



Focus on Research

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Update on Current NHDOT Research

Log Jam Monitoring

A section of NH 16 in Errol, NH, experienced extreme bank erosion that resulted in failure of the road structure. The roadway was realigned about 90 feet west and streambank protection options were evaluated. A first for NHDOT, this project included an engineered log jam (ELJ) stabilization method. The ELJ provided the benefit of a natural instream structure and cost savings over a conventional system. UNH is performing the required pre- and post-construction monitoring and documentation of this innovative bank stabilization method.



Stacked members of ELJ installation

Link: <https://www.nh.gov/dot/org/projectdevelopment/materials/research/projects/26962w.htm>



Principal Investigator: Dr. Tom Ballestero, UNH
NHDOT Champion: Tobey Reynolds, Highway Design

NHDOT Strive to Improve Shoulder Leveling Performance

After NHDOT resurfacing contracts are complete, gravel is placed to level the shoulder. As the material tends to wash out, NHDOT evaluated compaction methods and specified material gradation with the goal of improving performance. Three different rollers were used with the Road Widener (shown here) producing the most consistent results.



The findings were presented to the Specifications Committee and, as a result, gradation changes will be included as a Special Provision in paving contracts for this construction season. Further evaluation will be completed before deciding on a Specification change.

NHDOT Researchers:

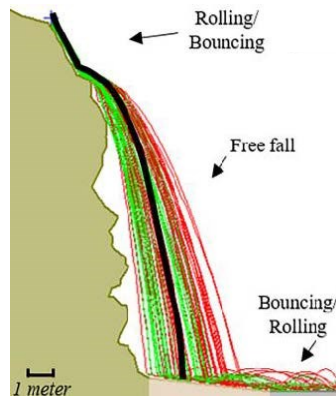
Kevin Belanger, Asst. District Engineer, District 4
Jim McMahon, Asst. District Engineer, District I

Link: <https://www.nh.gov/dot/org/projectdevelopment/materials/research/projects/42372e.htm>

NHDOT Research Projects - Partnering with University of New Hampshire

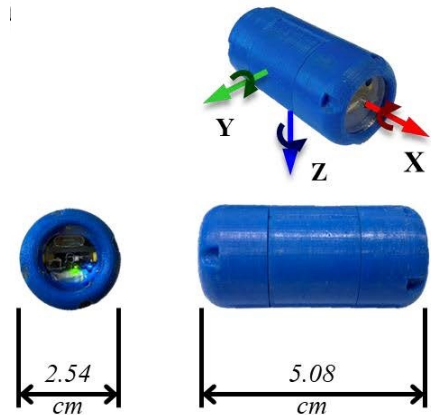
Use of Smart Rocks to Improve Slope Design

As rock slopes can be hazardous to the traveling public, "smart rock" technology can be used to better understand what happens during rockfall.



Assessments of more than 85 field experiments were performed with the aid of Smart Rock (SR) sensors. When physically inserted in a natural or fabricated rock, these devices can be used to evaluate rockfall events from the

perspective of the falling rock. The SR data can be used to estimate impact forces and block rotational kinetic energies leading to safer designs for motorists.



Link: <https://www.nh.gov/dot/org/projectdevelopment/materials/research/projects/26962z.htm>

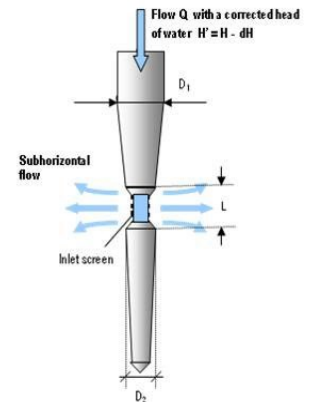
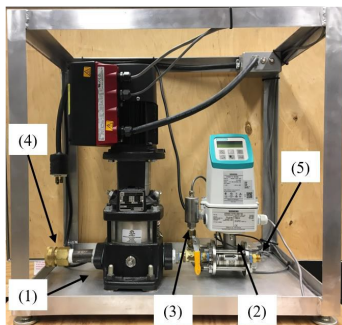
Principal Investigator: Dr. Jean Benoit, UNH
NHDOT Champion: Krystle Pelham, Geotechnical



University of
New Hampshire
College of Engineering
and Physical Sciences

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

To characterize hydraulic conductivity for the design of stormwater best management practices (BMP's), NHDOT currently uses a traditional field test, the borehole infiltration test. As this method is time consuming, an alternative procedure uses a Permeafor probe that can be advanced into the ground with conventional drilling methods and test each depth of interest in less than 20 minutes. The research demonstrated the potential of the Permeafor to rapidly hydraulically characterize soils at different depths to generate profiles of hydraulic conductivity.



