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ACCESS TO THE REGION'S CORE
FINAL ENVIRONMENTAL IMPACT STATEMENT

Soils/Geology Methodology Report

NJT Contract #03-118

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Submitted by:

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Final

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Prepared by: _____ **Date:** 05/08

Reviewed by: _____ **Date:** 12/06

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1. DESCRIPTION AND OBJECTIVE OF THE TASK/SUBTASK

The purpose of this report is to summarize the methodology that will be used to evaluate the ARC FEIS long-term and construction impacts to and from soils and geologic conditions. In addition to this methodology, geotechnical surveys and subsurface test borings will be conducted for unusual structures or soil conditions.

As the development of the long-term alternatives progress, this methodology may need to be adjusted or refined, as appropriate.

2. DATA REQUIREMENTS

It is anticipated that the following types of data will be required to inventory soils and geologic conditions to evaluate impacts of the proposed project alternatives to soils/geology:

- Seismicity
- Mineral resources
- Slope stability
- Geologic structure/faults
- Stratigraphy
- Unique geologic features

Geographic locations for which subsurface data are required for engineering design are:

- Manhattan: West 28th Street to West 34th Street, between Twelfth Avenue and Madison Avenue

Geographic locations for which subsurface data are required for engineering design of the Build Alternative include the following areas of common infrastructure west of and beneath the Hudson River:

- Secaucus, NJ (Track improvements along the Northeast Corridor Line west of the Hackensack River
- Secaucus, NJ, between the New Jersey Turnpike, the Hackensack River, and NJ TRANSIT's Main/Bergen Line (Secaucus Connection)
- Secaucus, NJ, the Frank R. Lautenberg Station (Fifth Track at Frank R. Lautenberg Station)
- Secaucus, Jersey City, and Hoboken, NJ (Two additional tracks on Northeast Corridor Line east of Secaucus Junction Station)
- Hoboken, NJ and Hudson River (Twin tunnels under Palisades and Hudson River beginning near Tonnelle Avenue in North Bergen)

Depending on the location and the proposed project structures, soils/geology data will be required for the following engineering elements:

- Foundations and subsurface structures
- Tunnel cross-sections and linings
- Tunnel sizing, lining, and waterproofing concept
- Tunnel or trench excavation methods

- Excavation geometry
- Interfaces between different types of construction
- Excavated tunnel material removal and disposal
- Construction staging and sequencing
- Number and location of fan plants/construction access shafts
- Underpinning requirements and protection of structures within construction influence zones
- Mitigation measures for any identified adverse impacts

The following data elements will be required to apply this methodology.

Information/Data Required	Description
Data from Academic and Research Institutions	
Geologic and subsurface information from research, theses, and university library holdings	Soil properties, sediment properties, rock properties, rock depth, groundwater depth, stratigraphy, seismicity, mineral resources, slope stability, geologic structure/faults, and unique geologic features; project area
Geologic and subsurface information published in peer-reviewed technical journals	Soil properties, sediment properties, rock properties, rock depth, groundwater depth, stratigraphy, seismicity, mineral resources, slope stability, geologic structure/faults, and unique geologic features; project area
Geologic and subsurface information from USGS	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, seismicity, mineral resources, slope stability, geologic structure/faults, and unique geologic features; project area
Geologic and subsurface information from Soil Conservation Service	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, mineral resources, and slope stability; project area
Geologic and subsurface information from NJDEP	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, seismicity, mineral resources, slope stability, geologic structure/faults, and unique geologic features; Hudson, Bergen, and Essex Counties, NJ
Geologic and subsurface information from NYCDEP	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, seismicity, mineral resources, slope stability, geologic structure/faults, and unique geologic features; Manhattan
Geologic and subsurface information from NYSDEC	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, seismicity, mineral resources, slope stability, geologic structure/faults, and unique geologic features; Manhattan
Geologic and subsurface information from NJGS	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, seismicity, mineral resources, slope stability, geologic structure/faults, and unique geologic features; Hudson, Bergen, and Essex Counties, NJ
Geologic and subsurface information from local jurisdictions	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, seismicity, mineral resources, slope stability, geologic structure/faults, and unique geologic features; project area

