July 2020

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

Bridges

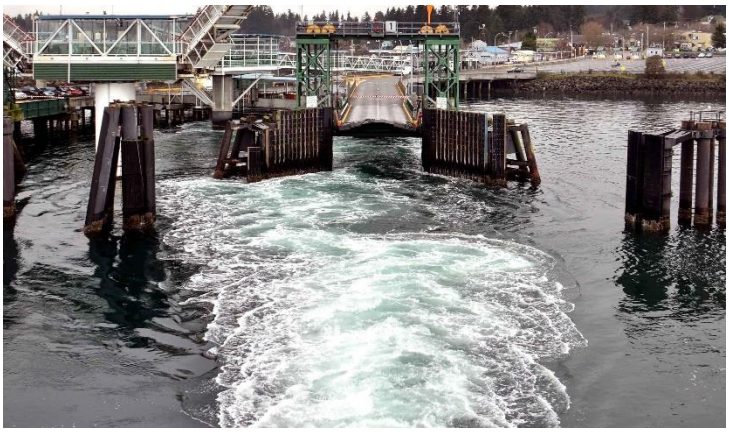
Effects of Cascadia Subduction Zone M9 earthquakes on bridges in Washington state

Research team: Marc Eberhard (UW) | Jeffrey Berman (UW) | Brett Maurer (UW) | Steven Kramer (UW) | Bijan Khaleghi (WSDOT) | Mustafa Mohamedali (WSDOT)
Sponsor: WSDOT

Ongoing: Western Washington has over 2,000 bridges, all of which could be affected by a large-magnitude, megathrust (M9) earthquake but not all of which can or even need to be retrofitted. This project will investigate critical combinations of geographic location, site conditions, and bridge characteristics that are likely to lead to the highest levels of damage during an M9 earthquake. This will allow WSDOT to improve the efficiency of the design of new bridges and the retrofit of existing ones by allowing it to direct resources to where they are most needed to reduce risk and increase resilience. Read more…

Ferry Systems

Ferry vessel propeller wash effects on scour at the Kingston Ferry Terminal



Research team: Alex Horner-Devine (UW) | Jim M. Thomson (UW) | Chris Stearns (WSDOT) | Jon Peterson (WSDOT)
Sponsor: WSDOT
WA-RD 899.1

Completed: In recent years, severe scour at the Kingston ferry terminal in Washington state has caused concern for terminal safety, as underwater erosion has caused an undersea cliff face to migrate shoreward toward the onshore ferry trestle structure. This project investigated the role of ferry-generated turbulence in causing the erosion by characterizing the ferry vessel wake and wash structure and by developing a model to better predict seabed stress at ferry terminals caused by propeller wash. Read more…

Washington State Ferries Triangle Route: analysis of alternative concepts of operation

Research team: Mark E. Hallenbeck (UW) | John Vezina (WSDOT) | Jon Peterson (WSDOT)
Sponsor: WSDOT
WA-RD 894.1

Completed: The Washington State Ferry (WSF) System's Triangle Route (Fauntleroy, Seattle – Vashon Island – Southworth, Port Orchard) is heavily used and experiences a number of significant operational challenges. To improve operation of the Triangle Route, WSF would like to identify and evaluate operational concepts for the route that would not only improve ferry service performance but that could be implemented within the budget constraints of the agency. After analysis of several options, the researchers recommended three operational concepts for further exploration. Read more…

Infrastructure

Research begins at the National Center for Transportation Infrastructure Durability and Life Extension

Center director: Xianming Shi (WSU)
Sponsor: USDOT

Research is beginning at the National Center for Transportation Infrastructure Durability and Life Extension (TriDurLE), established in 2019 as one of seven national University Transportation Centers by the U.S. Department of Transportation. The Center's focus is on improving the durability and extending the life of transportation infrastructure, with a vision of developing cost-effective innovations and finding holistic solutions to enhance multimodal infrastructure durability. The consortium is led by WSU and includes ten other universities from across the country. The Center's multidisciplinary and multimodal research, education, and workforce development will include all areas of infrastructure, including bridges, pavements, and maintenance. More information on the Center's sponsored research projects can be found at TriDurLE's website and in its spring 2020 newsletter, and the center also offers registration to a number of webinars upcoming through the year.

Intelligent Transportation Systems

Understanding opportunities with connected vehicles in the Smart Cities context

Research team: Yinhai Wang (UW) | Ali Hajbabaie (WSU) | Leila Hajibabai (WSU) | Doug Brodin (WSDOT)
Sponsors: PacTrans, WSDOT
WA-RD 885.1

Completed: Pedestrians, bicyclists, and other non-motorized road users represent a large percentage of all traffic-related fatalities. This project focused on these especially vulnerable road users by developing a way to use information from connected vehicles to identify locations prone to conflicts between motorized and non-motorized roadway users and improve traffic safety on multimodal networks. Researchers developed a cost-effective, solar-energy driven, small and lightweight communication device, called the Smart Road Sticker, to enable communication between connected vehicles and other roadway users via Bluetooth and dedicated short range [radio] communications. In tandem, they designed a supporting mobile application that allows pedestrians, bicyclists, and drivers of unconnected vehicles to communicate with the Smart Road Sticker. Read more…

