



THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION



Handwritten initials '69' and 'Beard'

CHRISTOPHER D. CLEMENT, SR.
COMMISSIONER

JEFF BRILLHART, P.E.
ASSISTANT COMMISSIONER

Bureau of Materials & Research
December 12, 2013

Her Excellency, Governor Margaret Wood Hassan
and the Honorable Council
State House
Concord, New Hampshire 03301

Sole Source

REQUESTED ACTION

- 1. Authorize the Department of Transportation to execute a sole-source Cooperative Project Agreement with the UNH Sponsored Programs Administration (Vendor 177867), Durham, New Hampshire, for a total fee not to exceed \$79,794, for a cooperative investigation to investigate and test accelerated bridge construction alternatives (SPR15680X) effective upon Governor and Council approval, through June 30, 2015. 100% Federal Funds.
2. Authorize the Department of Transportation to execute a sole-source Cooperative Project Agreement with the UNH Sponsored Programs Administration (Vendor 177867), Durham, New Hampshire, for a total fee not to exceed \$70,000, for a cooperative investigation to assess and develop planning tools that will validate pollutant load coefficients used for water quality modeling of stormwater runoff (SPR 15680Y) effective upon Governor and Council approval, through June 30, 2015. 100% Federal Funds.

Funding is available as follows:

Table with 3 columns: Fund Code, FY 2014, FY 2015. Rows include 04-96-96-962015-3036 SPR Research Funds and 046-500464 General Consultants Non-Benefit.

EXPLANATION

The research studies included in the requested action will each address an immediate Department need; are unique to New Hampshire's environment and conditions, thereby requiring substantial local experience; and are directly aligned with a particular area of University expertise. In addition, the Principal Investigators are nationally recognized experts in their respective fields. As such, the proposed work does not lend itself to a selection process that includes private industry or out-of-state organizations, and it is in the Department's and the State's best interest to work directly with the University of New Hampshire.

This work is part of the Departments Statewide Planning and Research (SPR) program. The requested action is in furtherance of a long-standing cooperative relationship of transportation research between the Department of Transportation and the University of New Hampshire. This relationship has been mutually beneficial, culminating in savings to the State while enhancing work force development and maintaining New Hampshire's position on the leading edge of new technology. Research studies conducted by UNH for the Department have led to numerous innovations in the highway and bridge industry, including such successes as high performance concrete, improved pavements, alternative reinforcing for bridge decks, increased use of recycled materials, and rapid construction techniques.

Statewide-SPR 15680X, Accelerated Bridge Construction (ABC) Alternatives for NH Bridges

The UNH Structures Group has performed extensive developmental research for the Department's bridge projects including the Gilford 15903 bridge rehabilitation project scheduled for construction in 2018. This research will provide the Department with additional analysis to evaluate the stresses induced in the concrete slab during placement thereby providing necessary guidelines for the bridge contractors and fabricators.

Additional work will investigate alternatives to expedite the placement of foundation members and installation of bridge approach roadways on saturated clay materials. The Department needs to address concerns of the environment and structural integrity in order to design an economically viable plan for the US4 bridge over Bunker Creek in Durham. Multiple road and bridge layout and structural design alternatives are being considered, which will be investigated with respect to the stated issues and concerns.

Statewide-SPR 15680Y, Validating Pollutant Load Estimates from Highways and Roads

It has been documented that the stormwater runoff from impervious surfaces degrades water quality. As stormwater runoff regulatory limits become more specific, it is important to have accurate pollutant mass load information to account for mass load reduction credit achieved through stormwater treatment practices.

The planning tools for pollutant mass load and export coefficients were developed 20 to 30 years ago. This research will validate coefficients necessary for NHDOT and municipal agencies that manage the critical planning and pollutant accounting information.

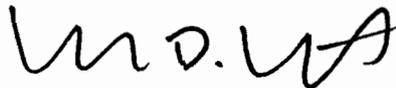
Highway traffic counts will be used in conjunction with stormwater sampling and monitoring to develop flow-weighted event mean concentrations (EMCs). The resultant EMCs will be used in the United States Environmental Protection Agency's Storm Water Management Model to develop simulated export coefficients based on dominant precipitation patterns. Pollutant transport characteristics for New Hampshire will provide the Department with a collection of real time data that will serve to validate the pollutant mass loading and credit from stormwater best management treatment practices.

