CHAPTER 1

GEOTECHNICAL OPERATIONS AND ADMINISTRATION
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1.1 SCOPE OF GEOTECHNICAL DESIGN, CONSTRUCTION, AND MAINTENANCE SUPPORT

The focus of geotechnical design, construction, and maintenance support within the context of NYSDOT is to ensure that the soil or rock beneath the ground surface can support the loads and conditions placed on it by transportation facilities. Typical geotechnical activities include the following:

- subsurface field investigations,
- geologic site characterization, laboratory testing of soil and rock,
- structure foundation and retaining wall design,
- soil cut and fill stability design,
- subsurface ground improvement,
- seismic site characterization and design,
- rock slope design,
- unstable slope management,
- unstable slope (e.g., rock fall, landslides, debris flow, etc.) mitigation,
- infiltration, subsurface drainage and related hydrogeologic design,
- material source (pits, quarries and stockpiles) evaluation,
- long-term site instrumentation and monitoring for geotechnical engineering purposes,
- support to Regional construction staff regarding geotechnical issues and contractor claims,
- support to Regional maintenance staff as geotechnical problems (e.g., landslides, rock fall, earthquake or flood damage, etc.) arise on transportation facilities throughout the state,
- training/certification for temporary and permanent Department employees on density and gradation testing performed in the field, via the Earthwork Inspector School,
- stage wall design,
- standard and special specifications, Standard Sheets, Bridge Design sheets and other details needed for geotechnical work,
- field technical support for geotechnical problems including slope mitigation, shoulder drop-offs and other maintenance problems, rock falls and instability, wash-outs, and geotechnical forensics,
- assistance for project scoping,
- design support,
- construction support, and
- conducting and interpreting dynamic pile load tests with signal matching.

A geotechnical investigation is conducted on all projects that involve significant earthwork quantities (including state owned materials source development), unstable ground, foundations for structures, and ground water impacts (including infiltration). The goal of the geotechnical investigation is to preserve the safety of the public who use the facility, as well as to preserve the economic investment by the State of New York.
As defined in this manual, geotechnical engineering is inclusive of all the aspects of design and construction support as described above, and includes the disciplines of foundation engineering and engineering geology. Geotechnical engineering shall be conducted by Engineers or Engineering Geologists who possess adequate geotechnical training and experience.

Geotechnical engineering shall be conducted in accordance with regionally or nationally accepted geotechnical practice, and the geotechnical engineering practice as defined by this manual. Geotechnical engineering shall be performed by, or under the direct supervision of, a person licensed to perform such work in the state of New York, who is qualified by education or experience in this technical specialty of engineering.

For work that does or does not require certification by a Professional Engineer, but does require evaluation by an Engineering Geologist (EG), such work shall be performed by, or under the direct supervision of, a person accredited to perform such work in the state of New York.

1.2 GEOTECHNICAL ORGANIZATION

1.2.1 Main Office Geotechnical Engineering Bureau

The Geotechnical Engineering Bureau fulfills its mission as follows:

- The Bureau manages, on a Department-wide basis, those portions of the Department's programs concerned with earth, rock and groundwater engineering studies.
- Coordinates technical activities of all Department units involving problems related to soils, foundations and geology.
- Directs operations of the Main Office soils program and technical operations of the Regional Geotechnical Sections.
- Provides earth engineering services (earthwork and foundation engineering) for design, construction and maintenance of highways, buildings, bridges, airports, railroads, ports and waterways.
- Develops plans, policies and procedures for fiscal management, purchasing and personnel development for the Main Office and Regional Geotechnical Sections.
- Monitors quality assurance of Main Office and Regional Geotechnical and Regional Construction groups concerning all aspects of the soils drilling, sampling, testing, materials acceptance, construction control and engineering services.
Figure 1-1 Geotechnical Engineering Bureau Organization
1.2.1.1 Highway Design & Construction Section

The Highway Design & Construction (HD&C) Section of the Geotechnical Engineering Bureau is a multifaceted organization involved in many aspects of the delivery of the Departments’ Capital Program. HD&C is the only section in the Bureau which is involved in projects from their inception through post construction. This may include, but is not limited to, scoping, planning, design, construction, orders-on-contracts, claim resolution and maintenance.

A. Regional Support:
   • Design and Technical Support,
   • Plan Review,
   • On-Site Construction Support:
     - Troubleshooting Design Details,
     - Design Support for Unexpected Conditions,
     - Design Support for Changed Conditions,
     - Agent for Specification Clarification,
     - Coordinator for Bureau Staff Site Review,
   • Training,
   • Maintenance Support,
     - Slope Distress,
     - Shoulder Drop-off/ Pavement Cracks,
     - Washouts/ Erosion,
   • Local Program Support,
   • Design-Build Support,
     - Specification Review,
     - Input into Quality Plan/ QA/ Owner Verification,
     - Submittal Review.

B. Bureau and Other Functional Units within the Department Support:
   • Design Assistance,
   • Resources,
   • Standard & Special Specifications,
   • Information Regarding Regional Needs.

C. General:
   • Claims and Dispute Resolutions,
   • Technical Expertise in Court Cases,
   • Documentation:
     - Geotechnical Report,
     - Lesson’s Learned Memorandum,
     - Case History
     - Technical Report
     - Geotechnical Manual
In addition to the above, the HD&C Section is supported by:

**A. General Soils Laboratory:**
- Granular materials,
- Recycled concrete aggregate,
- Topsoil,
- Soil stabilization,
- Classification, IAST, and SMRL.

**1.2.1.2 Subsurface Explorations Section**

The Subsurface Explorations Section of the Geotechnical Engineering Bureau is divided as follows:

**A. Drilling:** The Drilling Section provides:
- Field assistance and training in quality soil sampling and rock coring,
- Equipment and supplies for drilling operations,
- Soil/Rock drilling,
- Drill contract review,
- Field supervision of geotechnical drilling and pavement coring.

**B. Soil Survey and Mapping:** The Soil Survey and Mapping Section provides:
- Terrain reconnaissance mapping,
- Canal foundation investigations, design, and special projects,
- Canal dredge sampling and monitoring,
- Dam investigation and review,
- Building foundation investigation and design,
- Well sampling and monitoring.

**1.2.1.3 Structure Foundations Section**

The Structure Foundations Section of the Geotechnical Engineering Bureau provides:

**A. Analyses of Soil-Structure Interaction:**
- Conventional piles,
- Micropiles,
- Drilled Shafts,
- Spread footing foundations.

**B. Design & Review:**
- LRFD,
- Retaining walls,
- Excavation support systems,
- Precast wingwalls,
- Mechanically stabilized earth systems.
C. Special Interests:
   • Corrosion of mechanically stabilized earth systems,
   • Seismic effects,
   • Composite piles,
   • Spread footing foundations.

D. Training Activities:
   • Flexible walls,
   • Sign foundations,
   • Drilled shaft construction inspection,
   • Pile driving inspection.

In addition to the above, the Structure Foundations Section refines foundation designs during installation via **Dynamic Pile Testing**:
   • High-strain evaluation of driven foundation elements (H-piles, steel pipe piles, pre-stressed concrete and wood piles),
   • WEAP, CAPWAP analyses.

**1.2.1.4 Roadway Foundations Section**

The Roadway Foundations Section of the Geotechnical Engineering Bureau provides:

A. **Analyses of Soil Strata**:
   • Stability and settlement of embankment foundation soils, cut slopes, and landslides,
   • remedial treatments for weak soil conditions, unstable slopes, canal dikes and landslides,
   • Walls and geosynthetically reinforced soil structures,
   • Pipe and culvert installation standards,
   • Soil parameters for seismic design and recharge basin design,
   • Assistance during construction.

In addition to the above, the Roadway Foundations Section is supported by:

B. **Field Instrumentation Unit**:
   • Geotechnical instrumentation for monitoring field performance of foundations, earth slopes, embankments, and substructures.

C. **Soil Mechanics Laboratory**:
   • Strength, consolidation, and permeability testing,
   • Visual description of soils,
   • Geosynthetics.
1.2.1.5 Engineering Geology Section

The Engineering Geology Section of the Geotechnical Engineering Bureau provides:

A. Geologic Design:
   • Rock design parameters for foundations,
   • Rock slope design,
   • Remedial measures,
   • Rock slope inventory.

B. Geologic Construction:
   • Blasting operations (pre-blast meetings, structure removal, permit review, and maintenance),
   • Stone filling evaluation,
   • Bedrock foundation evaluation for structures,
   • Rock slope stabilization,
   • Rock excavation,
   • Blasting monitoring,
   • Ice jams,

C. Hydro-Geophysical:
   • Geophysical surveys (seismic, electrical resistivity, ground-penetrating radar),
   • Water supply (investigations, well design, and construction),
   • Pump tests and aquifer evaluation,
   • Vibration surveys.

D. Technology & Operations:
   • New technology and standards,
   • Special projects to develop innovative engineering geology operations via improved methods and specifications,
   • Exchange of information, procedures, inventories, and applications.

1.2.2 Regional Geotechnical Sections

Each Regional Office within the State includes a Regional Geotechnical Section. The primary responsibility of the Regional Geotechnical Section is to provide subsurface information in support of design. The Regional Geotechnical Section fulfills its mission by managing a State Drill Crew(s) or Drilling contracts. In addition, the Regional Geotechnical Section supports the activities of the Regional Design and Construction Groups.
New York State Department of Transportation

Regional Geotechnical Section

Regional Geotechnical Engineer

Design
  - Design
  - Highway Work Permit Review
  - Freedom of Information Law Requests

Construction
  - Construction Troubleshooting
  - Laboratory
  - Construction Testing & Quality Assurance

Drilling
  - Exploration Stake-out
  - Drilling

Figure 1-2 Regional Geotechnical Section Organization
1.2.2.1 Design Section

The Design Section of the Regional Geotechnical Section provides:

- **Design**: Design Support:
  - Design and Technical Support,
  - Plan Review,
  - Special specifications.

In addition to the above, the Design Section includes:

A. **Highway Work Permit Review**: The New York State Department of Transportation is responsible for the State highway system. The use of New York State highway right-of-way must be carried out and completed in accordance with terms and conditions of a work permit. The New York State Department of Transportation reviews all permit applications from developers, utility companies, municipalities, residents, etc., desiring to conduct various activities within the right of way. Such activities include for example: driveway installations and maintenance, construction of highway improvements, utility installations, etc. The Regional Geotechnical Section provides technical support in review of these applications.

B. **Freedom of Information Law Requests**: New York State’s Freedom of Information Law ([http://www.oms.nysed.gov/foil/](http://www.oms.nysed.gov/foil/)) allows members of the public to access records of Governmental Agencies. FOIL provides a process for the review and copying of an Agency’s records. The Regional Geotechnical Section has been requested to provide existing subsurface information in cited areas.

1.2.2.2 Construction Section

The Construction Section of the Regional Geotechnical Section provides:

A. **Troubleshooting**: On-Site Construction Support:
  - Troubleshooting Design Details,
  - Design Support for Unexpected Conditions,
  - Evaluation of fill compaction problems,
  - Evaluation of materials source and borrow problems,
  - Pavement subgrade problems.

In addition to the above, the Construction Section is supported by:

B. **Laboratory**:
   - Granular materials.

1.2.2.3 Drilling Section

The Drilling Section of the Regional Geotechnical Section provides:

A. **Exploration Stake-out**: The purpose of staking-out proposed explorations is to identify the locations for an Underground Facilities Protection Organization (UFPO) clearance, a.k.a. Dig Safely New York ([NYS Coderule 753](https://www.nys.gov/coderule/regulation)). This practice helps locators avoid
marking where not necessary while assuring the excavation site does get marked properly. The purpose of these rules is to establish procedures for the protection of underground facilities in order to assure public safety and to prevent damage to public and private property.

B. Drilling: The primary function of the drill crews is to obtain information about the subsurface conditions of the site for engineering design use. This is accomplished by

- Obtaining samples using proper procedures, and
- Keeping accurate field logs.

The more accurately the drill crew can sample and log the subsurface conditions, the better the engineer can design a more cost effective project. Drill crews are small, typically consisting of 2 or 3 members. Responsibilities include:

- Understanding the objective of the drilling program
- Understanding the quality and degree of urgency of the work and the standards to be achieved,
- Determining the level of stocks of materials and parts on-site relative to estimated depth,
- Choosing items of support equipment,
- Running the site,
- Providing a water supply and making other site arrangements,
- Unloading, setting up, aligning and servicing the rig,
- Selecting the bit types required,
- Setting out tools,
- Preparing sampling devices,
- Dig mud pits and mix mud,
- Prepare and transport samples for testing,
- Prepare and deliver completed logs, records, and reports,
- Arranging for rig moves,
- Communicating with Supervisors…conveying progress reports, problems, etc., and
- Site cleanup and closure.

1.3 AVENUES FOR OBTAINING SUBSURFACE EXPLORATIONS

1.3.1 State Forces

- Regional Forces,
- Main Office Drill Crew,
- Combined Group Effort.

Obtaining subsurface explorations with State Forces is the easiest, quickest, and least cost to program (Drill Crews are on the State payroll). The Drill Crews are under direct control for scheduled response and oversight is directly controlled by Departmental Geotechnical Engineers. The only delay is UFPO clearance (NYS Coderule 753), which takes about one week.
However, there are occasions when additional assistance is necessary. At those times, drilling contracts are let to procure the services of companies experienced in obtaining subsurface information, soil and rock samples, for geotechnical engineering purposes (see Appendix 1-B).

Guidelines for preparing the following contracts are available in Geotechnical Engineering Manual (GEM-19) Guidelines for Preparing Drilling Contracts. This manual provides the information that is necessary for preparing drilling contracts including: example scope of services; soil identification system; safety requirements; drill log preparation; site requirements; and the specification for providing subsurface explorations in contaminated areas.

### 1.3.2 State Let Contracts

Obtaining subsurface explorations via State let contracts can be realized through a number of methods:

- **Capital Projects:**
  
  This type of project would be developed and advance through normal Departmental channels. The Subsurface Exploration contract must be designated as a capital project and be assigned a Project Identification Number (PIN). A contract of this nature would typically require 6 to 8 months to prepare. If contract cost exceeds $150,000, this type of contract is the only method that may be used.

- **Purchase Order:**
  
  If the project is extremely small (e.g. cost less than $15,000), a Purchase Order contract is an avenue that may be explored. This type of contract can be quick, typically two or three weeks to advertise, and there is no Comptroller approval. Comptroller approval can take 4 to 6 weeks under normal circumstances.

  Purchase Order contracts can also be used for slightly larger contracts (Region 2) but this requires more time for appropriate approvals through the Comptroller’s office (as does PIN projects).

  Purchase Order contracts are “stand alone” contracts. They do not contain reference to contract language and requirements standard in the specification book. Thus, if work zone traffic control (WZTC) is needed, it must be itemized in the contract.

  A Purchase Order contract must be completed before another Purchase Order contract can be let, thus it is difficult to have flexibility in managing a Region’s drilling program.

