



STEADWIDE

PLANNING AND

RESEARCH

PART 2

SPR2 WORK PROGRAM

FFY 2021

September 2020

(Revised December 2020)

**THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION
BUREAU OF MATERIALS & RESEARCH**

**In cooperation with the
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION**

TABLE OF CONTENTS

FFY 2021 Estimated Budget – SPR2 Funds.....	1
Summary of Pooled-Fund Participation	2
Final Budget of SFY 2020 Revenues and Obligations	3
Revenue from Various Sources since Previous Work Program.....	4
FFY 2020 Estimated Budget - SPR2 Funds	5
Active Projects	6
Research Projects approved in previous Work Programs (active and pending obligation)	
15260G – Implementation of Research and Technology Transfer	7
15261G – AASHTO Technical Service Programs	8
15262G – Research Related Expenses	9
29729 – Statewide Strategic Transit Study Assessment.....	10
26962I – Stormwater Table	11
26962T – Airport Paint Study Implementation Evaluation	12
26962U – Improved Practices for Determining the Infiltration Characteristics of Soils for Design of Stormwater BMPs.....	13
26962V – Using Data Analytics to Forecast Future Bridge Conditions.....	14
26962W – Log Jam Monitoring	15
26962Y – Assessment of Embedded Culvert Low Flow Hydraulics	16
26962Z – Use of Smart Rocks to Improve Rock Slope Design	17
42372A – Optimization of Bead Application for Painted Pavement Markings Maintenance Application	18
42372B – Unmanned Aircraft Systems (UAS) Program Plan	19

Proposed Projects:

42372E – Crushed Gravel for Shoulder Leveling 304.32.....	20
42372F – Use of Drilling Parameters for Enhancing Geotechnical Site Investigations	21
42372G –Advancing Subsurface Investigations Beyond the Borehole	22
42372H – Water Quality Test Site and Public Outreach at the Sutton Rest Area	23
42372I – Wildlife Vehicle Collisions Data Gathering and Best Management Practices	24
42372J – Concrete Slab Jacking	25
42372K – Bus Stops and Passenger Amenities in Public Highway Right-Of-Ways.....	26

Transportation Pooled Fund Projects:

TPF-5 (XXX) – Core Program Services for a Highway RD&T Program – FFY 2020 (TRB FY 2021).....	27
TPF-5 (317) – Evaluation of Low Cost Safety Improvements Pooled Fund Study.....	27
TPF-5 (447) – Traffic Control Device (TCD) Consortium	28
TPF-5 (373) – New England Transportation Consortium	28
TPF-5 (353) – Clear Roads Winter Highway Operations Pooled Fund	29
TPF-5 (389) – Connected Vehicle Pooled Fund Study	29
TPF-5 (470) – Traffic Signal Change and Clearance Interval Pooled Fund Study	30

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
 Bureau of Materials Research
 FFY 2021 SPR2 Work Program
 September 2020

ESTIMATED BUDGET - SPR2 Funds

		Federal \$
Uncommitted funds carried forward from FFY 2020 Work Program (from p. 3)		\$ 533,774.81
SPR2 Apportionment - FFY 2021		\$ 889,778.00
		A \$ 1,423,552.81
Funds programmed for NCHRP, FFY 2021 (22% of SPR2 Apportionment)		\$ 195,751.16
Funds committed to FFY 2021 TPF Projects (from p. 2)		\$ 251,465.00
		B \$ 447,216.16
Funds Available for SPR2 Work Program		C=A-B \$ 976,336.65
<u>Annual Administrative (includes 10% for indirect costs except as noted)</u>		
<u>Research Projects (includes 10% for indirect costs)</u>		
New Projects *	43272A Optimization of Bead Application for Painted Pavement Markings Maintenance Application	\$55,000.00
	43272B Unmanned Aircraft Sustems (UAS) Program Plan	\$165,000.00
	42372E Crushed Gravel for Shoulder Leveling 304.32	\$121,000.00
	42372F** Use of Drilling Parameters for Enhancing Geotechnical Site Investigations	\$175,732.60
	42372G** Subsurface Investigations for the 21st Century - Advancing our practices beyond the borehole	\$187,000.00
	42372H** Water Quality Test Site and Public Outreach at the Sutton Rest Area	\$104,677.10
	42372I** Wildlife Vehicle Collisions Data Gathering and Best Management Practices	\$110,000.00
	42372J Concrete Slab Jacking	\$55,000.00
	42372K** Bus Stops and Passenger Amenities in Public Highway Right-Of-Ways	\$110,000.00
Total - Programmed Funds for SPR2 Work Program		D \$ 1,083,409.70
Grand Total of Programmed Federal Funds (FFY 2021)		E=B+D \$ 1,530,625.86
Difference between Available and Programmed FFY 2021 Funds**		A-E \$ (107,073.05)

Notes:

- * Projects prioritized by the NHDOT RAC on December 2, 2020
- ** Projects will be funded with FFY2021 and FFY2022 apportionments.

Revised 12/29/2020

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
 Bureau of Materials Research
 FFY 2021 SPR2 Work Program
 Summary of Pooled-Fund Participation

TPF No.	TPF Name	Lead Agency	Federal Fiscal Year	
			2020	2021
TPF-5(450)	Core Program Services for a Highway RD&T Program - FFY 2019 (TRB FY 2020)	FHWA	\$ 76,465	\$ -
TPF-5(xxx)	Core Program Services for a Highway RD&T Program - FFY 2020 (TRB FY 2021)	FHWA	\$ -	\$ 76,465
TPF-5(317)	Evaluation of Low-Cost Safety Improvements Pooled-Fund Study	FHWA	\$ 5,000	\$ 5,000
TPF-5(447)	Traffic Control Device (TCD) Consortium	FHWA	\$ 10,000	\$ 10,000
TPF-5(373)	New England Transportation Consortium (NETC VII)	Maine	\$ 130,486	\$ 100,000
TPF-5(353)	Clear Roads Winter Highway Operations Pooled Fund	Minnesota	\$ 25,000	\$ 25,000
TPF-5(389)	Connected Vehicle Pooled Fund Study	Virginia	\$ 25,000	\$ 25,000
TPF-5(470)	Traffic Signal Change and Clearance Interval Pooled Fund Study	FHWA	\$ -	\$ 10,000
Grand Totals			\$ 271,951	\$ 251,465

New TPF

Notes:

* Pooled fund approved by the NHDOT RAC on December 2, 2020

Revised 12/29/2020

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
 Bureau of Materials Research
 FFY 2021 SPR2 Work Program
 September 2020

Final Budget of SFY 2020 Revenue & Obligations

Revenue:	Federal \$
Funds carried forwarded from FFY 2020 Work Program (from p. 5)	\$ 252,671.74
FFY 2020 Apportionment*	\$ 895,414.00
De-obligated Funds from Projects Final Vouched in SFY2020 (from p. 4)	\$ 70,665.07
Funds Returned to NH from Closed-out Pooled Fund Projects (from p. 4)	\$ 30,485.66
	A \$ 1,249,236.47
Pooled-Fund Transfers:	
FFY 2020 NCHRP Contribution	\$ 146,971.00
FFY 2020 TPF Projects (from p. 2)	\$ 271,950.66
	B \$ 418,921.66
Obligated Funds for SPR2 Work Program	
<u>Annual Administrative Projects (includes 10% for indirect costs except as noted)</u>	
15260G Implementation of Research and Technology Transfer	\$132,000.00
15261G AASHTO Engineering Technical Service Programs**	\$128,000.00
15262G Research-Related Expenses	\$33,000.00
<u>Research Projects (includes 10% for indirect costs)</u>	
43272C Asphalt Mix Testing Improvements	\$3,540.00
	C \$ 296,540.00
FFY2020 SPR2 funds carried forward to p. 1 A-(B+C)	\$ 533,774.81

Notes:

- * 0.5% of a State's core Federal aid as defined by current legislation.
- ** AASHTO Technical Service Program costs - No Indirect Costs, No State Match

Revised 12/29/2020

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
 Bureau of Materials Research
 FFY 2021 SPR2 Work Program

Revenue from Various Sources since previous Work Program		Unobligated Federal \$
Final Vouchered Projects in SPR2 Work Program		
15258F	Annual Research Program Development	\$2,525.74
15260F	Implementation of Research and Technology Transfer	\$26,616.51
15262F	Research-Related Expenses	\$23,271.07
26962G	Structural Support for Tidal Energy Conversion at the Memorial Bridge	\$0.00
26962O	Incorporating Impact of Binder Aging on Cracking Performance of Asphalt Mixtures during Design	\$0.00
26962P	Reducing Cracking in New Bridge Curbs	\$4,613.86
26962Q	Iron Oxide Deposits on Highway Construction Projects	\$6,380.00
26962R	Active Transportation Accounting: Developing Metrics for Project Prioritization	\$2,614.67
26962X	LED Snowplow Lights	\$3,445.31
29337	Research Freight Information and Data in NH (formerly approved project 15680U)*	\$ -
42372C	Asphalt Mix Testing Improvements	\$1,197.91
(Available fund carried forward to p. 3)		<u>\$70,665.07</u>
Funds Returned to NH from Closed-out Pooled Fund Projects		
TPF-5(222)	New England Transportation Consortium (NETC VI)	\$30,485.66
(Available fund carried forward to p. 3)		<u>\$30,485.66</u>

Projects Anticipated to be Final Vouchered	
26962I	Stormwater Table
26962T	Airport Paint Study Implementation & Evaluation
29729	Statewide Strategic Transit Assessment Study (formerly approved project 15680T)**

Notes:

* Administered by the Bureau of Planning and Community Assistance

** Administered by the Bureau of Rail and Transit

Revised 12/29/2020

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
 Bureau of Materials Research
 FFY 2020 SPR2 Work Program
 September 2019

ESTIMATED BUDGET - SPR2 Funds

	Federal \$
Uncommitted funds carried forward from FFY 2019 Work Program	\$ 252,671.74
SPR2 Apportionment - FFY 2020	\$ 900,191.00
	A \$ 1,152,862.74
Funds programmed for NCHRP, FFY 2020 (22% of SPR2 Apportionment)	\$ 198,042.02
Funds committed to FFY 2020 TPF Projects	\$ 239,730.00
	B \$ 437,772.02
Funds Available for SPR2 Work Program	C=A-B \$ 715,090.72
<u>Annual Administrative (includes 10% for indirect costs except as noted)</u>	
15260G Implementation of Research and Technology Transfer	\$132,000.00
15261G AASHTO Engineering Technical Service Programs*	\$128,000.00
15262G Research-Related Expenses	\$33,000.00
<u>Research Projects (includes 10% for indirect costs)</u>	
43272A Optimization of Bead Application for Painted Pavement Markings Maintenance Application	\$55,000.00
43272B Unmanned Aircraft Sustems (UAS) Program Plan	\$165,000.00
43272C Asphalt Mix Testing Improvements**	\$3,540.00
Total - Programmed Funds for SPR2 Work Program	D \$ 516,540.00
Grand Total of Programmed Federal Funds (FFY 2020)	E=B+D \$ 954,312.02
Difference between Available and Programmed FFY 2020 Funds	A-E \$ 198,550.72

Notes:

* AASHTO Technical Service Program costs - No Indirect Costs, No State Match

** New Federal \$ Estimate

Revised 05/29/2020

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

Bureau of Materials Research
 FFY 2021 SPR2 Work Program
 September 2020

ACTIVE PROJECTS

Project Number	Administrative & Recurring Projects	FFY Work Program	Federal \$	Expenditures to Date
15260G	Implementation of Research and Technology Transfer	2020-21	\$ 120,000	\$ 26,492.32
15261G	Engineering Technical Service Programs	2020-21	\$ 128,000	\$ 128,000
15262G	Research Related Expenses	2020-21	\$ 30,000	\$ 1,985.96
<u>Research Projects</u>				
29729	Statewide Strategic Transit Assessment Study (formerly programmed as 15680T in FY 2014-15)	2014-15	\$ 120,000.00	\$ 93,557.34
26962I	Stormwater Table	2016	\$ 10,000.00	\$ 5,939.46
26962T*	Airport Paint Study Implementation Evaluation	2018	\$ 44,285.55	\$ 44,285.55
26962U	Improved Practices for Determining the Infiltration Characteristics of Soils for Design of Stormwater BMPs	2019	\$ 112,000.00	\$87,498.62
26962V	Using Data Analytics to Forecast Future Bridge Conditions	2019	\$ 160,000.00	\$45,764.64
26962W	Log Jam Monitoring	2019	\$ 100,000.00	\$44,158.07
26962Y	Assessment of Embedded Culvert Low Flow Hydraulics	2019	\$ 75,000.00	\$23,256.86
26962Z	Use of Smart Rocks to Improve Rock Slope Design	2019	\$ 110,250.00	\$51,893.85