These Agreements have been approved by the Attorney General as to form and execution. The Department has verified that the necessary funds are available. Copies of the fully-executed Agreements are on file at the Secretary of State's Office and the Department of Administrative Services, and subsequent to Governor and Council approval will be on file at the Department of Transportation.

The project funding is 80% federal funds with 20% state match. Turnpike toll credit is being utilized for match requirements, effectively using 100% federal funds.

It is respectfully requested that authority be given to enter into two (2) sole-source Agreements for consulting services as outlined above.

Sincerely,



Christopher D. Clement, Sr.
Commissioner

Attachments

COOPERATIVE PROJECT AGREEMENT

between the

STATE OF NEW HAMPSHIRE, **Department of Transportation**

and the

University of New Hampshire of the UNIVERSITY SYSTEM OF NEW HAMPSHIRE

- A. This Cooperative Project Agreement (hereinafter "Project Agreement") is entered into by the State of New Hampshire, **Department of Transportation**, (hereinafter "State"), and the University System of New Hampshire, acting through **University of New Hampshire**, (hereinafter "Campus"), for the purpose of undertaking a project of mutual interest. This Cooperative Project shall be carried out under the terms and conditions of the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002, except as may be modified herein.
- B. This Project Agreement and all obligations of the parties hereunder shall become effective on the date the Governor and Executive Council of the State of New Hampshire approve this Project Agreement ("Effective date") and shall end on **6/30/15**. If the provision of services by Campus precedes the Effective date, all services performed by Campus shall be performed at the sole risk of Campus and in the event that this Project Agreement does not become effective, State shall be under no obligation to pay Campus for costs incurred or services performed; however, if this Project Agreement becomes effective, all costs incurred prior to the Effective date that would otherwise be allowable shall be paid under the terms of this Project Agreement.
- C. The work to be performed under the terms of this Project Agreement is described in the proposal identified below and attached to this document as Exhibit A, the content of which is incorporated herein as a part of this Project Agreement.

Project Title: ABC Alternatives for Gilford and Bunker Creek

- D. The Following Individuals are designated as Project Administrators. These Project Administrators shall be responsible for the business aspects of this Project Agreement and all invoices, payments, project amendments and related correspondence shall be directed to the individuals so designated.

State Project Administrator

Name: Ann M. Scholz
 Address: NHDOT
Bureau of Material & Research
PO Box 483, 5 Hazen Drive
Concord, NH 03302-0483
 Phone: 603-271-3151

Campus Project Administrator

Name: Dianne Hall
 Address: University of New Hampshire
Sponsored Programs Administration
51 College Rd. Rm 116
Durham, NH 03824
 Phone: 603-862-1942

- E. The Following Individuals are designated as Project Directors. These Project Directors shall be responsible for the technical leadership and conduct of the project. All progress reports, completion reports and related correspondence shall be directed to the individuals so designated.

State Project Director

Name: David Scott
 Address: NHDOT
Bureau of Bridge Design
PO Box 483, 7 Hazen Drive
Concord, NH 03302-0483
 Phone: 603-271-2731

Campus Project Director

Name: Charles Goodspeed
 Address: University of New Hampshire
Kingsbury Hall
33 Adademic Way
Durham, NH 03824
 Phone: 603-862-1443

F. Total State funds in the amount of **\$79,794** have been allotted and are available for payment of allowable costs incurred under this Project Agreement. State will not reimburse Campus for costs exceeding the amount specified in this paragraph.

Check if applicable

Campus will cost-share _____ % of total costs during the term of this Project Agreement.

Federal funds paid to Campus under this Project Agreement are from Grant/Contract/Cooperative Agreement No. **n/a** from **State Planning and Research Part 2** under CFDA# **20.205**. Federal regulations required to be passed through to Campus as part of this Project Agreement, and in accordance with the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002, are attached to this document as Exhibit B, the content of which is incorporated herein as a part of this Project Agreement.