### 1.3.3 Consultant Let Contracts

Consultant let contracts are available if a consultant is designing the project. Depending on the cost, a Consultant has the options to:

- Just call a Drilling Contractor if the work is less than $5,000
- Require quotes if the limit is between $5,000 and $20,000
- Sealed bids required if between $20,000 and $150,000
With either contract option 1.3.2 or 1.3.3, location, depth, and sampling requirements must be specified. Furthermore, field inspection oversight services must be provided either by State forces or separate Consultant contract.
<table>
<thead>
<tr>
<th>Option</th>
<th>Cost</th>
<th>Schedule</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOT Drill Crews</td>
<td>Target (2 to 3 per crew), rigs, equipment, supplies, training, tech support.</td>
<td>Clear utilities &amp; reschedule crews (48 hrs. to 2 weeks).</td>
<td>Flexibility, co-worker relationship, quality thru training and tech support, institutional knowledge.</td>
<td>Use of limited target, fleet maintenance, supervision command &amp; control issues, winter downtime</td>
<td>Provides the only learning ground for Department drilling expertise.</td>
</tr>
<tr>
<td>Consultant Designer Sublet Drilling Contract</td>
<td>Limited to $150,000.00 by Comptroller’s rules. Add 40% for qualified inspection cost.</td>
<td>Time to clear utility &amp; schedule drill subs. (2 to 3 weeks).</td>
<td>Fast, done by supplemental agreement, inspected by another sub.</td>
<td>Limited in size by $150,000.00 cap. Requires competent separate inspector.</td>
<td>Convenient, but $ cap may prevent getting all information required.</td>
</tr>
<tr>
<td>State Let Drilling Contract</td>
<td>No dollar limit. Can be project-specific only, Region-wide, or Where &amp; When contract. Requires inspection.</td>
<td>Time to develop contract documents, advertise, review for award (3 to 6 months).</td>
<td>Can do large amounts of drilling at competitively bid prices if future program is well defined.</td>
<td>Spending your Capital Program $’s, have to define drilling well in advance, very hard to return to sites.</td>
<td>Inspection of work may require a consultant to properly monitor this specialty contract.</td>
</tr>
<tr>
<td>Purchase Order Drilling Contract</td>
<td>P.O rules apply. A few drill holes might be by quotes, more would be advertised &amp; let.</td>
<td>Develop documents, 2 week ads, more than $15,000.00 needs 45 day award.</td>
<td>Less than $15,000.00 fast (less than a month). More than $15,000.00, takes 2+ months due to Comptroller award review.</td>
<td>Inspection usually done by State drill staff or drill supervisors, if they are available. With less drill staff, limits number of State people who know about drilling.</td>
<td>Drilling is considered a product, not professional service. Can’t obtain with the same kind of agreement as survey or engineering. Can obtain with a P.O.</td>
</tr>
</tbody>
</table>

Table 1-1 Costs, Schedules, Benefits, and Limitations for Subsurface Explorations Obtained by Various Methods
1.4 DESIGN-BID-BUILD PROCESS

The NYSDOT’s Geotechnical Engineering Bureau (GEB) and the Regional Geotechnical Engineers (RGE) outlined in Section 1.2 Geotechnical Organization are the Department’s experts on geotechnical design. However, there are situations where the NYSDOT designates Consultants to perform geotechnical design services. Even when geotechnical design functions are delegated to a Consultant, the GEB and RGE’s have significant oversight, support and review functions (See Appendix 1-A).

The following Sections describe the involvement of the Departmental Geotechnical Engineer in the Design-Bid-Build process. “Departmental Geotechnical Engineer” identifies the individual(s) assigned the geotechnical design for the NYSDOT project, including geotechnical engineers from the GEB, the RGE, or the NYSDOT’s hired Consultant.

1.4.1 Geotechnical Support within the NYSDOT Program and Project Management System (PPMS)

All phases of NYSDOT capital transportation projects are delivered according to the principles and practices of the Program and Project Management System (PPMS). The Project Development Manual (PDM) reflects Department policy and procedures for progressing capital projects from project scoping to letting in an effective and efficient manner.
CHAPTER 1
Geotechnical Operations and Administration

Figure 1-3 NYSDOT Project Development Process
1.4.1.1 Planning Stage

Departmental Geotechnical Engineers may become involved in a project from as early as their inception through post construction.

The Initial Project Proposal (IPP) is the initial planning and programming document used to select projects based on program goals. It briefly describes a candidate project and how the proposal addresses an identified need. The IPP includes:

- A description of the problem.
- A preliminary project objective(s).
- Project elements to be investigated.
- Preliminary environmental classification.
- Issues or circumstances which may arise (e.g., community concerns and environmental issues).
- Preliminary schedule.
- A cost estimate.

Departmental Geotechnical Engineers obtain and review background information for the IPP, including:

- Record plans identifying any project elements to be investigated.
- Identification of any available pertinent historical subsurface information.

Departmental Geotechnical Engineers typically perform a site investigation to identify existing conditions which may impact proposed alignment, including:

- Poorly drained areas (swamps) requiring special ground improvement techniques,
- Large rock cuts – contact the Engineering Geology Section to provide a Rock Slope Location and Identification Report as outlined in the Geotechnical Design Procedure for Preparing Rock Slope Recommendations (GDP-13).
- Retaining walls required for cuts and fills which conflict with existing permanent features,
The Departmental Geotechnical Engineer’s IPP review is focused on any potential specialized construction operations, required to address subsurface conditions, which may impact the cost estimate. This information will allow Regional Planning to make adjustments to the IPP.

The Regional Planning and Program Manager’s (RPPM) group reviews the IPP, prioritizes, and selects IPP’s for recommendation to the Regional Director for approval and addition to the capital program. The Regional Director’s approval of the IPP formally identifies a need for corrective action, authorizes the RPPM to add a project to the Region’s capital program, and subsequently to obligate funds for advancement.

Upon approval of the IPP, the project is ready, from a capital program perspective, to advance to the next stage of project production, the Project Scoping Stage.

This and more information is available from the Departments Design Quality Assurance Bureau in the Project Development Manual at: https://www.dot.ny.gov/divisions/engineering/design/dqab/pdm

1.4.1.2 Scoping Stage

Departmental Geotechnical Engineers may become involved in a project from as early as their inception through post construction. The Project Scoping Stage begins after approval of the Initial Project Proposal (IPP).

The Project Scoping Report documents the scoping decisions and the considerations upon which those decisions were made. The amount of data collected, analyzed, and documented is a direct function of the project’s context including:

- Problems and needs.
- Complexity.
- Significance of related issues.
- Potential social, economic, and environmental issues.
- Stakeholders issues.
- Range of alternatives to be evaluated.
Figure 1-5 Scoping Stage
Departmental Geotechnical Engineers review the Project Scoping Report. After review of available background information and site inspections, a subsurface exploration program is drafted and scheduled to address the following:

- Structures and Culverts.
- Retaining walls.
- Cuts and Fills.

Although it’s more efficient to address all of design needs with one all-encompassing subsurface exploration program performed during one site mobilization, the Project Scoping Report is not a detailed design document and design aspects do change. In addition, a range of alternatives may be under evaluation. Therefore, the initial subsurface exploration program is typically focused on major design aspects and subsurface explorations are situated to address a range of alternatives.

This and more information is available from the Departments Design Quality Assurance Bureau in the Project Development Manual at:
https://www.dot.ny.gov/divisions/engineering/design/dqab/pdm
1.4.1.3 Design Stage

Departmental Geotechnical Engineers may become involved in a project from as early as their inception through post construction. The Design Stage begins after the Project Scoping Stage and is broken into six phases.

**Design Phase I:** Basic Design Report Format
- Chapter 1 – Executive Summary.
- Chapter 3 – Alternatives.
- Chapter 4 – Social, Economic, and Environmental Considerations.
- Appendicies.

Departmental Geotechnical Engineers review the Design Report. Details of the project become clearer and the subsurface exploration program may need to be modified.

The HD&C Area Geotechnical Engineer may notify the appropriate Geotechnical Engineering Bureau section concerning specific design proposals to initiate design support.
Design Phase II: Advisory Agency Review
- Publish Notices and Press Releases.

Design Phase III: Public Hearing
- Publish Notices and Press Releases.
- Prepare For and Conduct a Public Hearing or Meeting.

Design Phase IV: Final Evaluation & Recommendation
- Final Evaluation of Comments and Selection of the Preferred Alternative.
- Finalization of Design Approval Document and Distribution for Review.
- Publish Notice, as applicable.
- On Federal-Aid Projects, FHWA Makes or Concurs with NEPA Determination unless NEPA Checklist is used for Automatic or Programmatic Categorical Exclusions.
- Region Makes SEQR Determination.
- Design Approval Request Memorandum is Prepared and Design Approval is Obtained.
- Notice of Design Approval, as applicable.

Departmental Geotechnical Engineers review the Preferred Alternative. After review of the current subsurface information, the subsurface exploration program may be modified to address the following:
- Supplemental borings for Structures, Culverts, Retaining Walls, Cuts, and Fills.
- Retaining walls for staging.
- Noisebarrier walls.
- Stormwater management (detention/retention ponds).
- Overhead sign structures.

The HD&C Area Geotechnical Engineer will request the appropriate Geotechnical Engineering Bureau section concerning specific design proposals to develop design recommendations.

Design Phase V: Advanced Detail Plans (ADPs)
- Right-Of-Way Acquisition.
- Obtain Permits.
- Prepare ADP’s.
- Review ADP’s.

Departmental Geotechnical Engineers review the Advanced Detail Plans. The HD&C Area Geotechnical Engineer will request the appropriate Geotechnical Engineering Bureau section to review the design details for concurrence with their original recommendations.

Design Phase VI: Final Plans, Specifications, and Estimate
- Prepare PS&E.
- Submit Special Specification Requests, as necessary.
• Prepare PS&E Transmittal Memorandum.
• Prepare ECOPAC.
• Obtain Title Sheet Signature’s and Regional Director’s Approval.
• Submit for DQAB for Review and Approval.

Departmental Geotechnical Engineers review the Final Plans. The HD&C Area Geotechnical Engineer will request the appropriate Geotechnical Engineering Bureau section to review the design details for concurrence with their original recommendations.

This and more information is available from the Departments Design Quality Assurance Bureau in the Project Development Manual at: https://www.dot.ny.gov/divisions/engineering/design/dqab/pdm

1.4.1.4 Construction

Departmental Geotechnical Engineers may become involved in a project from as early as their inception through post construction. Construction begins after the project is advertised, Let, and awarded.

During construction, Departmental Geotechnical Engineers provide construction support. Construction support can involve various undertakings:
• Troubleshooting Design Details.
  Departmental Geotechnical Engineers offer their support to the Engineer-In-Charge concerning all soils-related items in a project. Questions regarding Geotechnical Engineering Bureau designs are resolved during site visits or, if needed, the appropriate Bureau section is contacted for explanation of their recommendations and the intent of the design.
• Design Support for Unexpected Conditions. Departmental Geotechnical Engineers offer their support to the Engineer-In-Charge during unexpected site conditions. These situations can involve requiring an undercut of a roadway section, installation of stone weeps, geotextiles, stone slope protection, etc.

• Design Support for Changed Conditions. Departmental Geotechnical Engineers offer their support to the Engineer-In-Charge during a changed condition situation. Questions regarding Geotechnical Engineering Bureau designs with respect to the newly assessed conditions are resolved with the appropriate Bureau section. Initial assessment of a claim can be outlined to support the Engineers strategy.

• Agent for Specification Clarification. Departmental Geotechnical Engineers discuss new and existing specifications with the Engineer-In-Charge to refine requirements and clarify payment issues.

• Coordinator for Bureau Staff Site Review. Departmental Geotechnical Engineers coordinate with the Engineer-In-Charge to provide project access to Bureau personnel to assess the status of the construction and/or develop an improved understanding of the technical logistics of their design.

1.4.1.5 Claims & Dispute Resolution

**Change:** A change is the difference from the contract requirements at the time of bid and the actual requirements imposed during construction.

There are many different ways to think about changes. First, changes can be directed or constructive:

1. Directed change - a directed change is a change issued directly by the owner which may require additional cost, increased labor, equipment, or time.
2. Constructive change - a constructive change is a change resulting indirectly from the owner’s action or inaction. These changes are not easily negotiated, can cause disputes, and may require design modifications.

Changes can also be major or non-major:

1. Major changes – a major change will significantly affect the cost of the project, alter the final product or change the scope of the work.
2. Non-major changes – Non-major changes do not alter the end result, change the scope of the project, or guarantee that additional cost is necessary.
Additionally, you can have:

1. **Material changes** – a material change results from a significant change in the character of work to be done. This can cause a change in the means or methods for completing the work as planned by the contractor,
2. **Suspension of work** – a suspension of work occurs when work must halted or suspended for a period of time. Suspension can be caused by a special need or event in the location the work is taking place. Considerations may be made for the special event as construction can cause rough roads, stress on monitoring public, or other adverse affects,
3. **Extra or eliminated work** – extra work to increase or decrease quantities may be asked of the contractor if necessary. In this case, the owner modifies the quantity of the final product which causes extra work to be required or a decrease in the work needed to complete the job, or
4. **Cardinal changes** – a cardinal change is an excessive change that alters the entire scope of the project. Cardinal changes are seen as a breach of contract if the contractor is not willing or able to do the work. Making a cardinal change may adversely impact the competitive bidding environment since doing so precludes other bidders from competing for the work.

23 CFR 635.120 is the authority on change orders. This regulation contains clauses that provide the Federal Government access to information about any change and allow the Federal Government to maintain presence and jurisdiction over the work.

There are several key issues in 23 CFR 635.120 that specifically reference change orders:

1. The method and degree of analysis is subject to the approval of the division administrator.
2. The state highway department shall perform and adequately document a cost-analysis of each negotiated change.
3. Force account is to be used only when strictly necessary.
4. Changes that affect the design of federally-funded construction shall be subject to review and concurrence by the division administrator.
5. Changes in contract time should be established with the change in work.
6. Contract time extensions shall be fully justified and adequately documented.

The Federal Government is responsible for ensuring that the States follow the established procedures and that the proposed changes and compensation are reasonable. All federal funds are controlled by the Federal Government, so, if there is any issue with the change, the Federal Government can choose not to pay or can choose to recoup funds that have been misused. The Federal Government is also responsible for enforcing all environmental commitments and ensuring that any change fits into the environmental scope of the document.
**Claim:** A claim is an unresolved change.

When determining the claim’s validity, there are three main considerations:

1. Entitlement is analyzed by reviewing the contract, reviewing the field conditions, review project records, and interviewing key personnel.
2. If, and only if, the Contractor is entitled, impact is assessed.
3. If the project was impacted, there is a basis for a claim and compensation or damages can be determined.

**Dispute:** A dispute is a disagreement between the owner and the contractor concerning a matter of contract performance or contract compensation.

The best way to resolve a dispute is to address the issue at as low a level as possible. Open communication and partnering between the owner and contractor provide defined accountability and can help address disputes, sometimes before they even occur. Dispute Resolution Boards can also be used to assess any claim and aid in the resolution process.

In order to avoid a dispute, ensure that the preparation of the design and contract package is clear and documented. Pre-Bid can aid in clarification of all contract requirements. Open communication between the owner and contractor helps sort out on-site issues before they become disputes. Proper documentation is imperative as anything that is not documented, in the eyes of the dispute resolution board, did not happen on the job. Finally, recognizing events that are claimable is necessary to understanding what can and cannot be claimed by the contractor.

This and more information is available from the FHWA at: [http://www.fhwa.dot.gov/construction/cqit/claims.cfm](http://www.fhwa.dot.gov/construction/cqit/claims.cfm)
Claims process overview:

Event → Review contract → Entitlement Analysis

- Review field conditions
- Review project records
- Interview key personnel

Project Impacted?

No claim

Yes →

- Direct & Indirect Costs
- Contractor Cost & Time
  
  Damages Assessment

Submit Documented Claim

Figure 1-9 Claims Process Overview
1.4.1.5.1 Geotechnical Claim Avoidance

The following is a condensed version of a paper written by Willard H. Slater, Chief of Geotechnical Services, Alaska DOT. It was prepared for the FHWA, Region 10, 13th Annual Northwest Geotechnical Workshop, August 24-28, 1987 in Portland, Oregon.

Introduction
Transportation Agencies across the country have been impacted by an ever-increasing volume of litigation arising from disputes that focus on the geotechnical aspects of highway construction projects. This is a situation that can be greatly mitigated by proper geotechnical engineering.

The Geotechnical Investigation
Geologic considerations and interpretations often comprise the most difficult phase of a highway engineering project because of the complexity and variability of natural earth and rock formations. The proper design of a highway requires a thorough evaluation of all pertinent geologic elements. This can only be done if such geologic elements are accurately identified, their location and aerial extent determined, and their physical properties measured. This (identification, location, and property measurements) is the purpose of the geotechnical investigations. If the investigation is inadequate, much of the geotechnical evaluations necessary for proper design must be done by guesswork: a no-win situation. The determination of proper backslope angles, embankment stability, ease (or difficulty) of excavation, usability of excavated materials, design of structure foundations, and material site locations, to name just a few, require good geotechnical data if construction difficulties and contract disputes are to be avoided.

