# The New Madrid Earthquakes: An Engineering-Geologic Interpretation of Relict Liquefaction Features

U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER 1336–B

COVER: Cypress trees along the shore of Reelfoot Lake in northwestern Tennessee. Reelfoot Lake, originally an oxbow lake in an abandoned Mississippi River meander, was substantially enlarged during the major New Madrid earthquake of February 7, 1812. Pen and ink drawing by Jeff Dietterle, 1987.

# The New Madrid Earthquakes: An Engineering-Geologic Interpretation of Relict Liquefaction Features

*By* STEPHEN F. OBERMEIER

THE NEW MADRID, MISSOURI, EARTHQUAKE REGION—
GEOLOGICAL, SEISMOLOGICAL, AND GEOTECHNICAL STUDIES

*Edited by* DAVID P. RUSS *and* ANTHONY J. CRONE

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*Geologic and engineering properties of alluvium are used to determine local controls on sand blow development, to locate approximately the epicenters of two large shocks, and to back-calculate accelerations in the alluvium*

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# FOREWORD

The great New Madrid, Missouri, earthquakes of 1811-12 and the extended series of aftershocks that followed have focused considerable U.S. attention on the geologic stability of the interior of the North American crustal plate. These and subsequent earthquakes have shown clearly that the mid-continent is capable of generating devastating earthquake ground motions and that study of these earthquakes is essential to reducing their associated hazards. This Professional Paper presents significant new contributions to fundamental knowledge about the seismicity, tectonic framework, and earthquake hazards of the New Madrid seismic zone. Some of the chapters refine the conclusions of earlier work, further clarifying the understanding of the seismotectonics of the region.

As early as 1846, the eminent English geologist Sir Charles Lyell studied the effects of the earthquakes of 1811-12 and recognized the effects of recurrent earthquakes on the physiography and structure of the Mississippi Valley. The first comprehensive geologic investigation of the New Madrid earthquakes was made by Myron Fuller of the U.S. Geological Survey (USGS), who published his findings in 1912. Fuller described the distribution and character of surface deformation and liquefaction features and compiled a detailed list of aftershocks and their effects.

In 1974, the USGS began multidisciplinary studies to investigate the cause of the New Madrid earthquakes and to determine the hazards and risk associated with the continuing seismicity in the region. In the same year, the Department of Earth and Atmospheric Sciences of St. Louis University began installation of a 16-station microearthquake-detection network in the Mississippi embayment (later expanded to 32 stations plus 8 additional stations in the Wabash Valley of Illinois and Indiana). The studies and seismograph network were designed to determine the temporal and spatial distribution of seismicity in the New Madrid seismic zone, to delineate the structural framework of the earthquake source zone, and to determine the recurrence rate of damaging earthquakes in the New Madrid region by investigations of surficial sediments and structures.

In 1977, the U.S. Nuclear Regulatory Commission initiated a multi-institutional seismotectonic study of the area within a 200-mile radius of New Madrid. The study was conducted by scientists from midwestern universities and State geological surveys, in coordination with Federal agencies conducting investigations in the area. The purpose of the study was to define the structural and tectonic setting of the New Madrid seismic zone in order to evaluate earthquake risks in the siting of nuclear facilities. Geological, engineering, and seismological studies for assessing earthquake hazards and risk associated with the Mississippi River and related waterways and manmade structures have been conducted independently by scientists and engineers of the U.S. Army Corps of Engineers.

Results of many of the investigations completed in the first 8 years of study (1974-82) in the northern Mississippi embayment were presented in USGS Professional Paper 1236. These studies revealed that earthquakes in the New Madrid area occur in linear zones that are spatially associated with structures in a buried continental rift that formed in the Precambrian. Reactivation of faults along the axis and flanks of the rift in a compressive stress field has produced uplift and many of the region's earthquakes. The buried Paleozoic surface has only minor structural relief, however, indicating that Cenozoic fault activity has been only modest or that most of the fault offset has been strike-slip. Earthquakes large enough to cause tectonic surface deformation and liquefaction features occur on the average of every 600-700 years in the New Madrid seismic zone.

Geophysical, geological, and seismological investigations by scientists of the USGS, State geological surveys, academia, and the U.S. Army Corps of Engineers have continued in the New Madrid seismic zone since the publication of USGS Professional Paper 1236. Of particular importance have been seismic-refraction and seismic-reflection surveys; geomorphic analyses of river terraces and stream profiles in Tennessee, Kentucky, and Arkansas; and studies of earthquake-induced hazards such as liquefaction, landslides, and ground motion. Some of the new data and conclusions from these investigations are given in chapters published at irregular intervals as part of this Professional Paper 1336. These chapters provide a more complete understanding of the seismicity and tectonic evolution of the New Madrid region and the effects of hazards that the earthquakes produce; consequently, they will enhance the effort to implement loss-reduction measures in an economical and effective manner.

David P.Russ

Anthony J. Crone

*Editors*

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[Plates are in pocket]

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# THE NEW MADRID EARTHQUAKES: AN ENGINEERING-GEOLOGIC INTERPRETATION OF RELICT LIQUEFACTION FEATURES

By STEPHEN F. OBERMEIER

ABSTRACT

Earthquake-induced sand blows and sand-filled fissures are present in a belt 40 to 60 km wide that extends from near Charleston, Mo., southward to about 20 km south of Marked Tree, Ark. This region of earthquake-induced sand blows and other liquefaction-related features is almost exclusively in the St. Francis Basin, an alluvial lowland that typically has a thin (2 to 8 m thick), clay-bearing topstratum underlain by about 30 to 60 m of unconsolidated sand (the substratum). Liquefaction of the substratum sands has made the sand blows.

The sand blows and other liquefaction-related features on the ground surface in the St. Francis Basin are almost certainly results of the New Madrid earthquakes of 1811–12. In this report, geologic and engineering properties of the alluvium are used in combination with a map showing the bounds of the liquefaction-related features to locate approximately the epicentral zones for two of the major shocks: the earthquakes of December 16, 1811, and February 7, 1812. Properties used for the analysis included the Standard Penetration Resistance of the substratum sands, characteristics of the sand's grain size, thickness of the topstratum, and the thickness of the post-Tertiary alluvium.

The method of analysis relies largely on the evaluation of the liquefaction potential of the sands. This is done by using the Standard Penetration Test blow counts and by devising a method that uses all possible combinations of liquefaction potential and a realistic relation between attenuation of earthquake accelerations and distance from the epicenter (or more correctly, energy-release center).

Two interpreted 1811–12 energy-release centers generally agree well with zones of seismicity defined by modern, small earthquakes. Bounds on accelerations are placed at the limits of sand blows that were generated by the 1811–12 earthquakes in the St. Francis Basin. Conclusions show how the topstratum thickness, sand size of the substratum, and thickness of alluvium affected the distribution of sand blows in the St. Francis Basin.