*Request made for Final Voucher

Expenditures Revised 12/29/2020

Implementation of Research and Technology Transfer

Admin-SPR 15260G

Project Description:

This project is intended to provide funds for implementation of promising results emanating from federal, regional, or state research activities. The project also covers training and certification of technicians providing inspection and materials testing on highway and bridge construction projects. Inclusive eligible expenses support the following technology transfer activities: travel expenses when the employee is making a technical presentation on a project included in this (or a previous) Work Program; an employee presenting their experience in implementing new technologies resulting from others' research; or gathering information that will benefit the employee's performance of an NHDOT-sponsored research project. Additionally, Project 15260G covers travel expenses for research and technology purposes such as: workshops, conferences, demonstrations, and committee meetings whose primary function includes monitoring regional or national research and/or developing research needs statements. Activities and training related to developing a culture of innovation and improving organizational readiness for adoption of innovative technologies designed to save money, improve safety, or enhance environmental stewardship, such as award programs recognizing innovative individuals are also covered by this project.

A preliminary budget of \$120,000 has been estimated for the project during the next two fiscal years. The project duration extends past the end of FFY 2021 to allow for closure of project.

Funding Notes:

Includes 10% indirect



Project Details



Title:

Implementation of Research
and Technology Transfer

Project #:

Admin-SPR 15260G

Start Date:

10/1/2019

End Date:

3/31/2022

Estimated Obligated Funds:

\$132,000

Estimated Project Budget:

\$120,000

**NHDOT SPR2 Program
FFY 2020 Proposed Projects**

**AASHTO Engineering Technical Service
Programs**

Admin-SPR 15261G

Project Description:

This item provides funding for Department participation in certain AASHTO Engineering Technical Service Programs (TSP). Participation is limited to those programs that demonstrate a direct and tangible benefit to the Department and is subject to review on an annual basis. The following programs will be supported:

- National Transportation Product Evaluation Program (NTPEP)
- Snow and Ice Cooperative Program (SICOP)
- Transportation System Preservation (TSP2)
- Equipment Management Technical Services Program (EMTSP)
- Load and Resistance Factor Design (LRFD) Bridges and Structures Specification Maintenance

The project duration extends past the end of FFY 2021 to allow for closure of project.

Funding Notes:

Managed by AASHTO for Technical Service Programs - No indirect costs. Authorized for 100% Federal funds by FHWA - no match required.



Project Details



Title:

AASHTO Engineering
Technical Service Programs

Project #:

Admin-SPR 15261G

Start Date:

10/1/2019

End Date:

3/31/2022

Estimated Obligated Funds:

\$128,000

Estimated Project Budget:

\$128,000

**NHDOT SPR2 Program
FFY 2020 Proposed Projects**

Research-Related Expenses

Admin-SPR 15262G

Project Description:

This item is intended to provide funds for quick-turnaround research-related expenses or initial investigation of research needs that arise during the federal fiscal year. Participation in miscellaneous research activities not accounted for elsewhere in the SPR2 Work Program can be charged to this project. If a research project develops from initial investigations, future charges will be applied to new project. Previous initial investigation expenses will remain in project 15262G.

Non project-specific costs related to developing the NHDOT's SPR2 Work Program are included under this item. These costs include off-site research meeting expenses; equipment needed for collection of data and materials for managing the research program, research office supplies, computer software associated with the SPR2 program, and marketing activities.

The project duration extends past the end of FFY 2021 to allow for closure of project.

Funding Notes:

Includes 10% indirect



Project Details



Title:

Research-Related Expenses

Project #:

Admin-SPR 15262G

Start Date:

10/1/2019

End Date:

3/31/2022

Estimated Obligated Funds:

\$33,000

Estimated Project Budget:

\$30,000

NHDOT SPR2 Program
FFY 2014-2015 Proposed Projects

Statewide Strategic Transit Assessment Study

Bureau-SPR 29729 (formerly Statewide-SPR 15680T)

Project Description:

The State of NH has never conducted a comprehensive "Statewide Strategic Transit Assessment Study" and has not conducted an official "Intercity Bus & Intermodal Needs Assessment" since 2003. With limited federal and state dollars and mounting federal consultation and certification requirements, having a third-party Statewide Transit Needs Assessment conducted would assist the Department with long-term planning by assisting with funding projections and would help provide a statewide context and understanding of potential transit expansion priorities and capital/facility needs. Such a study would help the Department meet the Federal requirement under Title 49 U.S.C. 5311(f) to consult with intercity bus providers and ensure their needs are adequately met, which must be demonstrated through an assessment of statewide intercity mobility needs no more than four years before the date of the certification.

This research will assist the Bureau of Rail & Transit by prioritizing future expansion corridors and projects and helping to shape RFPs or CMAQ applications submitted on behalf of the Department. The study will also assist Department staff involved in constructing new intermodal facilities (bus terminals and/or park & ride lots) through a reliable transit-related needs assessment to substantiate or help with prioritization of projects.

The Bureau of Rail and Transit presented this problem statement to the NHDOT Research Advisory Council (RAC) in April 2013.

Managed by Rail & Transit, a final report, NHDOT Statewide Strategic Transit Assessment dated January 31, 2020, has been accepted by NHDOT. For more information, visit www.nh.gov/dot, Bureau of Rail and Transit, Statewide Strategic Transit Assessment Study.

Funding Notes:

Includes 10% indirect.



Project Details



Title:

Statewide Strategic Transit Assessment Study

Project #:

Bureau-SPR 29729

Start Date:

9/21/2016

End Date:

6/30/2020

Estimated Obligated Funds:

\$132,000

Estimated Project Budget:

\$120,000

**NHDOT SPR2 Program
FFY 2016 Proposed Projects**

Stormwater Table

Statewide-SPR 26962I

Project Description:

The Department is committed to fulfill the federally mandated National Pollutant Discharge Elimination System (NPDES) Phase II regulations. One of the requirements under the Small MS4 portion of this program is an education and outreach component that presents best management practices resulting from research in water quality issues and innovations in storm water management. Storm water simulator tables have allowed personnel from various bureaus within the Department to become actively involved. It has also provides a valuable tool in educating Department personnel, contractors and the general public on point and non-point source pollution. The stormwater table incorporates a variety of Department-related activities to increase water quality awareness by Department personnel.

