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6-2018

Making Sustainable Roadways from 7,000 Year-old Volcanic Ash

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Recommended Citation

Sleep, Matthew and Masley, Morgan. Making Sustainable Roadways from 7,000 Year-old Volcanic Ash. Project Brief. NITC-RR-1075. Portland, OR: Transportation Research and Education Center (TREC), 2018.

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MAKING SUSTAINABLE ROADWAYS FROM 7,000-YEAR-OLD VOLCANIC ASH

This NITC Small Starts project investigated the viability of using volcanic ash deposited from the eruption of Mt. Mazama as a natural pozzolan and substitute for the more conventional methods of soil stabilization and unpaved roadway improvement, including dust abatement.

A sustainability analysis concluded that replacing portland cement with volcanic ash would reduce carbon dioxide emissions and embodied energy. Researchers tested the mechanical properties of the ash and found that:

- Chemical analyses show that Mt. Mazama volcanic ash has similar chemistry to that found in many pozzolanic materials.
- Standard and modified strength activity index testing was performed on a variety of mixtures containing volcanic ash, hydrated lime, crushed volcanic ash and portland cement at different percentages.
- A gravel wash sieve test and a slurry mix test were devised in order to determine how the ash could be used to both penetrate into compacted gravel layers and bind material together for the prevention of dust mitigation as defined by the Environmental Protection Agency.

These procedures indicate that Mt. Mazama ash can be effective as a supplement to portland cement for binding compacted gravel layers and reducing the dust particulate percentage. Further soil testing and laboratory analysis of the ash's other mechanical properties is a goal for future research, as is the development of a cost comparison between the use of Mt. Mazama Ash and other innovative soil stabilization techniques.

NITC has funded a second phase of this research, *ADA Accessible Trail Improvement with Naturally Occurring, Sustainable Materials*, anticipated in December 2018.

Volcanic ash from Mt. Mazama, prevalent in Southern Oregon, could be used as a natural pozzolan for unpaved roadway improvements. Sustainability benefits would include reduced carbon emissions.

The Use of Mt. Mazama Volcanic Ash as Natural Pozzolans for Sustainable Soil and Unpaved Road Improvement (#2018-1075)

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Final Report: <http://nitc.trec.pdx.edu/research/project/1075>

Oregon **TECH**

This study was funded by the **National Institute for Transportation and Communities (NITC)**. NITC is one of five U.S. Department of Transportation national university transportation centers. Housed at Portland State University, NITC is a program of the Transportation Research and Education Center (TREC). This Portland State-led research partnership includes the University of Oregon, Oregon Institute of Technology, University of Utah and new partners University of Arizona and University of Texas at Arlington.