## INTRODUCTION

The succession of great earthquakes collectively designated as the New Madrid earthquakes (of 1811–12) caused widespread, severe liquefaction in an area of the northern Mississippi Embayment (figs. 1 and 2) near the Mississippi River valley, including southeastern Missouri, northeastern Arkansas, western Kentucky, and western Tennessee. According to the earliest extensive documentary account (Fuller, 1912), three major shocks occurred: December 16, 1811; January 23, 1812; and February 7, 1812. The earthquakes caused multitudes of fissures and sand blows[1] over a large region in the Mississippi River valley, set off numerous landslides, and caused some localized doming and submerging of the ground surface. A map (fig. 3) showing regions of the most severe ground-failure features was compiled from field investigations by Fuller (1912) some 100 years after the earthquake. Because of the absence of any known surface faults associated with the earthquakes, Fuller selected an epicentral line based on the general trend and shape of ground-failure features, taken in connection with the reported direction of earth waves. He placed particular emphasis on the regional development of sand blows and what he interpreted as regional doming and submergence.

The sand blows are particularly well developed on the vast plains west of the Mississippi River. These plains are typically underlain by the youngest and thickest weak sediments in the northern Mississippi Embayment and contain a sequence generally 30 to 100 m thick that is made up of Holocene and Pleistocene alluvium.

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[1]Sand blows are small, domelike accumulations on the ground surface that are predominantly made of sand. Those induced by the 1811–12 earthquakes in this geographic region are commonly 15 to 60 m in diameter and 1 m high. Sand blows are formed by ground water, temporarily under artesian pressure as a consequence of the earthquake shaking, that rapidly flows to the surface and forms a fountain of sediment-laden water that deposits a conical mound of transported sand and silt. Some authors refer to these features as sand boils.

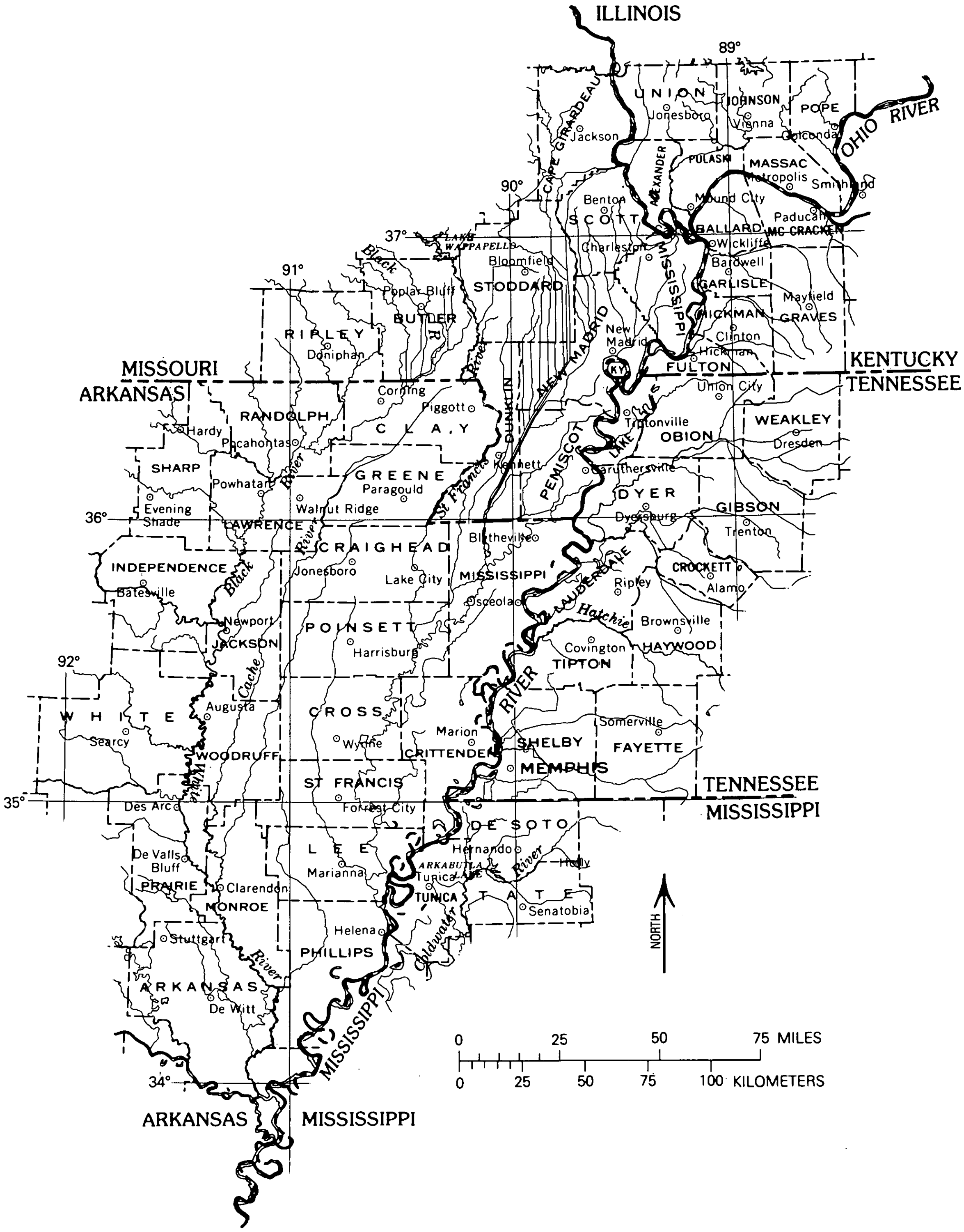



FIGURE 1.—Index map of counties and some towns in the study area and surrounding region.

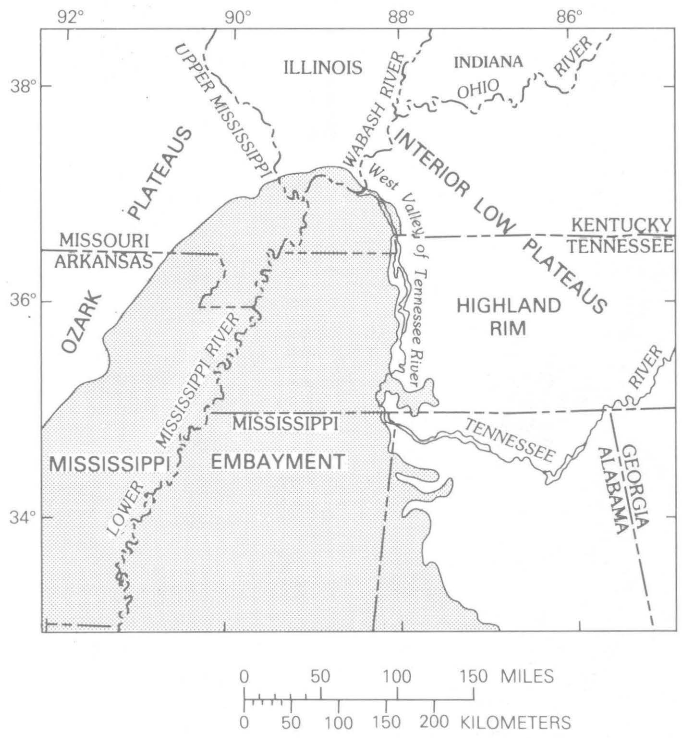



FIGURE 2.—Physiographic provinces in the study area (modified from Stearns and Wilson, 1972).