CONSTRUCTION RECORDS

Geotechnical data as well as site plans and facility as-built records will be researched as follows:

Information/ Data Required	**Description** *Pre-Review: Data Type, Data Location*
Data from Transportation Agencies	
Geologic and subsurface information, site plans, and facility as-built records from NJ TRANSIT	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, rock structure; project area
Geologic and subsurface information, site plans, and facility as-built records from NJ TRANSIT, Hudson-Bergen Light Rail (HBLRTS)	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, rock structure; Hudson and Bergen Counties, NJ
Geologic and subsurface information, site plans, and facility as-built records from Amtrak	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, rock structure; project area
Geologic and subsurface information, site plans, and facility as-built records from Conrail	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, rock structure; project area
Geologic and subsurface information, site plans, and facility as-built records from PANYNJ	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, rock structure; project area
Geologic and subsurface information, site plans, and facility as-built records from NYCT	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, rock structure; Manhattan
Geologic and subsurface information, site plans, and facility as-built records from MTA/NYCT/LIRR for existing underground structures, No. 7 Line Extension, Second Avenue Subway, and East Side Access Project	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, rock structure; Manhattan
Geologic and subsurface information, site plans, and facility as-built records from NYSDOT, Westway	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, rock structure; Manhattan, NY, Hudson River
Geologic and subsurface information, site plans, and facility as-built records from NJ Turnpike Authority	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, rock structure; Secaucus, NJ
Geologic and subsurface information, site plans, and facility as-built records from NYCDEP, water tunnels	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, rock structure; Manhattan
Geologic and subsurface information, site plans, and facility as-built records from other private developers and consulting engineering firms in NYC	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, rock structure; Manhattan
Geologic and subsurface information, site plans, and facility as-built records from other private developers and consulting engineering firms in NJ	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, rock structure; Hudson, Bergen, and Essex Counties, NJ
Geologic and subsurface information from NYC Department of Design and Construction	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, rock structure; Manhattan
Geologic and subsurface information from U.S. Army	Soil properties, sediment properties, rock

Information/ Data Required	Description *Pre-Review: Data Type, Data Location*
Data from Transportation Agencies	
Corps of Engineers	properties, rock depth, groundwater depth, stratigraphy, rock structure; New York Harbor, NY/NJ
Geologic and subsurface information from USEPA	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, rock structure; project area
Geologic and subsurface information from U.S. Coast Guard	Soil properties, rock properties, rock depth, groundwater depth, stratigraphy, rock structure; Hudson River, NY/NJ

2. CITATIONS OF APPLICABLE GUIDELINES/REGULATIONS

The methodology was prepared in accordance with NEPA/FTA EIS guidelines requiring thorough, detailed documentation of the material and human environment potentially affected by proposed major transportation projects. No specific NEPA/FTA guidelines/regulations exist for the investigation of soils/geology.

3. PROPOSED VARIATIONS FROM FTA GUIDANCE

None

4. KEY ASSUMPTIONS

The following key assumption applies to the methodology described herein that will be used to investigate soils/geologic conditions for the ARC FEIS improvements:

Subsurface geotechnical data collected for previous project work and for other construction in the project area are readily accessible.

5. METHODOLOGY APPROACH

STEP 1: REVIEW OF EXISTING PROJECT DATA AND IDENTIFICATION OF ADDITIONAL DATA NEEDS

Any soils/geology data collected for previous project studies will be reviewed and evaluated in the context of additional FEIS data needs.

Additional data that are required to provide a complete inventory of soil and geologic conditions, to a FEIS-level of detail, along the proposed project alignment and in adjacent geographic areas, anticipated to impact or be impacted by the project, will be identified.

Additional data that are required to complete engineering studies to support analyses of impacts will be identified.