G. Check if applicable

Article(s) _____ of the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002 is/are hereby amended to read:

H. State has chosen **not to take** possession of equipment purchased under this Project Agreement.
 State has chosen **to take** possession of equipment purchased under this Project Agreement and will issue instructions for the disposition of such equipment within 90 days of the Project Agreement's end-date. Any expenses incurred by Campus in carrying out State's requested disposition will be fully reimbursed by State.

This Project Agreement and the Master Agreement constitute the entire agreement between State and Campus regarding this Cooperative Project, and supersede and replace any previously existing arrangements, oral or written; all changes herein must be made by written amendment and executed for the parties by their authorized officials.

IN WITNESS WHEREOF, the University System of New Hampshire, acting through the **University of New Hampshire** and the State of New Hampshire, **Department of Transportation** have executed this Project Agreement.

By An Authorized Official of:
University of New Hampshire
Name: Karen M. Jensen
Title: Manager, Sponsored Programs Administration
Signature and Date: [Signature] 11/25/13

By An Authorized Official of: the New Hampshire Office of the Attorney General
Name: [Signature]
Title: [Signature]
Signature and Date: [Signature] 11/25/13

By An Authorized Official of:
Department of Transportation
Name: William J. Cass
Title: Director of Project Development
Signature and Date: [Signature] 11/25/13
Director of Project Development
NHDOT

By An Authorized Official of: the New Hampshire Governor & Executive Council
Name: _____
Title: _____
Signature and Date: _____

EXHIBIT A

A. Project Title: ABC Alternatives for Gilford and Bunker Creek

B. Project Period: G&C Approval - 06/30/15

C. Objectives: The UNH Structures Group is investigating innovative Accelerated Bridge Construction (ABC) alternatives appropriate for two future New Hampshire bridge projects: Gilford Bridge at (Rt 3 over Rt 11) in Gilford and Bunker Creek bridge (Rt 4) in Durham.

D. Scope of Work:
GILFORD BRIDGE

(1) Extensive developmental work has been completed by the research team for the Gilford bridge project to be scheduled for construction in 2014. In 2012 contractors and fabricators brought up many issues during the first bidding cycle for this project necessitating tasks included in this proposal: Trucking and Handling Analysis Background: The proposed full bridge width deck slab with a 2% lane slopes from the crown placed at a 23 degree skew is approximately 57 feet long weighing approximately 6,000 lbs. This design is significantly longer than conventional 8 inch thick and shorter precast deck slabs. Conventional shipping and handling alternatives are not sufficient to prevent slab cracking.

Task 1: A finite element analysis will be done to evaluate the stresses induced in the slab using the PCI recommended 4 point lifting pattern.

Deliverable: Graphs illustrating acceptable lift cable angle and position of the 4 lift points as a function of slab length and weight. These graphs will illustrate span length limits for the 4 point lifting pattern.

Task 2: Evaluate using a finite element analysis the use of a strong back to facilitate lifting the proposed leveling/lifting combined connections.

Deliverable: Graphs illustrating the lifting position spacing and induced stresses in the slab.

Task 3: Design a steel handling structure sufficiently rigid to support the slab at leveling/loading points as to not induce tension stress in the slab.

Deliverable: An analysis package to determine the handling structure's cross member thicknesses. The analysis package will calculate the thickness of each member that spans between the two longitudinal support members that run parallel to the slab and are supported on a truck flatbed at or near the slab ends. The cross members need a thickness sufficient to support the weight and be thick enough to compensate for the deflection in the two longitudinal girders. When a skewed slab is being supported the cross members are placed across the two longitudinal members at an angle equal to the thus different loading patterns on the two longitudinal girders. By supporting the slab in this way it will not flex enough to induce tension stress in the slab sufficient to cause cracking.

Task 4: Fabricate a 1/8 scale handling structure to demonstrate the handling /trucking procedures for a long, crowned, and thin slab. A 1/8 scale slab model, of a crown slab with 2% negative slope on each side, was initially built to illustrate that at the time of stressing no camber occurs when prestressing cables are concentrically located in the cross section.

Deliverable : A scaled handling/trucking model to illustrate transportation support alternatives. A crowned slab model that can be used to illustrate handling procedures using 4 point (or more) lifting locations with a strong back, and anchoring techniques to hold the slab on a handling/trucking

structure. The two models can be used to demonstrate construction and handling of a slab similar to the proposed Gilford design.