The alluvium is dominantly unconsolidated sand that is underlain by about 600 m of only slightly more consolidated Tertiary and Cretaceous sediments. Such weakly consolidated materials are a poor medium for transmitting offsets from faults at depth to the ground surface. Thus there has long been doubt about Fuller's interpretation of an epicentral line (Davison, 1936). Nuttli (1973a) used intensity data that indicated the first shock was centered near Marked Tree, Ark. (fig. 3), as Fuller hypothesized, but suggested the last great shock was in the vicinity of New Madrid, Mo. (fig. 3). An earlier investigator (Shepard, 1905) thought the epicenter was in the Ozarks or possibly other areas surrounding the embayment, a possibility thought to have some credence because of the suspected relatively greater susceptibility to ground failure of young alluvium in the Mississippi Valley as compared to older materials.

The lack of surface faults associated with the 1811–12 earthquakes has complicated efforts at developing relations between seismicity and the structural framework of the region. The only beds that are offset through Holocene sediments and that show good evidence of tectonic faulting are small and rather short features, located near Reelfoot Lake, in extreme northwestern Tennessee (Russ, 1979). These small faults, however, show no evidence of movement during the 1811–12 earthquakes. Until 1978, the only other structural information about the embayment was interpretations from indirect forms of evidence. Hildenbrand and others (1977) used aeromagnetic and gravity data to interpret a northeast-trending, riftlike structure beneath the Mississippi Valley. A major linear zone of recent seismicity extends along the center of the rift between Marked Tree, Ark., and Caruthersville, Mo. (fig. 4) (Stauder and others, 1976; Stauder, 1982). The fault or faults presumably responsible for this zone of seismicity are parallel to, and may be continuous with, the zone of faults mapped as the New Madrid fault system (Heyl and McKeown, 1978) in uplands northeast of the Mississippi Embayment (fig. 4). Another major seismic zone extends from just west of New Madrid, Mo., south-southeast for about 55 km into Tennessee (Stauder and others, 1976; Stauder, 1982) (fig. 4).

To better assess the relation of ground failure to patterns of modern seismicity and to the indirect evidence of the structural framework, a study was initiated by the writer in 1978 comparing the distribution of sand blows and ground failure features with the geologic and engineering character of the sediments in the northern Mississippi Embayment. It was hoped that such a study would help determine if the interpretations of 1811–12 epicenters were compatible with observations of ground failure.

To make the text understandable to both geotechnical engineers and geologists, the writer has included geologic background information relevant to ground failure and a summary of the geotechnical engineering state of knowledge relevant to sand blow development.

## GEOLOGIC SETTING

The study area emcompasses those lowland portions of the northern Mississippi Embayment most susceptible to liquefaction, primarily the St. Francis Basin and Western Lowlands physiographic subdivisions, both topographic basins filled with late Quaternary alluvium (fig. 5). The basins were formed dominantly by fluvial erosion and deposition associated with the Mississippi and the Ohio Rivers and their tributaries (Saucier, 1974). Other regions briefly examined for ground failure include lowlands along the Ohio River extending from Cairo, Ill., to Paducah, Ky. (about 70 km upstream from Cairo), the pre-Wisconsin(?) depositional terraces north of Cairo, and the late Quaternary depositional terraces (Saucier, this volume) along the Obion, Forked Deer, and Hatchie Rivers in western Tennessee (fig. 5).

### PHYSIOGRAPHY

The lowlands are typically very flat over extensive areas, having a local relief of about 0.3 to 4 m. Numerous

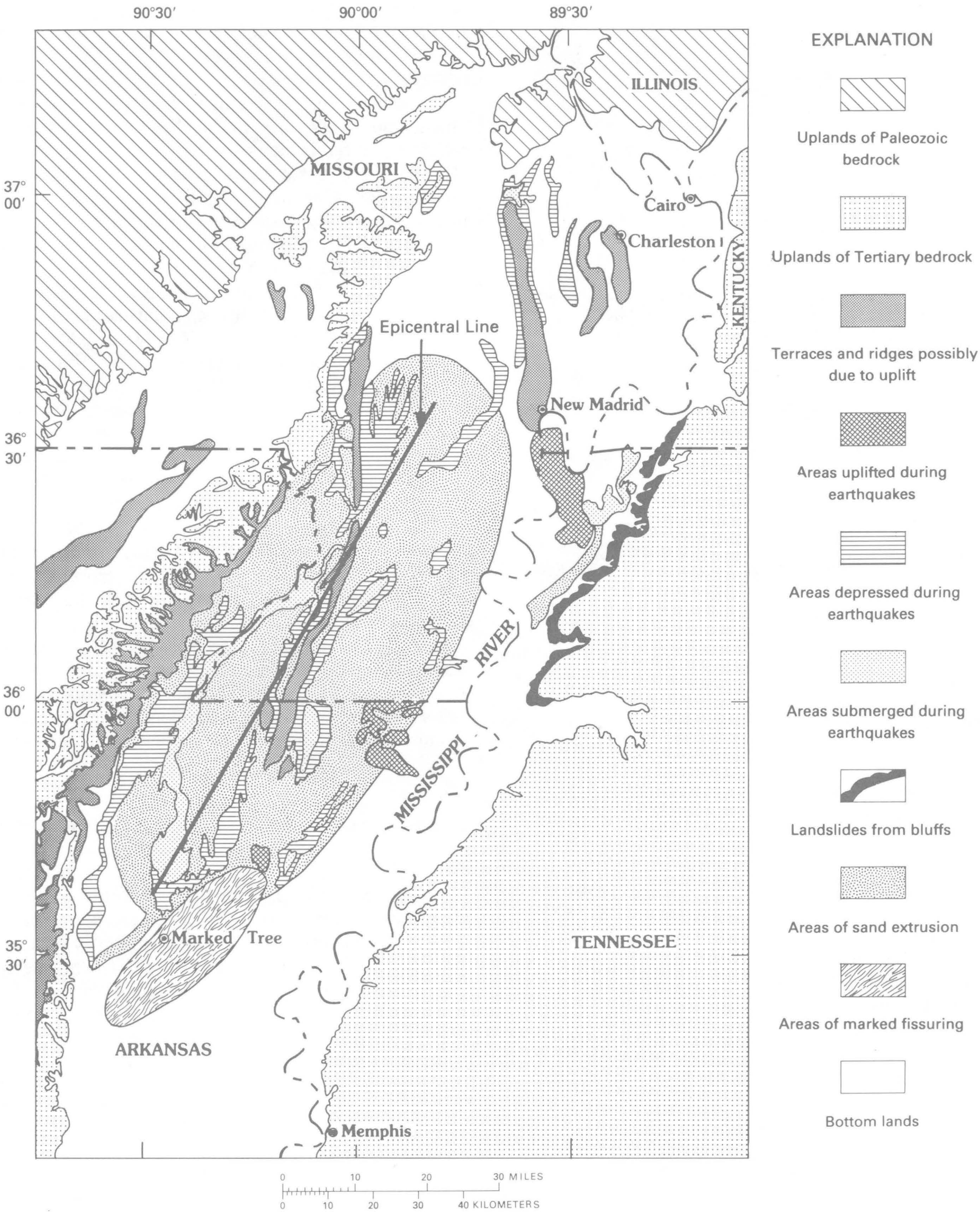



FIGURE 3.—Earthquake features of the New Madrid district (from Jibson, 1985, modified from Fuller, 1912).