Link: <https://www.nh.gov/dot/org/projectdevelopment/materials/research/projects/26962u.htm>

Principal Investigator: Dr. Jean Benoit, UNH
NHDOT Champion: Krystle Pelham, Geotechnical

RECENTLY PUBLISHED

Accelerated Innovative Deployment (AID) Grant for the City of Nashua, NH

The City of Nashua proposes to improve pedestrian safety in its downtown core through the implementation of proven safety countermeasures promoted through the fifth round of Everyday Counts (EDC-5) under the Safe Transportation for Every Pedestrian (STEP) Program. Funding through the Accelerated Innovation Deployment (AID) Demonstration Program will be used to improve pedestrian safety at 20 uncontrolled crossings located in an area that has a mix of residential, municipal and commercial properties



Main Street at High Street: Proposed Countermeasures are High Visibility Crosswalk Markings and a Rectangular Rapid-Flashing Beacon.

with high volumes of motorized traffic, high volumes of pedestrians and a high number of transit stops. Specific improvements include installing rectangular rapid-flashing beacons, enhancing crosswalk visibility, and designing a road diet.

The \$565,000 project is made possible by \$452,000 from FHWA's Accelerated Innovation Deployment (AID) Demonstration Grants and the city's share of \$113,000.

Every Day Counts (EDC) Round 6 Update



Two FHWA EDC Round 6 initiatives with NHDOT participation have seen recent advancements. Virtual Public Involvement (VPI) has moved from the assessment stage to institutionalized while Digital As-Builts have made progress within the development stage.

Virtual Public Involvement: NHDOT has expanded the Public Meeting virtual component by adding equipment that more effectively supports hybrid meetings, in person with a virtual option, leading to increased participation and positive feedback from the public.

Digital As-Builts: NHDOT received 2022 STIC funding and is in the process of purchasing four additional GNSS rovers. To expand the use of these devices in areas without cellular reception and therefore no access to the CORS network, the current purchase adds economical base stations to the inventory, which can be used with all of the rovers purchased to date.

In addition, the STIC grant is funding the purchase of a drone that will be equipped with LiDAR technology. The two purchases are a joint venture between the Bureau of Construction and the Bureau of Aeronautics. Use of the drone at various stages of construction on select projects is anticipated.

INNOVATIVE INITIATIVES

Embedded Culverts and Low Flow Hydraulics

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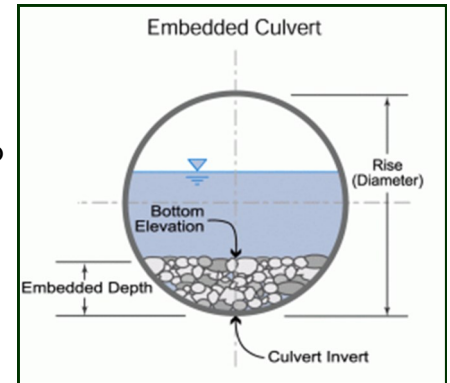
[www.nh.gov/
dot/research](http://www.nh.gov/dot/research)

*“Success is a
science;
if you have the
conditions,
you get the
results.”*

Oscar Wilde
(1854-1900)
Irish poet and
playwright

New Hampshire
DOT
Department of Transportation

Embedded culverts have their bottom invert placed below the stream bed. The culvert invert is filled with natural materials burying that embedment. This research project assessed 24 constructed embedded culverts to investigate the concern that at low flows, the stream completely disappears into the coarse sediment, or goes “hyporheic”, impacting aquatic habitat. The goal was to understand the hydraulic consequences and diagnose the issues leading to successful embedded culverts that provide passage for aquatic organisms.



An embedded culvert in Londonderry, NH, that is hyporheic (movement of stream water into the subsurface).

A number of variables contribute to the function of the embedded culvert: drainage area, culvert span, culvert length, average culvert embedded depth, upstream slope, downstream slope, culvert slope, and stream slope within culvert.

- **Principle Investigator:**
Dr. Tom Ballestero, UNH
- **NHDOT Champion:**
Chris Carucci, Highway Design

Link: <https://www.nh.gov/dot/org/projectdevelopment/materials/research/projects/26962y.htm>

Technology Transfer - Share the Knowledge!

This research was shared with about 90 attendees from the region and other states through a recent webinar, “Assessment of Embedded Culvert Low Flow Hydraulics”, held on March 29, 2022. Assisted by the UNH Technology Transfer Center, Dr. Tom Ballestero presented the results of the embedded culvert research.

The webinar can be viewed via this link:

[https://media.unh.edu/media/
Project+ReviewA+Assessment+of+Embedded+Culvert+Low+Flow+Hydraulics/1_2ayyph9](https://media.unh.edu/media/Project+ReviewA+Assessment+of+Embedded+Culvert+Low+Flow+Hydraulics/1_2ayyph9)

For more information on the project, please visit:

<https://www.nh.gov/dot/org/projectdevelopment/materials/research/projects/26962y.htm>

NHDOT Research Unit Website:

<https://www.nh.gov/dot/org/projectdevelopment/materials/research/index.htm>