- (2) **Presentations and Demonstrations Background:** Four full depth 16 foot slabs were fabricated to illustrate the proposed construction procedure and 4 - 8WF24's were purchased to model the Gilford Bridge girders. The girders are placed on 2 ft high blocks with steel supports to simulate abutment supports. Shims are used to vary girder vertical positions. This scaled model will be used to illustrate the proposed ABC alternatives.

Task 1: A one day demonstration will be hosted for perspective contractors, fabricators and engineers to illustrate the ABC techniques used in the project, these include:

- i. Leveling/lifting screws
- ii. Tongue and groove transverse joints with polymer sealant
- iii. Sequential torqueing of screws to assure appropriate loading applied to girders
- iv. Posttensioning bars used to segmentally stress the deck as each slab is installed

Deliverable: Additional research results will be presented to perspective engineers, fabricators, and contractors to illustrate the use of new products, and ABC construction techniques.

BUNKER CREEK

This work will investigate alternatives to expedite the placement of foundation members and installation of roadways on saturated clay materials. There are many concerns regarding environmental, private sector issues, traffic control and structural integrity that must be addressed in order to develop an economically viable reconstruction plans. Multiple road and bridge layouts and structural design alternatives are being considered and must be investigated with respect to the stated issues and concerns.

It must be recognized that work is currently being done on this project. Preliminary designs and construction schedules are being discussed, meetings with the general public and state agencies have and are continuing, and students have met with the consultant under contract with the DOT for this project. This work was initially undertaken as part of a graduate level course in Prestressed Concrete and now is being pursued by graduate students conducting their graduate research. When under contract the task/s being worked on will be accelerated as graduate students will be assigned work on the project for 20 hours per week.

General overviews of the tasks are presented herein and task and deliverables are given in detail see Table.

The proposed primary tasks for this project are to host meetings with the general public, investigate ABC techniques to minimize environmental impact, public disturbance, esthetic value, and to propose innovative member designs pertinent to proposed ABC construction techniques. Proposed tasks maybe addressed prior to contract approval; it is recognized that this work will be done at the researcher's expense.

- (1) **Host Meetings:** Professional meetings will be held with the general public, regulatory agencies, and project engineers.

Task 1: The first public meeting will be held at the Durham Town offices. An announcement will be sent from the DOT and at the meeting the UNH contingency will present preliminary design options and construction techniques. Additional meetings with the local

Town government and Departments will be schedule per DOT request and approvals. (see Table 1 for more detail on proposed meetings)

Deliverables: Minutes of the meetings will be prepared and circulated under this contract. Ideas and needed changes stemming from meetings will be identified and tasks to address them as part of this proposal will be submitted to the DOT and the contracted engineering company.

Task 2: The bridge passes through a salt water estuary, abuts conservation lands and is adjacent to a protected species area. Meetings will be held and presentations made to appropriate enforcement agencies per NHDOT approval. All suggestions evolving from these meetings will be addressed by the researchers and proposed resolutions will be prepared.

Deliverables: Minutes of the meeting will be prepared and circulated under this contract. Ideas and needed changes stemming from meetings will be identified and tasks to address them under this proposal will be submitted to the DOT and the contracted engineering company for approval.

Task 3: To accomplish ABC construction techniques to replace the bridge within an anticipated 4 day closure agreement innovative structural designs are needed in the substructure. The UNH team will investigate design alternatives outlined below for use on the project:

- a. The NEXT D beam with the possible use of FRP carbon for the top flange reinforcement.
- b. A rectangular cross beam with a cast in place section installed by the fabricator to simulate an abutment.
- c. Using a tongue and grove transverse joint in place of the currently used cast in place joint for the NEXT D beam.
- d. Extending the NEXT D flange 1 ft beyond the two webs to span over the retaining wall section cast on the cross beam
- e. Use of splice sleeves to connect the cross beam to the end columns cast in drilled shafts.

Deliverable: All finite element analysis models investigating possible NEXT D beams and cross beams will be submitted. All analysis data preparation calculations will be submitted in MATHCAD format. Advantages of the use of each of the investigated technologies will be submitted in report format. Analysis will include cost comparison with conventional techniques, without consideration for soft costs such as reduced congestion, reduced project duration, increased work zone safety etc.