The original stormwater demonstration table was created under Statewide-SPR 13733U. As the stormwater table is showing signs of wear, this research project will repair and update the table to reflect the current understanding of the science. This project will also provide funds to support the associated outreach activities.

Funding Notes:

Includes 10% indirect.



Project Details



Title: Stormwater Table

Project #: Statewide-SPR 26962I

Start Date: 02/04/2016

End Date: 12/31/2020

Estimated Obligated Funds: \$11,000

Estimated Project Budget: \$10,000

NHDOT SPR2 Program
FFY 2018 Proposed Projects

Airport Paint Study Implementation Evaluation

Statewide-SPR 26962T

Project Description:

Airport runways are marked with white paint and taxiways with yellow paint to allow pilots to easily identify where to land. NHDOT completed a research study, Project 15680J, in 2015 to identify the cause of staining of paint at airports. Project 15680J determined that iron oxides in the pavement aggregate were discoloring the paint making the white paint appear yellow and, therefore, made it more difficult for pilots to distinguish the runway from the taxiway, which could lead to extremely unsafe conditions.

The objective of this project is to evaluate performance of the recommended paint. Laconia Airport has experienced the paint staining. The recommended paint will be installed during the summer 2017 and this project will evaluate the paint for two complete years to determine the effectiveness of the treatment.

The Bureau of Aeronautics presented this problem statement which was approved by the NHDOT Research Advisory Council. **A task order under an existing on-call contract with Jacobs Engineering Group, Inc., managed by the Bureau of Aeronautics is being used to accomplish this work.**

Funding Notes:

Includes 10% indirect.



Project Details



Title:

Airport Paint Study
Implementation Evaluation

Project #:

Statewide-SPR 26962T

Start Date:

10/1/2017

End Date:

3/31/2020

Revised End Date:

11/30/2020

Estimated Obligated Funds:

\$48,714.10 (Rev. 6/24/2019)

Estimated Project Budget:

\$44,285.55 (Rev. 6/24/2019)

Improved Practices for Determining the Infiltration Characteristics of Soils for Design of Stormwater BMPs

Statewide-SPR 26962U

Project Description:

Soil infiltration test results are utilized by Design personnel to assess the suitability of a site for various stormwater best management practices (BMPs). With the recent issuance of EPA's final Municipal Separate Storm Sewer System (MS4) permit rules, the need for such testing is expected to increase.

Current practice uses a variation of the borehole infiltration test prescribed in the NHDES Alteration of Terrain (AoT) rules using conventional drilling equipment in order to estimate infiltration rates. Testing protocols are time consuming and inefficient (approximately 4 hours per test interval), particularly when multiple sites or depths must be tested.

The proposed research will evaluate alternative methods for determining the infiltration rate of soils at potential BMP sites including side-by-side comparisons with current test protocols as well as calibration with grain-size analyses and permeability water tests performed in the laboratory. Appropriate formulas for converting field results to design infiltration rates compatible with AoT rules will also be developed.

The Bureau of Materials and Research presented the problem statement that was selected by the NHDOT Research Advisory Council in October 2018.

A Cooperative Project Agreement (CPA) was executed with UNH on April 17, 2019.

Funding Notes:

Includes 10% indirect.



Project Details

• • •

Title:

Improved Practices for
Determining the Infiltration
Characteristics of Soils for
Design of Stormwater
BMPs

Project #:

Statewide-SPR 26962U

Start Date:

11/1/2018

End Date:

6/30/2021

Estimated Obligated Funds:

\$123,200.00

Estimated Project Budget:

\$112,000.00

Using Data Analytics to Forecast Future Bridge Conditions

Statewide-SPR 26962V

Project Description:

Reliable data-driven forecasting models allow for public agencies to plan for future needs and resource allocation. Conditions of bridge assets are managed through maintenance, preservation, rehabilitation and reconstruction. The New Hampshire Department of Transportation documents the appropriate timing of these treatments in Recommended Investment Schedules (RIS). Adhering to a bridge's RIS extends useful service life. Quantification of the service life extension as well as how well bridges have adhered to Recommended Investment Schedules remains a challenge.

This proposed research will develop New Hampshire specific deterioration curves for key bridge elements based on collected bridge element condition data and maintenance records and, additionally, the framework to track adherence to recommended bridge investment strategies and determine the appropriateness of the strategies for New Hampshire.

The University of New Hampshire (UNH) presented this problem statement to the NHDOT Research Advisory Council in October 2018 with support from the Office of Asset Management, Performance, and Strategies (AMPS).

A Cooperative Project Agreement (CPA) was executed with UNH on July 31, 2019.

Funding Notes:

Includes 10% indirect.



Project Details

• • •

Title:

Using Data Analytics to
Forecast Future Bridge
Conditions

Project #:

Statewide-SPR 26962V

Start Date:

11/1/2018

End Date:

12/31/2021

Estimated Obligated Funds:

\$176,000.00

Estimated Project Budget:

\$160,000.00

NHDOT SPR2 Program
FFY 2019 Proposed Projects

Log Jam Monitoring

Statewide-SPR 26962W

Project Description:

Many roads and highways exist close to streams that exhibit lateral instability (bank erosion). Conventional practices were to armor such locations, and these solutions are expensive, do not provide ecosystem value, and result in high mitigation fees. Natural channel design structures, such as engineered log jams, offer a greener, less expensive alternative to armor solutions. Route 16 in Errol, NH is an example. Extreme bank erosion requires road relocation and streambank stabilization. An engineered log jam has been proposed at the site and is to be constructed during the summer 2019. This is the first NHDOT such installation. Identifying the benefits of natural instream structures to replace conventional armoring solutions could result in significant cost savings on all such projects.

Bank and channel impact mitigation costs have been eliminated with the selection of the engineered log jam solution on the Errol project. Had conventional armoring been selected for this project, bank and channel impact mitigation costs were estimated to be \$101,000. At this writing, there is no demonstrated and documented information about engineered log jam solutions in New Hampshire, and although employed in the Pacific northwest, there is very limited information nationally as well.

A three-year project is proposed that includes eight months of pre-construction monitoring and two years of post-construction monitoring. The monitoring is broken into the following facets: hydraulic, structural, flora, and fauna. In addition the monitoring provides inspection to assess any need for maintenance or repairs.

The research objective is to document all salient aspects of engineered log jams relative to road planning, design, permitting, construction, and maintenance. In addition, stream system changes resulting from the engineered log jam will be documented.

