTMENT LEVELS

Principal Investigator: Billy Connor (UAF – AUTC)
Funding: $100,000 SP&R
Project Manager: Anna Bosin, P.E.
Estimated Completion: December 2018

State crash data shows fatal crashes occur more often on rural high speed highways, and higher volume highways. The highest density of severe crashes occurs within the State’s four designated Safety Corridors. There is a need to optimize highway enforcement performance levels (and in turn optimize the State’s funding) so that highway travel is no longer a leading risk.

How can enforcement be directly linked to road safety when officers provide multiple duties away from roads? Reductions in citations or arrests could falsely indicate staffing reductions are possible when they may actually be needed to continue the trend.

This research project will focus on documenting the benefits of enforcement presence and the costs associated with enforcement presence on some of the higher risk road segments in Alaska. The study is expected to include the use of GPS based automated tracking technologies to quantify the presence of enforcement patrol vehicles throughout the Central Region and portions of the Northern Region connected roadway system. The study will develop a benefit/cost relationship for fatal and major injury crashes compared to the cost of the enforcement hours and produce a sensitivity analysis to optimize the cost vs benefit of reduced crashes.

Benefits to the State: Annual audits of the Traffic Safety Corridors emphasize the importance of increased enforcement to combat aggressive driving, DUls and speeding, but do not quantify how much additional enforcement is needed. This project’s approach of tracking officer presence will provide a full picture of enforcement impacts on our highways.

Data collected could be presented graphically, comparing "hours" of police presence by year against crash experience by severity, citation, or aggressive/impairs violations. Having this information organized could reveal unrecognized correlations and permit a new level of decision-making to be applied to safety and enforcement efforts on State Highways, helping to optimize the State’s investment in law enforcement. This project was extended an additional 18 months to collect a total of 3 years of data.

Photo: This map shows an analysis of fatal crash locations on a Parks Highway Safety Corridor, Graphic from the Alaska Highway Safety Office website http://www.dot.alaska.gov/stwdplng/hwysafety/safety_corridors.shtml
**T2-14-07 EXPERIMENTAL FEATURE: WAVETRONIX® RADAR TRAFFIC DETECTION**

Principal Investigator: Sarah Schacher, P.E., Northern Region
Preconstruction Funding: $35,000 (SP&R)
Project Manager: Carolyn Morehouse
Estimated Completion: December 2018

This experimental feature will test the effectiveness and constructability of Wavetronix® Radar on two major arterials (Johansen Expressway and Airport Way) in Fairbanks as compared to traditional in-ground loops and video detection currently employed at signalized intersections in Fairbanks.

Wavetronix® radar is a radar based detection system for intersections that can effectively detect vehicles in weather conditions that can cause problems for typical video based detection systems. Because the detection uses radar and not light, like video detection, environmental factors like low light, shadows, and heavy ice fog don’t have as pronounced of an effect on the system capability to detect vehicles.

The product was successfully installed at eight intersections on Airport Way in Fairbanks. Post Construction report was submitted to FHWA Jan 2015. To date there is a noticeable decrease in false calls due to environmental factors and the accuracy of detection has improved for all intersections, translating to improved cycle times in all directions.

Devices were installed in the last four intersections on the Johansen Expressway in the fall of 2015, and will be monitored over the winter.

**Benefits to the State:** If the Wavetronix® system proves to be effective, it could replace in-ground loops and video detection for signal systems in Alaska. This is expected to provide significant maintenance cost savings and reduced impacts to the traveling public due to malfunction during commonly occurring weather.

**T2-14-16 MODELING PASSING LANE BEHAVIOR ON 2-LANE HIGHWAYS**

This project will create design models to predict the passing risk level at a variety of configuration on two lane rural highways in Alaska. The following are two projects support the modeling effort.

