



April 2022

TRAC e-News: Delivering Research Results!

The Washington State Transportation Center ([TRAC](#)), conducts transportation research through collaborative partnerships among WSDOT, the University of Washington (UW), and Washington State University (WSU).

In this issue

- Maintaining the streambed channel in simulated culverts
- Obtaining AADT estimates from non-traditional data sources
- Developing rockfall models to manage rock slopes adjacent to highway infrastructure
- Optimizing the timing of signalized intersections in semi-connected corridors
- Testing additives for electrically conductive concrete pavements
- Analyzing changes in the rates of active school transport and impacts of Safe Routes to School
- WSDOT Webinar Wednesdays: upcoming and previous webinars

Environment

Flume-based design recommendations for stream simulation culverts



Research team: [Nicholas Engdahl](#) (WSU) | [Julie Heilman](#) (WSDOT) | [Jon Peterson](#) (WSDOT)

Sponsor: WSDOT

[WA-RD 903.1](#)

Completed: Fish populations have decreased in the Puget Sound area in part because fish barriers such as culverts have limited the ability of fish to swim upstream to reach their food supplies and spawning grounds. This project looked at better ways to maintain a common replacement

for traditional culverts, stream simulation culverts. Stream simulation culverts are road-stream crossings that incorporate a sediment lining that provides an environment more conducive to fish movement. To determine the most effective ways to maintain a channel in such a simulated streambed, this research investigated the incorporation of material such as bands of sediment made of coarse material, called coarse bands, and point bars constructed of coarse material, called boulder bars, into a simulated streambed. Tests showed that even minimal additions of coarse bands reduced sediment transport in channel cross-sections and generally maintained the channel shape to provide a low-flow channel. [Read more...](#)

Freeway and Arterial Management

Guidelines for obtaining AADT estimates from non-traditional data sources

Research team: [Mark Hallenbeck](#) (UW) | [Laura Schewel](#) (Streetlight Data) | [Sean Co](#) (Streetlight Data)
Sponsors: Streetlight Data, Inc | FHWA
[Report](#)

Completed: “Passively collected data” are gathered from non-traditional vehicle stream sources such as smart phones, vehicle transponders, and vehicle tracking devices, rather than with traditional roadway sensors. This study developed a guide to help public agencies purchase and test traffic volume information that is based on non-traditional data sources. The guidance is designed to help agencies prepare for purchasing data, interact with potential data providers, determine the quality and accuracy of the data, and evaluate their value. Passive data collection methods, if validated, could reduce costs and improve the efficiency of collecting traffic data for state departments of transportation and other public agencies. [Read more...](#)



Geotechnical Engineering

WSDOT developing and calibrating fragmental rockfall models



Research team: [Joseph Wartman](#) (UW) | [Jean Hutchinson](#) (Queen’s University) | [Michael Olsen](#) (Queen’s University) | [Marc Fish](#) (WSDOT) | [Jon Peterson](#) (WSDOT)
Sponsors: WSDOT | Transportation Pooled Fund

Ongoing: Managing rock slopes adjacent to highway infrastructure requires considering possible slope instability and designing mitigation efforts to prevent rockfall damage to the roadway and travelers. When engineers design a slope scaling program, rockfall catchment area, or rockfall barrier, they generally use a rockfall simulation model to predict the potential path and distribution of falling rocks. Recent studies have demonstrated that rockfall models built in game engine environments can replicate the observed pathways and fragmentation sizes of rockfall events. The goal of this pooled fund study, led by WSDOT, is to develop “game-engine”-based 3D rockfall simulation software, based on data from light detection and ranging (LiDAR) or photogrammetry models, that has the potential to more realistically model rockfall fragmentation and large block interaction. [Read more...](#)

Intelligent Transportation Systems

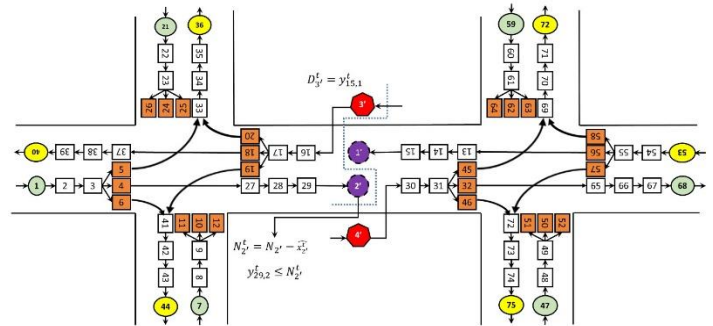
Hierarchical priority-based control of signalized intersections in semi-connected corridors

Research team: Ali Hajbabaie (WSU/North Carolina State University)

Sponsor: PacTrans

[Report](#)

