

MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 20-422 (project 390) | October 2020

Evaluation of Secondary Consolidation Settlement Associated with Embankment Construction for Fast-paced Transportation Projects



the **ISSUE**

In areas along the urban Wasatch Front in Utah, soft, clayey deposits can cause excessive differential settlement and premature pavement damage at bridge approaches resulting from secondary consolidation settlement of the foundation soils. Such settlement is long-term in that it accumulates over many years and can produce a significant bump at the bridge approach. In some cases, the approach fills need to be reconstructed, or frequently maintained using asphalt overlays in the damaged area.

the **RESEARCH**

This report discusses the design and implementation of surcharging technology and the required laboratory, field, and engineering evaluations. Surcharging or preloading of the earthen embankments and underlying compressible soils is the most commonly deployed strategy to reduce the magnitude of secondary compression. Surcharging or overconsolidating of the foundation soils can be used to reduce the post-construction secondary settlement. In this research, 22 consolidation tests and 88 time-rate tests were performed on Pleistocene and recent fine-grained, cohesive, lacustrine deposits comprised of Lake Bonneville and more recent clays, most likely of Utah Lake origin located along the Wasatch Front, in Utah.



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Project Title

Design and Construction
Monitoring of Surcharged
Embankment

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the FINDINGS

Plots of the adjusted amount of surcharge were plotted versus the normalized rate of secondary settlement and compared with prior laboratory data. The data from these research plots are in better agreement with the long-term settlement performance monitoring data obtained from the I-15 Reconstruction Project in Salt Lake County.

the IMPACT

The researchers present a recommended method for designing surcharge fills considering post-construction (i.e., secondary compression) settlement effects. The implementation of the research will reduce the settlement damage at bridge crossings. It will also improve the ride quality at these bridges and extend the service life of the bridge approaches.

For more information on this project, download the entire report at <https://www.ugpti.org/resources/reports/details.php?id=1005>

For more information or additional copies, visit the Web site at www.mountain-plains.org, call (701) 231-7767 or write to Mountain-Plains Consortium, Upper Great Plains Transportation Institute, North Dakota State University, Dept. 2880, PO Box 6050, Fargo, ND 58108-6050.



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