SECTION I - BACKGROUND

This report summarizes a method of design for drilled shaft sound wall foundations that was developed through a research project sponsored by the Virginia Transportation Research Council and the Virginia Department of Transportation. Support for the research was also provided by an FHWA Eisenhower Fellowship, and by a Via Fellowship in the Department of Civil Engineering at Virginia Tech.

The purpose of the research was to investigate the accuracy of the sound wall foundation design method used by VDOT, and to develop ways to make the process of designing these foundations, and the process of checking designs, more efficient for VDOT engineers.

Field tests were performed on drilled shafts at five sites in Virginia, and laboratory tests were performed on the silty and clayey soils from the sites. These data were used by Helmers et al. (1997) and Mokwa et al. (1997) to develop and to verify the accuracy of the method of design described in this report.

The design method described in this report is consistent with current VDOT design practice, which involves these steps:

- Use AASHTO guidelines to determine wind load and load eccentricity based on wind speed, exposure, wall height, and post spacing.
- Estimate a value of friction angle for the foundation soils based on the measured value of SPT blow count.
- Estimate the diameter and length of the drilled shaft foundation required to support the wall with a suitable factor of safety.
- Use Broms's (1964b) ultimate load theory for cohesionless soils to determine the ultimate load capacity of the drilled shaft.
- Calculate the factor of safety by dividing the ultimate load capacity by the actual load carried by the drilled shaft.
- Use repeated trials to refine the estimated shaft size.

In the procedure described in this report, the calculations are automated through use of an Excel spreadsheet named LCAP101. Basic data defining wall geometry, soil conditions and wind load are entered in the spread sheet, and the required lengths of drilled shafts are calculated by the spread sheet for diameters ranging from 18 inches to 54 inches. The volumes of concrete and maximum moments are also calculated for each of these sizes. A suitable diameter and percentage of longitudinal reinforcement can then be selected by reference to a chart, table, or formula. Ground line deflections under design load conditions can be estimated using another table.

Use of the spreadsheet, tables and charts improves the efficiency of the process and reduces the likelihood of computational errors. Because it includes calculations using Brinch-Hansen's (1961) theory as well as Broms's (1964b) theory, the