What is an adequate geotechnical investigation? Well, obviously, an investigation that provides good, defensible data to support the design assumptions is an adequate one. Obtaining such an investigation, however, is another matter.

The following guidelines may help you to avoid the pitfalls of an inadequate geotechnical investigation:

1. Develop an Exploration Plan: Never initiate the field data collection program without first developing a comprehensive exploration plan. Steps in the formulation of the plan should include:
   A. Evaluate Existing Data: Geological and geotechnical data pertaining to the project should be obtained and analyzed to determine the scope of the geotechnical investigation. This data may include pavement deflection surveys, pavement condition surveys, as-built plans, existing geological and geotechnical reports, aerial photographs, reconnaissance reports, hydrology reports, area construction history reports, and maintenance reports.
   B. Preliminary On-Site Examinations: The Geotechnical Engineer should make an on-site examination of the area with the Design Engineer. If the project is along an existing route, the area maintenance foreman should be included in the on-site survey of the project to provide input for any problem areas. A foot traverse should be made of all proposed realignments. The topography along the proposed route should be
analyzed for any problems expected during investigation such as difficult access in rough terrain or remote geographic areas. For remote area projects, it is also advisable to talk to local residents as they are often a valuable source of information.

C. Formulate the Exploration Plan: The plan should include a list of the equipment needed to perform the field investigations, a cost estimate, estimated length of time required, a boring plan including expected in-situ testing and a discussion of any special problems anticipated. The plan should stress intensive investigation in areas where excavation will be required and in areas where stability should be evaluated.

2. Obtain a Preliminary Plan and Profile: If at all possible, the subsurface investigation should not begin until a copy of a preliminary plan and profile is in hand, and the alignment is staked in the field. The preliminary plans should show the proposed alignment and stationing. The profile should show the existing ground line and a proposed grade. Cross sections are also required in rugged terrain. The proposed roadway template should be shown on the cross sections.

   In nearly level terrain, the Geotechnical Engineer may be able to conduct an adequate investigation without a plan and profile. However, in uneven terrain, one cannot determine either where borings should be or how deep they should be without plan, profile, and staked line. Therefore, if a subsurface investigation is begun prior to receipt of these necessary data, it will often be necessary to return to the field after the plan and profile have been developed. Often, it seems the “return” does not happen, or is scanty because of budget or schedule.

3. Be Careful on Boring Locations: Careful thought should be given to locations of borings and other explorations. If, as is often the case, there are time and budget constraints, you must prioritize boring locations. It is often a mistake to blindly drill on a grid pattern or on evenly spaced intervals along a proposed highway project. It is not necessary to obtain a lot of borings under proposed fills of modest height over level terrain if you are satisfied by probing or other cursory examination that there are no “soft ground” problems. Save your borings for the high-risk areas (the cuts).

   Use geologic interpretation to help you determine where geotechnical data is needed.

4. Collect Appropriate Geotechnical Data: Fit your data collection to the project needs. If it is a rock job involving high cuts, concentrate on detailed data collection that will describe the spatial orientation of joints and other rock structure. This will allow a stability analysis utilizing rock mechanic techniques, and the cuts can then be properly designed. Remember that the overburden will have to be accounted for; determine its thickness and characteristics.

   If the project will involve dewatering for a structure foundation, do what is necessary to determine dewatering characteristics. Give the Designer something to work with, such as, soil gradation and/or estimated soil permeability. Don’t make him guess!

   If embankments over soft ground are involved, gather enough undisturbed samples so that adequate data for shear strength and consolidation characteristics can be developed. Obtain plenty of stratigraphic data so that pore-water drainage path lengths can be estimated for settlement time analysis. Make sure the thickness of the soft ground is well defined throughout the aerial extend of the deposit.
The above discussions are to point out the each project will have its unique high-risk aspects. Determine what they are, and concentrate your investigations on them.

The Geotechnical Analysis
The biggest pitfall in geotechnical analysis lies in the failure to recognize that the data base (upon which the analysis is made) must often be developed from extremely variable and complex soil and rock formations. A reliable analysis can be made only if all geologic elements are identified and properly evaluated. Sometimes it simply is not possible to quantify all the critical aspects of geologic conditions, regardless of the completeness of the investigation. The Geotechnical Engineer must recognize when he is dealing with a geologic environment that is unusually complex and has a low degree of predictability. The limitations of the investigation methodology must be understood, and appropriate conservative measures should be incorporated into his analysis. Based on the above described philosophy, the following guidelines are suggested:

1. Risk Assessment Should Control Parameter Selection: There is always a finite probability of failure of the results of any geotechnical analysis, and because of this the Geotechnical Engineer must evaluate the consequences or harm that may result, and choose parameters (e.g. soil strength, factor of safety, water table elevation, etc.) accordingly.

2. Compare the Geotechnical Risk of Design Alternatives: If dealing with a project where design alternatives are available, consider utilizing the design that has the lowest geotechnical risk, even if that alternative may appear to be more expensive. Consider the use of instrumentation to reduce risk of other design alternatives.

3. Avoid “Optimistic” Assumptions: Any critical assumption should be supported by data and analyses. Don’t assume that a bedrock outcropping will produce a specification size rock simply because it “looked OK on the surface”.

   If the material to be excavated from a large cut is critically needed for embankment purposes, satisfy yourself by both boring data and geologic interpretation that the material is suitable for its intended purpose.

   If your analysis indicates that a geotechnical design is “awful close”, encourage the Design Engineer to somehow reduce the risk.

The Geotechnical Report
The various items of geotechnical information that have been obtained for a project are usually compiled into a project geotechnical report. In many cases, these reports included both factual data, and such data interpretation as is necessary to develop and present specific design and construction recommendations. The present practice in most Transportation Agencies is to make this report available to bidders to use as an aid in preparing their bids. Logically, then, the geotechnical report becomes a key document to both the owner and the Contractor if a geotechnical dispute arises during construction of a project. Because of this, it behooves us to prepare the report with the idea in mind that if improperly prepared, it may constitute the basis of a geotechnical claim. The technical content of a good geotechnical report has been discussed many times in the literature, and will not be dealt with here. A person seeking such guidelines would do well to obtain “Checklist and Guidelines for Review of Geotechnical Report and Preliminary Plans and Specifications” published by the FHWA in 1985. All the technical aspects
of the geotechnical report are well covered in that document. The discussions provided below cover common pitfalls that have, in my experience, led to geotechnical claims.

1. Avoid Incomplete, Ambiguous, or Subjective Descriptions: Claims have been lost on the basis of the interpretation of, literally, one or two words in a report. The choice of geologic words is so important that every author of a report should have reference to a glossary of geologic terms, a dictionary, and reliable reference tests in specialty fields such as engineering geology, ground water, geophysics, and soil and rock mechanics. He should check himself whenever he has the slightest question as to the meaning which a Contractor may put upon a word. If in a claim situation, a favored tactic by the Contractor (and his lawyers) is to examine the report in minute detail in an attempt to find statements that will help his claim by being inaccurate, very broad, or ambiguous.

A. Many claims have focused on boulders, and exactly how best to describe them on boring logs has been the subject of much discussion. Here is what I suggest:
   • Do not use terms such as “occasional” or “some” or “scattered” boulders.
   • Mention in the log text that boulders were noted, and graphically portray on the log each point at which the drilling reaction indicated the possible presence of cobbles or boulders.
   • Do not attempt to estimate the size of the boulders from the drill reaction (You may not be drilling through the long dimension). Just say boulders.
   • The above procedure is not applicable to boulders encountered in test pits. Defensible techniques are available for estimating the size and percentage of boulders in a test pit.

B. Your defense to a claim can be ruined by an unintentional ambiguity. Examine your statements with a critical eye to this end.

C. If the logs shown in the report are not exact copies of the field logs, care must be taken when editing, rewording, condensing, or changing original field soil textural descriptions.

2. Don’t Make Unnecessary Interpretations: For some reason, authors of geotechnical reports often seem to feel compelled to make interpretations that either are not necessary, or that are overly optimistic. Before a given interpretation or conclusionary remark is included in a report, it should be closely examined to ascertain that it contributes to the technical content of the report. The author (or reviewer) should always keep in mind that the report can present the necessary interpretations and still guard the best interests of the owner.

   Data interpretation and geologic interpretation is often necessary in a geotechnical report. But the best purpose for such interpretation is not to sell the reader on the good (even glowing) aspects of the project. The best purpose of the geologic interpretation is to guard the owner’s best interest by alerting the Designer, and the potential Contractor to the aspects of the project where risk is present. A key question that every good attorney asks at a claims-hearing or court case is some form of “Was my client warned”? If you can answer that question in the affirmative, your have gone a long way toward defeating the claim.

   When contemplating whether something you have written should be revised or
deleted, imaging that the project is underway, and that things have gone wrong in a worst-case scenario. Now, examine the statement in this light and see if you still want it written the way you wrote it.

**The Contract Plans and Specifications**

There is much room for improvement in the contract documents. It is my belief that there is not enough attention given in many contract documents to the geotechnical aspects of the project.

There is a natural reluctance on the part of Designers and contract-writers to “tamper” with previously used clauses and specifications that have “worked” on other projects. The result of this is that many contracts are patchwork marriages of clauses and special provisions from other projects. There is nothing wrong with this philosophy of “If it isn’t broke, don’t fix it”. However, it doesn’t always work. The reason it doesn’t work is that Mother Nature doesn’t “copy” from previous projects.

1. Assure that the plans and specifications are tailored to the geotechnical aspects of the project: A close review of the contract documents must be made to ascertain that such items as aggregate specifications, borrow specifications, excavation specifications, etc., are out of touch with the geotechnical realities of the project locale. Address the geotechnical aspects in the Special Provisions (Notes). These are an excellent vehicle to alert the Contractor to unusual or possibly difficult conditions.

2. Disclaimers should be specific: General disclaimers have not been very effective, particularly if the contract contains a “Differing Site Conditions” clause. However, disclaimers which include a high degree of specificity can, in my opinion, be of much value, since they can serve to alert the Contractor and counter the common claim in court that the State was hiding something that it knew.

3. Design elements that have more than a normal risk should be acknowledged contractually: Dirt work is always a “chancy” game, but some projects include aspects that are more risky than usual. There are contractual ways to mitigate the risk, and these should be used if at all possible.

### 1.4.1.6 Technical Expertise in Court Cases

If all disputes are not resolved by the Department during project/contract closeout, the Contractor may commence litigation in the NYS Court of Claims. The NYSDOT Claims Bureau provides continued engineering services to the Office of the Attorney General (OAG) for all construction contract claims. The Claims Bureau also provides the necessary interface between DOT and OAG in the development of the defenses to the claim.

The Area Geotechnical Engineers of the HD&C Section may become involved in the litigation process through support of the Claims Bureau’s engineering analysis and support of the Office of Construction relating to complex construction contract disputes.

This and more information is available at the Office of Legal Affairs at: [https://www.dot.ny.gov/divisions/legal-services-division](https://www.dot.ny.gov/divisions/legal-services-division)
1.5 GEOTECHNICAL INFORMATION PROVIDED TO BIDDERS

Form CONR 9 - Supplemental Information Available to Bidders, is completed and submitted with the PS&E materials for all projects. Project designers assess pertinent data used during design for individual projects. Providing this data assists bidders in gaining project familiarity, and can reduce perceived risks attributed to unknown conditions, resulting in lower bids. Supplemental Information Available to Bidders is a component of the Contract Documents, and is referred to as Base Line Data in Section 102 of the Standard Specifications.

1.5.1 Rock Cores

Rock Samples (i.e., cores) obtained for the project should be available for inspection. Rock cores are not available for sale.

1.5.2 Subsurface Information

Subsurface information, if prepared for the project, will be provided to the Designer by the Geotechnical Engineer. For example:

- Subsurface Exploration Logs, with soil sample descriptions.
- Undisturbed Sample Logs, with soil sample descriptions.
- Laboratory Test Data from Soil Samples (This data may be in summary form or included on the logs described above.)
- Tabulated Results of Probing
- Tabulated Depth to Bedrock as determined by geophysical investigations (seismic).
- Rock Core Evaluation Logs
- Compression Test Data from Rock Samples
- Rock Outcrop Maps
- Granular Materials Resource Survey Reports
- Terrain Reconnaissance Reports

1.5.3 Subsurface Information, Other Information

- Pertinent subsurface information or data obtained from sources outside the Department and used in the design of the project.
- Information pertaining to sources of granular material and aggregates.
- Special reports, drawings and documents that contain subsurface information or data pertinent to the construction of the project.

The above information that are in readily reproducible form can be sold to bidders, unless the proprietary rights of others prohibit such sale.

Subsurface information included under 1.5.2 and 1.5.3 are sold in complete sets, that is, a complete set of bridge logs, a complete set of highway logs or both sets together.
1.6 SAMPLE RETENTION AND CHAIN OF CUSTODY

In general, there are three types of samples obtained by the Regional Geotechnical Sections, Geotechnical Engineering Bureau or geotechnical consultants: disturbed soil samples (includes sack samples from test pits), undisturbed soil samples, and rock cores. Disturbed soil samples are typically used for soil classification purposes, though on occasion they may be used for more sophisticated testing. Disturbed samples are retained and stored to allow the Departmental Geotechnical Engineer access for handling, visual inspection, and evaluation with respect to the Driller’s log. However, disturbed samples lose their usefulness after about 2 years. Undisturbed soil samples are primarily used for more sophisticated testing, though they may also be used for evaluation of detailed layering and soil structure. Undisturbed samples typically degrade significantly and are not useful for testing purposes after about 3 to 6 months. Disturbed and undisturbed soil samples are for design purposes only, and should be disposed of once the boring logs and all necessary testing have been completed. Soil samples for projects where final plans have been received by the Design Quality Assurance Bureau are to be discarded. Soil samples are not available for inspection at either the Geotechnical Engineering Bureau or the Regional Offices by prospective bidders or project contractors.

Rock core obtained by the Drill Crews are to be delivered to the Regional Geotechnical Section. The Regional Geotechnical Section will maintain an inventory of all rock cores stored at the Region. Rock cores must be available for inspection by prospective bidders in the Regional Offices. These rock cores will be retained until the award of the project contract. The rock cores will be disposed of following the award of the project contract.

All samples of soil or rock that are obtained on behalf of NYSDOT by consultants and transported to the Regional Offices or Geotechnical Engineering Bureau Laboratory shall become the property of NYSDOT.

1.7 GEOTECHNICAL DESIGN POLICIES AND THEIR BASIS

Technical policies and design requirements provided in this manual have been derived from national standards and design guidelines such as those produced by AASHTO and the FHWA. The following AASHTO manuals, listed in order of priority, shall be the primary source of geotechnical design policy for NYSDOT:

1. AASHTO LRFD Bridge Design Specifications, most current edition plus interims

FHWA geotechnical design manuals, or other nationally recognized design manuals, are considered secondary relative to the AASHTO manuals listed above for establishing NYSDOT geotechnical design policy. FHWA geotechnical design manuals have been used to address areas not specifically covered by the above listed AASHTO manuals.

Where justified by research or local experience, the design policies and requirements provided herein deviate from the AASHTO and FHWA design specifications and guidelines, as described...
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herein, and shall supersede the requirements and guidelines within the AASHTO and FHWA manuals.

For foundation and wall design, the load and resistance factor design (LRFD) approach shall be used, to be consistent with NYSDOT Bridge Office structural design policy. For aspects of foundation and wall design that have not yet been developed in the LRFD format, allowable stress (ASD) or load factor design (LFD) will be used until such time the LRFD approach has been developed. Therefore, for those aspects of foundation and wall design for which the LRFD approach is available, alternative ASD or LFD design formats are not presented in this manual.

