



U.S. Department of Transportation
Federal Highway Administration

FHWA GEOTECHNICAL ENGINEERING PROGRAM

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FHWA GEOTECHNICAL PROGRAM

The Geotechnical Team is currently comprised of 21 Full-Time Engineers:

Headquarters Program Office (3)

- Justice Maswoswe
- Khalid Mohamed
- Silas Nichols

Research (1)

- Jennifer Nicks

Federal Lands (17)

- Eastern, Central, Western



FHWA GEOTECHNICAL PROGRAM

- Broad program with both research and program roadmaps
- Reflects trends and opportunities influencing and impacting the discipline
- Priorities identified through annual Geotechnical Spending Plan
- Roadmap is informed through feedback from State DOTs, FHWA Division offices, industry, and academia



FHWA GEOTECHNICAL PROGRAM



Headquarters Roles and Responsibilities:

- Direct support of State project delivery
- Review of critical and complex structures
- Provide information to assist development and maintenance
- Research identification and support
- National Highway Institute (NHI) curriculum and training oversight

PROJECT DELIVERY SUPPORT AND PROJECT REVIEWS

1. I-695 over Patapsco River/Baltimore Harbor, Francis Scott Key Bridge (MD)
2. I-71/75 over Ohio River, Brent Spence Bridge (OH/KY)
3. I-39/90/94 over Wisconsin River (WI)
4. I-278 BQE Central Project (NY)
5. I-80 Sinkholes - Wharton (NJ)
6. Western Hills Viaduct (OH)
7. Burnside Bridge (OR)
8. Last Chance Grade (CA)
9. Hurricane Helene Response (NC)
10. US-51 over Ohio River (KY/IL)
11. I-195 over Seekonk River, Washington Bridge (RI)



