



## NHDOT RAC Prioritizes New Problem Statements

The NHDOT Research Advisory Council (RAC) met on April 10th at the New Hampshire Audubon's McLane Center in Concord. The RAC plays a key role in evaluating and prioritizing research problem statements submitted for funding through the Department's SPR Research program. The Council is comprised primarily of Bureau Administrators representing the major divisions of the NHDOT. Both highway and non-highway transportation modes are represented.



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This year, a record 23 problem statements were submitted, 21 of which were presented to the RAC for consideration. Presenters included staff from Project Management and the Bureaus of Highway Design, Aeronautics, Materials & Research (M&R), and Rail & Transit. In addition, Department personnel collaborated with presenters from the University of New Hampshire (UNH), the U.S. Geological Survey (USGS), the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL), and Sensible Spreader Technologies. The top 7 ranked topics are outlined in the box below along with the origin of the problem statement:

### Top-Ranked New Research Projects April 2013

1. **Correlation Between Lab- and Plant-Produced High-RAP/RAS Mixtures (M&R, UNH)**
2. **Structural Condition Assessment of Reinforced Base Course Pavement (Construction, M&R, CRREL)**
3. **Statewide Strategic Transit Assessment Study (Rail & Transit)**
4. **Research Freight Information and Data in New Hampshire (Aeronautics)**
5. **Fingerprinting Sources of Nitrogen in Wells near Blasting Sites (M&R, USGS)**
6. **Design and Maintenance of Subsurface Gravel Wetlands (Highway Design, UNH)**
7. **Accelerated Bridge Construction (ABC) Alternatives for NH Bridge Projects (Bridge Design, UNH)**

## Correlation Between Lab- and Plant-Produced High-RAP/RAS Mixtures

The use of reclaimed asphalt pavement (RAP) in hot mix asphalt is routine in New Hampshire and the use of Recycled Asphalt Shingles (RAS) has gained attention over the last several years. For a variety of reasons, NHDOT and local contractors are interested in pursuing the use of higher percentages of RAP and RAS on state paving projects. NHDOT specifications currently limit the amount of total recycled asphalt binder in a mixture to 1.0% without extensive additional testing. The amount of RAS binder is limited to 0.6%. These values typically correspond to approximately 20-25% RAP and 2.5-3% RAS by total weight.

The additional testing requires contractors to produce mixtures with the higher RAP/RAS percentages in their plant, along with a comparison virgin mixture. The asphalt binder is then extracted and recovered from both plant mixtures and the low temperature performance of the recovered binder is evaluated. If the performance of the RAP/RAS blended binder is acceptable compared to the virgin mixture, the material is approved.

This project will investigate the use of laboratory mixtures for evaluating and approving higher percentages of RAP and RAS in order to reduce or eliminate the significant expense and effort required to produce test mixtures at the plant.

Preliminary discussions have identified a milling and resurfacing project planned on NH 12 in Westmoreland during August through October. The project will involve testing of both laboratory and plant produced mixtures that contain a range of recycled binder percentages (both RAP and RAS) using two typical NH virgin binder grades to account for the impact of binder chemistry/source. The product of the study will be specific guidance on what testing is appropriate for evaluating mixtures containing higher amounts of RAP and/or RAS and suggested changes to the existing specifications.



## Structural Condition Assessment of Reinforced Base Course Pavement

In 2011, NHDOT reconstructed two (2) miles of Pickering Road in Rochester. Half of the project included installation of a reinforced base course using a Tensar®TriAx TX 160 Geogrid. The remaining half was a standard pavement section. The cost of reinforced material is roughly \$4-6 per square yard, equivalent to a square yard of 1- inch thick asphalt pavement. The manufacturer claims that the application of this product can reduce asphalt layer thickness 15-30% and aggregate layer thickness 25-50% by providing additional strength in comparison to the conventional section. The NHDOT is interested in a seasonal assessment of this section to quantify the significance in structural change and performance.

Research conducted through this study will include 1) FWD testing on the reinforced base course and adjacent conventional pavement sections in the summer (representing a normal condition), fall (after a rain event), and spring (under thawing condition) seasons, 2) back-calculation and analysis of FWD data to quantify the layer moduli values, and 3) summarizing the layer moduli values and relating to design.

The study will examine the economic viability of the reinforced pavement application for NHDOT in comparison to conventional pavement sections. Potential benefits include reducing excavation of subgrade materials, reduced pavement structure thicknesses, and reduced maintenance. In addition, the results from this study will provide input into the design and evaluation of pavement structures using the AASHTO mechanistic empirical pavement design guide (MEPDG).

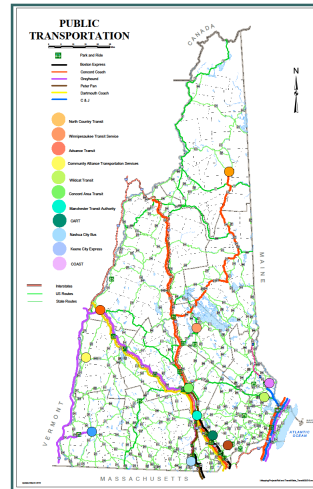


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## Statewide Strategic Transit Assessment Study

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 while helping to 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.