1.8 COMMUNICATION PROTOCOLS FOR CONSTRUCTION SUPPORT

Departmental Geotechnical Engineers support to Main Office Construction, Regional Construction, and/or Engineers-In-Charge must always be technical in nature, leaving construction administration issues to the construction offices in which they are supporting. Since the technical support the Departmental Geotechnical Engineer provides could affect the construction contract, it is extremely important to contact Main Office Construction as soon as possible to let them know of the situation, in addition to addressing the situation with the specific Regional Offices being supported. Direct communication and directions to the Contractor should be avoided, unless the boundaries of such communication have been approved in advance by the Engineer-In-Charge and as appropriate, Main Office Construction. Any communication in writing, including e-mail correspondence, must be written in a way that communicates only technical issues and does not compromise NYSDOT’s ability to effectively administer the contract. This is especially important if potential Contractor claims are involved.

If potential Contractor claims are involved in the construction problem, the Departmental Geotechnical Engineers role is to provide assistance to the Main Office Construction Office. For example, with changed conditions claims, the Departmental Geotechnical Engineers professional evaluation of the situation should focus on determining and describing the geotechnical conditions observed during construction in comparison to what was expected based on the data available at time of bidding. The Departmental Geotechnical Engineer is not to determine, or even imply, the merits of the Contractor’s claim. Main Office Construction will do that.

Evaluations of Contractor claims, as well as geotechnical recommendations for the redesign of a geotechnical element in a contract, must be put in a formal written format. E-mail should not be used as a communication vehicle for this type of information. Furthermore, the Departmental Geotechnical Engineer, or the individual delegated to act on behalf of the Departmental Geotechnical Engineer, must review and approve such documents before they are distributed. Memorandums that provide an evaluation of a Contractor claim should be addressed to the Main Office Construction Office, and a copy should not be sent to the Engineer-In-Charge in this case. The Main Office Construction Office will forward the Departmental Geotechnical Engineers response to the Engineer-In-Charge with their final determination of the validity of the claim. If a claim evaluation is not involved and only technical recommendations in support of a contract redesign are being provided, address the letter to the Main Office Construction Office, with a copy to the Engineer-In-Charge and others as necessary (e.g., Main Office Structures, Regional
Design Section). If the resulting change order will be within the Region authority to approve, the memorandum should be addressed to the Engineer-In-Charge with a copy to Main Office Construction and the Regional Design Section.

1.9 GEOTECHNICAL SUBMITTAL REVIEW POLICIES

The specification for the item to be constructed will identify the submittal procedure. Most construction contract submittals include information that various Functional Units will need to review. Therefore, the Main Office identifies a coordinating Unit for the initial submission and this Unit distributes it as appropriate.

The following identifiers are used in specifications to identify the appropriate coordinating Unit:

- **DCES – Deputy Chief Engineer for Structures Design and Construction.** For foundation elements, Main Office Structures has the lead. The Geotechnical Engineering Bureau’s Structure Foundation Section works closely with the Main Office Structure’s Construction Support/Bridge Foundations Unit to develop a response.
- **Materials Bureau.** The Office of Technical Service’s Materials Bureau has the lead for precast concrete retaining walls. The Geotechnical Engineering Bureau works closely with the Materials Bureau to develop a response.
- **DCETS – Deputy Chief Engineer for Technical Services.** The Office of Technical Service’s Geotechnical Engineering Bureau has the lead for various geotechnical items, including:
  - Lightweight Fill,
  - Instrumentation,
  - Grouted Tiebacks,
  - Soil Nails,
  - Drilling and Grouting,
  - Blast Plans,
  - Rock Slope Reinforcement and Catchment Systems,
  - Stone Columns,
  - Non-Destructive Testing of Foundation Elements,
  - Excavation Support,
  - Trenchless Installation of Casing.

1.10 DESIGN-BUILD PROCESS

The decision whether to use the Design-Build (DB) method of project delivery may be determined by action of the Legislature or may be left to the discretion of the Commissioner. The Design-Build Procedures Manual (DBPM) reflects Department policy and procedures for progressing capital projects utilizing the DB process. The Department’s DB process consists of five phases after scoping and the decision to use design-build to deliver a project. The four subphases of DB Phase II, Environmental Process, are very similar to Design Phases I through IV outlined in the Department’s Project Development Manual. The other four phases are specific to DB, except for the Procurement Strategy Development Phase, which precedes all other DB Phases. The phases for DB projects are:
DB Phase I: Procurement Strategy Development
DB Phase II: Environmental Process
   DB Subphase IIA: Development of Feasible Design Alternatives, Identification and Assessment of Impacts
   DB Subphase IIB: Advisory Agency Review (if needed)
   DB Subphase IIC: Public Hearing/Informational Meeting (if needed)
   DB Subphase IID: Final Evaluation and Recommendation
DB Phase III: Preliminary Engineering
DB Phase IV: DB Procurement
DB Phase V: DB Execution

The following Sections describe the involvement of the Departmental Geotechnical Engineer in the Design-Build process. “Departmental Geotechnical Engineer” identifies the individual(s) assigned the geotechnical design for the NYSDOT project, including geotechnical engineers from the GEB, the RGE, or the NYSDOT’s hired Consultant. This is differentiated from the term “Geotechnical Designer of Record”, who is the geotechnical engineer for the DB Team.
Figure 1-10 Design-Build Project Development
In contrast to the Design-Bid-Build approach (which consists of the appointment of a Designer on one side and the appointment of a Contractor on the other side), the Design–Build process changes the traditional sequence of work and provides for a single-point of responsibility in an attempt to reduce risks and overall costs. DB allows owners to avoid being placed directly between the Engineer and the Contractor by placing the responsibility for design errors and omissions on the Design–Builder, thus relieving themselves of major legal and managerial responsibilities. Although the burden for these costs and associated risks are transferred to the DB team, the Design-Build acquires liberties within the development of the design elements, which spurs innovation for a potential in cost reductions, and also is able to reduce the delivery schedule by overlapping the design phase and construction phase of a project.

![Design-Build Process Diagram](image)

**Figure 1-11 Time Savings in the Design-Build Process**

### 1.10.1 Geotechnical Support within the Design-Build Process

For DB projects, the first responder for geotechnical construction problems is the Geotechnical Designer of Record for the Design-Build. However, prior to construction, the Departmental Geotechnical Engineer has responsibilities to aid in progressing the project from development to execution, in an effective and efficient manner.
1.10.1.1 Procurement Strategy Development

The Department will organize a Project Management Team for the DB project and, in coordination with representative of key Stakeholders, develops a list of project goals in the form of time, quality, and cost.

1.10.1.1.1 Assess and Allocate Risk

Risk analysis is a crucial part of the DB planning process. A systematic approach to risk management can reduce the initial contract price and other Department costs, and can help to avoid potential contract disputes. Once risks are identified, the Department will evaluate possible measures to mitigate the potential impact of a risk and will determine how to allocate risks among the Department, Design-Build and others.

The Department’s project team and project Stakeholders participate in the risk identification. The process consists of five steps as described below.

**Step 1:** Identify (list) and define the risks. The list should include those risks that may affect successful implementation of the project, regardless of when such risks may occur.

**Departmental Geotechnical Engineer:** The Departmental Geotechnical Engineer should be aware that a common risk identified is “geotechnical conditions”.

**Step 2:** Assess the likelihood (probability) a risk event of the nature listed and defined will occur over the course of the contract, including Warranty periods.

**Step 3:** Assess the degree of impact (severity) the occurrence of an identified risk event would have on the Project.

**Step 4:** The overall risk rating is determined by multiplying the probability rating by the severity rating, resulting in an overall risk rating.

**Step 5:** This step involves establishing the priorities for addressing the risks, determining risk mitigation measures, and allocating the risk between the parties to the contract.
The general rule is to allocate the risk to the party that can best manage or deal with it in a positive, proactive manner.

**Departmental Geotechnical Engineer:** The Departmental Geotechnical Engineer may become involved in risk mitigation measures for the projects “geotechnical conditions”. This may involve the production of a Terrain Reconnaissance report or progressing preliminary subsurface investigations.

The results of the risk analysis process are used in preparing contract provisions and agreements with Stakeholders and other third parties and are used to identify the type and extent of PE for different components of the Project.

### 1.10.1.2 Environmental Process

The four subphases of DB Phase II, Environmental Process, are very similar to Design Phases I through IV outlined in the Department’s Project Development Manual. See NYSDOT GDM Section 1.4.1.

![Figure 1-13 Environmental Process](image)

**1.10.1.3 Preliminary Engineering**

During the DB Subphases IIA through IID, certain minimum PE work is required to support the environmental documents and analysis. Additional or supplemental PE and estimating may be necessary or desirable to further the Projects goals, to better define the scope and Project criteria/parameters, and/or to support the assessment and allocation of project risks and minimize contingency costs on the part of the Department and the Design-Builder. The Departmental Geotechnical Engineer will work with the Project Manager to determine the need for preliminary subsurface explorations.
1.10.1.3.1 Supplemental Data Acquisition

In most DB Projects major risks or unknowns include issues associated with subsurface conditions. While some preliminary information regarding the site conditions may have been gathered as part of DB Subphases IIA through IID, it is frequently beneficial to perform additional, more detailed geotechnical investigations to provide more information to Proposers regarding existing conditions in order to lessen uncertainty and reduce contingency amounts included in Proposal prices.

It may also be desirable to obtain additional information in order to speed up project development. For example, taking geotechnical borings while the RFP is being developed, in lieu of including the borings in the Design-Builder’s scope, could shorten the time required to complete the Project.

In some cases it may be desirable to conduct preconstruction condition surveys of buildings and structures to document their condition and provide a basis for settlement of or defense against damage claims during construction. If the Designer determines the distance between the proposed construction activity and the building or structure in question may pose a potential for damage, consultation with the Geotechnical Engineering Bureau’s Engineering Geology Section is recommended. Site specific information will be reviewed, including material damping (soil type, moisture content and temperature) and an appropriate maximum allowable peak particle velocity (PPV) will be assigned to the structure.
1.10.1.3.2 Specifications

Additional PE efforts may focus on preparing Performance Specifications and Special Provisions (modifications to the Standard Specifications) specific to the Project. The Departmental Geotechnical Engineer may be asked to provide technical support in developing performance specifications for geotechnical elements, which focus on defining the design and performance requirements to be met by the Design-Builder while allowing the Design-Builder the latitude to develop the specific means and methods of accomplishing the specified level of performance.

1.10.1.3.3 Cost Estimating

While preliminary cost estimates will be prepared during Design Phases I through IV, refinements to such estimates will be necessary as the RFP is developed, to ensure that all costs are recognized in the estimate. Cost estimates obtained by the Department for Design-Bid-Build projects are based on: (1) having a design (plans and specifications); and (2) review of comparable prices for the construction of the design. A different process is used for DB cost estimates. A DB estimate is developed following the same process that will be used by the Proposers—involving selection among different design alternatives, work zone traffic control (WZTC) scheme, and means and methods of construction. Engineering and design costs must be considered, as well as the costs of additional responsibilities assigned to Design-Builders that are normally performed by the Department in Design-Bid-Build projects and the potential costs associated with risks that have been allocated to the DB Contractor. The Departmental Geotechnical Engineer provides technical support in the evaluation of the means and methods of construction involving geotechnical elements and WZTC schemes.

1.10.1.3.4 Value Engineering

Significant benefits can often be derived by performing a value engineering (VE) study in the early stages of DB Project development as preliminary engineering (PE) and the environmental documents are being done, project requirements are being defined, and specifications and other contract requirements are being prepared. For Federal-aid DB Projects, the Department is required to perform a VE analysis prior to the release of the RFP (See 23 CFR 627.5). Departmental Geotechnical Engineers may be requested to participate in VE brainstorming sessions.

1.10.1.4 Design-Build Procurement

The Department’s enabling legislation permits a “best value” selection process to be used for DB contracts, allowing price and other factors to be considered when selecting a Design-Builder, instead of the competitive bidding selection process typically used for construction contracts, or the qualifications based selection process used for design agreements.
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1.10.1.4.1 Request for Qualifications (RFQ)

The RFQ is the basic action/document of step one of the two-step selection process. The primary purpose of an RFQ is to determine the Short-List, typically from three to five Proposers best qualified to develop the Project based on stated evaluation criteria. The RFQs focus on determining the qualifications of potential Design-Builders as opposed to seeking solutions at this first step of the procurement. By doing so, it minimizes the cost to the Proposers in preparing their statement of qualifications (SOQs) and minimizes the Department resources required to evaluate the SOQs and determine an appropriate Short-List. Departmental Geotechnical Engineers may become involved in reviewing SOQ’s on projects which require significant geotechnical involvement.
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The RFQ should allow interested firms to submit questions seeking to clarify portions of the RFQ. Departmental Geotechnical Engineers may be requested to provide responses to submitted questions. Responses are communicated to the Project Manager to be sent to all firms that received an RFQ.

1.10.1.4.2 Request for Proposals (RFP)

The RFP is step two in the two-step selection method required by the New York State DB legislation. For DB, the RFP is analogous to the production of plans, specifications, and an estimate in a Design-Bid-Build delivery process. The primary purpose of an RFP is to solicit Proposals that will allow the Department to determine which Proposer has provided the best combination of quality and price (i.e., best value) to complete the design and construction of the project based on stated evaluation criteria. During the preparation of the RFP, rather than attempting to solve problems, the focus should be on identifying problems for the Design-Builder to solve and defining parameters/criteria applicable to potential solutions.

The RFP will be prepared by the Department’s Project Management Team. Departmental Geotechnical Engineers provide technical support in developing provisions to address geotechnical elements in the various Contract Document Parts as identified below:

1.10.1.4.2.1 Design-Build Agreement (Contract Documents Part 1)

This Contract Document Part is the actual binding agreement between the State and the Design-Builder; all the other documents that make up the Contract Documents are incorporated into the contract through Article 5 of the DB Agreement. The Departmental Geotechnical Engineers have no responsibility in the development or alterations to these provisions.

1.10.1.4.2.2 Design-Build Section 100 (Contract Documents Part 2)

DB Section 100 is the General Provisions that will be relevant to the Department’s DB procurements. Some of the provisions found in the DB Section 100 are new provisions that are applicable only to DB projects. In other instances, portions of the Design-Bid-Build Section 100 have been modified to comply with the DB process or have been included in their entirety in the DB Section 100. Regardless of whether a specific provision is new, updated from Design-Bid-Build, or the same as Design-Bid-Build, the DB Section 100 provisions will not change from project to project. If there are issues that are project specific, they have been inserted into Special Provisions, which are updated on a project-by-project basis.

DB Section 104 – Scope of Work. The DB Section 104 contains general provisions related to the scope of the work. Departmental Geotechnical Engineers play an integral role in evaluating claims of Differing Site Conditions. Since the information provided in a DB RFP is substantially less than that provided in Design-Bid-Build contract plans, the RFP will specifically spell out the responsibilities and risks associated with site conditions.
Geotechnical information is almost always identified as a high-risk issue. In most cases, this will result in the Department (1) performing a thorough geotechnical investigation, (2) providing the results of the investigation to the Design-Builders, and (3) warranting the data for use by the Design-Builders. This risk sharing approach is a compromise between (1) warranting all site conditions as with Design-Bid-Build, and the other extreme of (2) holding the Design-Builders responsible for all site conditions. The Design-Builders are responsible to determine what additional geotechnical information is required to support its design and is responsible for obtaining such information, along with its accuracy. This is a significant shift in the degree of risk from the typical Design-Bid-Build contract. The Design-Builders is only able to rely on the information shown in the contract at the specific locations of the investigations or tests, and that any interpolation between those points is the responsibility of the Design-Builders.

DB Section 105 – Control of the Work
The DB Section 105 discusses control of the work, including the Project’s organization, inspection, and meetings. The Department will only “approve” those submittals, activities, actions, and/or work that are specifically identified in the Contract Documents for “Approval”. Requirements for Department “Approvals” are limited to avoid the Department’s prematurely incurring/assuming risk and responsibility that should remain with the Design-Builders until Final Acceptance of the Project.

Departmental Geotechnical Engineers provide technical support in the analysis of the Design-Builders' submittals, including the following:

- Subcontractors;
- Quality Plan and updates;
- Value Engineering Change Proposal (VECP) concepts and VECPs;
- Project Specifications representing lower quality than that specified in the Contract Documents, including the Design-Builders’ Proposal;
- Geotechnical Design (at time of Approval of As-Built Plans);
- Orders-on-Contract;
- Deviations from sampling and testing methods and/or frequencies; and
- Geotechnical Design exceptions.