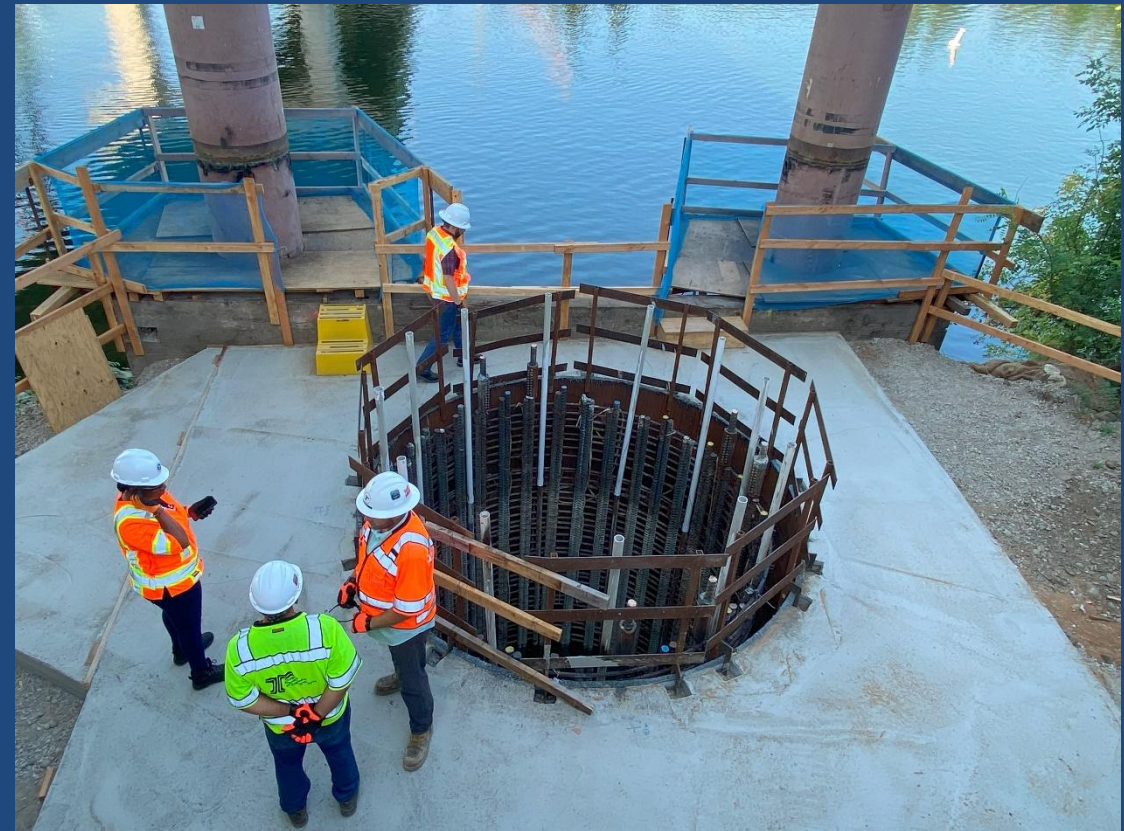
GEOTECHNICAL TEAM FOCUS AREAS

- Innovations in Geotechnical Design and Construction Methods
- Advanced Site Characterization
- Geotechnical Asset and Performance Management
- Geotechnics of Scour
- Geotechnical Aspects of Pavement



DISCIPLINE CONSIDERATIONS

- Importance of construction means and methods to geotechnical design and performance
 - Size and depth of foundation elements
 - Technique and system innovations
 - Construction control methods for establishing reliability of geotechnical elements
- Continued issues with the application of Load and Resistance Factor Design (LRFD) to geotechnical applications
 - Strength and service limit state calibration and application
 - Development of probabilistic approaches
 - Geotechnical data as part of asset management
 - Understanding geotechnical performance



DISCIPLINE CONSIDERATIONS

- Understanding risks associated with not properly characterizing geohazards
 - Value of a properly scoped and executed site investigation program
 - Advances in site investigation tools
 - Influence of investigation or test type, and quantity on reliability of geotechnical elements
- Cross-discipline cooperation
 - Pavements
 - Structures
 - Hydraulics
 - Transportation Asset Management
 - Construction
 - Environment



Source: Harry Moore (Retired TN DOT)

