

## SRP 2.5.4 STABILITY OF SUBSURFACE MATERIALS AND FOUNDATIONS Modernization Plan

### Team Members

Function	Name	Division/Branch
Primary Reviewer	Weijun Wang	DEX/ESEA
Counterpart Primary Reviewer	N/A	
Interface 1 (Geology)	TBD	DEX/EXHB
Interface 2 (Seismology)	David Heeszel	DEX/EXHB
Interface 3 (Hydrology)	TBD	DEX/EXHB
Interface 3 (Structural Engineering)	TBD	DEX/ESEA

### I. PURPOSE

Provides staff guidance for reviewing the applicant's information concerning the characteristics and stability of the soil and rock underlying the site that could affect the safe design and siting of the nuclear facility. Specifically, SRP Section 2.5.4 provides staff guidance on site investigations undertaken to characterize the geology and geotechnical engineering features of the site, and to establish the engineering properties of the sub-surface soil and rock underlying a nuclear facility. Additionally, SRP Section 2.5.4 provides guidance to enable the staff to determine if the subsurface materials are suitable for use in the design of the facility foundations when subject to the loads imposed by natural phenomena and operational processes for the designed life-cycle.

### AREAS OF REVIEW

#### 1. Regulatory Requirement

10 CFR 100.23 (c) and (d)(4) require applicants to investigate the geological, seismological, and engineering characteristics of a site and its environs in sufficient scope and detail to support evaluations of siting factors and potential causes of failure, including the physical properties of the materials underlying the site, ground disruption, soil and rock stability, liquefaction potential, and the effects of vibratory ground motion that may affect the design and operation of the proposed nuclear power plant.

#### Acceptance Criteria

The applicant provided an adequate description of the site investigation program performed to characterize the static and dynamic engineering properties of the soil and rock and evaluate the stability of the near surface subsurface materials below foundations of safety-related structures, embankments and engineered slopes. The site investigation program identified the geotechnical testing and geophysical surveys conducted to characterize the subsurface engineering properties in order to determine foundation stability, potential for soil liquefaction, and the effects of vibratory ground motion that may affect the design and operations of the proposed nuclear facility.

#### Finding

The staff finds that the applicant has implemented a systematic program for site investigation by using standardized and well-established procedures for field investigations, sample collections, and laboratory testing in order to characterize the soil and rock static and dynamic engineering properties. Based on its comprehensive evaluation of the applicant's investigation program, the staff finds reasonable assurance that the site subsurface material static and dynamic engineering properties are adequately determined for establishing the stability of the foundation design and dynamic response to seismic loading. The staff therefore concludes that this section of the application meets the requirements of 10 CFR 100.23 (c) and (d)(4).

## 2. Regulatory Requirement

10 CFR Part 50, Appendix A GDC 2 and Appendix S require that the design of nuclear power plant SSCs important to safety shall be designed to withstand the effects of natural phenomenon such as earthquakes and surface deformation without a loss of capability to perform their safety functions.

### Acceptance Criteria

The applicant adequately investigated and analyzed the stability of all safety-related structures from a static and dynamic stability standpoint, including bearing capacity, rebound, settlement and lateral earth pressure under the dead loads of fills and plant facilities and dynamic loads, including seismic loads. Field and laboratory test procedures and results have been included to document the soil and rock properties used in the analyses and these properties represent the actual site conditions beneath the planned locations of plant facilities. In addition, the liquefaction potential for soils adjacent to and under Category I structures has been adequately evaluated with consideration of the site stratigraphy, critical soil parameters, and the location of safety-related foundations.

### Finding

The staff concludes that the applicant has provided reasonable assurance that the foundations and underlying materials can support the superstructures, and embankments will respond as designed, under seismic loading and other anticipated loading conditions using described methods with well-defined soil and rock engineering properties. In addition, the staff concludes that the applicant has performed sufficient investigations at the site to justify the soil and rock characteristics used in the design, and the design analyses contain adequate margins of safety for construction and operation of the nuclear facility and meets the requirements of GDC 2 and 10 CFR Part 50, Appendix S.

## **II. ADDITIONAL INFORMATION**

This SRP section was selected for modernization as site characterization and site subsurface material properties determination are technology neutral. This SRP section can also be used for other nuclear facilities to meet their specific requirements.

The revised SRP will take the risk significance into consideration and apply probabilistic approach when reaching the safety evaluation findings. However, the deterministic approach will be used where the probabilistic methods/procedures are not available.

The development of this SRP section will follow the guidance of the NRR LIC-200, Revision 2 "Maintaining and Updating the Standard Review Plan," March 9, 2020.

### **III. APPROVALS**

	<b>Name</b>	<b>Date</b>
<b>Branch: DEX/ESEA</b>	<b>Joseph Colaccino</b>	<b>June 17, 2020</b>
<b>Division: DEX</b>	<b>Eric Benner</b>	<b>June 18, 2020</b>