**ANALYZING DRIVER BEHAVIOR IN PASSING ZONES WITH DIFFERENTIAL SPEED LIMITS**

Principal Investigator: Rob Lang, Ph.D., Osama Abaza, Ph.D., (Co-PI)-UAA
Funding: $165,000 (SP&R)
Project Manager: Anna Bosin, P.E.
Estimated Completion: February 2018

This project follows a previous DOT&PF funded driver simulation study that evaluated signing and striping scenarios in rural passing lanes to recommend optimal passing maneuvers. Implementation of that study’s results followed by including a new signing configuration of differential speed limits for the passing lanes between MP 59-66 of the Seward Highway in the DOT&PF Central Region paving project during summer, 2015. This study will conduct a before/after analysis to
examine the real-world effects of differential speed limits on traffic flow characteristics, along with drivers’ perception of this change.

**Benefits to the State:** Recommendations and a final report could help define optimal characteristics for passing lane efficiency.

**MODELING PASSING ZONE BEHAVIOR AND SIGHT DISTANCE ON RURAL TWO-LANE HIGHWAYS**
Principal Investigator: Billy Connor P.E. (UAF – AUTC), Nathan Belz, Ph.D. (UAF – AUTC)
Funding: $110,000 (SP&R), $83,849 PacTrans
Project Manager: Anna Bosin, P.E.
Estimated Completion: February 2018

UAF researchers will conduct a driver-simulator-based study in partnership with University of Idaho to investigate passing maneuvers in two-lane rural highways under different geometric configurations and for different driver groups and for different vehicle types. Passing decisions will be modeled using data that are collected using scenarios modeled after segments of interest along the Seward Highway, Parks Highway, and Sterling Highway. Participants in the study will complete a driving simulator session and a questionnaire to further document the characteristics of their behavior.

**Benefits to the State:** The outcome of the project will provide the DOT&PF’s with models that can be used to predict the risk level on two-lane rural highway and may contribute to modifications to striping specifications and improved maintenance operations for rural highways in Alaska.

**76293 FREQUENCY & POTENTIAL SEVERITY OF RED LIGHT RUNNING IN ANCHORAGE, PHASE II**
Principal Investigator: Dr. Osama Abaza, UAA
Funding: $80,000 (SP&R)
Project Manager: Anna Bosin, P.E.
Estimated Completion: January 2018

This study will evaluate six intersections in Anchorage, AK during fall and winter conditions. Will collect signal timing data and video at each location for analysis. Analysis includes the severity of the red light running infractions as well as recommendations for countermeasures.

**Photo:** Diagram showing the field of view of each camera in the system

**Benefits to the State:** Reduce the number of crashes that occur relative to red light running and assist local enforcement with red light running identifiers.
4000175 - SURVEY AND ECONOMIC ANALYSIS OF PAVEMENT IMPACTS FROM STUDDED TIRE USE IN ALASKA

Principal Investigator: Osama A. Abaza, C.Eng, Ph.D
Funding: $75,000 (SP&R)
Project Manager: Dave Waldo
Estimated Completion: December 2020

The study will examine the extent of usage of studded tires in the state, and alternative solutions which might be cost effective for the Alaskan roadway network.

The researcher will collect comprehensive studded tire tax revenue data and compare to the pavement costs associated solely with studded tire usage.

Also, survey the current tire options in Alaska and their published testing results, to draw conclusion for ratios of studded tires/non-studded tires currently on the road system.

Benefits to the State: Quantifying the financial impacts of studded tire wear will help the state make an informed decision on their continued use.

SAFETY EVALUATION OF OFF-HIGHWAY VEHICLE USE IN ALASKA
Principal Investigator: Dr. Nathan Belz, UAF
Funding: $104,000 DOT&PF (SP&R), $60,000 Pactrans
Project Manager: Anna Bosin, P.E.
Estimated Completion: December 2020

Traffic volumes and crash history of off-highway Vehicles (e.g. snow machine, all-terrain vehicles, dog sleds) are not well documented in rural Alaska. Yet trauma registry data indicate that users are being hurt on roadways. This indicates a lack of reporting of crashes in many parts of the state, but by how much? How much OHV traffic is on rural roadways? How much conflict between users is happening? The DOT&PF needs to learn more about the use before resources and countermeasures can be implemented to address the injuries.