Maintenance

Impacts of homeless encampments on roadway safety and DOT policy

Research team: Yinhai Wang (UW) | Pasco Bakotich (WSDOT) | Doug Brodin (WSDOT)
Sponsors: WSDOT, PacTrans

Ongoing: The number of homeless people living in and around the country's metropolitan areas is a critical issue for state departments of transportation (DOTs), as the homelessness issue has an immediate effect on the operations and safety of state transportation infrastructure. These encampments can pose safety risks to DOT and construction employees who must access those areas, as well as dangerous conflicts between motorists and the homeless. This project will interview professionals to supplement information that WSDOT has already gathered on other state DOTs' policies and practices and will analyze the results. Study goals are to raise awareness of the issues surrounding homelessness on state right-of-ways and to recommend guidance to help state DOTs increase safety and create more equitable policies to address homelessness. Read more…

AASHTO recognizes two WSDOT projects for High Value of Research

Each year, the AASHTO Research Advisory Committee (RAC) asks states to identify recently completed "high-value" research projects that demonstrate a significant value or benefit to their respective DOT. The four RAC regions host an open competition, each selecting six projects. Four projects receive "AASHTO Research Sweet Sixteen Awards," and two are awarded supplemental status. Two WSDOT projects were awarded supplemental recognition by the RAC High Value of Research Region IV Taskforce, one in the Safety category and the other in the category of Maintenance, Management, and Preservation.

Evaluation of new rumble strip designs to reduce roadside noise and promote safety

Research team: Jim Laughlin (WSDOT)| John Donahue (WSDOT)| Jon Peterson (WSDOT)|
Sponsor: WSDOT
WA-RD 881.1

Completed: This project examined noise caused by vehicles passing over rumble strips, a major source of disturbance and complaints from residents living adjacent to highways in Washington state. Researchers evaluated the wayside noise levels from various new centerline and shoulder rumble strip designs to determine overall sound levels and one-third-octave band frequencies. Four potential rumble strip designs were installed at test locations around the state. The tested patterns included three modifications to longstanding milled designs and one sinusoidal design. Notably, increases in exterior noise levels from the

sinusoidal rumble strip were 6 to 11 decibels lower than those from the standard milled designs, while in-cabin noise increases fell within the targeted level. WSDOT has since made the sinusoidal design available as the standard rumble strip for projects in noise-sensitive areas.

Bio-based renewable additives for anti-icing applications

Research team: Xianming Shi (WSU)| James Morin (WSDOT)| Doug Brodin (WSDOT)
Sponsor: WSDOT
WA-RD 883.1

Completed: This project examined the performance and impacts of 21 agro-based compounds (such as Concord grape extract and glycerin) along with a traditional chloride-based anti-icer (sodium chloride, sodium metasilicate, and sodium formate) by using the central composite design method. Agro-based solutions derived from locally sourced agro-based materials, mixed with salt brine and commercial additives (with little toxicity), were tested for their ice-melting capacity, ice penetration rate, ability to protect asphalt binder and concrete, effect on the friction coefficient of deiced and anti-iced asphalt pavement, and anti-corrosion performance. Laboratory data indicated that the selection and formulation of innovative agro-based snow- and ice-control chemicals can significantly reduce the costs of winter maintenance operations. 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.

Below is information about upcoming and recent webinars:

This Book Is a Bridge! Transportation and the arts

July 8, 2020, 10:30-11:30 PT
To register (free): https://attendee.gotowebinar.com/register/73965654389896203
All who register will receive a link to the recording.

WSDOT's artists-in-residence program is the first in the nation to embed artists within a statewide government agency. Having completed their tenure, WSDOT's two artists-in-residence see their collaborations as an important bridge to new ways of thinking about transportation and arts. In addition to their year of research, conversation, site visits, and experiments, they've produced a series of creative print projects—a newspaper, a book, and a creative conversation deck. The Maintenance Post is a hyper-local newsprint publication that connects the traveling public to the often invisible labor of maintenance and preservation workers. *This Book is a Bridge* is a roadmap to WSDOT's pilot residency program. The DOT Deck is a creative deck for understanding the conversational nature of transportation work. In this webinar the artists will talk about their time with WSDOT and sketch out some ideas they have for the future.

OpenSidewalks and resilient cities: a pedestrian-centric approach

Access the recording

Presenter: Anat Caspi, UW Assistant Professor of Electrical and Computer Engineering

This May 20th webinar was a record breaker, attracting an international audience of over 360 attendees. It discusses OpenSidewalks, a simple, detailed data approach to the pedestrian/bike transportation network. The talk discusses the important role of GIS and data-driven information technologies in providing equitable access to mobility and transportation for a changing, unequal, aging population.

Transportation big data: promises, issues, and potential solutions

Access the recording

Presenters: Jeff Ban, UW Professor of Civil and Environmental Engineering | Cynthia Chen, UW Professor of Civil and Environmental Engineering

Big data and related data analytics methods have received much recent attention in transportation for various planning and operational applications. This webinar summarizes the promises of big data and illustrates potential issues of some commonly used big data sources in transportation. It also discusses the implications of such issues and briefly presents a recent UW project that used big data (supplemented by other data sources) to analyze the impacts of the new Alaska Way Tunnel on regional travel patterns.

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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