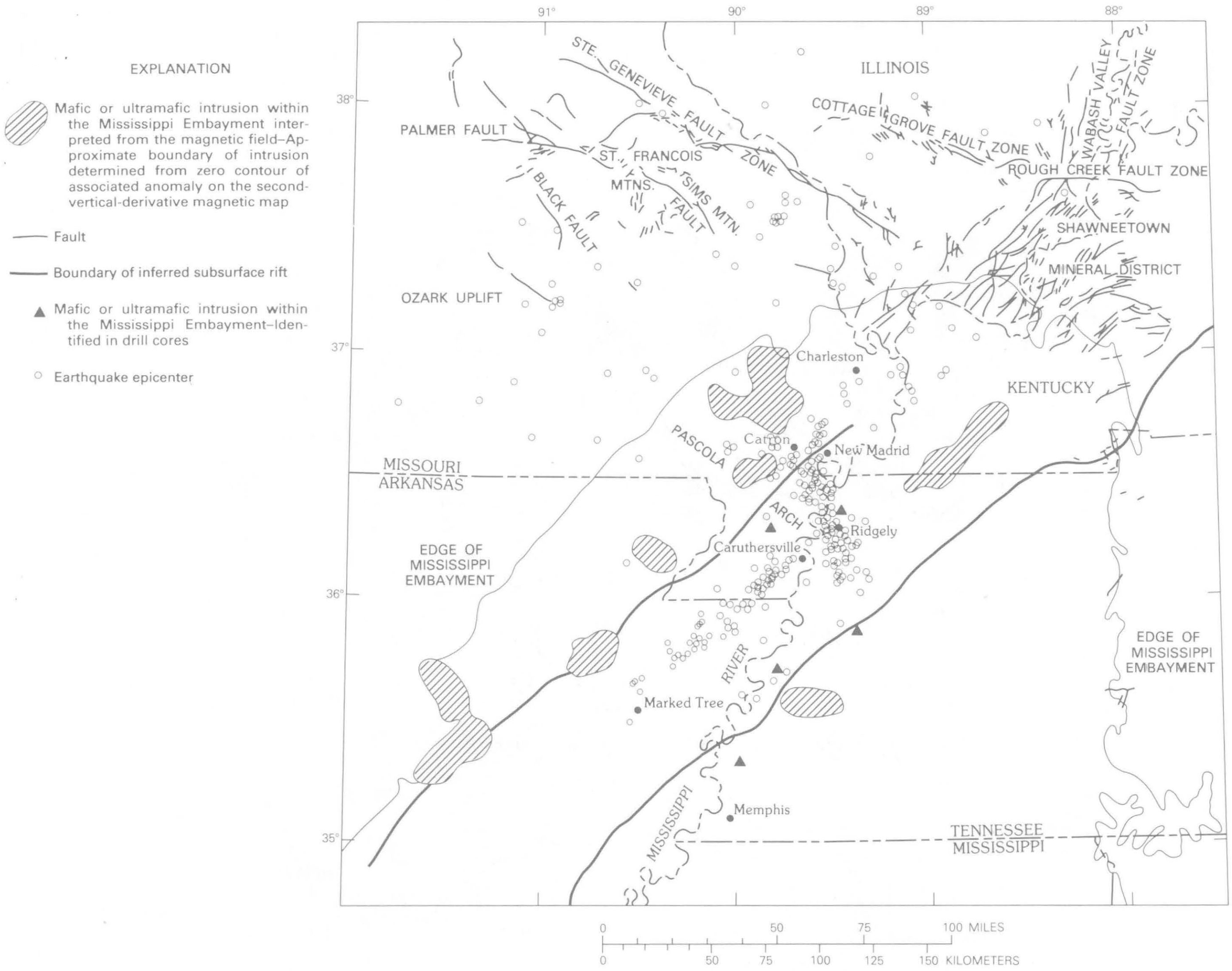



FIGURE 4.—Northern Mississippi Embayment region showing earthquake epicenters, plutons, rift boundaries, and faults (modified from Zoback and others, 1980).

small scarps have been made by depositional or erosional processes. Many of these scarps separate adjacent braided-stream surfaces and are shown on the surficial feature maps for the St. Francis Basin (Saucier, 1964) and the Western Lowlands (Smith and Saucier, 1971). These maps also show other relief-forming features such as sand dunes, natural levees, abandoned channels, and backswamps. Sikeston Ridge, a major alluvial feature, is a north-south-oriented braided-stream terrace that commonly rises as much as 6 m above the adjoining plains on both sides (fig. 5). Crowley's Ridge (figs. 5 and 6), an upland erosional remnant that is topographically higher than the lowlands on either side, separates the St. Francis Basin from the Western Lowlands. Crowley's Ridge is capped at most places with loess or gravel, which is underlain in turn by semiconsolidated pre-Quatenary sediments. Upland areas shown in figure 5 are typically made up of strongly to weakly consolidated sediments that are not susceptible to liquefaction. Upland areas surround the St. Francis Basin and the Western Lowlands, except in the southwestern extremities, where the basins are bounded by the Grand Prairie (fig. 5).

Elevations in the lowlands exceed 100 m near Cairo, Ill., and decrease southward to less than 60 m near Memphis, Tenn. Natural levees of the Mississippi River typically cause many regions near the river to be substantially higher than lowlands farther away.

Widespread floods were commonplace events in the lowlands prior to construction in this century of man-made levees along the Mississippi River. Standing water occupied the lower parts of many lowlands for