DB Section 106 – Control of Materials
Materials and the treatment, storage, and other requirements of such Materials, including Buy America provisions, are the topics of DB Section 106. Whenever any specification provides for “Approved List” as a Basis of Acceptance, the Department reserves the right to sample and/or test material. The Departmental Geotechnical Engineer or Departmental Inspector will verify that the QC Inspector assures that, for each material used, the material appears on the Approved List and checks that the material used on the project is the same as that identified on the Approved List.

DB Section 107 - Legal Relations and Responsibility to the Public. The DB Section 107 of the DB Section 100 addresses legal relations for the Project as well as the Design-Builders’ insurance requirements and responsibility to the public during the Project. This Section identifies
requirements for project safety and security and for ROW. Departmental Engineering Geologists play an integral role in evaluating blasting operations as outlined in §107-7.14 Drilling and Blasting.

**DB Section 111 – Design Management and Design Quality Assurance/Quality Control.** This is an entirely new Section of the general provisions to cover the management and quality control (QC) of the design produced by the Design-Builder.

Department representatives [the Design Compliance Engineer (DCE) and/or Design Compliance Monitors (DCM)] will provide continuous design oversight throughout the Project. The Department and the Design-Builder will meet and mutually agree on the schedule and duration of reviews of Design Units. The Department’s participation in the review of Design Units must be accomplished in a timely manner but still must be thorough. The Departmental Geotechnical Engineer provides technical support in the analysis of Design Units which involve geotechnical elements.

**DB Section 112 – Construction Quality Assurance and Quality Control.** This is an entirely new Section of the general provisions to cover the management and quality control (QC) of the Design-Builder’s construction.

Quality Control (QC) is the total of all activities performed by the Design-Builder, Designer, Subcontractor, Producer or Manufacturer to ensure that the work meets contract requirements. Quality Assurance (QA) is all planned and systematic oversight actions by the Department necessary to provide confidence that the Design-Builder is performing QC in accordance with the Quality Plan. The prime responsibility for quality will rest with the Design-Builder, including sampling and testing.

The inspection requirements and sampling and testing requirements are defined in the roles and responsibilities for both (1) QC sampling and testing by the Design-Builder, and (2) QA program by the Department, including Owner Verification (OV) Sampling and Testing. The Design- Builders frequency of QC operations will be at least equal to current Agency practices as established in specifications, Materials Methods and Procedures, Granular Control Procedures, and other Department documents.

Owner Verification (OV) on the Design Builder’s QC process will be progressed according to values defined in the RFP (See Appendix 1-C). The values are tied to the risk associated with use of a given material. The Departmental Geotechnical Engineer will be involved in the material and construction inspection requirements for the following items:

- Section 203 Excavation and Embankment
  - **General Requirements:** The Departmental Geotechnical Engineer or Departmental Inspector will spot check test result sheets from material QC testing at the specified rate identified in the RFP. Construction Inspection OV testing will involve performing material tests at the specified rate identified in the RFP.
Material tests include density, gradation, pH, sulfate soundness, etc. as required per spec.

- **Drilling and Blasting**: The Departmental Engineering Geologist will verify that the QC Consultant has completed all the steps needed for blasting, including reviewing the blast plan, and conducting the pre-blast meeting. The Departmental Engineering Geologist will participate in the pre-blast meeting.

- **Compaction and Density**: The Departmental Geotechnical Engineer or Departmental Inspector will observe a percentage of the density testing required in the Quality Plan. The Departmental Geotechnical Engineer or Departmental Inspector will perform an OV test adjacent to the QC test (side by side) on a percentage of those tests observed.

- **Material and Sampling Requirements for Stockpiled Material**: The Departmental Geotechnical Engineer or Departmental Inspector will perform materials testing on the first, and a percentage of the subsequent, stockpiles. The Departmental Geotechnical Engineer or Departmental Inspector will observe the Design-Builders QC Inspection Team stockpile sampling procedures for the first stockpile, and a percentage of the subsequent stockpiles. The Departmental Geotechnical Engineer or Departmental Inspector will visually inspect a percentage of the stockpiles.

- **Material and Sampling Requirements for Non-Stockpiled Material**: The Departmental Geotechnical Engineer or Departmental Inspector will spot check test results from QC testing at a rate specified in the RFP. The Departmental Geotechnical Engineer or Departmental Inspector will visually inspect a percentage by volume of the material placed to verify composition (i.e. deleterious material in RCA, no RAP in Select Structural Fill, etc.).

- **Settlement Measurements**: The Departmental Geotechnical Engineer or Departmental Inspector will check the documentation required by specification and the Quality Plan to verify that the equipment to be used has been calibrated as required. The Departmental Geotechnical Engineer or Departmental Inspector will observe the first installation of each type of monitoring device and a percentage of any subsequent installations. The Geotechnical Engineering Bureau will verify readings by obtaining their own for a percentage of the readings taken.

- **Pore Water Pressure Measurements**: The Departmental Geotechnical Engineer or Departmental Inspector will check the documentation to verify that the equipment used has been calibrated as required. The Departmental Geotechnical Engineer or Departmental Inspector will observe the first installation of each type of monitoring device and a percentage of any subsequent installations. The Geotechnical Engineering Bureau will verify readings by obtaining their own for a percentage of the readings taken.

- **Slope Movements**: The Departmental Geotechnical Engineer or Departmental Inspector will check the documentation to verify that the equipment used has been calibrated as required. The Departmental Geotechnical Engineer or Departmental Inspector will observe the first installation of each type of monitoring device and a percentage of any subsequent installations. The Geotechnical Engineering Bureau will verify readings by obtaining their own for a percentage of the readings taken.
• Section 204 Flowable Fill
  o Material (Flow Test, Cylinder Breaks) and Placement: The Departmental Geotechnical Engineer or Departmental Inspector will review each mix design to verify compliance with the specification and perform cylinder breaks on a percentage of the number required in the Quality Plan. The Departmental Geotechnical Engineer or Departmental Inspector will observe flow tests for a percentage of the flow tests performed and observe placement operations for a percentage of the volume placed.

• Section 206 Trench, Culvert and Structure Excavation
  o Safety, Support and Protective Systems, Test Pits, Trench and Culvert Excavation, and Disposal of Excavated Material: The Departmental Geotechnical Engineer or Departmental Inspector will check the design completed for temporary sheeting or soldier pile and lagging wall to verify that the method and parameters are appropriate.

• Section 207 Geotextiles
  o Brand Name and Type: The Departmental Geotechnical Engineer or Departmental Inspector will verify that material is on Approved List, for each material to be used. The Departmental Geotechnical Engineer or Departmental Inspector will verify that the QC Inspector checks that the material used on the project is the same as that shown to be used on the plans at a rate identified in the RFP.

• Section 211 Internally Stabilized Cut Structures
  o Materials, Certified Mill Test Results, Certified Mix Design for grout and shotcrete, Jack and Pressure Gauge Calibration, Geotextile Approved List, Gout Cube Tests Nail Tests, and Shotcrete: The Departmental Geotechnical Engineer or Departmental Inspector will review material documentation and perform grout cube breaks on a percentage of the number required in the Quality Plan. The Departmental Geotechnical Engineer or Departmental Inspector will observe a percentage of the soil nail/grouted tieback testing required in the Quality Plan

• Section 212 Rock Slope Reinforcement and Catchment Systems
  o Materials, Certified Mill Test Results, Test Results demonstrating capability, Approved List, Grout Cube Tests, Anchor Proof Tests, Rock Bolt Tensioning, and Gradation Test for Cushion Sand: The Departmental Geotechnical Engineer or Departmental Inspector will review material documentation and perform grout cube breaks on a percentage of the number required in the Quality Plan. The Departmental Engineering Geologist or Departmental Inspector will observe a percentage of the anchor proof tests/rock bolt tensioning required in the Quality Plan.

• Section 304 Subbase Course
  o Information documented on MURK 1d (Equipment used for compaction and number of passes, Lift thickness prior to compaction, Thickness of subbase Material placed, Addition of water to subbase, Construction of stockpiles, Only Material from approved source or stockpile incorporated in Work), and Results of stockpile sampling and testing, in accordance with the requirements of GCP-17: The Departmental Geotechnical Engineer or Departmental Inspector will perform materials testing on the first stockpile and on a percentage of the subsequent
stockpiles. The Departmental Geotechnical Engineer or Departmental Inspector will observe the Design-Builders QC Inspection Team stockpile sampling procedures for the first stockpile, and a percentage of the subsequent stockpiles. The Departmental Geotechnical Engineer or Departmental Inspector will perform stockpile sampling and testing on the first and on a percentage of the subsequent stockpiles. The Departmental Geotechnical Engineer or Departmental Inspector will visually inspect a percentage of the stockpiles.

- Section 551 Pile and Pile Driving Equipment;
- Drilled Shafts
  - Drilling, Concreting, Integrity Testing, Shaft Plumbness, Shaft Soil Field Log, Rebar Cage (Centralizers, Access Tubes), and Load Testing: The Departmental Geotechnical/Material Engineer or Departmental Inspector will review material documentation and observe concrete acceptance on a percentage of the number required in the Quality Plan. The Departmental Geotechnical Engineer or Departmental Inspector will review shaft plumbness on a percentage of the number required in the Quality Plan. The Departmental Geotechnical Engineer will review integrity testing results of first shaft and for a percentage of the subsequent shafts tested. The Departmental Geotechnical Engineer or Departmental Inspector will observe a percentage of the load testing required in the Quality Plan.
- Micropiles
  - Drilling, Grouting, Reinforcement, and Load Testing: The Departmental Geotechnical Engineer or Departmental Inspector will review material documentation and observe grout acceptance on a percentage of the number required in the Quality Plan. The Departmental Geotechnical Engineer or Departmental Inspector will review grouting pressure on a percentage of the number required in the Quality Plan and observe a percentage of the load testing required in the Quality Plan.
- Section 554 Fill Type Retaining Walls
  - Approved List, Materials, Methods, Foundation Area, Erection Tolerances, Backfill Material, Reinforcing Elements, Equipment Movements, Subsurface Drainage System, Identification Markers, Coping Units, and Aesthetic Treatment: The Departmental Geotechnical Engineer or Departmental Inspector will perform materials testing on the first stockpile and on a percentage of the subsequent stockpiles. The Departmental Geotechnical Engineer or Departmental Inspector will observe the Design-Builders QC Inspection Team stockpile sampling procedures for the first stockpile, and for a percentage of the subsequent stockpiles. The Departmental Geotechnical Engineer or Departmental Inspector will perform stockpile sampling and testing on the first and on a percentage of the subsequent stockpiles.
- Section 605 Underdrains
  - Materials, Bed Preparation, Placement, Pipe Installation, Filter Installation, and Backfill and Compaction: The Departmental Geotechnical Engineer or Departmental Inspector will perform materials testing on the first stockpile and on a percentage of the subsequent
stockpiles. The Departmental Geotechnical Engineer or Departmental Inspector will observe the Design-Builders QC Inspection Team stockpile sampling procedures for the first stockpile, and a percentage of the subsequent stockpiles. The Departmental Geotechnical Engineer or Departmental Inspector will perform stockpile sampling and testing on the first and on a percentage of the subsequent stockpiles. The Departmental Geotechnical Engineer or Departmental Inspector will visually inspect a percentage of the stockpiles.

- **Section 620 Bank and Channel Protection**
  - **Materials, Ground Surface Preparation, Bedding Material, Stone Filling, Riprap (Plain and Grouted), Concrete Block Paving, and Gabions:** The Departmental Inspector and Departmental Engineering Geologist will perform materials testing on the first stockpile and on a percentage of the subsequent stockpiles. The Departmental Engineering Geologist or Departmental Inspector will visually inspect a percentage of the stockpiles.

- **Section 650 Trenchless Installation of Casing**
  - **SubContractor Qualifications, Designed Drill Path, CODE 753 Clearance Ticket, Equipment List, Installation Method, Design of Entrance and Exit Pits, Thrust Block Design, Monitoring Plan, Method of Grouting; Certified Mix Design, Spread Diameter Field Test Results, Cylinder Break Test Results, MSDS, and Steering and Tracking Equipment:** The Departmental Geotechnical Engineer or Departmental Inspector will review material documentation and perform grout cube breaks on a percentage of the number required in the Quality Plan. The Departmental Geotechnical Engineer or Departmental Inspector will observe steering and tracking procedures for the first, and for percentage of the subsequent, installations. The Departmental Geotechnical Engineer or Departmental Inspector will observe the monitoring plan for the first installation, and for a percentage of the subsequent, installations.

**DB Section 113 – Design-Builder’s Quality Plan.** This is an entirely new Section of the general provisions to cover the preparation of the Design-Builder’s Quality Plan.

This section specifies the requirements for the management of the Design-Builder’s QC organization and the format and contents of the Design-Builder’s Quality Plan. The Quality Plan identifies a “quality system team”, distinct and separate from the design and construction production organization. The Quality Plan describes the quality system to be implemented at all levels of the Design-Builder’s organization, to include Sub-Design-Builders (design and construction) at all levels.

The Department will approve the Design-Builder’s Quality Plan. Departmental Geotechnical Engineers will provide technical support in the approval process to ensure geotechnical related elements are addressed.

- **Design Control**
Design Input: The essence of this sub-element is that the Design-Builder determines what information is needed and the available sources for information, reviews all pertinent available data, assures itself that there is sufficient information to carry out its assignment, and resolves with the Department and other appropriate authorities any actual or apparent conflicts or inconsistencies in the information so gathered. The Departmental Geotechnical Engineer will resolve identified conflicts or inconsistencies in the Design-Builder's research associated with the construction or placement of geotechnical related elements.

Design Review: At appropriate stages of design, documented reviews of Design Units are planned and conducted. Participants of each design review include representatives of all functions concerned with the design stage being reviewed, as well as other specialist personnel, as required. The Departmental Geotechnical Engineer will provide technical support for the review of the proposed construction or placement of geotechnical related elements.

Design Changes: After a design is complete and the Work is ready to be executed, or is being executed, or is complete, all subsequent design changes and modifications will be identified, documented, reviewed and approved by authorized personnel before their implementation. The Departmental Geotechnical Engineer will provide technical support for the review of the proposed changes to construction or placement of geotechnical related elements.

• Procurement and Purchasing
  Evaluation of SubContractors, Suppliers, and Vendors: The Design-Builder will evaluate and select subcontractors and define the type and extent of control exercised over subcontractors. This control is dependent upon the type of services or products, the impact of subcontracted Work on the quality of final product and, where applicable, on the quality audit reports and/or quality records of the previously demonstrated capability and performance of subcontractors. The procedures will detail how subcontractors (including consultants) will be presented to the Department for approval. The Departmental Geotechnical Engineer will provide technical support for the review and approval of specialty subcontractor proposed to construct or install geotechnical related elements.

• Inspection and Testing
  In-Process Inspection and Testing: Checkpoints and hold points (Work that must be inspected and approved by the assigned QC Inspector before Work can proceed) will be established and identified on the Project execution schedule. The Design-Builder will hold product until the required inspection and tests have been completed or necessary reports have been received and verified. The Departmental Geotechnical Engineer will provide technical support for the review of hold product associated with geotechnical related elements.
  Final Inspection: The Design-Builder will jointly conduct all final inspection and testing with the Department in accordance with the Contract requirements and the Quality Plan and/or documented procedures to complete the evidence of conformance of the finished Project to the specified requirements. The Departmental Geotechnical Engineer will provide technical support for the review of the constructed or installed geotechnical related elements.
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- Control of Nonconforming Product
  - Review and Disposition of Nonconforming Product: A nonconformance is defined as any condition in equipment, materials, or processes which does not comply with required plans, specifications, codes, standards, documentation, records, procedures, or contract requirements which cause the acceptability of equipment, materials, or processes to be unacceptable or indeterminate. Nonconforming product is to be reviewed in accordance with documented procedures and it may be accepted with or without repair by consent of the Department. Repaired and/or reworked product will be re-inspected in accordance with the Quality Plan and/or documented procedures. Repairs require the involvement of the Department, the Designer, and/or an authorized third party to review the condition and determine that, although it does not meet the specified requirements, the overall impact is such that the resulting condition is acceptable. The Departmental Geotechnical Engineer will provide technical support for the review of nonconforming product associated with geotechnical related elements.