This project will review multiple sources for injury data as well as conduct traffic counts in several remote communities to determine the use of OHVs.

Benefit to the State: Safety funds are data driven and must adhere to reported crash data and traffic data to direct projects and programs. This project will create a baseline of data for evaluation as well as make recommendations to improve data collection and crash reporting in rural Alaska. The interim results will help the Department address OHVs in the Strategic Highway Safety Plan update being conducted in 2018.
SUPPLEMENTAL RESEARCH & TECHNOLOGY PROGRAM

T2-14-04 RAPID RESEARCH RESPONSE FFY 2014-16
Principal Investigator: Various
Project Manager: Carolyn Morehouse, P.E.
Completion Date: Varies by project but all must be completed by December 2016

The Rapid Research Response program supports a portfolio of research projects, technology transfer, and workforce development activities to rapidly respond to opportunities to improve practices, procedures, and processes within the department as they arise and on an ad hoc basis. The account is funded through a revolving line item in the section’s work program entitled “Rapid Research Response”.

The research response project funds the following types of research activities:
• Generally short term, high priority research projects to provide or address urgently needed information and or problems.
• Augment existing research projects to take advantage of unforeseen opportunities where timing is of the essence. During the course of a research project, the researchers may identify a previously unforeseen opportunity or method worthy of exploration to enhance the research and provide more useful results. The “Rapid Response” funds allow timely response to such opportunities.
• Research coordination and advisory services with national, university, and other state research programs.
• Unique and timely research and technology demonstration efforts.
• Policy-related research to address the immediate needs of decision-makers.

Benefits to the State: DOT&PF can conduct research in a short period of time with quick results for immediate implementation.

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Project #</th>
<th>Amount</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eagle Monitoring</td>
<td>64006</td>
<td>$33,000</td>
<td>Janelle White</td>
</tr>
<tr>
<td>Anti-Skid Inlaid MMA Test Deck</td>
<td>HFHWY00075</td>
<td>$37,110</td>
<td>Anna Bosin</td>
</tr>
</tbody>
</table>

Sarah Salvucci from CR Traffic taking British Pendulum Unit Friction readings for test deck
EXPERIMENTAL FEATURES

Principal Investigator: Varies
Funding: $145,000 (Federal)
Project Manager: Carolyn Morehouse, P.E.
Completion Date: varies

The Federal Highway Administration (FHWA) Experimental Features Program encourages innovation in state highway design and construction. Experimental features incorporated into highway projects under this program are eligible for federal funding participation, which is normally limited to more proven and conventional items. Another advantage of the Program is that if an experimental feature fails for any reason, the FHWA will pay for its repair or replacement. Experimental features are often physical objects, however, can also be a new technique for using conventional materials. The RD&T2 Program maintains an account to support evaluations of Experimental Features for a time period requested by FHWA, normally 3-5 years.

Benefits to the State: DOT&PF can conduct research and evaluate experimental features during construction and monitor results.