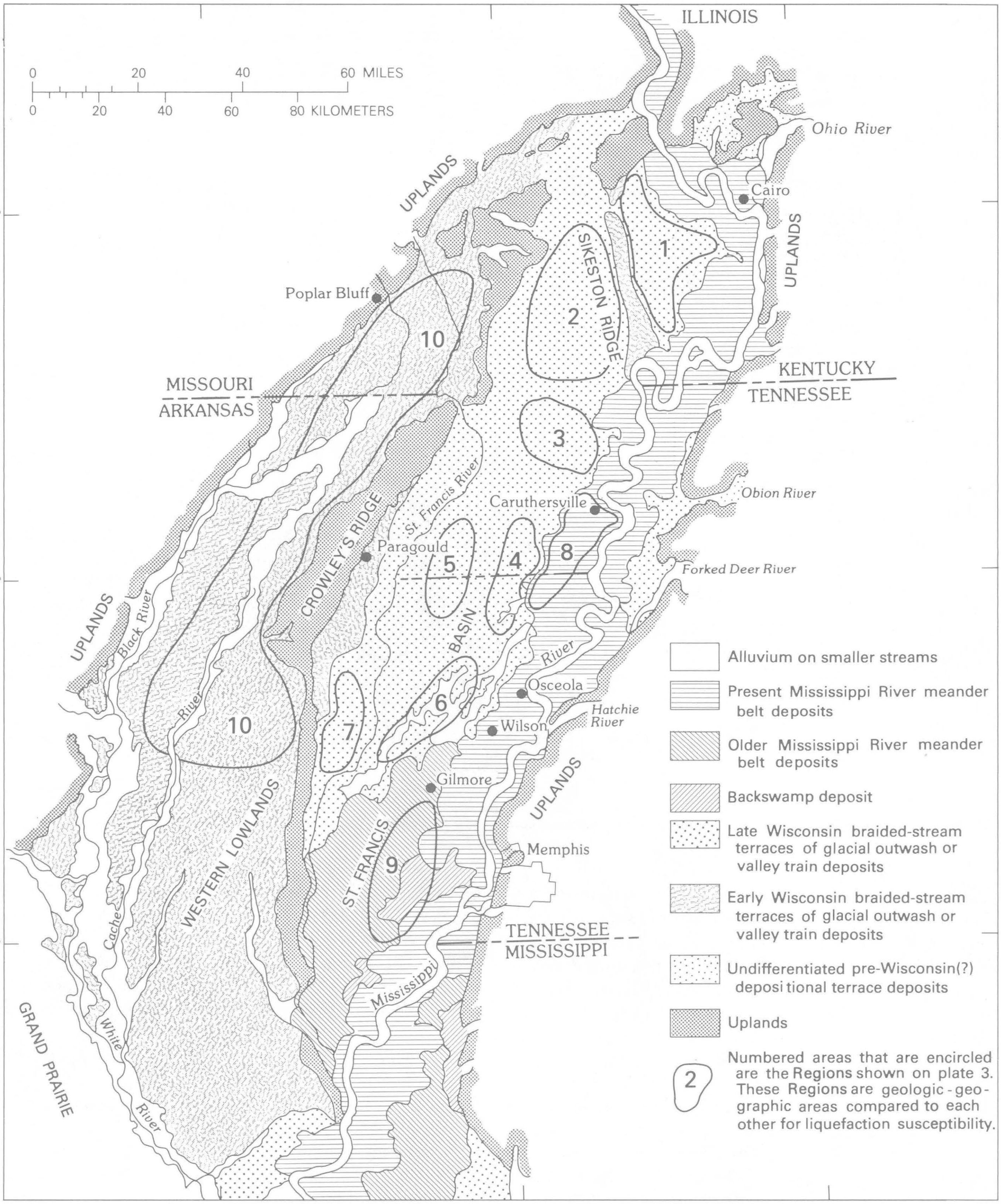



FIGURE 5.—Late Quaternary alluvial deposits in the St. Francis and Western Lowlands Basins (from Saucier, 1974) showing Regions from plate 3. Information on Regions is presented later in text.

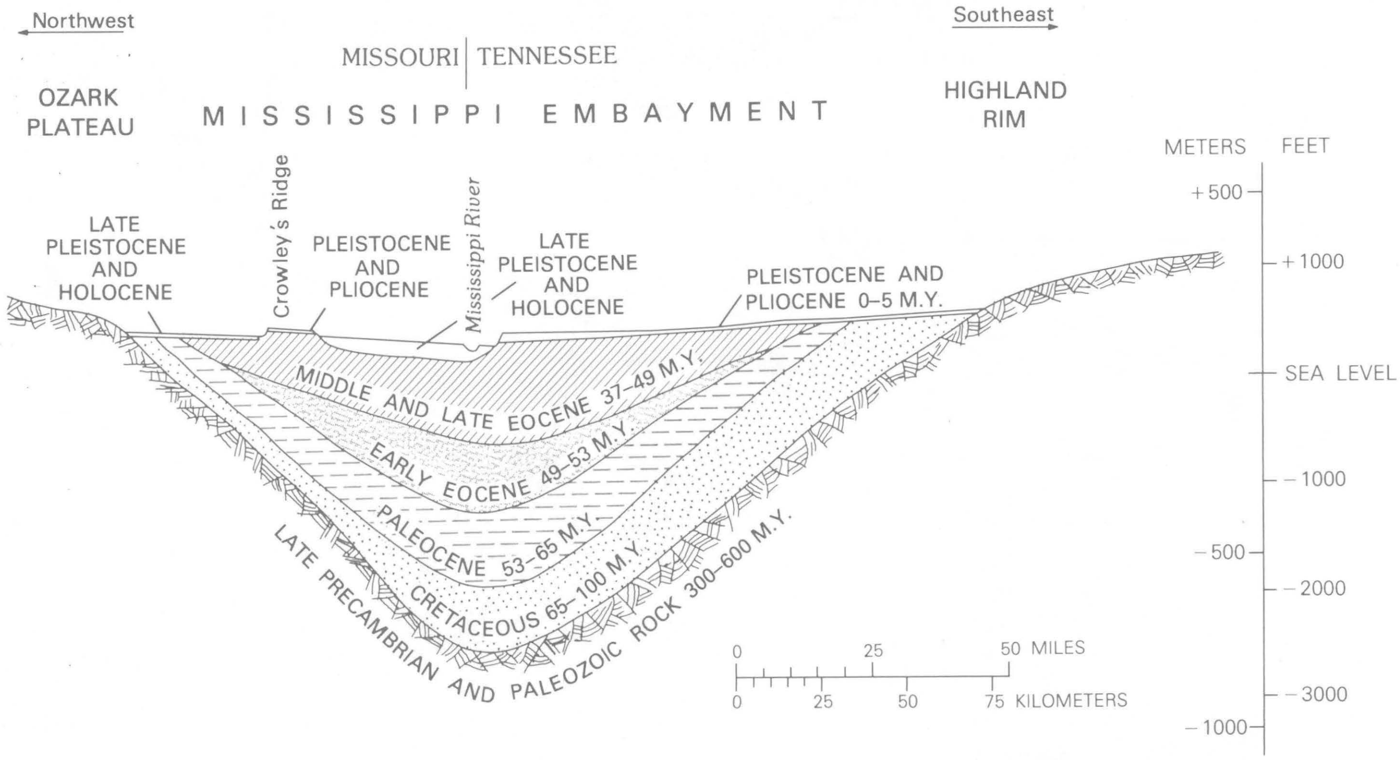



FIGURE 6.—Diagrammatic cross section of the Mississippi Embayment showing the approximate thickness of systems and series (modified from Stearns and Wilson, 1972).

much of the year before the levees were built and before huge drainage ditches were excavated by the U.S. Army Corps of Engineers. Dense forests of hardwood trees and cypress swamps originally occupied almost all of the St. Francis Basin and probably most of the Western Lowlands. Major portions of the St. Francis Basin had virgin stands of timber until 40 years ago.

## GEOLOGY

This summary of the geologic characteristics of the embayment includes interpreted structural and seismic features that could have been associated with the New Madrid earthquakes of 1811–12. An expanded discussion of the character of the late Quaternary alluvial deposits shown in figure 5 follows; they are the only deposits considered to be so weakly consolidated that they were prone to widespread liquefaction during the earthquakes.

### CHARACTERISTICS OF THE EMBAYMENT

Figure 6 is a diagrammatic northwest-southeast cross section through the embayment (Stearns and Wilson, 1972). Beneath the Quaternary alluvium are Tertiary and late Mesozoic marine and nonmarine deposits that filled the embayment. The Mesozoic sediments unconformably overlie Paleozoic siltstones, carbonates, and quartzites that are locally intruded by plutons. This simplistic depiction is complicated by the effects of tectonic deformation. Not shown in figure 6 are structural features and igneous intrusions that have been interpreted from geophysical data.

Geophysical and petrologic data indicate that intracontinental rifting took place in the embayment in the late Precambrian or Early and Middle Cambrian (McKeown, 1982). The rifting was followed by deposition of Paleozoic sediments, some of which were subsequently uplifted across the Pascola Arch (fig. 4) in late Paleozoic or early Mesozoic time. The region then began subsiding in Late Cretaceous time and probably continued until at least the beginning of the Holocene.

