Memo

To: David Stevens, Project Manager, Utah DOT, Research Division, email: davidstevens@utah.gov
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Re: Task 6 Memo reporting completion of lateral pile load testing of 24-in diameter piles.

We have completed lateral load tests on four 24-inch diameter steel pipe piles located at distances of 2, 3, 4, and 5 pile diameters (D) from the center of the pile to the back face of the MSE wall. The test piles were driven through the 20 feet MSE backfill and 20 feet into the underlying silty sands. The pile head was restrained using 2-feet thick pile caps that extended approximately 2.5 feet around the test piles. Tests were performed with a free-head boundary condition.

We performed these tests at the simulated bridge abutment constructed at the point of the mountain. To create a virgin loading condition, without reconstructing the entire wall, the backfill soil was excavated to the top of the third layer of reinforcements or 6.25 ft. H-piles that were already located within the backfill in the vicinity of the 24-inch piles were extracted using a vibratory hammer. This vibratory extraction procedure caused the sandy backfill to _____???_____. Because the lateral resistance of the piles near the MSE wall is primarily dominated by the soil stiffness and reinforcements in the shallow layers, this approach produced an MSE wall and backfill that was similar to the virgin condition. The original welded wire grid and ribbed strip reinforcements were destroyed in the excavation process but were replaced with new reinforcements with new strain gauges. Therefore, the tensile force distribution in the reinforcements could be measured during the lateral pile load testing. In addition to lateral load-deflection, bending moment was measured with depth in each pile. Furthermore, ground deflection, failure planes, and wall movement were measured during lateral pile loading.

Despite the change in the pile diameter, the tests still showed a reduction in lateral resistance as the piles were placed closer to the MSE wall as shown by the pile head load-deflection curves in Fig. 1. Previous studies on free-head piles indicated that lateral pile resistance was largely unaffected by the presence of the MSE wall when piles were place more than about 4D behind the wall, but reduced resistance occurred for piles closer to the wall. Similarly, for these lateral load tests on 24-inch diameter pipe piles, relatively little reduction in resistance was observed for the pile at 4D in comparison to the pile at 5D. However, the piles located at 3D and 2D behind the wall experienced much greater reductions in resistance. However, the reduction for the 3D pile was somewhat greater than we expected.

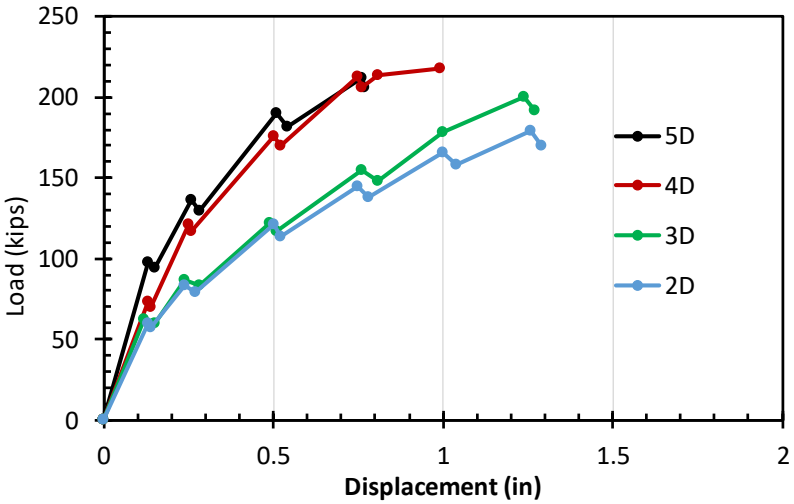

Fig. 2 Measured lateral pile head load versus deflection curves for 24-inch diameter free-head test piles located at 2, 3, 4, and 5 pile diameters (D) behind the wall. (Results are preliminary based on measurements during field testing.)