<table>
<thead>
<tr>
<th>Project Title (construction project)</th>
<th>DOT&amp;PF Project #</th>
<th>Amount</th>
<th>Estimated Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spray Applied MMA Bridge Deck Waterproofing (Rich MP 201 Phelan Cr Bridge)</td>
<td>64317</td>
<td>$29,000</td>
<td>Dec 31, 2018</td>
</tr>
<tr>
<td>Wavetronix Radar Detection (Johansen &amp; Airport Way PM)</td>
<td>64321</td>
<td>$35,000</td>
<td>Dec 31, 2018</td>
</tr>
<tr>
<td>Polyester Concrete Approach Slabs (Parks MP 239-252)</td>
<td>T2-13-19</td>
<td>$51,000</td>
<td>Dec 31, 2017</td>
</tr>
<tr>
<td>Steel Fiber Reinforced Rubberized Concrete</td>
<td>4000165</td>
<td>$45,000</td>
<td>December 31, 2019</td>
</tr>
<tr>
<td>High Friction Surface Treatment Monitoring</td>
<td>000S882</td>
<td>$155,000</td>
<td>December 31, 2019</td>
</tr>
<tr>
<td>Geotechnical Asset Management Through Thermal Modeling-Dalton Hwy</td>
<td>64230</td>
<td>$125,500</td>
<td>December 31, 2019</td>
</tr>
<tr>
<td>Construction of an air convection embankment with non-angular ACE</td>
<td>4000172</td>
<td>$33,000</td>
<td>March 31, 2020</td>
</tr>
</tbody>
</table>

Wavetronix Radar Detection
POOLED FUND STUDIES
Principal Investigator: Varies
Funding: $70,000 (SP&R)
Completion Date: varies

Benefits to the State: When significant or widespread interest is shown in solving transportation-related problems, research, planning, and technology transfer activities may be jointly funded by several federal, state, regional, and local transportation agencies, academic institutions, foundations, or private firms as a pooled fund study. The FHWA Transportation Pooled Fund (TPF) Program allows federal, state, and local agencies and other organizations to combine resources to support transportation research studies.

DOT&PF participates in the following pooled fund studies. Details and status are available at http://www.pooledfund.org/.

<table>
<thead>
<tr>
<th>Pooled Fund Project Title</th>
<th>Study ID</th>
<th>Lead Agency</th>
<th>DOT&amp;PF FFY 2015 Funding</th>
<th>Project Website/DOT&amp;PF Technical Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhancement to the Intelligent Construction Data Management System (Veta) and Implementation</td>
<td>TPF-5(334)</td>
<td>Minnesota DOT</td>
<td>$10,000</td>
<td><a href="http://www.pooledfund.org/Details/Study/583">http://www.pooledfund.org/Details/Study/583</a> Rich Giessel</td>
</tr>
<tr>
<td>Wildlife Vehicle Collision Reduction and Habitat Connectivity</td>
<td>TPF-5(358)</td>
<td>Nevada Department of Transportation</td>
<td>$20,000</td>
<td><a href="http://www.pooledfund.org/Details/Study/610">http://www.pooledfund.org/Details/Study/610</a> Jon Knowles</td>
</tr>
</tbody>
</table>
ALASKA TECHNOLOGY TRANSFER

Housed within DOT&PF’s Research Section, Technology Transfer (T2) provides support to federal, state, and local governments and other transportation personnel. We are comprised of three programs, integrated to provide a seamless training and technology transfer service.

CY2016 PROGRAM DASHBOARD
- Total number of training sessions: 188
- Total number of participants: 2249

LOCAL TECHNICAL ASSISTANCE PROGRAM: $300,000
LTAP is a national network of centers funded by FHWA. LTAP’s mission is to foster a safe, efficient, and environmentally sound surface transportation system by improving skills and increasing knowledge of the transportation workforce and decision makers. Each LTAP center adapts its program to address the unique challenges faced by the customers it serves. LTAP’s primary focus:
  - Training events and programs
  - Newsletters and tech briefs
  - Library services.

NATIONAL HIGHWAY INSTITUTE: $350,000
These STP funds provide transportation-related education programs to AK DOT&PF employees to help improve the quality of the state’s highway system through technology transfer to the planning, design, construction, and maintenance personnel working for Alaska’s transportation infrastructure.

T2 HIGHLIGHTS
- Updating Training Management System to include a video content page.
- Results Based Alignment (RBA) added to online modules.
- Working with regions and statewide sections to identify content for alternate delivery and just-in-time learning.
- On-going management/delivery of the ATSSA and Alaska CESCL training programs.