The University of New Hampshire (UNH) presented this problem statement to the NHDOT Research Advisory Council in October 2018 with support from the Bureau of Highway Design.

A Cooperative Project Agreement (CPA) was executed with UNH on May 1, 2019.

Funding Notes:

Includes 10% indirect.



Project Details



Title:

Log Jam Monitoring

Project #:

Statewide-SPR 26962W

Start Date:

11/1/2018

End Date:

4/30/2022

Estimated Obligated Funds:

\$110,000.00

Estimated Project Budget:

\$100,000.00

NHDOT SPR2 Program
FFY 2019 Proposed Projects

Assessment of Embedded Culvert Low Flow Hydraulics

Statewide-SPR 26962Y

Project Description:

In 2010, New Hampshire adopted new rules for the permitting of stream crossings. One aspect is that new culverts should have natural materials located at the stream bed. In culverts that are not open bottom, this means oversizing the culvert and embedding it (burying the bottom of the culvert). Often the material placed in the embedded culvert is specifically sized to match the native material in the stream as well as to be stable. This results in very coarse sediments. Being coarse, at low flows, water can completely disappear into these sediments leaving no aquatic habitat there. Thus, at the same time that culverts are recommended to be embedded, the practice is criticized for its impact on aquatic habitat.

The proposed research has two thrusts: to study constructed embedded culverts in NH as well as to complete literature review and interviews with the many other states requiring embedded culverts. In addition the contracting community will be interviewed to determine if there are limitations in the supply or placement of the embedment material. For the field monitoring portion, embedded culverts at various ages will be inspected at low flows for sediment imbrication. In addition the bed sediment particle size distribution at the time of inspection will be developed and compared to that of the design. Aquatic organism passage will be assessed at low flows.

The products of this research will be a diagnosis of the issue (real or perceived) and the elements of bed sediment design leading to successful embedded culverts that provide passage for aquatic organisms.

The University of New Hampshire (UNH) presented this problem statement to the NHDOT Research Advisory Council in October 2018 with support from the Bureau of Highway Design.

A Cooperative Project Agreement (CPA) was executed with UNH on May 1, 2019.

Funding Notes:

Includes 10% indirect.



Project Details



Title:

Assessment of Embedded
Culvert Low Flow
Hydraulics

Project #:

Statewide-SPR 26962Y

Start Date:

11/1/2018

End Date:

4/30/2021

Estimated Obligated Funds:

\$82,500.00

Estimated Project Budget:

\$75,000.00

**NHDOT SPR2 Program
FFY 2019 Proposed Projects**

Use of Smart Rocks to Improve Rock Slope Design

Statewide-SPR 26962Z

Project Description:

Rock slopes pose a hazard to the traveling public when weathering processes dislodge portions of the slope that can fall into the road. Current ditch design practice relies on design criteria developed decades ago in different environments with different rock types. Current hazard rating practice rates the rock slopes based on semi-quantitative measures using a Rockfall Hazard Rating System (RHRS). Both the design of new rock slopes and the hazard assessment of existing rock slopes need improvement to increase safety against rockfall, construct better engineered slopes and reduce short and long term maintenance costs.

This proposed research project will conduct rockfall experiments with a smart rock on 10 rock cuts that are rated A or B according to the New Hampshire RHRS. The smart rock is a sensor system equipped with a 3-axis accelerometer and gyroscope, embedded in a regular rock, to measure impact (acceleration) and rotational velocity (gyroscope). The results of these experiments can be used to calibrate a model for rockfall simulation. Concurrent work funded through the STIC grant program is collecting highly detailed 3D point clouds for 20 A and B rated slopes. The results of the STIC work will serve as input for the smart rock models.

The calibrated rockfall model will be used, in conjunction with structural risk factors from the 3D point cloud, to further refine hazard ratings of rock slopes and prioritize remediation efforts. For new rock cuts, design slopes will be input to the model to refine catchment geometries.

The Bureau of Materials and Research presented the problem statement that was selected by the NHDOT Research Advisory Council in October 2018.

A Cooperative Project Agreement (CPA) was executed with UNH on April 17, 2019.

Funding Notes:

Includes 10% indirect.



Project Details



Title: Use of Smart Rocks to Improve Rock Slope Design

Project #: Statewide-SPR 26962Z

Start Date: 11/1/2018

End Date: 6/30/2021

Estimated Obligated Funds: \$110,270.00*

Estimated Project Budget: \$100,250.00*

*revised 2/26/2019

Optimization of Bead Application for Painted Pavement Markings Maintenance Application

Statewide-SPR 42372A

Project Description:

NHDOT forces perform maintenance applications of painted pavement markings to roadways each year. Retroreflective beads are applied as part of the paint application for nighttime reflectivity. The application rate of beads can vary. Too little and the retroreflectivity wears away before annual re-application; too much and the beads are wasted. This study will research the optimum application rate such that minimum retroreflectivity is achieved for the life of the painted line (12-16 month) without unnecessary expense for beads.

The major tasks are outlined as follows:

- Establish a test deck with a series of painted lines, each with a different application rate of beads (6.0 pound/gallon to 9.0 pound/gal at 1.0 or 0.5 pound increments)
- Subject the test deck to traffic and winter maintenance.
- Test retroreflectivity regularly (2 month intervals)
- Evaluate reduction of retroreflectivity versus time and determine which application rate allowed minimum retroreflectivity to be maintained for 12 months and 16 months

Application rates for future maintenance will be adjusted to the optimum rate.

The Bureau of Traffic presented the problem statement that was selected by the NHDOT Research Advisory Council in October 2018. It is anticipated that this project will be performed in-house.

Note:

- * This project is on hold at the request of the Bureau of Traffic.

Funding Notes:

Includes 10% indirect.



Project Details

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Title:

Optimization of Bead Application for Painted Pavement Markings Maintenance Applications

Project #:

Statewide-SPR 42372A

Start Date:*

End Date:*

Estimated Obligated Funds:

\$55,000.00

Estimated Project Budget:

\$50,000.00

**NHDOT SPR2 Program
FFY 2019 Proposed Projects**

**Unmanned Aircraft Systems (UAS)
Program Plan**

Statewide-SPR 42372B

Project Description:

Unmanned Aircraft Systems (UAS) are being used nationwide in an effort to improve safety, increase efficiency, increase quality, and reduce costs. A previous SPR2 funded research project tested UAS technology to ascertain the ability to assist NHDOT with operations, development, and the execution of transportation-related projects. In addition the study assessed UAS uses for other NH state agencies such as the Department of Safety.