Completed: Connected vehicles, the internet of things, and smart infrastructure technologies support the exchange of real-time, highly granular traffic information among transportation network users, system operators, and the supporting infrastructure. This project worked to harness this emergent connectivity and to improve traffic mobility by optimizing the timing of signalized intersections. Typical signal system technology operates with data from pavement point detectors such as magnetic loops. This project developed an efficient distributed yet coordinated algorithm that can control signalized intersections in both connected corridors and those where not all vehicles have connectivity capability. The optimization model and solution technique can determine signal timing parameters in real time for large transportation networks. The model can account for different percentages of connected vehicles, transit movements, and time-varying demand. [Read more...](#)



Maintenance

Use of a microwave method to prototype electrically conductive concrete



Research team: Somayeh Nassiri (WSU)

Sponsor: PacTrans

[Report](#)

Completed: The heavy use of various kinds of deicers has proved to have undesirable effects on the natural and built environments. As an alternative, electrically conductive concrete (ECC) pavements, which contain different types of conductive components, can melt surface ice and snow when an electric current is passed through the slab. This study

explored additives that can increase the electrical conductivity of pavement materials as a replacement for traditional deicing approaches and also investigated a method for evaluating conductive mixes. The researchers tested steel fibers, carbon fibers, and carbon nanotubes. Chopped carbon fibers were found to be most effective, increasing the permittivity and electrical conductivity of plain cement paste by a maximum of eight times. [Read more...](#)

Multimodal Transportation

Longitudinal analyses of Washington state student travel surveys

Research team: [Anne Vernez Moudon](#) (UW)

Sponsor: PacTrans

Report

Completed: The Washington State Student Travel Survey is one of the largest longitudinal travel surveys of school children in the U.S. This project analyzed changes in the rates of active school transport captured in the 2016 and 2019 Student Travel Surveys and also evaluated the likely impacts of Safe Routes to School (SRTS) projects on rates of active school transport. It was part of a long-term collaboration between the UW and the WSDOT to model the environmental determinants of active school transport (AST) in order to help support and promote AST and to ensure the safety of students traveling to school. Among other results, the study found that, on average, schools with SRTS projects saw a 33 percent increase in the number of students walking and a 104 percent increase the number of students biking. [Read more...](#)



Webinar Wednesdays

WSDOT's [Research & Library Services Office](#) hosts *Webinar Wednesdays*, a series of bimonthly, one-hour webinars. Each webinar showcases a research project whose results could eventually be implemented statewide. [Previous webinars are available for access here.](#)

Below is information about upcoming and recent research webinars:

Forensic evaluations: Listen to what our pavements are telling us – April 20, 2022 (10:30-11:30 PST)

To register (free): <https://register.gotowebinar.com/register/5063282254272587277>

Presenters: Deborah Walker, PE, FHWA | [Kim Schofield](#), PE, WSDOT | Gonzalo Rada, PhD PE, Wood E&IS | Kevin Senn, PE, NCE

The Long-Term Pavement Performance (LTPP) program was established 35 years ago to help gather the data needed to understand how pavements perform and why. Considered the premiere source of pavement performance data in the world, the LTPP database has benefitted from forensic investigations. To overcome funding constraints to perform more investigations, [TPF-5\(332\) "LTPP Forensic Evaluations"](#) was established in 2017, and [solicitation #1560 for a follow-up stage 2 study](#) is ongoing to take advantage of lessons learned before the narrow window of opportunity closes as these pavements are being replaced. This presentation will look at the history of forensic investigations within the LTPP program, from the early days to the TPF studies, with a focus on the derived benefits.

Effects of mega earthquakes on bridges based on a study in Washington state (February)

[Access the recording](#)



Presenters: [Bijan Khaleghi](#), WSDOT State Bridge Design Engineer | [Marc Eberhard](#), UW Professor of Civil and Environmental Engineering

The Cascadia Subduction Zone has the potential to generate magnitude 9 earthquakes that could have large impacts on bridges throughout the western portion of the Pacific Northwest. This presentation discussed the vulnerability of typical bridges located in various regions of Washington state.

TRAC e-News will be delivered about three times a year. For more information about TRAC and the ground-breaking work we are doing, please visit our [Current Projects](#) and [Research News](#) pages. A downloadable, pdf version of [this newsletter](#) is also available.

For contact information, follow these links:

- [WSDOT Contacts](#)
- [UW Contacts](#)
- [WSU Contacts](#)

The Washington State Transportation Center (TRAC) is a cooperative, interdisciplinary transportation research agency. Its members, the Washington State Department of Transportation (WSDOT), Washington State University (WSU), and the University of Washington (UW), formed TRAC in 1983 to coordinate transportation research efforts—both state and commercial, public and private—and to develop research opportunities both nationally and locally. TRAC acts as a link among government agencies, university researchers, and the private sector.

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