E. Deliverables Schedule: See scope of work and budget and invoicing sections D and E

F. Budget and Invoicing Instructions: Campus will submit invoices to State on regular Campus invoice forms accompanied by the reports for each task completed according to the schedule specified below. State will pay campus within 30 days of receipt of each invoice and task completion report. Campus will submit its final invoice not later than 75 days after the Project Period end date.

	Task	Deliverable	Amount
1			\$ 4,860.00
	a Visit Carrara precast company in Middlebury, VT.	Meeting Summary	
	b Inspect the type(s) of connection method(s) they have to attach a trucking structure to the truck and a trucking structure to a remote controlled steerable dolly. Bring scaled model to gather feedback.	Pictures and details of connections	
	c Model the type of connection option(s) Carrara has available. Decide how trucking structure should be connected so the truck will transfer the least travel induced force to the precast slab member.	Report	
2			\$ 1,890.00
	a Build a trucking structure in SAP2000 to represent two steel frames being clamped to a precast slab member on the top and bottom of the slab. Support the trucking structure at two locations and support the slab member on the trucking structure at designated points that slab was designed for. Identify maximum stresses caused by 1.3 x Dead Load to represent an impact load.	SAP analysis results	
3			\$ 1,890.00
	a Research at what maximum speed the truck and dolly system will travel at. Determine what kind of braking forces the dolly end will see from coming to a complete stop from that maximum speed.	Research and calculation results	
	b Simulate forces from braking calculations in SAP2000 and analyze effects in slab for each trucking structure.	SAP analysis results	
4			\$ 2,835.00
	a Contact Florida DOT to gain insight of how to reinforce precast members during transportation to maintain stiffness.	Report	
	b Model the slab and trucking structure in SAP 2000 being distorted by elevating varies combinations of corners representing a superelevation.	SAP analysis results	
5			\$ 9,855.00
	a Build a SAP2000 model of the scaled version of the slab. Account for different concrete strengths and prestressing in model.	SAP analysis results	
	b Build Lab testing structures	Pictures and summary of setup	
	c Test bumps and curves with slab supported on trucking structure with the use of springs and elevating corners of the slab and trucking structure.	Test results	
	d Use DIC (Digital Image Correlation) with speckle pattern to find strain in slab and relate it to stresses. Compare to SAP2000 results.	Test results	
6			\$ 1,890.00
	a With all data gathered from SAP2000 analyses and Lab tests, conclude on a trucking structure that will ensure the slab will be delivered to the construction site without cracking and will serve as the most economical method.	Summary of conclusion	
7			\$ 19,179.00

a	Report Preparation	Outline of report
b	Preparing Information Exchange Documents	Final Documents
c	Demonstration Preparation	Demonstration outline
d	Demonstrations/Presentations	
Total for all Tasks		\$ 42,399.00

Bunker Creek Bridge Design		
	Task	Deliverables
1	Presentation and Public Informational at UNH	\$945.00
a	Meet with DOT, Consultant, and Strafford Regional Planning Committee to present design ideas and discuss plans for project.	Meeting Summary
2	Initial Designs and Plans	\$7,560.00
a	Determine Loadings Requirements	Report and calculation results
b	Determine member sizes (girders, cross beams, and drilled shafts)	Report and calculation results
c	Determine Connection Details	Report and detail drawing
d	Complete a full project construction plan	Report and construction plan
e	Complete an initial cost estimate	Summary /spreadsheet
3	Presentations, Meetings, and Hearings (preparation time included)	\$5,670.00
a	ACE - Initial meeting with representative from the Army Corp of Engineers (ACE) to present initial designs and request suggestions pertaining to the permitting process	Meeting Summary
b	Public Hearing - Conduction a public meeting for local residents and present initial construction plans and timeline. Provide opportunity for community to voice concerns and suggestions	Meeting Summary
c	Environment Meeting - Open to all parties with environmental concerns (Conservation Society, Fish and Game, ect...) Will include a presentation of construction plans followed by a site visit.	Meeting Summary
d	Historical Meeting - Discussion of the historical aspects of the site, open to all parties with historical concerns.	Meeting Summary
4	Update Designs and Plans	\$2,835.00
a	Update designs based upon feedback from previous group meetings, Consultant, and DOT. If needed, resize any members and edit the construction plans and schedule.	Report and drawings
5	SAP Analysis	\$3,780.00
a	Build a SAP2000 model of the bridge. Account for difference concrete strengths and prestressing in model. Complete a structural analysis of the model showing multiple load cases as well as moving loads.	SAP Analysis results
6	DOT and Consultant Meeting (preparation time included)	\$1,890.00