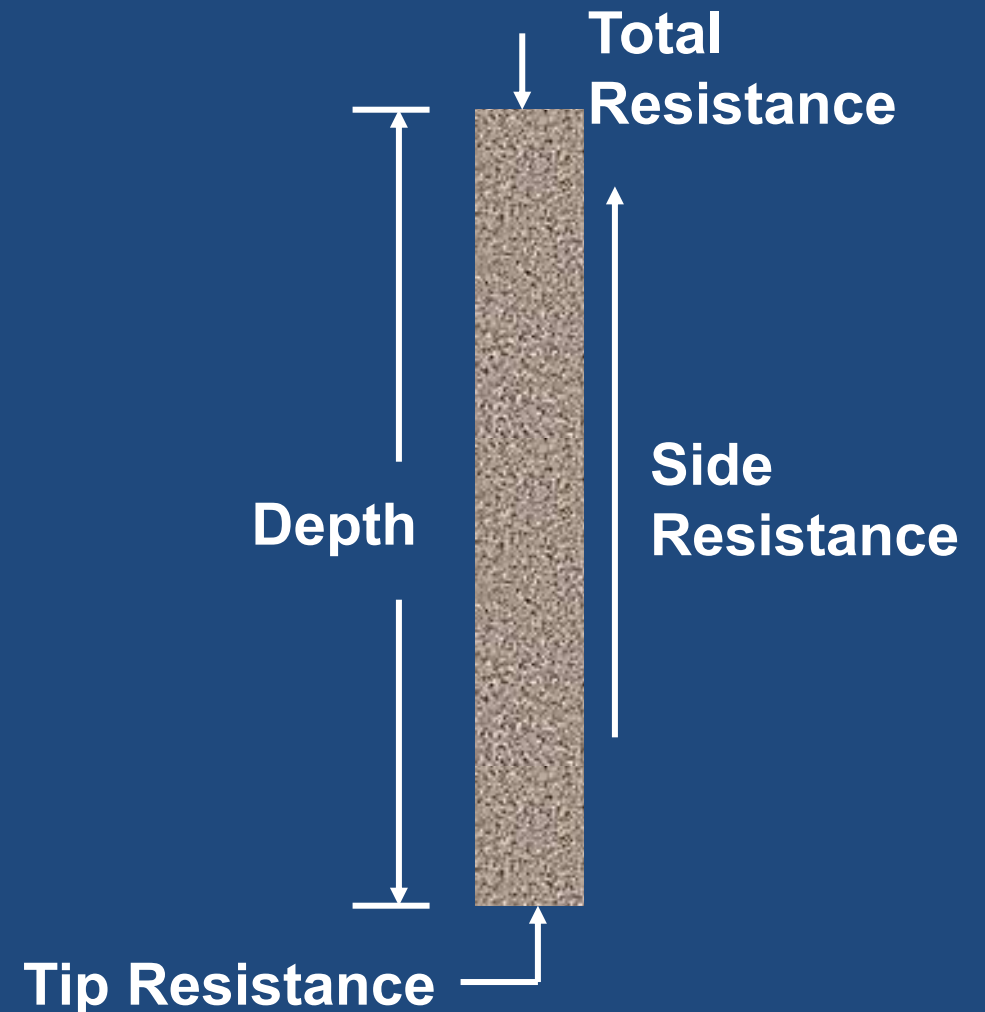
CURRENT ACTIVITIES FOR THE GEOTECHNICAL PROGRAM

- Evaluation of LRFD Geotechnical Limit States for Structural Foundations
- Quality Assurance Procedures for Large Diameter Drilled Shafts
- NextScour: Developing Approaches for Determining the Allowable Critical Shear Stress of Clays
- Texas A&M National Geotechnical Experimentation Site (NGES): Evaluation of Exhumed Foundation Elements
- Support for American Association of State Highway Transportation Officials (AASHTO) Re-Write of Section 10 to Consider the Reliability of Site Characterization Programs
- Liquefaction and Consequences Data Gathering and Model Development
- Continued Maintenance of Technical Reference Manuals and NHI Training

EVALUATION OF LRFD GEOTECHNICAL LIMIT STATES FOR STRUCTURAL FOUNDATIONS

Research objective is to evaluate current geotechnical limit states for the design of structure foundations considering:

- Advances in available technology
- More complex design concerns
- Innovations in construction means and methods



EVALUATION OF QA PROCEDURES FOR LARGE DIAMETER DRILLED SHAFTS

Purpose is to address QA issues related to use of rotator/oscillator drilled shaft installation equipment:

- Differences in inspection procedures vs. traditional installation methods
- Use of drilling fluids with rotator/oscillator drilling
- Maintenance of soil plugs
- Installation plan development



DEVELOPING APPROACHES FOR DETERMINING THE ALLOWABLE CRITICAL SHEAR STRESS IN CLAYS

FHWA has developed a long-term research strategy (NextScour) to address scour as a complex geotechnical soil-structure interaction problem

- Early phase work has focused on improving simplified, conservative assumptions for scour in cohesive soils
- Development of a framework for defining critical shear stress (τ_c)



EVALUATION OF EXHUMED FOUNDATION ELEMENTS

Opportunity to decommission the fully characterized “outdoor labs” established by FHWA and NSF at the National Geotechnical Experimentation Sites (NGES) at Texas A&M. Objectives are to:

- Exhume existing foundation elements to evaluate for corrosion and long term concrete and steel performance
- Re-characterize the site for evaluation of current soil properties
- Evaluate and develop testing protocols



Source: Texas A&M University



Source: Texas A&M University

RELIABILITY OF SITE CHARACTERIZATION PROGRAMS

Development of implementation aids for potential use of for Section 10 of the AASHTO LRFD Bridge Design Specifications update. Considerations include:

- Address uncertainty in site characterization by accounting for reliability of the subsurface investigation program as published in FHWA-NHI-17-072
- For static analysis methods, resistance factors can be based on the coefficient of variation of the critical design parameter
- Address both direct and indirect measurements for determination of a design parameter



U.S. Department of Transportation

Publication No. FHWA NHI-16-072
April 2017

NHI Course No. 132031

Geotechnical Engineering Circular No.5

Geotechnical Site Characterization



NATIONAL HIGHWAY INSTITUTE
Training Solutions for Transportation Excellence

IMPROVED LIQUEFACTION HAZARD ASSESSMENTS

Research effort supporting the Next Generation Liquefaction (NGL) project to produce probabilistic models for liquefaction susceptibility

- Goal of improved predictive capabilities
- Current and potential future tasks to continue data gathering efforts and develop models for:
 - Triggering and Manifestation
 - Lateral Spreading
 - Deep Liquefaction



NHI GEOTECHNICAL TRAINING

NHI serves as a communication and technical assistance mechanism. Currently evolving program to:

- Increase **methods and opportunities** for accessing and delivering training
- Provide improved **technical assistance** vehicles
- Provide better **consistency** in training materials and delivery



ACCESS TO NHI TRAINING

- Blackboard Learning Management System (LMS) is live!
 - More interactive and user-friendly platform
 - Easier access to course information
 - Simplified course registration
 - Transcript viewing and management of profile information



THANK YOU!



Source: Aero Aggregates