The relation between seismicity and the tectonic framework of the region remains an unresolved problem. Researchers (Zoback and others, 1980) have recently suggested that the New Madrid earthquakes may be associated with ancient faults located within the Precambrian–early Paleozoic rift; they note that others have previously attributed the earthquakes to elastic stress concentrations associated with mafic or ultramafic plutons, to faults extending southwestward

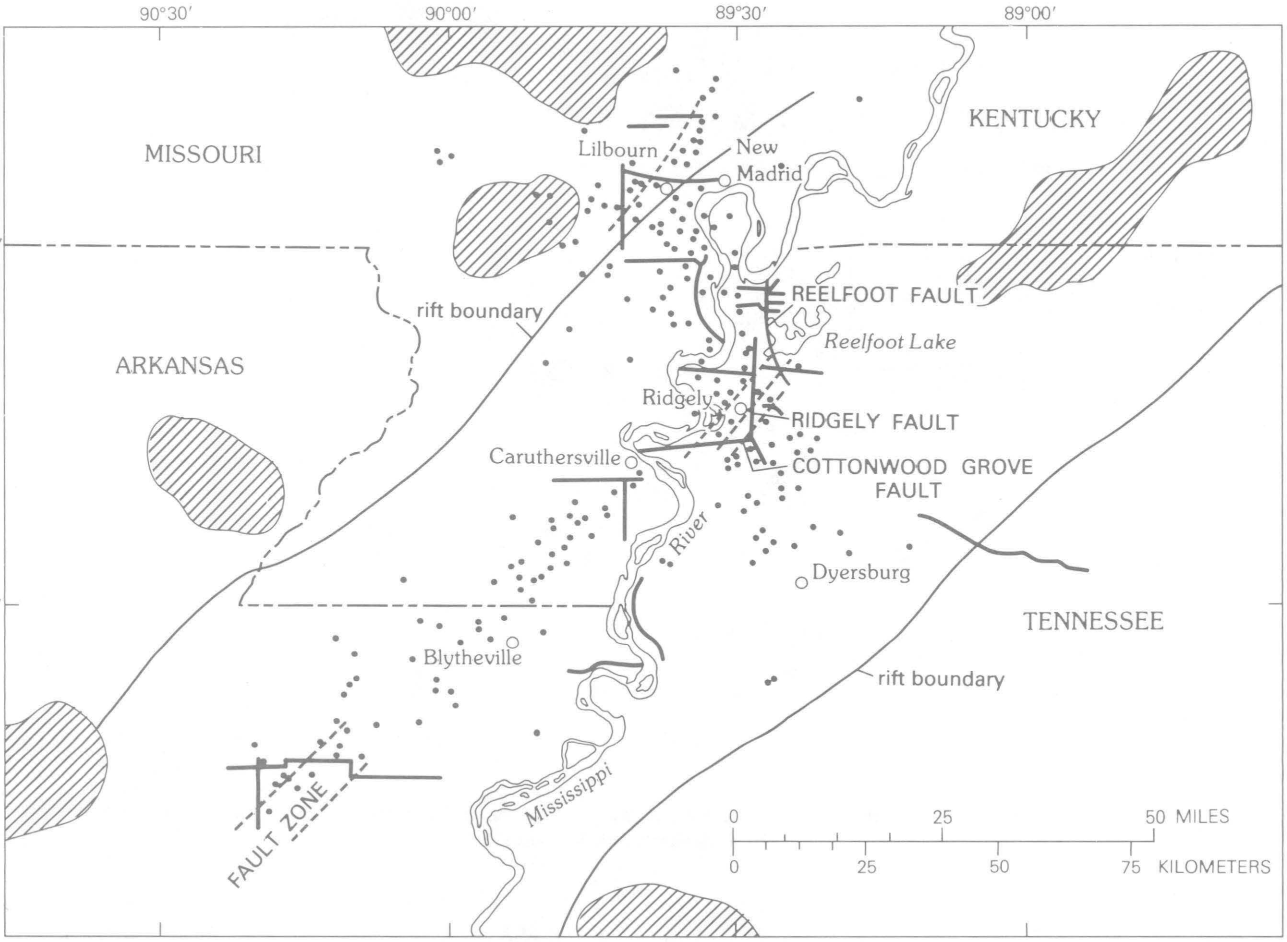



FIGURE 7.—Detail of the New Madrid region showing plutons (diagonally striped areas), earthquake epicenters (dots), locations of seismic reflection profiles (heavy solid lines), and principal faults and fault zones (intensely faulted zones) inferred from the data (dashed straight lines) (modified from Zoback and others, 1980).

beneath the embayment from the "New Madrid fault system" of Kentucky and Illinois, and to release of stress concentrations at the intersection of the downwarped Mississippi Embayment and the northwest-southeast-trending Pascola Arch. Results of recent seismologic, geologic, and geophysical studies summarized by McKeown (1982) emphasize the relation between modern seismicity and faults within the rift zone, with local control related to stress concentrations around the plutons. This rift may extend through part of the Wabash Valley (Braile and others, 1982); the southwestern boundary of the rift is unknown, but it extends southwest of Memphis, Tenn., into northern Arkansas (Hildenbrand and others, 1983). Figure 4 shows the boundaries of the inferred subsurface rift, interpreted intrusive bodies within the embayment (Zoback and others, 1980), and earthquake epicenters recorded by a regional seismic network from 1974 to 1979.

Figure 7 shows the epicenters, location of seismic reflection profile lines, and faults identified from the lines (Zoback and others, 1980). Near Ridgely, Tenn., an apparent high-angle reverse fault has a post-Paleozoic displacement of about 80 m; most of the displacement on this fault occurred since the middle Eocene. A north-northwestward-striking fault near Reelfoot Lake vertically displaces post-Paleozoic sediments a minimum of about 53 m (Zoback, 1979). Evidence of a major deep-seated structural discontinuity interpreted as a fault zone was found in northeast Arkansas where the southernmost reflection profiles were run. West of the town of New Madrid, a dip-slip fault vertically displaces Tertiary sediments about 35 m. This fault extends northwestward toward Charleston, Mo., where one of the two largest earthquakes to hit the region since 1812 took place in 1895. From figures 4 and 7 it is apparent that very recent earthquake activity is concentrated along three principal zones: (1) a 100-km linear zone extending from Marked Tree, Ark., to Caruthersville, Mo., approximately along the center of the rift structure; (2) a zone of relatively more intense activity extending from near Ridgely, Tenn., northward to west of New Madrid; and (3) a relatively short, northeasterly oriented zone from west of New Madrid toward Charleston, Mo. Fault-plane solutions for earthquakes in the Marked Tree–Caruthersville region indicate the movement is predominantly right-lateral strike-slip (Herrmann and Canas, 1978). It has been suggested (Zoback and others, 1980) that if current seismicity is indicative of post-Cretaceous deformation, the predominantly strike-slip component may explain why there is little vertical separation in the younger strata between Marked Tree and Caruthersville.