In order to facilitate deployment of UAS in the day-to-day activities of NHDOT, a UAS program plan is needed that will outline the organizational structure and program requirements to support implementation of this valuable technology. As many DOTs are ahead or behind on UAS implementation, portions of this plan could be gathered from or shared with other states as well as other NH State agencies.

This proposed research project will develop a UAS program plan that may include but not limited to the following:

- Review regional and national research on UAS application on transportation-related projects
- Develop an internal policy for NHDOT UAS use. (NHDOT currently has a Commissioner Directive)
- Review and determine the ITS needs for UAS Data. (Hardware, Software, Storage)
- Determine current and future UAS budget needs
- Short, medium, and long term alternatives for future UAS uses
- Evaluate hiring a UAS consultant versus NHDOT UAS ownership
- Develop a public outreach plan, include addressing privacy concerns
- Develop a required safety plan for NHDOT UAS missions
- Evaluate and recommend UAS Legislation
- Determine and outline UAS skillset needs for NHDOT employees (current and future) to implement a UAS program.

The Bureau of Aeronautics presented the problem statement that was selected by the NHDOT Research Advisory Council in October 2018. **This project will be managed by the Bureau of Aeronautics and a contract is in the process of being finalized with a consultant.**

Note:

* Contract with WSP pending approval.

Funding Notes:

Includes 10% indirect.



Project Details

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Title:

Unmanned Aircraft Systems
(UAS) Program Plan

Project #:

Statewide-SPR 42372B

Start Date:*

End Date:*

Estimated Obligated Funds:

\$165,000.00

Estimated Project Budget:

\$150,000.00

Proposed Projects

NHDOT SPR2 Program
FFY 2021 Proposed Projects

Crushed Gravel for Shoulder Leveling 304.32

Statewide-SPR 42372E

Project Description:

After the Department’s resurfacing contracts are complete and accepted, gravel is placed to level the shoulder along the newly paved roadway sections. This material tends to ravel or wash out depending on factors that include the profile grade, amount of stormwater runoff, and the extent of vehicle off tracking. Shoulder gravel material on the paved roadway presents a safety hazard and creates a maintenance issue for the District workforce. Concerns that the current specification does not provide a final product that is well compacted and stay in place may be related to the material where other factors may include the site condition and/or placement method.

The Bureau of Highway Maintenance will establish test sections along a resurfacing project for the purpose of evaluating different gradations and compaction methods when placing shoulder gravel. The outcome of this project will be to recommend improvements to the Department’s specification 304.32, Crushed Gravel for Shoulder Leveling that improves performance of gravel used for shoulder leveling.

The Bureau of Highway Maintenance presented the problem statement that was selected by the NHDOT Research Advisory Council in December 2020. It is anticipated that this project will be performed in-house.

Funding Notes:

Includes 10% indirect.



Project Details



Title:

Crushed Gravel for
Shoulder Leveling
304.32

Project #:

Statewide-SPR 42372E

Start Date:

11/1/2020

End Date:

12/31/2022

Estimated Obligated Funds:

\$121,000.00

Estimated Project Budget:

\$110,000.00

Use of Drilling Parameters for Enhancing Geotechnical Site Investigations

Statewide-SPR 42372F

Project Description:

The standard penetration test (SPT) is a proven tool widely used in providing disturbed soil samples to aid in geotechnical site characterization along with estimating soil properties for the design of DOT projects. Testing and sampling is typically done at 5 to 10 foot intervals and thus between these samples, use of engineering judgement identifies changes in stratigraphy and the soils respective properties. These tests are used to develop recommendations and aid in the design of Department projects. Performing the SPT in a continuous fashion can be time consuming and labor intensive. The test is also not well-suited for soils containing large particles such as gravel.

A technique known as Monitoring-While-Drilling (MWD) makes use of the mechanical response of the drill rig and cutting tools while advancing a borehole. When combined with SPT testing, a continuous quantitative drilling record is produced and the correlated parameters applied into the analysis. This will result in a thorough and accurate representation of subsurface conditions leading to safer and more economical designs. MWD is recognized as an underutilized site characterization tool by the Federal Highway Administration EDC-5: Advanced Geotechnical Methods in Exploration (A-GaME) initiative.

The proposed research will assess the use of MWD on roadway and bridge foundation projects for the DOT. The drilling parameters recorded will be compared to measurements traditionally collected by SPT and the associated soil samples, along with rock cores for deep foundations. Drilling machine parameters controlled by the operator will be collected such as: thrust on drilling tool, rotation rate, and drilling fluid rate. Parameters that directly correspond to the ground response will be collected such as: advance rate, torque, fluid injection pressure and drilling fluid return rate. Other non-controlled parameters will be evaluated to include tool wear and changes in drilling fluid composition. This effort will support more efficient use of design and construction resources and reduces the chance of delays due to unexpected subsurface conditions. Additionally, the information will make an important contribution to the DOT Geotechnical Manual and can support mapping efforts and water quality studies performed by other agencies.

The Bureau of Materials and Research presented the problem statement that was selected by the NHDOT Research Advisory Council in December 2020. It is anticipated that this project will be performed by UNH.

Funding Notes:

Includes 10% indirect.



Project Details

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Title:

Use of Drilling Parameters for Enhancing Geotechnical Site Investigations

Project #:

Statewide-SPR 42372F

Start Date:

6/1/2021

End Date:

5/31/2023

Estimated Obligated Funds:

\$175,732.60

Estimated Project Budget:

\$159,756.00

**NHDOT SPR2 Program
FFY 2021 Proposed Projects**

**Advancing Subsurface Investigations
Beyond the Borehole**

Statewide-SPR 42372G

Project Description:

Geotechnical site characterization sometimes fails to fully characterize the below-ground bedrock surface and hydrologic conditions using conventional borings. By combining geophysical and boring data analysis, transportation projects can produce a more thorough and accurate representation of geotechnical subsurface conditions, reducing the disruption work plans, forced revision of designs, and cost increases from schedule delays, claims, or change orders. The need to bring more geophysics into transportation projects is recognized by the Federal Highway Administrations EDC-5: Advanced Geotechnical Methods in Exploration (A-GaME) initiative.