	a	Present the updated plans with changes highlighted to DOT and Consultant for review. Provide opportunity for both parties to give feedback and critic designs and plans for improvement. Provide SAP analysis results of the design to DOT and Consultant.	Meeting Summary	
7	Meeting with Army Corp of Engineers (preparation time included)			\$945.00
	a	Discuss updated plan as well as results of previous group meetings	Meeting Summary	
8	Finalizing Presentation Material			\$2,835.00
	a	Update any designs from feedback gathered from DOT and Consultant. Complete a presentable draft of construction plans and schedule.	Report and drawings	
9	Conclusion and Final Presentations			\$10,935.00
	a	Consolidate all findings into final report as well as a formal presentation of design plan. Conduct multiple presentations (DOT, Consultant, Abuders, Other interested parties) of final material. Outline the design of the all members and the construction schedule in detail.	Final Documents	
Total All Tasks				\$37,395.00

Total Project Costs

\$79,794.00

EXHIBIT B

This Project Agreement is funded under a Grant/Contract/Cooperative Agreement to State from the Federal sponsor specified in Project Agreement article F. All applicable requirements, regulations, provisions, terms and conditions of this Federal Grant/Contract/Cooperative Agreement are hereby adopted in full force and effect to the relationship between State and Campus, except that wherever such requirements, regulations, provisions and terms and conditions differ for INSTITUTIONS OF HIGHER EDUCATION, the appropriate requirements should be substituted (e.g., OMB Circulars A-21 and A-110, rather than OMB Circulars A-87 and A-102). References to Contractor or Recipient in the Federal language will be taken to mean Campus; references to the Government or Federal Awarding Agency will be taken to mean Government/Federal Awarding Agency or State or both, as appropriate.

Special Federal provisions are listed here: None or .

COOPERATIVE PROJECT AGREEMENT

between the

STATE OF NEW HAMPSHIRE, **Department of Transportation**

and the

University of New Hampshire of the UNIVERSITY SYSTEM OF NEW HAMPSHIRE

- A. This Cooperative Project Agreement (hereinafter "Project Agreement") is entered into by the State of New Hampshire, **Department of Transportation**, (hereinafter "State"), and the University System of New Hampshire, acting through **University of New Hampshire**, (hereinafter "Campus"), for the purpose of undertaking a project of mutual interest. This Cooperative Project shall be carried out under the terms and conditions of the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002, except as may be modified herein.
- B. This Project Agreement and all obligations of the parties hereunder shall become effective on the date the Governor and Executive Council of the State of New Hampshire approve this Project Agreement ("Effective date") and shall end on **6/30/15**. If the provision of services by Campus precedes the Effective date, all services performed by Campus shall be performed at the sole risk of Campus and in the event that this Project Agreement does not become effective, State shall be under no obligation to pay Campus for costs incurred or services performed; however, if this Project Agreement becomes effective, all costs incurred prior to the Effective date that would otherwise be allowable shall be paid under the terms of this Project Agreement.
- C. The work to be performed under the terms of this Project Agreement is described in the proposal identified below and attached to this document as Exhibit A, the content of which is incorporated herein as a part of this Project Agreement.

Project Title: **Validating Pollutant Load Estimates from Highways and Roads**

- D. The Following Individuals are designated as Project Administrators. These Project Administrators shall be responsible for the business aspects of this Project Agreement and all invoices, payments, project amendments and related correspondence shall be directed to the individuals so designated.

State Project Administrator

Name: Julie Fowler
 Address: NHDOT Bureau of Materials & Research
 5 Hazen Drive, P.O. Box 483
 Concord, NH 03302-0483
 Phone: 271-3151

Campus Project Administrator

Name: Dianne Hall
 Address: University of New Hampshire
 Sponsored Programs Administration
 51 College Rd. Rm 116
 Durham, NH 03824
 Phone: 603-862-1942

- E. The Following Individuals are designated as Project Directors. These Project Directors shall be responsible for the technical leadership and conduct of the project. All progress reports, completion reports and related correspondence shall be directed to the individuals so designated.