1.10.1.4.2.3 Design Requirements (Contract Documents Part 3)

The Contract Documents contain or indicate the applicable Design Requirements for all components of the Project. The Design Requirements are listed or specified in a logical format, with separate Sections in Part 3 of the Contract Documents. The Section pertaining to Geotechnics includes, but not limited to: investigations, construction, and monitoring and preparation of all geotechnical designs, analyses, construction and as-built drawings, specifications and reports in accordance with all applicable codes and standards.

The Design-Builder will perform all geotechnical work for the design and construction of all permanent and temporary structures, geotechnical instrumentation and monitoring, and protection of existing structures and utilities. The Geotechnics Section specifies the requirements for:

- Geotechnical Investigation Plan;
- Geotechnical Report;
- Seismic Geotechnical Design;
- Foundations;
- Retaining Walls;
- Fill/Embankment Design;
- Soil Improvement;
- Erosion Control and Drainage;
- Cut Slopes;
- Miscellaneous Construction Considerations;
- Construction Instrumentation Monitoring Program;
- Preconstruction Survey;
- Earthwork Material Acceptance;
- Staging Areas;
• Directional Drilling;
• Software; and
• Submittals.

1.10.1.4.2.4 Performance Specifications (Contract Documents Part 4)

In contrast to the typical Design-Bid-Build “prescriptive” specifications which focus on precisely detailing how to do the work, “performance” specifications fit well with DB in that (if properly written) they can provide more flexibility and encourage more innovation and creativity. Performance specifications inherently recognize that there may be more than one way to achieve the desired result. Therefore, rather than focusing on how to do the work, performance specifications define the required results.

The Departmental Geotechnical Engineer will provide technical support in the development of specifications for the construction or installation of geotechnical related elements. See Appendix I-D. In addition, the DBPM provides two sample Geotechnical Performance Specifications – see Volume III, Part 4, Geotechnical Samples #1 and #2).

1.10.1.4.2.5 Special Provisions (Contract Documents Part 5)

Special Provisions are required to:

A) Provide project-specific supplements to the provisions in DB Section 100;
B) Specify project-specific requirements not covered by the Standard Specifications, Construction and Materials, and Engineering Instructions (EIs) (Part 9);
C) Modify technical standards and references cited in the Contract Documents or other documents included in the contract by reference; and/or
D) Modify the Standard Specifications and/or EIs so they are compatible with the design-build concepts and procedures specified elsewhere in the contract.

The Departmental Geotechnical Engineer will provide technical support in the development of Special Provisions for the construction or installation of geotechnical related elements.
1.10.1.4.2.6 Design-Build Utility Requirements (Contract Documents Part 6)

The Contract Documents contain or indicate the applicable requirements for the protection-in-place or relocation of utilities affected by the Project. The Department has the responsibility to investigate and indicate in the RFP Plans the locations of all potentially affected Utilities. The Departmental Geotechnical Engineer will work with the Utilities Engineer to identify proposed locations to be explored in order to define subsurface conditions for the installation of utilities.

1.10.1.4.2.7 RFP Plans (Contract Documents Part 7)

RFP Plans are those Department and Stakeholder plans provided with the RFP and included in the Contract Documents. Generally speaking, RFP Plans are incomplete plans representing the Project and its components. However, there are different categories of RFP Plans based on what the plans represent and the degree of latitude allowed the Design-Build in completing the design. Depending on the need, the Geotechnical Engineering Bureau has developed Boring Location Plans and Subsurface Profile Drawings for structure replacements. Additionally, the Geotechnical Engineering Bureau has developed temporary and permanent geosynthetically reinforced soil system (GRSS) slope or wall drawings upon request.

1.10.1.4.2.8 Engineering Data (Contract Documents Part 8)

Engineering data that is integrated into the Contract Documents includes geotechnical investigation data and maps, results of condition surveys and preconstruction surveys done for the Project, and similar technical data and information gathered for the Project. The Departmental Geotechnical Engineer will work with the Project Manager to identify the geotechnical information to be incorporated as Engineering Data (see NYSDOT GDM 1.5 Geotechnical Information Provided to Bidders).

1.10.1.4.2.9 Standard Specification and Engineering Instructions (Contract Documents Part 9)

The intent of the DB Contract is to have the Design-Build use the Standard Specifications and EIs in preparing its own project specifications that are tailored to the specific design and construction means and methods the Design-Build will use on the project. The Departmental Geotechnical Engineers have no responsibility in assembling these provisions.

1.10.1.5 Design-Build Execution

Overall project roles differ significantly from the typical Design-Bid-Build project. Through the DB Contract, the Design-Build is given significantly more responsibility and authority to manage and control the Work. The Department has continuing roles to verify that the interests of the State and the public are met, including monitoring; auditing; and verifying.
1.10.1.5.1 Use of Department Technical Specialists

Although Department technical specialists (such as Departmental Geotechnical Engineers) may be used to review Design Plans and solutions to problems that arise during design and construction, the primary responsibility for determining the solution to such problems rests with the Design-Border and it’s Designer. Department technical specialists may participate in reviews of designs and solutions developed by the Design-Border and its Designer but normally should not provide the solutions. If the Department provides solutions, the risk for adequacy of the solutions may shift to the Department even though the Design-Border is responsible for designing the Department’s solution correctly.

Similarly, requests for clarification of Design Plans and/or Project Specifications prepared by the Design-Border’s organization should be referred to the Design-Border’s Designer, not to the Department. Department staff should check clarifying statements or documents to ensure such statements or documents conform to contract requirements.
1.11 REFERENCES


Design-Build Procedures Manual, New York State Department of Transportation, [https://www.dot.ny.gov/divisions/engineering/design/dqab/design-build/dbpm](https://www.dot.ny.gov/divisions/engineering/design/dqab/design-build/dbpm)


Appendix 1-A
Geotechnical Engineering Services – Scope of Work

The NYSDOT often designates Consultants to perform design services. The general tasks are defined in the Base Scope of Services. However, the Base Scope of Services does not specifically address the various aspects of geotechnical design. The NYSDOT’s Geotechnical Engineering Bureau and the Regional Geotechnical Engineers are the Department’s experts on geotechnical design. Even when geotechnical design functions are delegated to the Consultant, the Geotechnical Engineering Bureau and Regional Geotechnical Engineer’s have significant oversight, support and review functions.

GDP-12 Design Consultant Agreements Soil-Related Task Assignments divides responsibilities for various soils-related tasks and defines the information needed to complete those tasks. It documents how to assign tasks once the Department has made the decision to use Consultant design and/or inspection services. For geotechnical related tasks, the first point of contact should be the Regional Geotechnical Engineer, who will then provide direction to the appropriate destination.
Appendix 1-B
Geotechnical Engineering Services – Preparing Drilling Contracts

The Geotechnical Engineering Bureau provides earthwork and foundation engineering services for the design and construction of Departmental projects statewide. The progression of explorations to obtain subsurface information is an integral part of this work. This information is generally provided through the Regional Geotechnical Section. However, there are occasions when additional assistance is necessary. At those times, drilling contracts are let to procure the services of companies experienced in obtaining subsurface information, soil and rock samples, for geotechnical engineering purposes.

GEM-19 Guidelines for Preparing Drilling Contracts provides the information that is necessary for preparing drilling contracts including:

- Example scope of services;
- Soil identification system;
- Safety requirements;
- Drill log preparation;
- Site requirements; and
- The specification for providing subsurface explorations in contaminated areas.
Appendix 1-C
Design-Build Project Requirements – Owner Verification Testing

Owner Verification (OV) Sampling and Testing will be performed by the Department or its designated representatives assigned to this Project. Verification Sampling and Testing technicians shall be certified in accordance with the Department Technician Certification Program. They will perform tests separate from the construction QC Sampling and Testing.

The verification samples will be taken separately from the QC samples but from the same lot as the QC samples. The verification samples will include separate samples and witness samples. At no time will the verification testing be done on the same Sampling and Testing devices as the QC testing. Verification Sampling and Testing will be done to validate the quality of the product and to assess the adequacy of the Quality Plan.

The Verification Sampling and Testing technicians will complete daily inspection records. The reports will detail the Work performed that day clearly indicating pass/fail test results. There will be an indication of the correlation between tests by the construction QC samplers and testers and the verification tests. As part of the Quality Programs Managerial analysis, there should be clear records to evaluate any indication of trends in the test results which may be indicative of further investigations. All failing verification tests will immediately trigger a Construction Noncompliance Report for the Design-Builder to reconcile the problem. OV samplers and testers should be aware of the status on the log of failed tests and communicate with the construction QC samplers and testers to attend the reconciling tests. The verification Technicians will be familiar with the Quality Plan and assure that construction QC samplers and testers adhere to that plan. A list of verification Technicians shall be maintained that indicates what test certifications each person currently holds and the certification expiration date.

Verification Sampling and Testing will be performed according to levels defined below, which are tied to the risk associated with the use of a given material. The level of risk for various items will determine the frequency at which the Department will conduct OV sampling and testing. Statistical methods may be considered for use by the Department to evaluate the effectiveness of sampling and testing for acceptance purposes.

Level 1 provides continuous analysis for those categories that are strong indicators of performance. Examples include compressive strength for hydraulic cement concrete, percent soil compaction for embankment, and percent asphalt content for hot-mix asphalt concrete. The QC testing frequency shall be in compliance with various Departmental documents, and the OV testing frequency will be statistically significant relative to the QC testing frequency.
Level 2 provides independent verification for those materials that are secondary indicators of performance. Examples include the slump test for hydraulic cement concrete and gradation tests for select granular materials. Approved List products that require more than manufacturer certification to assure quality are covered under this item. The QC testing frequency is required to be in compliance with various Departmental documents and the OV testing frequency should be 10% of the QC testing frequency.

Level 3 provides observation verification for those materials that only require very few QC tests for compliance with various Departmental documents or where materials are accepted based on inclusion in the NYSDOT Approved List of Materials. For these materials, risk of failure does not affect the long-term performance of the facility provided approved products are used. The DB should perform QC as deemed necessary. Under the Level 3 approach, OV does not perform tests but observes any QC test performance for equipment and procedural compliance for a product. The frequency of this testing is a minimum of once per project per test method, or periodically as determined by the DB QCM. For Level 3, the OV representative will observe the QC technician performing the test. Review of documentation for certifications from manufacturers will be progressed through random audits.
Appendix 1-D

Design-Build Project Requirements – Geotechnics

The following is an example Geotechnics section. Actual contract documents should be developed to reflect the specific project requirements.

SECTION X. GEOTECHNICS

X.1. SCOPE

The Design-Builder shall be responsible for all Work necessary for the geotechnical design and construction of all permanent and temporary structures, including assessing available information, planning and implementing subsurface investigations, geotechnical analysis and reporting, geotechnical instrumentation and monitoring, and protection of existing infrastructure, structures and utilities in accordance with the requirements of the Contract Documents.

The Owner has performed limited subsurface investigations in the vicinity of the Project Site. Boring logs and laboratory test data from these previous subsurface investigations are provided in Part 8 – Engineering Data – No.____ Geotechnics and Foundations. In addition, samples of soil and rock cores obtained during these previous subsurface investigations are available for inspection by the Design-Builder at the NYSDOT Regional Office_________________________. The Design-Builder shall be responsible for making any arrangements to view the samples from the previous subsurface investigations, by first seeking the prior consent of the Owner’s Project Manager and then making an appointment in advance with the Regional Geotechnical Engineer ______________________ telephone ___________; email ___________________. Information from these previous subsurface investigations shall be considered part of the Contract Documents only to the extent that they are used to represent soil conditions at the depths indicated within the respective borings drilled at the approximate locations shown. Presentation of this information in no way implies that subsurface conditions are the same at other locations and different times.

The Design-Builder shall be familiar with available geotechnical, geologic, seismic, hydrogeology, and soils literature, shall be familiar with the existing Site conditions, both native and man-made, shall interpret the existing geotechnical data pertaining to the Project Site. The Design-Builder shall form its own interpretation of the existing geotechnical data and satisfy itself as to the nature and behavior of the ground and sub-soil, the form and nature of the Site, and nature of the Work that may affect its detailed design, construction method, and tools.

X.2. Standards and References

The Design-Builder shall perform geotechnical activities in accordance with the following Standards, unless otherwise stipulated in the Project Requirements herein.
X.2.1. Standards

A. AASHTO LRFD Bridge Design Specifications, with Interim Revisions and the NYSDOT “Blue Pages”, which together constitute the NYSDOT LRFD Bridge Design Specifications
B. AASHTO LRFD Bridge Construction Specifications
C. NYSDOT Highway Design Manual
D. ASTM Standards
E. FHWA Geotechnical Engineering Publications
F. AASHTO Standard Specifications for Highway Bridges
G. PTI Post-Tensioning Institute Recommendations for Pre-stressed Rock and Soil Anchors
H. AASHTO Guide Specification and Commentary for Vessel Collision Design of Highway Bridges
I. NYSDOT Standard Specifications
J. NYSDOT Special Specifications

X.2.2. References

A. NYSDOT Bridge Manual
B. NYSDOT Geotechnical Bureau Manual
C. NYSDOT Manual of Uniform Record Keeping (MURK)
D. AASHTO Manual on Subsurface Investigations
E. NYS Steel Construction Manual

X.3. Equipment Requirements

X.3.1. Calibration

The Design-Builder shall be responsible for ensuring that all field and laboratory equipment used for the Project shall be calibrated within the 12 months prior to its use on the Project and as required by the manufacturer, unless the Project Specification or other Contract requirements state that a more recent calibration is required.

Laboratories used to analyze and test soil and rock specimens shall be AASHTO-certified for the tests performed and shall have documentation of calibration within the last year for all equipment used for testing.

X.3.1.1. Instrumentation

The instrumentation selected by the Design-Builder and utilized in carrying out the monitoring program shall include appropriate types and quantities of monitoring instruments capable of measuring horizontal and vertical movement, tilt of adjacent structures, soil pore pressure, vibration, and noise, as applicable. The types and numbers of instruments will depend on factors including the size, type and location of proposed Work.
X. 4. Personnel Requirements

X.4.1. Foundations Lead Designer

The Design-Builder shall provide a Foundations Lead Designer who shall be a Professional Engineer licensed in the State of New York and shall be the team leader for the Project geotechnical team. The Foundations Lead Designer shall be in charge of all geotechnical Work, and shall perform or directly oversee all geotechnical Work, and shall sign or co-sign and stamp all geotechnical related design, analysis, released for construction documents, As-Built Plans and other related documents. The Foundations Lead Designer shall have a minimum of 15 years of recent experience that include the exploration, analysis, design, and construction of the following:

A. Current LRFD methodology and requirements;
B. Bridge structures and foundations of the magnitude and type that will be used including cofferdam design;
C. Planning and conducting subsurface exploration for highway structures and other facilities;
D. Site characterization, including the development of design soil/rock profiles with relevant properties for the purpose of foundation type and size selection, analysis, design, and construction;
E. Analysis and design of structure foundations for static as well as dynamic (seismic) loading;
F. Soil-foundation-structure interaction analysis; and
G. Derivation of parameters for, and design and construction of, temporary and permanent earth support structures.

X.4.2. Seismic Specialist

The Design-Builder shall provide a seismic specialist who shall be a qualified Professional Engineer licensed in the State of New York and shall be the team leader for the Project geoseismic team. The seismic specialist shall have a minimum of 15 years practicing earthquake engineering in the eastern United States. The prior project experience of the seismic specialist shall include at a minimum: ground motion evaluation, spatial variability, and soil structure interaction effects, evaluation of pile demonstration programs and derivation of soil-pile parameters, finite element modeling of complete soil-pile-structure interaction including pile-to-pile interaction and kinematic effects.