The proposed research will test a number of established geophysical techniques and their correlation with established geotechnical assessments used by the New Hampshire Department of Transportation. Passive Horizontal-to-Vertical Spectral Ratio (HVSr) seismic and multi-frequency electromagnetic induction geophysical methods can be rapidly deployed and are well suited to enhance geotechnical cross sections generated with conventional borings and compliment other geophysical methods already in use by DOTs. Measurements of specific conductance of and depth to water along with direct-current resistivity of split spoon samples from borings will be used to help calibrate interpretations of geophysical data where feasible.

This effort will contribute to the overall goal of improving efficiency of the Department by increasing delivery time of subsurface conditions and decreasing the time it takes to complete.

The Bureau of Materials and Research presented the problem statement that was selected by the NHDOT Research Advisory Council in December 2020. It is anticipated that this project will be performed by the U.S. Geological Service (USGS).

Funding Notes:

Includes 10% indirect.



Project Details



Title:

Advancing Subsurface
Investigations Beyond
the Borehole

Project #:

Statewide-SPR 42372G

Start Date:

11/1/2020

End Date:

12/31/2022

Estimated Obligated Funds:

\$187,000.00

Estimated Project Budget:

\$170,000.00

**NHDOT SPR2 Program
FFY 2021 Proposed Projects**

**Water Quality Test Site and Public
Outreach at the I-89 Sutton Rest Area**

Statewide-SPR 42372H

Project Description:

The Department has been and will continue to construct water quality best management practices to meet stormwater runoff quality regulations. The size of the measures required often extend beyond the available right-of-way (ROW) and require the acquisition of private property. These measures also require maintenance to remain effective. The Department would benefit from solutions that require less space, that can be constructed in our linear ROWs, and be very low or zero maintenance.

The current construction project, Sutton 42419, will explore the design, construction, efficiency, and monitoring of smaller, linear water quality measures that will require very little to no maintenance.

Another potential component to this project is public outreach. Due to the location of this test site there is an opportunity to share this research with the public who stop to use the rest area. This outreach may help the public understand the reason the Department constructs these features along the highways and may influence others to think about storm runoff and the impact it can have on the environment.

The Bureau of Highway Design presented the problem statement that was selected by the NHDOT Research Advisory Council in December 2020. It is anticipated that this project will be performed by UNH.

Funding Notes:

Includes 10% indirect.



Project Details



Title:

Water Quality Test Site and
Public Outreach at the Sutton
Rest Area

Project #:

Statewide-SPR 42372H

Start Date:

11/1/2020

End Date:

12/31/2022

Estimated Obligated Funds:

\$104,677.10

Estimated Project Budget:

\$95,161

**NHDOT SPR2 Program
FFY 2021 Proposed Projects**

**Wildlife Vehicle Collisions Data Gathering
and Best Management Practices**

Statewide-SPR 42372I

Project Description:

Currently we do not understand the scope or the cost of wildlife vehicle collisions (WVCs) in New Hampshire. Citizens die every year in New Hampshire in collisions with wildlife. There is also a cost in terms of emergency response and property damage from the collisions. Records of collisions with wildlife are not held in one easy to access central location. A better understanding of where these collisions are happening and how often could allow future projects to incorporate more wildlife crossing structures during project development and design to reduce wildlife vehicle conflict.

The proposed project will include a review of the sources of information available about WVCs in NH including the Department of Safety data that is shared with the Highway Design Bureau, the roadkill and accident data collected by the various NHDOT Districts and the NH Fish and Game roadkill data. Data from the NH Fish and Game wildlife sightings database may also be pertinent.

Based on the results of this review process, the project deliverables will include a mapping interface that would identify hot spots of WVCs, a review of WVC mitigation measures, and a summary of best management practices that have been found to effectively reduce WVCs in the Northeast. Development of educational material for NHDOT staff about the cost and prevention of WVCs is also planned.

The Bureau of Environment presented the problem statement that was selected by the NHDOT Research Advisory Council in December 2020. It is anticipated that this project will be performed by a consultant.

Funding Notes:

Includes 10% indirect.



Project Details



Title:

Wildlife Vehicle Collisions
Data Gathering and Best
Management Practices

Project #:

Statewide-SPR 42372I

Start Date:

11/1/2020

End Date:

12/31/2022

Estimated Obligated Funds:

\$110,000.00

Estimated Project Budget:

\$100,000.00

**NHDOT SPR2 Program
FFY 2021 Proposed Projects**

Concrete Slab Jacking

Statewide-SPR 42372J

Project Description:

Department's concrete road sections are a chronic problem to our maintenance Districts. The prime culprit for these conditions is poor quality base materials. The deteriorated base conditions result in excessive vibrations and noise from vehicles driving over these roadway sections. Surficial repair is virtually pointless and driver satisfaction is zero.

Discussions with URETEK, a company that specializes in subsurface injection of polyurethane foam for jacking and sealing purposes, indicate that it is feasible to treat the existing bases through the pavement. Polymer injection would fill the void spaces under the concrete slab. Expectations are similar to the benefits of cement-stabilization of soils, but without the need for total reconstruction of the roadway. In an atmosphere of pavement preservation, a reasonable initial cost to improve these roadways will save money long term, while improving its service to the public.

The purpose of this project is to evaluate the effectiveness of injectable polyurethane foam (such as that used for subsurface jacking applications) as a means of stabilizing unconstructed roadway base materials.

The Bureau of Highway Maintenance presented the problem statement that was selected by the NHDOT Research Advisory Council in December 2020. It is anticipated that this project will be performed in-house.

Funding Notes:

Includes 10% indirect.



Project Details



Title:
Concrete Slab Jacking

Project #:
Statewide-SPR 42372J

Start Date:
11/1/2020

End Date:
12/31/2022

Estimated Obligated Funds:
\$55,000.00

Estimated Project Budget:
\$50,000.00

NHDOT SPR2 Program
FFY 2021 Proposed Projects

**Bus Stops and Passenger Amenities in
Public Highway Right-Of-Ways**

Statewide-SPR 42372K

Project Description:

Public transit providers within NH have bus stops, transit amenities, and way finding signage within public highway ROWs, including state-maintained ROWs. There is no clear policy or process by which a transit provider seeks and gains approval to implement stops, etc. There are safety and maintenance considerations that need to be balanced with the mobility/accessibility issues. The installation of bus stops, etc. has been going on for decades and will likely continue to occur haphazardly, but consideration should be given to the benefit of researching and formalizing the process.

The tasks associated with this project will include research of best practices throughout the country, consultation with affected NHDOT Divisions/Bureaus, consultation with NH public transit providers or NH Transit Association, and review of associated Federal or State laws, if applicable.