State Project Director

Name: Melodie Esterberg, PE
 Address: NHDOT Bureau of Materials & Research
 5 Hazen Drive, P.O. Box 483
 Concord, NH 03302-0483
 Phone: 271-2171

Campus Project Director

Name: Dr. Thomas Ballestero
 Address: University of New Hampshire
 Gregg Hall, Rm 238
 Colovos Road
 Durham, NH 03824
 Phone: 862-1405

F. Total State funds in the amount of \$70,000.00 have been allotted and are available for payment of allowable costs incurred under this Project Agreement. State will not reimburse Campus for costs exceeding the amount specified in this paragraph.

Check if applicable

Campus will cost-share _____ % of total costs during the term of this Project Agreement.

Federal funds paid to Campus under this Project Agreement are from Grant/Contract/Cooperative Agreement No. N/A from **Federal Highway Administration** under CFDA# **20.205**. Federal regulations required to be passed through to Campus as part of this Project Agreement, and in accordance with the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002, are attached to this document as Exhibit B, the content of which is incorporated herein as a part of this Project Agreement.

G. Check if applicable

Article(s) _____ of the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002 is/are hereby amended to read:

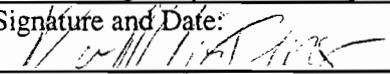
H. State has chosen **not to take** possession of equipment purchased under this Project Agreement.
 State has chosen **to take** possession of equipment purchased under this Project Agreement and will issue instructions for the disposition of such equipment within 90 days of the Project Agreement's end-date. Any expenses incurred by Campus in carrying out State's requested disposition will be fully reimbursed by State.

This Project Agreement and the Master Agreement constitute the entire agreement between State and Campus regarding this Cooperative Project, and supersede and replace any previously existing arrangements, oral or written; all changes herein must be made by written amendment and executed for the parties by their authorized officials.

IN WITNESS WHEREOF, the University System of New Hampshire, acting through the **University of New Hampshire** and the State of New Hampshire, **Department of Transportation** have executed this Project Agreement.

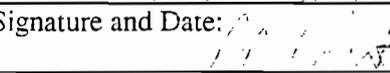
**By An Authorized Official of:
University of New Hampshire**

Name: Karen M. Jensen
Title: Manager, Sponsored Programs Administration

Signature and Date:  11/2/13

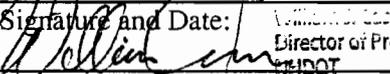
**By An Authorized Official of: the New
Hampshire Office of the Attorney General**

Name: _____
Title: _____

Signature and Date:  11/2/13

**By An Authorized Official of:
Department of Transportation**

Name: William J. Cass
Title: Director of Project Development

Signature and Date:  11/2/13
Director of Project Development

**By An Authorized Official of: the New
Hampshire Governor & Executive Council**

Name: _____
Title: _____

Signature and Date: _____

Task 2 – Review and synthesis of literature information to serve as comparator base. Historic data sources will be compiled for the target pollutants. Each data source will be briefly discussed and a brief assessment as to the relevance of the data today. All data will be compiled into tables and figures into which the data of the present study can be compared. A Task end report will contain the data, its synthesis, and a full bibliography. As much as possible, electronic versions of data source reports and web sites will be gathered and sent to State as the reference base for this project.

Task 3 - Equipment installations. As soon as it appears that winter (freezing weather) has broken (possibly March or April), equipment will be deployed to the field to embark on monitoring. The equipment will remain in the field until winter again occurs, requiring equipment to be removed, unless sites afford sufficient power to help insulate the equipment and the runoff to prevent freezing. In case of the latter, equipment will be deployed through the winter. Sites are visited weekly to inspect that everything is working, calibrate probes, and download data. Also, the equipment is visited after each storm to collect runoff samples to be sent to the lab. Collected samples will be composited (flow-weighted) samples in order that the sample analysis directly generates an event mean concentration. A photographic record is made of each installation. An estimate of the contributing watershed area to the site will be made in order to develop pollutant load per acre of land in subsequent Tasks. A memo describing the installation and set-up of equipment will be transmitted at the conclusion of this Task to State.