X.4.3. Geotechnical Instrumentation Engineer

The Design-Builder shall provide a designated geotechnical instrumentation engineer at all times during the duration of the Project. The geotechnical instrumentation engineer shall be a licensed Professional Engineer in the State of New York. The geotechnical instrumentation engineer shall have at least 15 years of experience in instrumentation work similar to the scope of that in this Project.
X.5. Design Requirements

The Design-Builder shall at a minimum provide the following:

A. Geotechnical work plan (see Section X.5.1);
B. Geotechnical investigation plan (see Section X.5.2);
C. Geotechnical data report (see Section X.5.3);
D. Geotechnical interpretive report (see Section X.5.4);
E. Seismic assessment report (see Section X.5.5);
F. Construction monitoring plans (see Section X.5.6);
G. Foundation design reports (see Section X.5.7).

X.5.1. Geotechnical Work Plan

The Design-Builder shall prepare a geotechnical work plan, which shall include:

A. Design-Builder’s knowledge and understanding of the geotechnical, geologic, hydrogeology and seismic settings of the Project Site and how the nature and behavior of the soil, rock, groundwater and subsurface conditions will affect the design and methods of construction;
B. Anticipated methods of analysis and design for the bridge foundations and a discussion of the foundation optimization process and rationale for selection of the foundation types;
C. Identify key Project constraints and describe how the geotechnical activities will be designed and constructed to meet these constraints;
D. Identification of all principal geotechnical deliverables and activities;
E. A narrative describing the approach to quality control during design and construction of the geotechnical Works;
F. A risk register identifying all major design and construction risks of the geotechnical activities, and describe how these risks are managed and mitigated;
G. Resumes of the Foundations Lead Designer, geotechnical instrumentation engineer, and seismic specialist;
H. Minimum numbers, depths, types of subsurface investigations to be carried out for the bridge design, including a narrative of the in-situ tests and laboratory tests to be carried out;
I. Minimum numbers, and types of axial load tests for each foundation type, size and subsurface condition;
J. Minimum numbers, and types of lateral load tests for each foundation type and subsurface condition;
K. Minimum percentage and/or numbers of driven piles as tested piles to be dynamically tested;
L. Minimum percentage and/or numbers of drilled shafts for non destructive testing, including but not limited to crosshole sonic logging and thermal integrity profiling;
M. Minimum percentage and/or numbers of drilled shafts to carry out shaft base/rock interface coring.
X.5.2. Geotechnical Investigation Plan

The Design-Builder shall prepare a geotechnical investigation plan, including specifications for performing the Work. The geotechnical investigation plan shall include the criteria or rationale used in developing the plan, and shall identify the locations of all field investigation sites, in-situ testing sites, and borings, together with their depths, sampling intervals, and a description of both the field and laboratory testing programs utilized. The geotechnical investigation plan shall be prepared and signed and sealed by the Design-Builder’s Foundations Lead Designer. The geotechnical investigation plan shall be integrated with the traffic control and site access plans (see Project Requirement ____ – Work Zone Traffic Control and Access) and shall include details of borehole abandonment procedures and a list of all permits required to perform the geotechnical investigation.

X.5.2.1. Design-Builder’s Subsurface Investigations

The Design-Builder shall plan and conduct subsurface investigations in accordance with the Owner’s and AASHTO Standards for subsurface exploration programs, and as deemed necessary by the Design-Builder’s Foundations Lead Designer to establish the geotechnical conditions and to perform all geotechnical and foundation design and analysis. The subsurface investigation shall include standard penetration tests (SPT), cone penetration tests (CPT), and other in-situ test methods. The subsurface investigation shall also include laboratory testing of soil and rock samples retrieved in the investigation. The Design-Builder shall be responsible for ensuring that all soil and rock samples shall be shipped to a storage location provided by the Design-Builder and suitably stored for a period of five years after Final Acceptance.

The Design-Builder shall determine the coordinate location and ground surface elevation or mudline elevation for each boring and field investigation position, and shall show the coordinates, station and offset, and elevation for each individual boring log or investigation record. Coordinates and station and offset shall be referenced to the Project survey control. Elevations shall be referenced to the Project datum and horizontal control system. Boring horizontal coordinates shall be accurate to +/- 1.0 foot; vertical coordinates shall be accurate to +/- 0.5 foot.

X.5.2.1.1. Minimum Number of Borings

Table X.5-1 summarizes the minimum number of borings required for various structures. Information from existing borings provided by the Owner in Part 8 – Engineering Data may be combined by the Design-Builder with the Design-Builder’s subsurface investigation to comply with the requirements presented in Table X.5-1. It is the sole responsibility of the Design-Builder’s Foundations Lead Designer to determine if the existing borings are suitable for use in the Project. It is the sole responsibility of the Design-Builder to determine the extent to which further borings by the Design-Builder are necessary.
Table X.5-1 Minimum Requirements for Subsurface Investigations

<table>
<thead>
<tr>
<th>Geotechnical Feature</th>
<th>Minimum Number of Borings</th>
<th>Minimum Investigation Depths</th>
</tr>
</thead>
<tbody>
<tr>
<td>At each Main Span foundation</td>
<td>5</td>
<td>In accordance with AASHTO LRFD Bridge Design Specifications, and as required by the Foundations Lead Designer.</td>
</tr>
<tr>
<td>At each Approach Span pile cap having any side exceeding 100 ft. in length</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>All other pile caps</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Bridge abutment</td>
<td>A minimum of two within a 50 ft. radius of the centroid of the substructure. At least one of the two borings shall be within the footprint of the foundation substructure.</td>
<td></td>
</tr>
<tr>
<td>Retaining walls</td>
<td>Two borings at each retaining wall. For retaining walls more than 100 ft. in length, spacing between borings shall be no greater than 100 ft. Spacing of borings shall be at least adequate for design for bearing, settlement and stability.</td>
<td>In accordance with AASHTO LRFD Bridge Design Specifications, and as required by the Foundations Lead Designer.</td>
</tr>
<tr>
<td>Ancillary structures</td>
<td>As required by Foundations Lead Designer.</td>
<td>As required by Foundations Lead Designer.</td>
</tr>
<tr>
<td>Roadways</td>
<td>In accordance with FHWA NHI-01-031 Subsurface Investigations – Geotechnical Site Characterization, and as required by the Foundations Lead Designer.</td>
<td>In accordance with FHWA NHI-01-031 Subsurface Investigations – Geotechnical Site Characterization, and as required by the Foundations Lead Designer.</td>
</tr>
<tr>
<td>Embankments and cutting</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

X.5.2.2. Subsurface Investigation Records

The Design-Builder shall be responsible for keeping a continuous and accurate log of the materials encountered and a complete record of the operation of progressing the casing. Where driving is used, a record of the number of blows required to advance the sampling barrel, each 6 inches in the soil where each sample is taken, shall be kept. Records shall include at least the following data:

A. Dates and times of beginning and completion of Work;
B. Identifying number and location of test boring;
C. Ground surface elevation at the boring;
D. Diameter and description of casing;
E. Total length of each size of casing;
F. Length of casing extending below ground surface at the completion of the boring;
G. Weight, number of blows, and drop of hammer used to drive casing each successive foot;
H. Elevation of ground water table;
I. Elevation of top of each different material penetrated;
J. Elevation of the bottom of sampler at start of driving for each sample;
K. Elevation to which sampler was driven;
L. Weight and drop of hammer used to drive sampler, and number of blows required to drive it each 6 inches for each sample;
M. Methods and forces used to push sampler tube when not driven;
N. Length of sample obtained;
O. Distance from the bottom of sampler to the lower of the sample when the sampler is not filled to the bottom, and any other circumstances of obtaining the sample;
P. Stratum represented by the sample;
Q. Loss or gain of drilling water or mud;
R. For rock cores, record the core barrel type and diameter, the percent recovery, and the rock quality designation (RQD);
S. Any sudden dropping of drill rods or other abnormal behavior.

X.5.2.3. Software Requirements

The Design-Builders shall use Bentley gINT® or similar commercial software to develop and maintain an electronic database of subsurface information including in-situ test and laboratory test results, and to produce boring records.

Computer software used for analysis shall be produced by reputable software houses and shall have undergone extensive testing and validation. Unless otherwise specified in the Contract Documents, the Design-Builders shall ensure the most current version of the software is used. When in-house programs or spreadsheets are used, sample output shall be validated with hand calculations verifying the results for all possible calculation scenarios.

X.5.3. Geotechnical Data Report

The Design-Builders shall be responsible for preparing a geotechnical data report, signed and sealed by the Foundations Lead Designer. The geotechnical data report shall serve as a factual depiction of the subsurface conditions and at a minimum it shall include:

A. A detailed description of the investigation methods;
B. Complete records with summary tables of investigation;
C. Complete records with summary tables of laboratory test results;
D. Exploratory hole location plan, showing locations of any existing (pre-award) exploratory holes for which data was used by the Design-Builders plus locations of post-award exploratory hole locations undertaken by the Design-Builders;
E. Plots of in-situ test results versus elevations for separate areas and soil types; and
F. Plots of laboratory test results versus elevations for separate areas and soil types.
The Design-Builder shall provide the Owner with a copy of the final log for each subsurface investigation exploratory hole progressed. Exhibit A of this Project Requirement presents the minimum amount and type of information that shall be recorded by the Design-Builder in the log for a borehole-type exploratory hole.

X.5.4. Geotechnical Interpretive Report

The Design-Builder shall be responsible for preparing a geotechnical interpretive report. The geotechnical interpretive report shall be signed and sealed by the Foundations Lead Designer. The geotechnical interpretive report shall include a method statement describing the general philosophy and anticipated methods of analysis, design, construction, and construction monitoring. The geotechnical interpretive report shall include a discussion of the rationale for selection of the proposed construction methods for all geotechnical and foundation aspects of the Project. In the geotechnical interpretive report, the Design-Builder shall provide details of equipment and methods proposed for foundation and earthwork construction and demonstrate how they are consistent with the design approach and assumptions. The details presented shall demonstrate compliance with the requirements of these Project Requirements and shall demonstrate an understanding of the ground conditions and Project constraints.

Via the geotechnical interpretive report, the Design-Builder shall define the engineering and design approach that will be followed by the Design-Builder in order to develop technically and environmentally acceptable and durable foundations, embankment, cut-and-fill slopes, retaining structures, and geotechnical designs for the Project. The geotechnical interpretive report shall discuss all aspects of the required geotechnical effort, design and analysis, including:

A. Subsurface investigations;
B. Description of geology and various ground types and hydrology to be encountered within the Project Site;
C. Assessment of the engineering properties of all soil and rock types, including the expected average and range of soil and rock strengths and deformation properties;
D. Recommended geotechnical design parameters for all soil and rock types for foundation design, including parameters of lateral loading response of soils, retaining wall design, embankment, slope stability and basal instability analyses, settlement analyses, and rock socket design (if any).
E. Design approach and method of analysis for the design of the bridge foundations and for design of other foundations;
F. Design approach and method of analysis for retaining walls;
G. Design approach and method of analysis for embankment and slope stability assessment;
H. Design approach for erosion control measures including method of analysis;
I. Design approach and discussion of settlements and associated lateral ground movements and their effect on existing and proposed structures and foundations. The discussion shall include specific recommendations for foundation analysis and design, including the type of soil-structure interaction analyses and numerical analyses that will need to be performed for evaluation of the effect of vertical compression and lateral deformation of soils on the proposed foundations;
J. Discussion on embankment fill settlement, slope stability analysis, and retaining wall stability during pile driving, drilled shaft installation, or ground improvements;
K. Effects of the proposed bridge and retaining wall structures on the existing approach embankment;
L. Planned field testing programs, including pile and drilled shaft integrity and load testing and ground improvement testing;
M. Anticipated ground behavior and categorization of ground during excavation, filling, and foundation and retaining structure construction;
N. Design approach and method of analysis to determine the site-specific seismic response spectra and liquefaction assessment for the design earthquakes;
O. Ground improvement or treatment of in-situ soils;
P. Selection of foundation systems;
Q. Lateral and vertical earth pressures on structures;
R. Support of excavation and groundwater control considerations;
S. Anticipated use and/or protection of adjacent temporary/permanent retaining structures and/or embankment fills;
T. Time-related settlement and lateral deformation and determination of the resulting effects on the Works and on adjacent facilities;
U. Consideration for, discussion of, and rationale for protection of existing structures, embankments, bodies of water, and utilities;
V. Expected serviceability and durability of proposed solutions; and
W. Other items related to soil structure interaction or Site conditions that may affect design or construction.

The geotechnical interpretive report shall be prepared and signed and sealed by the Design-Builder’s Foundations Lead Designer. Where the geotechnical design and geotechnical-related as-built construction differ from the information described in the geotechnical interpretive report, the Design-Builder shall revise the geotechnical interpretive report to reflect the as-built changes.

**X.5.5. Seismic Assessment Report**

The Design-Builder shall provide a seismic assessment report for the Project. The seismic assessment report shall include at a minimum:

A. Analysis of liquefaction potential. Should this show that liquefaction is a potential hazard at the Site, the risk potential on the bridge shall be evaluated by the Design Builder, and any remediation solutions proposed by the Design-Builder shall be demonstrated by analytical and field methods. The site response shall be evaluated in one- and two-dimensions and shall include any topography effects. The Design-Builder’s adopted level of analysis (linear, equivalent-linear, or non-linear) shall be substantiated by the Design-Builder. Spatial variability effects shall be accounted for, as applicable;

B. Seismic soil structure interaction evaluation of deep foundations shall include determination of the maximum imposed curvatures and bending from earthquake ground motions and structure response, including free-field soil strains modified for soil-foundation-structure interaction coupled with deep foundation deformations associated with earthquake loads imparted to the foundation by the structure (i.e. inertial response).
Prior to issue to the Owner, the Design-Builder shall ensure that the seismic assessment report shall be peer-reviewed by a suitably qualified specialist in this field.

Uniform-hazard acceleration response spectra at bedrock at the Project area are provided in Part 8 – Engineering Data – No. ___ Uniform Hazard Spectra, for a return period of approximately 2,500 years (a 3% probability of exceedance in 75 years) and a return period of approximately 1,000 years (a 7% probability of exceedance in 75 years), with an assumed bedrock damping of 5% and an assumed shear wave velocity in the bedrock of greater than 5,000 feet per second.

**X.5.6. Construction Monitoring Plan**

The Design-Builder shall be responsible for preparing a construction monitoring plan to monitor vibration, accelerations, vertical settlement, and lateral movement of temporary support structures and adjacent ground, and existing structures and infrastructure during construction including the existing bridge, ancillary structures and infrastructure. The Design-Builder shall be responsible for the implementation of its construction monitoring plan.

The Design-Builder’s construction monitoring plan shall include details of the proposed program of instrumentation and monitoring, monitoring frequency, assesses the impacts to existing structures and utilities, establishes threshold values of the monitored parameters, and describes the response plan that will be implemented when threshold parameters are exceeded.

Construction monitoring of the bridge shall include vertical, horizontal, and tilt movements and vibration of bridge piers in sufficient locations as to determine adequate performance and safety of the bridge and its foundations during construction.

The construction monitoring system shall be sufficiently robust as to be in good working condition and if damaged, repairable to good working condition such that there is minimal disruption to monitoring capabilities.

The design and distribution of instrumentation within the Design-Builder’s construction monitoring plan shall demonstrate its understanding of the need, purpose and application of each proposed instrumentation type. The Design-Builder shall provide, install and maintain the instrumentation and monitor the measurements during and after construction up to Final Acceptance.

The Design-Builder shall ensure that the instrumentation can be read remotely and that data shall be uploaded to a website provided by the Design-Builder, and which shall be accessible remotely by both the Design-Builder and the Owner. Remote-access functionality shall include the ability to extract data and to isolate an individual monitoring point or multiple points. The presentation system shall include the functionality to modify the extents and scale of data plotting such that arbitrary views are available.

The Design-Builder shall provide weekly construction instrumentation monitoring reports to the Owner. Monitoring reports shall be interpretive in nature, and shall enumerate any corrections.
applied to the data including, but not limited to any notification measures taken regarding data. The weekly reports shall include clear and explicit statements of exceedances of any pre-determined threshold values.