The Bureau of Rail and Transit presented the problem statement that was selected by the NHDOT Research Advisory Council in December 2020. The principle investigator for this project has not been determined.

Funding Notes:

Includes 10% indirect.



Project Details



Title:

Bus Stops and Passenger
Amenities in Public
Highway Right-Of-Ways

Project #:

Statewide-SPR 42372K

Start Date:

11/1/2020

End Date:

12/31/2022

Estimated Obligated Funds:

\$110,000.00

Estimated Project Budget:

\$100,000.00

Transportation
Pooled Funds

**NHDOT SPR2 Program
FFY 2021 Proposed Transportation Pooled Fund Projects**

**Core Program Services for a Highway
RD&T Program – FFY 2020 (TRB FY 2021)**

Project Description:

The TRB Core Technical Activities are the historical foundation of the Transportation Research Board (TRB). They consist of standing committee and task force activities, the TRB annual meeting, the state DOT field visit program, TRB publications, the TRB Library, and the Transportation Research International Documentation (TRID) database.

Lead Agency:

FHWA

Partners:

Nationwide participation

**Evaluation of Low Cost Safety
Improvements Pooled Fund Study**

Project Description:

The goal of this research is to develop reliable estimates of the effectiveness of the safety improvements that are identified as strategies in the National Cooperative Highway Research Program (NCHRP) Report 500 Guides. These estimates are determined by conducting scientifically rigorous before-after evaluations at sites in the U.S. where these strategies are being implemented. A steering committee, comprised of the pooled fund State DOT representatives, will provide guidance on the strategies selected for evaluation.

Lead Agency:

FHWA

Partners:

AL, AR, AZ, CA, CO, CT, DC, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, MI, ME, MN, MO, MS, MT, NC, ND, NE, NV, NY, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VA, WA, WI,



Project Details



Project #: TPF-5(XXX)
Yearly Commitment: Varies
Commitment to Date: \$938,717.00
Committed Since: FFY 2009



Project Details



Project #: TPF-5(317)
Yearly Commitment: \$5,000.00
Commitment to Date: \$45,000.00
Committed Since: FFY 2014

**NHDOT SPR2 Program
FFY 2021 Proposed Transportation Pooled Fund Projects**

Traffic Control Device (TCD) Consortium

Project Description:

The TCD Consortium, composed of regional, State, local entities, appropriate organizations, and the FHWA, focuses on establishing a systematic procedure to select, test, and evaluate approaches to novel TCD concepts as well as incorporation of results into the MUTCD. Projects that will evaluate the novel TCDs will be initiated and monitored and the results will be disseminated. The consortium will assist in MUTCD incorporation and implementation of results.

Lead Agency:

FHWA

Partners:

AL, DE, IA, IL, KS, KY, MA, MD, MO, MT, NC, NE, NJ, NY, OR, PA, TN, TX



Project Details



Project #: TPF-5(447)
Yearly Commitment: \$10,000.00
Commitment to Date: \$155,000.00
Committed Since: FFY 2007

New England Transportation Consortium

Project Description:

The New England Transportation Consortium (NETC) is a research cooperative where financial, professional and academic resources of the region are pooled to research and develop improved methods of dealing with common problems in the planning, design, construction, maintenance, rehabilitation, reconstruction, and operation of transportation systems in the participating states.

Lead Agency:

Maine

Partners:

CT, MA, ME, RI, VT



Project Details



Project #: TPF-5(373)
Yearly Commitment: \$100,000.00
Commitment to Date: \$2,230,000.00
Committed Since: FFY 1993

**NHDOT SPR2 Program
FFY 2021 Proposed Transportation Pooled Fund Projects**

**Clear Roads Winter Highway Operations
Pooled Fund**

Project Description:

The Clear Roads (Phase II) pooled fund project focuses on advancing winter highway operations nationally through practical, practice-ready research related to materials, equipment and methods. The project will address both operational and management research needs, investigating the most effective tools and practices for clearing snow and ice and for managing program resources, budgets and performance measures. Expanded support for implementation and technology transfer will be provided through the development of user manuals, training modules, peer exchanges, and quick turnaround syntheses of the most effective state practices from around the country.

Lead Agency:

Minnesota

Partners:

AK, AZ, CA, CO, CT, DE, IA, ID, IL, IN, KS, MA, MD, ME, MI, MN, MO, MT, ND, NE, NV, NY, OH, OR, PA, RI, SD, TX, UT, VA, VT, WA, WI, WV, WY



Project Details



Project #: TPF-5(353)

Yearly Commitment: \$25,000.00

Commitment to Date: \$300,000.00

Committed Since: FFY 2010

Connected Vehicle Pooled Fund Study

Project Description:

The Connected Vehicle pooled fund study will provide technology transfer to transportation agencies and manufacturers to prepare for deployment of connected vehicle infrastructure. A multi-phase program will be established to facilitate research, field demonstration, evaluation, and technology transfer of connected vehicle infrastructure, vehicles, and applications.

Lead Agency:

Virginia

Partners:

AK, AZ, AL, CA, CT, DE, FHWA, FL, GA, ID, IL, MD, MI, MN, MS, NJ, OH, PA, TN, TX, UT, VA, WI



Project Details



Project #: TPF-5(389)

Yearly Commitment: \$25,000.00

Commitment to Date: \$75,000.00

Committed Since: FFY 2019

NHDOT SPR2 Program
FFY 2021 Proposed Transportation Pooled Fund Projects

**Traffic Signal Change and Clearance
Interval Pooled Fund Study**

Project Description:

The goal of the Traffic Signal Change and Clearance Interval Pooled Fund Study is to ensure the application of traffic signal change and clearance intervals maximize the safe transfer or right of way at signalized intersections. The objective is to provide a forum for participants and interested observers to collaboratively identify and pursue research needs that extend existing knowledge about the interaction between human factors and traffic signal change intervals and clearance intervals. The research findings of the pooled fund study will clarify existing assumptions and provide supplemental procedures, and methodology to appropriately and consistently apply current and recommended practices for the computation of traffic signal change and clearance intervals.

Lead Agency:

FHWA

Partners:

Oakland County, CT, FHWA, IA, IL, IN, MDOT SHA, MS, NC, NY, OR, PA, PBOT, UT , VA, WA



Project Details

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Project #: TPF-5(470)

Yearly Commitment: \$10,000.00

Commitment to Date: \$10,000.00

Committed Since: FFY 2021