## CHARACTERISTICS OF QUATERNARY ALLUVIUM

The most recent comprehensive review of the Quaternary geology of the lower Mississippi Valley is a report by Saucier (1974). Cyclic Pleistocene glaciations are direct or indirect geologic controls of the origin, character, and distribution of virtually all of the Pleistocene deposits shown in figure 5. Although continental glaciers did not actually extend into the lower Mississippi Valley area, they nevertheless were responsible for deranging preglacial drainage supplying the southward-flowing river systems, which repeatedly carried large volumes of glacial meltwater and outwash. Considerable thicknesses of valley fill composed of coarse-grained glacial debris were deposited by braided streams. These braided streams, although aggrading the valley, also appreciably widened and deepened the valley through lateral planation and valley deepening through periodic scouring to the underlying bedrock. Sedimentation rates evidently reached their highest levels in the parts of the Mississippi Valley shown on figure 5 during the early stages of waning glaciation. Aggradation in the northern part of the valley probably lasted no more than a few thousand years. After this time, the ratio of sediment to meltwater declined and valley degradation occurred, although a braided-stream regimen still existed. The degradation resulted in the creation of numerous braided-stream terraces.

In the early Holocene time, stream discharge and sediment load declined until the ancestral Mississippi River changed from a braided to a meandering regimen. This change possibly took place about 6,000 years ago in the latitude north of Memphis. In most places slow valley aggradation has taken place since the establishment of the meandering regimen.

The geologic units of figure 5 typically have significant differences in age, origin, composition, or other factors relevant to ground failure and sand blow potential. All alluvial units, however, probably have at least minor susceptibility to liquefaction during intense earthquake-induced ground shaking. Following is a brief description of the alluvial units, including geologic characteristics most relevant to sand blow development.

### UNDIFFERENTIATED TERRACES

The only undifferentiated terraces shown on figure 5 are located north of Cairo, Ill., and along the Obion River in western Tennessee. The terraces north of Cairo primarily occupy a valley believed to be a spillway for glacial meltwaters and abnormally high Holocene floods of the Ohio River (Alexander and Prior, 1968). Data in the report by Alexander and Prior show that the depositional terraces are likely capped with clayey silt at least 8 to 12 m thick. The character and depth of unconsolidated material beneath the cap are unknown, though it's quite likely that clean sands underlie the clayey silt.

At least two depositional terraces are present along the Obion River. Both terraces have a silt to silty sand cap at most places, probably less than 1 m thick, that is underlain by clean, fine- to medium-grained sand of unknown thickness.

### BRAIDED-STREAM TERRACES

Braided-stream deposits of glacial outwash or valley train deposits are the principal Quaternary deposits north of Memphis. Several streams were involved in the formation of these deposits (Saucier, 1974). In the Western Lowlands, west of Crowley's Ridge, the sediments were derived from glacial outwash of the Mississippi and Missouri River drainage basins, whereas the deposits in the St. Francis Basin, east of Crowley's Ridge, were contributed by both those streams and the Ohio River. Most deposits in the St. Francis Basin are younger than the deposits in the Western Lowlands, except perhaps Sikeston Ridge and the terrace east of Crowley's Ridge, near Paragould, Ark. (fig. 5). Sikeston Ridge (the highest terrace east of Crowley's Ridge) and the Western Lowlands are early Wisconsin in age, while the braided-stream terraces of the St. Francis Basin are late Wisconsin. Despite different sources and ages, deposits in both basins are lithologically and morphologically similar. The older deposits are topographically higher, have greater relief, and have sandier surfaces than younger deposits. The older deposits occur in several terrace sublevels separated by 2 to 6 m. Each sublevel is characteristically broad and flat to gently rolling. Fine-grained, silty or clayey sediments 3 to 6 m thick (the topstratum) commonly cap the clean medium- to coarse-grained outwash sands and gravels (the substratum) for vast expanses except at the highest sublevels and interfluves. The topstratum was deposited by relatively slack streams as individual braided-stream levels were successively abandoned, or it was deposited by overbank deposition during widespread flooding of the Mississippi River and local streams that now occupy the topographic lows. The highest topographic terraces and interfluve regions often have very sandy and silty surfaces that grade downward into the clean sands of the substratum. Substratum sands and gravels are generally in irregular, intercalated strata and lenses from a few centimeters to a meter thick, extend to depths of 45 to 60 m, and become increasingly coarser with depth.

At some places, a thin veneer of sand, several centimeters to a meter thick, though locally up to 6 m or more thick, occurs over the topstratum. For example, in Mississippi County, Mo., many sand dunes (Saucier, 1964), a large alluvial fan (Ray, 1964), and numerous very young Mississippi River crevasse flood deposits exist. In the Western Lowlands, especially in Clay and Greene Counties, Ark. (figs. 1 and 3), many sand dunes and large elliptically shaped sand deposits of unknown origin occur.

#### Mississippi River Meander Belts

The Mississippi River meander belts are Holocene landforms that represent successive individual courses that formed by lateral migration of the river. Most of the meander belt consists of "accretion" topography of parallel arcuate ridges and swales, abandoned channels in various stages of filling, and natural levees. At many places, surficially, meander-belt deposits hide other meander-belt deposits of a completely different texture. Throughout the meander belt, for example, bore holes often penetrate two or three sequences of silts, clays, and clean sands before entering clean sands and gravels at a depth of 9 to 18 m. These clean sands and gravels represent the alluvial substratum and commonly extend 30 m or more in depth.

Many abandoned channels are filled with 30 m or more of soft clays and silts and are swampy or densely forested. In contrast to the abandoned channels, natural levees are predominantly well-drained clayey to sandy silts. The relatively coarse-grained deposits that result from river migration (and form accretion topography) are referred to as point-bar deposits. Point-bar deposits of the Mississippi River typically have 2 to 3 m of local relief.

#### Mississippi River Backswamp Deposits

Backswamp areas are marginal to meander belts (Saucier, 1974). Backswamp deposits were formed during the Holocene by a nearly continuous accumulation of silts and clays carried into an area by flood waters. The deposits are generally very flat, occupy the lowest regions of flood plains, average 12 m of fine-grained materials, and are as much as 18 m thick.

#### Undifferentiated Alluvium

These Holocene deposits are usually meander-belt sediments, capped with fine-grained material, that have been laid down along small streams.

## LIQUEFACTION AND SAND BLOW DEVELOPMENT

Geotechnical engineering studies have not been made of the detailed mechanics of sand blow development induced by earthquakes, but it is generally accepted that sand blows are caused primarily by liquefaction. Liquefaction is defined by the American Society of Civil Engineers Committee on Soil Dynamics, Geotechnical Engineering Division (1978), as "the act or process of transforming any substance into a liquid," and in cohesionless soils the transformation is from a solid state to a liquefied state as a consequence of increased pore pressure and reduced effective stress. This definition of liquefaction can have two meanings relevant to earthquake-induced sand blow development: the soil has liquefied *during earthquake shaking* because of an induced, high pore water pressure, or the soil has liquefied *after earthquake shaking* because a critical (sufficiently high) hydraulic gradient has been reached by high pore water pressure, sufficient to cause an upward flow of water. Further reference to liquefaction in this paper can be interpreted in either sense unless there is reference to when the liquefaction is taking place.