It is anticipated that the engineering design elements most likely to require additional geotechnical data collection will be related to optimization of the following critical design elements: methods for tunnel excavation; tunnel cross sections and linings; tunnel sizing, lining, and waterproofing concept; limits of types of construction and their transitions; excavated tunnel material removal and disposal; construction staging and sequencing; number and location of construction access shafts and fan plants; location of tunnels portals; construction influence zones and underpinning requirements; and construction methods to address environmental constraints.

STEP 2: COLLECTION OF ADDITIONAL EXISTING DATA

Based on work conducted in Step 1, additional existing geotechnical data will be collected to close the identified data gaps to: 1) completely inventory soils/geologic conditions along the proposed project corridor; and 2) provide geotechnical input for critical design elements to support analyses of impacts.

Existing published and unpublished soils/geologic data will be collected, including published geologic maps and reports, as well as records generated for public and private construction. These latter records may include site pre-construction exploration records, site plans, and facility as-built drawings.

The records search will be conducted as appropriate to optimize results. To ensure completeness of data collection, in-house records will be searched first and summarized as to data location, data type, and data availability. Requests for information will then be submitted as necessary to appropriate public and private organizations. Results of each records search will be recorded, including both positive and negative findings.

Data to be collected will be prioritized on the basis of: 1) geographic areas anticipated to impact or be impacted by the project; 2) stratigraphy within the anticipated depth expected to impact or be impacted by the project; and 3) occurrences of similar materials or conditions in areas adjacent to the areas or depths of interest, which might be anticipated to extend into the project area.

STEP 3: DATA REVIEW AND EVALUATION OF DATA COMPLETENESS

Data collected in Step 2 will be reviewed and synthesized. Data will be validated if they appear inconsistent or if appropriate quality control procedures were not implemented during their original generation. Data whose validity cannot be confirmed will not be used for project work. Review of the collected data will be documented. Collected data that are in electronic format will be filed in a GIS-based database.

Data completeness will be evaluated on the basis of sufficiency to evaluate impacts of the proposed project alternatives to soils/geology and on the basis of sufficiency for preliminary engineering of critical design elements. Data gaps will be identified, and specific subsurface data requirements will be identified.

The quality and quantity of existing subsurface data will be evaluated as the preliminary subsurface profiles along the proposed alignment(s) are developed.

STEP 4: EVALUATION OF IMPACTS OF PROPOSED PROJECT ALTERNATIVES TO SOILS/GEOLOGY

The collected data will be used to complete the existing inventory of soils and geologic conditions for areas potentially impacted by the proposed project. Potential impacts of the proposed project alternatives within the proposed project area will be evaluated for each of the following features of the soils/geologic environment:

- Seismicity
- Mineral resources
- Slope stability
- Geologic structure/faults
- Stratigraphy
- Unique geologic features

STEP 5: INPUT TO ENGINEERING

The collected soils/geology data will be reduced and summarized. Soil stratigraphic units will be defined and rock formations identified. Geologic cross-sections will be prepared along the proposed project alternatives, including, as available, soil stratigraphy, depth to top of rock, and depth to ground water. Available relevant engineering properties data will be tabulated and summarized.

STEP 6: SUBSURFACE INVESTIGATIONS

It is anticipated that existing data will be insufficient in detail or distribution for some geographic areas or structures and that a targeted subsurface investigation program will be required to provide the necessary data to complete preliminary engineering.

A subsurface investigation plan will be developed to address the data gaps, if any, identified in Step 3. It is anticipated that a subsurface investigation would include test borings and sampling in soil and rock, along with routine and specialized geotechnical laboratory testing, groundwater measurements and sampling, geophysical surveys, and in-situ geotechnical testing. The plan will be developed in conjunction with NJ TRANSIT.

Specifications will be developed to solicit bids from drilling firms. Contractor-submitted bid packages will be reviewed as requested by NJ TRANSIT.

The subsurface investigation plan will be implemented as directed by NJ TRANSIT. Specialized geotechnical inspection and contract administration will be provided.

If required for hazardous materials investigations, borings will also be used to supplement environmental investigations of potentially contaminated soils and ground water.

STEP 7: DOCUMENTATION

Results of Soil/Geology analysis will be incorporated into the FEIS.