Task 4 – Monitoring and sampling. Over the course of the ensuing six to eight months, real-time and event data will be collected. As many storm events as possible will be sampled. At a minimum, 15 storms will be reported under this contract. Because monitoring is initiated by weather reports, when rain is predicted, automated samplers are prepared to sample, but that it was a simple storm. Therefore, for budgeting purposes, it was assumed that 25 storms would be sampled. Real-time monitoring will be continuously collecting data. Six weeks after the equipment is removed from the field, a memo will be sent to State with data. This will also include the transmission of the data files.

Task 5 – Final Report. All data will be synthesized and built into the Task 2 literature synthesis. A description of how the NH data matches or varies from the literature values will be included as well as the ranges of pollutant loadings (pounds per acre) for each monitored pollutant. Pollutant export coefficients will be developed from the monitoring data and compared to those used present day. The final report will be delivered to State. A poster will be submitted as part of the final report, in both electronic format (Power Point, Publisher, or Word) and hard copy. The poster shall be 30" X 40" with a border of approximately 10 point located approximately one inch from the edge of the sheet. Text should be easily read at six to eight feet away. Main title should be approximately 3/4" tall (72-80 pt), sub-titles will be approximately 3/8" tall (30-36 pt), and general text will be approximately 1/4" tall (25-28 pt). The State logo (to be provided by Materials and Research) should be displayed at approximately 3" x 4.5".

EXPECTED BENEFITS:

Pollutant load and export coefficients will be developed for various road types to develop pollutant export rates. These rates will be developed for sediment, phosphorus, and nitrogen. Real time in situ measurements will validate the model and help to calibrate pollutant fluxes during runoff events. Expected outcomes and products from the project include increased capacity for State and municipal decision makers to develop cost and benefit estimates for stormwater management strategies, improved selection of appropriate management technologies, increased awareness of appropriate BMP selection for pollutant load mitigation in new and redevelopment areas throughout the New England states, and improved aquatic habitat. These tools will support better stormwater planning

and management strategies to develop effective watershed management plans to comply with pollutant load reduction requirements associated with Total Maximum Daily Loads (TMDLs).

E. Deliverables Schedule: The results of this project will 1) improve planning tools necessary for State and municipal agencies for stormwater management, 2) will provide critical planning and pollutant accounting information, 3) will allow State and communities to critically assess pollutant loads from roads and to maximize pollutant load reductions, and 4) will enable the development of effective cost and benefit estimates for mitigation of changing land use patterns.

Task 1 – Memo on site selection

Task 2 – Report of literature information with pollution descriptions, as well as why information is suspect

Task 3 – Memo on installations

Task 4 – Memo on data results

Task 5 – Final Report

F. Budget and Invoicing Instructions:

Campus will submit invoices to State on regular Campus invoice forms for each task when completed, the dates below are included as estimates only based on the tasks timelines. State will pay campus within 30 days of receipt of each invoice and task completion report. Campus will submit its final invoice not later than 75days after the Project Period end date.

	INVOICE DATE	INVOICE AMOUNT
Task 1	Feb. 15, 2014	\$3,500
Task 2	July 15, 2014	\$6,000
Task 3	June 15, 2014	\$54,000
Task 4	June 1, 2015	\$1,000
Task 5	July 30, 2015	\$5,500
Total Costs		\$70,000

EXHIBIT B

This Project Agreement is funded under a Grant/Contract/Cooperative Agreement to State from the Federal sponsor specified in Project Agreement article F. All applicable requirements, regulations, provisions, terms and conditions of this Federal Grant/Contract/Cooperative Agreement are hereby adopted in full force and effect to the relationship between State and Campus, except that wherever such requirements, regulations, provisions and terms and conditions differ for INSTITUTIONS OF HIGHER EDUCATION, the appropriate requirements should be substituted (e.g., OMB Circulars A-21 and A-110, rather than OMB Circulars A-87 and A-102). References to Contractor or Recipient in the Federal language will be taken to mean Campus; references to the Government or Federal Awarding Agency will be taken to mean Government/Federal Awarding Agency or State or both, as appropriate.

Special Federal provisions are listed here: None or .