See Project Requirement _____ – Bridge Maintenance and Operation Requirements for details of the requirements for bridge monitoring in service.

X.5.7. Foundation Design Reports

The Design-Builders shall be responsible for preparing a foundation design report for all structures included in the Project. The foundation design report shall detail the analysis and design of each foundation element, including any foundation optimization process such as foundation element pile spacing, and shall detail the anticipated total and differential settlements over time. The foundation design report shall be signed and sealed by the Foundations Lead Designer.

X.5.7.1. Bridge Foundation Design

The Design-Builders shall design and construct permanent foundations based on the requirements of NYSDOT LRFD Bridge Design Specifications, AASHTO LRFD Bridge Design Specifications and AASHTO LRFD Bridge Construction Specifications.

The Design-Builders shall not use auger cast piles, screw piles, timber piles, buoyant foundations or re-use any existing foundations.

X.5.7.2. Wave Equation Analyses

The Design-Builders shall be responsible for performing wave equation analyses for driven pile foundations to obtain the relationship between blow counts and estimated nominal resistance of the driven piles with elevation. Wave equation analyses shall be performed using a wave equation analysis program (WEAP) in accordance with AASHTO Standard Specifications for Highway Bridges. The use of dynamic pile driving formulae will not be an acceptable method for developing driving criteria or performing drivability studies for the purposes of determining hammer energy requirements.

X.5.7.3. Retaining Walls

The Design-Builders shall design and construct retaining walls in accordance with Project Requirement _____ – Structures. The Design-Builders shall provide retaining wall designs to address internal, external, and global (overall) stability and settlements (total and differential) of the walls in accordance with the AASHTO LRFD Bridge Design Specifications.

All retaining walls supporting bridge approaches shall be designed for seismic events.
X.5.8. Fill/Embankments

X.5.8.1. Excavation and Embankment

Excavations and embankment construction shall be in accordance with the requirements of Section 203 of the NYSDOT Standard Specifications (see Part 5 – Special Provisions). Embankment cross-sections shall be in accordance with the requirements of the Roadway Geometrics Performance Specification. Embankment slopes shall be no steeper than 1:2 (vertical:horizontal). All fill shall be compacted to a minimum density of 90% of the standard Proctor maximum density. All subgrade shall be compacted to a minimum density of 95% of the standard Proctor maximum density. The minimum compaction control testing and graduation testing shall be in accordance with NYSDOT Construction Inspection Manual Section 203 – Excavation and Embankment.

X.5.8.2. Settlement

The Design-Builder shall be responsible for predictions and estimations of settlement induced by fill placements, including immediate settlement in granular soils, and both immediate and consolidation (timedependent) settlements in cohesive soils. The Design-Builder shall establish design criteria for settlement of embankments and structures.

The Design-Builder shall consider and account for the effects of down-drag forces on deep foundations throughout the Project Limits.

X.5.8.3. Reinforced Soil Slope Design

The Design-Builder shall conduct analyses for reinforced soil slopes (RSS) in accordance with the design procedures and requirements contained in FHWA-NHI-00-043 Mechanically Stabilized Earth Walls and Reinforced Soil Slopes Design and Construction Guidelines.

The Design-Builder shall be responsible for provision of all necessary surface and subsurface drainage, and slope protection and erosion control provisions, which shall be incorporated into the RSS designs in accordance with the requirements of FHWA-NHI-00-043 Mechanically Stabilized Earth Walls and Reinforced Soil Slopes Design and Construction Guidelines and as required herein. Construction of reinforced soil slope shall be in accordance with the requirements of NYSDOT Standard Specifications Section 554.

X.5.9. Soil Improvement

Any soil improvement systems adopted by the Design-Builder shall be designed using procedures as specified in FHWA Ground Improvement Methods. The Design-Builder shall be responsible for devising and implementing pre-production field testing program to demonstrate that the proposed methods and design will provide the ground improvement level required by the Design-Builder. The geotechnical interpretive report shall include details of any soil improvement systems adopted.
methods being utilized, purpose of the application, test program and field monitoring and verification during construction.

**X.5.10. Erosion Control and Drainage**

The Design-Builders shall be responsible for the design and implementation of erosion control and drainage measures for the Project.

**X.5.11. Slope Stability**

The Design-Builders shall be responsible for assessing the stability of all existing slopes, new fill and cut slopes (permanent and temporary) within or affected by the Project, and ensuring for the stability of these slopes.

The Design-Builders shall design new fill and cut slopes, and check existing slopes for the static case in accordance with FHWA *Soil Slope and Embankment Designs* and for the seismic case in accordance with FHWA-NHI-11-032 GEC No.3 *LRFD Seismic Analysis and Design of Transportation Geotechnical Features and Structural Foundations*. The Design-Builders shall be responsible for ensuring that the following minimum requirements are satisfied:

A. The minimum factors of safety from limit equilibrium analysis for static load conditions for permanent slopes shall be 1.3 for non-critical slopes and 1.5 for critical slopes (at bridge abutments, wingwalls and existing structures);

B. The minimum factor of safety for seismic load cases shall be 1.0 for non-critical slopes and 1.1 for critical slopes and the Design-Builders shall be responsible for establishing the acceptable deformations the slopes can accommodate for the design seismic events;

C. The minimum factor of safety for a rapid drawdown condition shall be 1.1;

D. For non-permanent slopes, the minimum safety factor shall be 1.3 under static load conditions.

The Design-Builders shall use resistance factors determined as the reciprocals of the minimum factors of safety values stated in this Section X.5.11.

**X.5.12. Rock Slopes and Rock Excavation**

The Design-Builders shall be responsible for ensuring adequate safety and stability of rock slopes in the Project Limits, including but not limited to slope stability analysis, rock fall analysis, and stabilization.


The Design-Builders shall ensure that the factor of safety for rock slope stability shall be 1.3 or greater for static stability, and 1.0 or greater for seismic stability. The Design-Builders shall use
resistance factors determined as the reciprocals of the minimum factors of safety values stated in this Section X.5.12.

For any rock cuts that do not meet the above description and the Designer-Builder determines that the material will behave more like a soil, slope stability analyses shall be performed using soil mechanics methods, and the requirements of Section X.5.11 herein.

The Design-Builder is not precluded from using blasting methods for the excavation of rock at the east and west landing areas, in rock located above the highest high water level. The Design-Builder shall be wholly responsible for obtaining all consents and approvals associated with the use of any explosives and blasting methods to excavate rock, if it elects to use such methods. The use of explosives and blasting method is not permitted within or on the waters of ______________, nor on the existing bridge, nor for any Project purpose aside from excavating rock above highest high water level.

Rock fall modeling or rock fall simulation analyses shall be performed to predict rock fall behavior and to design rock fall catchment systems for each rock cut. For all existing rock cut slopes that do not meet the design criteria referenced above for stability, Design-Builder shall implement stabilization measures to produce a stable slope.

X.5.13. Temporary Works

All temporary excavations shall be designed and constructed such that Occupational Safety & Health Administration (OSHA) requirements are met or exceeded.

The Design-Builder shall be responsible for ensuring that all temporary excavation support systems shall be designed and constructed so as to maintain a safe system for the travelling public, and will provide support for existing facilities and utilities. The Design-Builder shall take full account of all relevant factors, including surcharge pressures due to structures, point, line and area loads in lateral earth pressure diagrams.

Appropriate construction materials and equipment loads shall be determined by the Design-Builder’s Foundations Lead Designer and shall be consistent with the methods actually used.

The Design Builder shall ensure the design and drawings for temporary decking, sheeting, and bracing are signed and sealed by a Professional Engineer licensed to practice in the State of New York.

For cofferdams, the Design-Builder shall submit signed and sealed drawings including means and methods for construction of cofferdams. Cofferdams shall be constructed so that any pile cap reinforcing steel and pile cap concrete can be placed in the dry.
X.6. Construction Requirements

X.6.1. Deep Foundations

The Design-Build is responsible for the design, construction and testing of all deep foundations used for the Project.

The Design-Build shall carry out sufficient axial load tests to verify the design nominal resistance for each production pile type, diameter and subsurface condition type (specifically, either founded within soil only, or founded within or upon rock). For each type and diameter of pile/shaft per subsurface condition type, a minimum of 1% of the total number of piles/shafts but no less than one static load test shall be performed.

The Design-Build shall carry out sufficient lateral load tests to verify the lateral resistance for each production pile type and subsurface condition type. For each type and diameter of pile/shaft per subsurface condition type, a minimum of two static lateral load tests shall be performed.

After completion of a pile load test, the Design-Build shall be responsible for either fully removing the test pile from the ground or for cutting off the test pile at an elevation that shall be the deepest of either: (i) ten feet below the original pre-construction mudline level at the test pile location, as determined from the Design-Build’s pre-construction hydrographic survey; or (ii) at the level of the dredged surface at the test pile location.

For driven pile foundations, the Design-Build shall be responsible for performing wave equation analyses to obtain the relationship between blow counts and estimated nominal resistances for each test pile in each pile group identified in the Design-Build’s drawings. Separate wave equation analyses shall be performed for each hammer, pile type and driving system to be used. Wave equation analyses shall be performed using a wave equation analysis program (WEAP) in accordance with AASHTO Standard Specifications for Highway Bridges.

For each substructure supported with driven piles, a minimum of 5% but no less than two of all the piles to be installed within that substructure unit or pile group shall be driven and dynamically tested during the entire initial drive and all restrikes. A pile driving analyzer (PDA) shall be used to measure the hammer energy and the case pile wave analysis program (CAPWAP) shall be used to analyze the data on these piles. Dynamic pile testing shall be performed in accordance with the FHWA Design and Construction of Driven Pile Foundations Reference Manual.

The Design-Build shall provide integrity testing of all drilled shafts and test shafts. At a minimum, integrity testing requirements shall comprise crosshole sonic logging on all drilled shafts. In addition, the Design-Build shall carry out thermal integrity profiling testing to investigate the integrity of the cover concrete and the shaft perimeter behavior, and shaft base/rock interface coring to prove the shaft base is bearing directly on rock on selected drilled shafts.
As part of the As-Built Plans, the Design-Builder shall provide installation records for all piles/shafts installed. For driven piles, the pile driving records shall include hammer stroke, fuel setting, final pile tip elevations, resistance achieved, pile lengths used, and details of the cap, cap block and cushion system.

Inspection records for drilled shafts shall be in accordance with NYSDOT Geotechnical Engineering Manual GEM-18 Drilled Shaft Inspector’s Guidelines. Inspection records for micropiles shall be in accordance with NYSDOT Geotechnical Engineering Manual GEM-25 Micropile Inspector Guidelines. For all drilled shafts with rock sockets or bearing on rock, the rock socket and the base of the drilled shaft shall be inspected utilizing an underwater video recorder. The video recorder shall be capable of capturing the depth of the recording. A digital copy of the video recording shall be submitted to the Owner as part of the drilled shaft installation record.

X.6.2. Dewatering and Groundwater Control

The Design-Builder shall be responsible for evaluating the potential need for dewatering and groundwater control, and for implementing such measures as appropriate, and shall evaluate the effects on existing facilities resulting from any dewatering and draw down.

X.6.3. Condition Surveys

X.6.3.1. Pre-Construction Condition Survey

The Design-Builder shall conduct a pre-construction condition survey for the purposes of generating photographic and video documentation of existing damage, leaks and cracks. The pre-construction condition survey shall form the basis against which all new cracks, existing progressive cracks, or damage will be measured. The spatial extent of the pre-construction survey shall encompass the Project Limits plus certain areas beyond the Project Limits, as detailed herein.

The full spatial extent of the Design-Builder’s pre-construction condition survey necessarily depends upon the Design-Builder’s design and proposed means and methods of construction. In its preparation for the preconstruction survey, the Design-Builder shall be responsible for predicting anticipated vibration and settlement effects at various offset distances from the Project Limits, and for ensuring that the preconstruction condition survey encompasses at a minimum all properties within areas that are identified by the Design-Builder to be potentially prone to: (i) ground vibration levels, expressed as resultant peak particle velocity, in excess of 0.25 inches per second; and (ii) predicted ground settlements of greater than 1.0 millimeter.

In addition, the spatial extent of the pre-construction condition survey shall be integrated with the Design-Builder’s implementation of its strategy for conformance with the Environmental Performance Commitments related to the protection of cultural resources (see Project Requirement 3 – No.____ Environmental Compliance). This strategy shall include properties within designated historic districts.
For the pre-construction condition survey of the existing bridge, the Design-Builder can, in place of undertaking its own survey, elect to utilize the most recent biennial inspection report for the existing bridge, as undertaken by the Owner in ______. If the Design-Builder elects to use the ______ biennial inspection report as the pre-construction condition survey of the existing bridge, the Design-Builder shall thereby agree and affirm that the ______ biennial survey report presents an accurate and comprehensive survey of the pre-construction condition of the existing bridge. The ______ biennial inspection report of the existing bridge is a confidential document, and will be made available to the Design-Builder in response to a written request sent to the Owner.

The Design-Builder shall submit to the Owner the records and photographic and video documentation of the pre-construction condition survey, which shall be signed and stamped by a Professional Engineer registered in the State of New York.

**X.6.3.2. Post-Construction Condition Survey**

The Design-Builder shall conduct a post-construction condition survey of the zone and properties covered by the pre-construction conditions survey (see Section X.6.3.1 herein). The post-construction condition survey shall be performed by the Design-Builder at Physical Completion, and it shall compare the post-construction conditions with the conditions recorded in the pre-construction condition survey. The location and scope of the post-construction condition survey shall match those of the pre-construction condition survey. The complete documentation of the post-construction survey, describing the comparison with the preconstruction conditions and signed by a Professional Engineer registered in the State of New York, shall be submitted to the Owner.

**X.6.4. Stockpiled and Non-Stockpiled Earthwork Material**

The material shall be stockpiled in accordance with the NYSDOT Geotechnical Control Procedure (GCP-17) Procedure for the Control and Quality Assurance of Granular Materials. The Design-Builder shall be responsible for tests and quality control and assurance methods pertaining to the material requirements in conformance with the procedures contained in GCP-17.

**X.7. Deliverables**

At a minimum, the deliverables shall include the items listed in Table X.7-1 for the Owner’s consultation and written comment.
Table X.7-1 Deliverables

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Number of Copies</th>
<th>Delivery Schedule</th>
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<tr>
<td>Geotechnical work plan</td>
<td>5</td>
<td>60 days after NTP</td>
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<tr>
<td>Geotechnical investigation plan</td>
<td>5</td>
<td>15 days before start of geotechnical investigation Works</td>
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<td>Geotechnical data report</td>
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<td>60 days after completion of subsurface investigation, including testing</td>
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<td>5 days in advance of Readiness for Construction Review</td>
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<td>Seismic assessment report</td>
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<td>X.5.5</td>
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<tr>
<td>Construction monitoring plan</td>
<td>5</td>
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<td>X.5.6</td>
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<td>Foundation design reports</td>
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<td>Pile performance testing protocol</td>
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<td>Not more than 30 days prior to planned start of pile testing</td>
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<tr>
<td>Pre-construction condition survey report</td>
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<td>Not more than 30 days prior to start of construction</td>
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<tr>
<td>Post-construction condition survey</td>
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<tr>
<td>Pile performance test results</td>
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<td>Not more than 15 days after completion of each pile test</td>
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<td>Periodically during construction</td>
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<tr>
<td>Foundation inspection reports</td>
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<td>Periodically during construction</td>
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PART 3, PROJECT REQUIREMENT X – GEOTECHNICS EXHIBIT A
Example of Subsurface Exploration Log Sheet

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<tr>
<th>REGION</th>
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<th>HAMMER FALL-CASING</th>
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<th>WET CONTENT (%)</th>
<th>DESCRIPTION OF SOIL AND ROCK</th>
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DRILL RIG OPERATOR
SOIL & ROCK DESCRIPTION
FOUNDATIONS LEAD DESIGNER
DATE APPROVED
ENGINEER
STRUCTURE NAME
D.J.N.

CONTRACT _____ CONTRACTOR _____ SHEET ___ OF ___ HOLE ___