



# Comparison of SPT N-value with Alternative Field Test Methods in Determining Moduli for Settlement Predictions

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**Background**



# Introduction

- Determination of immediate settlement for embankment and shallow foundations requires modulus of the soil as a critical material parameter
- Typically found as correlation with SPT-N
- Several national and international correlations yield a range of results
- Uncertainties and risk lead to conservative design



# Introduction

- Additionally, many other field methods are or may be used for obtaining soil modulus - e.g. CPT, Dilatometer, Pressuremeter, and seismic geophysical methods
- Not known if these other field methods yield more accurate correlations than SPT-N
- Also, numerous methods to predict settlement based on  $E_s$  yield wide range of results
- Beneficial to assess accuracy for soil types and conditions specific to Central Florida



# Previous Research at UCF



# Previous Research

- In 2003, FDOT Research Project, BC355-05, ***Site Preparation for a Deep Foundation Test Site at UCF***, UCF and UF conducted an extensive site investigation for a test site located on the UCF campus
- Site investigation included SPT, CPT, DMT and PMT, as well as a laboratory test program that resulted in some moduli from triaxial and consolidation tests
- Results will be utilized for this project



# Previous Research

- This UCF site is still accessible
- Will be used to conduct full scale surcharge load testing along with instrumentation to assess settlements under various embankment loading conditions
- Additional field and laboratory tests will be performed at SMO and UCF to supplement the work from the initial project



Impact





# Impact

- Without accurate modulus values, engineers will typically assign a conservative value
- This conservatism often predicts larger settlements than actually will occur
- Resulting in higher construction costs than if more accurate soil parameters were used that reflect the true site conditions
- In cases where the engineer under-predicts the settlement, significant cost impact on construction and maintenance because of excessive settlements



# Research Plan



# Goals

- To identify the most appropriate correlations with SPT-N to obtain accurate modulus values compared to current practice of using general correlations identified in various textbooks
- Identify supplemental field test methods that may yield more accurate moduli correlation than those from SPT-N correlations
- Analysis based on performance results using actual field settlement measurements under controlled conditions.
- Additional laboratory testing



# Planned Tasks (tentative list)

- Review of literature related to current methods for modulus and immediate settlement predictions
- Survey of practitioners and district engineers
- Study previous research report – differentiate different layers and identify two or three locations for field testing
- Perform Conical load tests
- Measurements using settlement plates and spider magnet rings at intermediate layers
- Pore pressure transducers and Shelby tube samples for silty layers



# Planned Tasks (tentative list)

- Additional CPT, DMT, PMT and seismic geophysical
- Index testing (at UCF and SMO)
- Consolidation and triaxial tests on soil samples with significant fines
- Analysis of data
- Progress updates per FDOT requirements
- Reporting
- Implementation



# Implementation



# Implementation

- Publishing revised method(s) to predict settlement and correlation(s) to obtain modulus values most appropriate for the specific soil types and conditions tested which are frequently found in and around Central Florida
- These methods and correlations would likely be much more appropriate for use in similar conditions in other parts of Florida than the nationally published values which were based on testing in the Midwest, the Northeastern United States and abroad



# Handbook and Guidelines

- The methods and correlations will be included in the Soils and Foundations Handbook (SFH) and referenced in the Structures Design Guidelines (SDG)
- The results will be presented in the yearly Design Expo to inform consultants of the revisions made to SDG and SFH
- GRIP Presentation









**Thank you!**  
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