The Research Advisory Council voted to support this effort at a 40% funding level based on the amount of required work that is considered to be research. It is understood that additional funding sources will need to be identified to move the project forward.



NEW  
RESEARCH

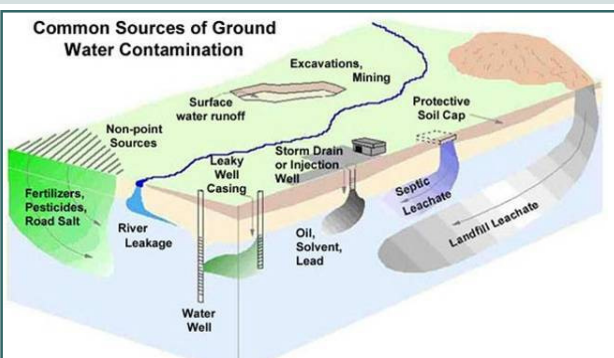
## Research Freight Information and Data in New Hampshire

The Department has minimal data and minimal experience on issues regarding the movement of freight in New Hampshire. MAP-21, the Moving Ahead for Progress in the 21st Century Act, includes a number of provisions to improve the condition and performance of the national freight network, and to allow for better planning of freight activities. This research study would be the first step in collecting freight information specific to New Hampshire.

This project will collect data of existing freight movements in New Hampshire and include documentation of the other modes of transportation, such as, rail, air and port. Collection of this data will enable the Department to better understand the movements of freight in, out, within and through the state. This effort will also include the collection of information from the freight industry, from their perspective, on the problems related to the movement of freight in the state. It is expected that the data collected will be information used as inventory for a freight plan that will be completed at a later time, under a separate project.



## Fingerprinting Sources of Nitrogen in Wells near Blasting Sites



Blasting operations have the potential to contaminate groundwater wells; however, there are often other sources of contamination that exist within proximity of wells. Standard water quality analyses designed to determine the safety of drinking water are not sufficient to identify sources, and, therefore, additional analyses are needed. When groundwater

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*“Research serves to make building stones out of stumbling blocks.”*

**- Arthur D. Little**

## Fingerprinting Sources of Nitrogen (cont'd)

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contamination of drinking water wells is reported on a NHDOT project with blasting operations cited as the source, it is difficult to confirm whether the blasting operation is the actual source of the contamination. Differentiating between blasting-related contaminants and those from other potential sources such as septic systems, animal wastes, fertilizers, decomposing vegetation or landfill leachate would aid in determining or limiting liability of the NHDOT.

Isotopes of nitrogen in water from private wells and in monitoring wells near-blasting sites will be used to indicate whether nitrate originated from fertilizer or waste sources. Well water will be characterized through detailed water quality analyses using isotopes of nitrogen and oxygen.

The study will address 1) whether blasting contributes to groundwater contamination in New Hampshire, 2) if so, how isotope data can be used as a standard method to differentiate nitrogen sources at other blasting sites, and 3) when a monitoring program should be implemented. Results are expected to provide an understanding of how contaminants sometimes associated with blasting can be differentiated from other similar contaminants. These results will help identify settings that may be more or less susceptible to contamination.

## Design and Maintenance of Subsurface Gravel Wetlands

The NHDOT has adopted the subsurface gravel wetland to treat runoff from highway applications and has implemented the systems at various locations across the state. The current NHDOT designs should be reviewed with respect to potential cost savings and maintenance reduction associated with smaller linear footprints and alternative hydraulic inlet structures. NHDOT designs currently have large footprints and employ much larger inflow risers than current UNH specifications, and these risers have larger openings for water to enter the subsurface gravel layer. As such it is expected that there may be design alternatives that would fit better in the linear highway environment, save money and still have equivalent performance.

The proposed research will review design guidance and propose cost-effective and maintenance-reducing options. Efforts will be made to compare and contrast cost, suitability and performance, as well as document the collection of gross solids in the NH DOT subsurface gravel wetlands and whether they result in a hydraulic performance penalty.

## Accelerated Bridge Construction (ABC) Alternatives for NH Bridge Projects

The UNH Structures Group (structures and geotechnical faculty and graduate students) is investigating innovative Accelerated Bridge Construction (ABC) alternatives appropriate for two future New Hampshire bridge projects: Gilford at Rt 3 / Rt 11 and Bunker Creek in Durham.

For the Gilford bridge, the proposed research will include modeling and analysis to predict beam deflections during staged construction of deck panels. A more complex model will also be prepared to model panel flexibility.

The Bunker Creek restoration will investigate alternatives to expedite the placement of foundation members and installation of roadways on saturated clay materials. Wicking and other techniques to accelerate consolidation in tidal areas such as in the small Bunker Creek estuary need to be investigated for compatibility with ABC techniques.



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