The pore water pressure induced by and occurring *during* cyclic earthquake shaking can be as large as the total overburden pressure (Seed, 1979). *After* the cyclic stress applications stop, residual pore water pressure in liquefied soil can equal the overburden pressure, a condition that will inevitably lead to an upward flow of water. It is likely that the upward flow of water to the ground surface from an underlying layer having a high pore water pressure is the major causative factor in carrying sand to the ground surface and producing sand blows (Housner, 1958; Seed, 1979).

In some instances, fountains of sand and water continue long after the ground shaking has stopped (Housner, 1958; Kishida, 1970; Seed, 1979). Kishida, for example, reported that the fountains continued for about an hour after the Tokachioki, Japan, earthquake of May 16, 1968. Fuller's (1912) discussion of the sand blows from the 1811–12 New Madrid earthquakes

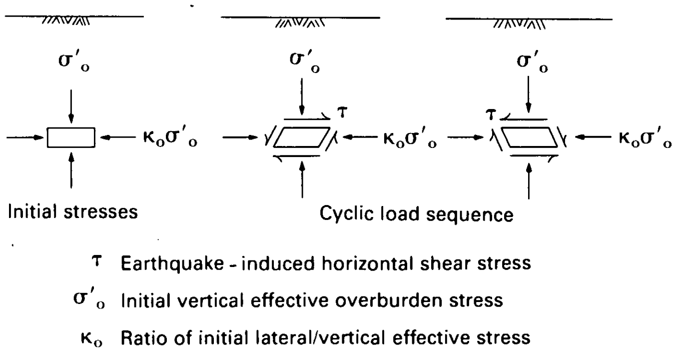



FIGURE 8.—Idealized field loading conditions.

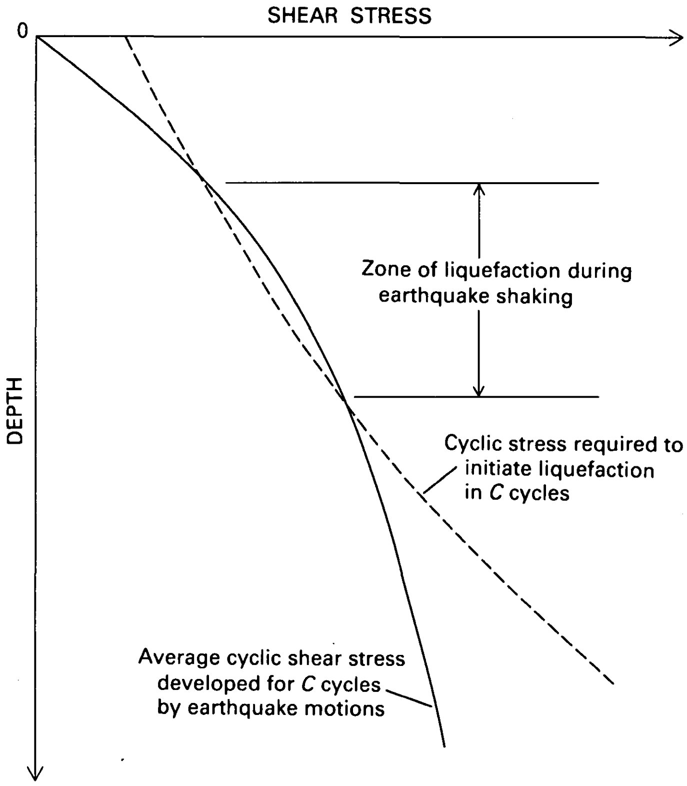



FIGURE 9.—Schematic depiction of the location of zone of liquefaction during earthquake shaking (modified from Seed and Idriss, 1971). $C$ is number of cycles.

states that the blows appeared to be of two general types: violent ejections and quiet extrusions. The violent ejections were presumably contemporaneous with opening and closing of fissures generated by earth waves; Fuller also suggests that a possible cause supplemental to this was the explosive escape of gases generated by the decay of organic matter trapped beneath the topstratum. Fuller states,

The quiet extrusion appears, on the other hand, to be due to the local and temporary development of true artesian conditions, presumably by the unequal settling of the deposits and the production of differential pressures. Although longer lived than the violent ejections, they generally last only a few minutes or hours. It is the outflow of waters by quiet extrusion that has carried the sand of the blows.

Thus the field observations of the mechanism by which most of the sand is vented to the ground surface agree with the conceptual model that invokes liquefaction induced by cyclic shaking (Housner, 1958; Seed, 1979). This premise is used as the basis for comparing engineering properties with sand blow development.

The buildup of pore water pressure in saturated, cohesionless soils is caused by the application of cyclic shear stresses induced by ground motions (Seed, 1979; Seed and others, 1976a). These stresses are generally considered to be due primarily to the upward propagation of shear waves. A soil element on level ground undergoes loading conditions as depicted in figure 8, the stress applications being somewhat random but nonetheless cyclic. Because of the shearing, cohesionless soils that are sufficiently loose tend to become more compact (occupy less volume), the result being an increase in the pore water pressure and a decrease in intergranular stress. With continued application of cyclic shear stresses, the pore pressure of loose sands can approach a value equal to the total overburden pressure, even though the shear strains are still small. Further cyclic shearing can cause the pore pressure to increase suddenly to the confining pressure, with large shear straining resulting. Denser, cohesionless materials may develop a residual pore pressure equal to the confining pressure and produce sand blows, though without the large shear straining.

## SEISMOLOGICAL AND GEOTECHNICAL FACTORS AFFECTING LIQUEFACTION

Liquefaction during earthquake shaking commonly originates in a zone from 2 to 5 m below the ground surface but can originate at a depth greater than 20 m (Seed, 1979). This zone of liquefaction is depicted schematically in figure 9. The location of the zone depends on the relation between the cyclic shear stresses generated by the earthquake and the resistance to liquefaction of the soil. During prolonged shaking or after shaking has stopped, the zone of liquefaction may move upward.

If a relatively impermeable, fine-grained capping is above a zone of liquefied sand, the pore water pressure developed during shaking may escape through fractures in the capping. The sand and water can be carried upward to the ground surface from the liquefied zone and in this manner make sand blows.

## SEISMOLOGICAL FACTORS

Principal seismological factors that control liquefaction during shaking include the intensity of the cyclic shear stresses and the number of applications of the shear stresses (Seed, 1979). In the field this translates to shaking intensity and duration. Methods of analytical engineering for handling variable cyclic shear stress applications and irregular cyclic stress applications typical of real earthquakes are presently well developed and yield quite acceptable results, provided that the stress histories are known or can be predicted with reasonable accuracy.

## GEOTECHNICAL FACTORS

Geotechnical factors that are primary controls of sand liquefaction during shaking (Seed, 1976; Casagrande, 1976) include relative density; initial static confining and shear stresses; particle size, shape, and gradation; particle arrangement; sediment age; previous seismic history; and stratification or layering details. In addition, lithology is important insomuch as it affects cohesion, because a small cohesion greatly increases resistance to liquefaction. Major factors that control liquefaction immediately after shaking has stopped include permeability of materials in and above the liquefied zone and possibly the deformation characteristics, cohesion, and thickness of soils above the liquefied zone. A brief discussion of the possible importance and role of each of the factors listed above is in appendix B.

## ENGINEERING EVALUATION OF LIQUEFACTION POTENTIAL

Many independent factors can significantly affect liquefaction and sand blow development. The state of the art for the prediction of liquefaction and sand blow development, based on theoretical and laboratory techniques, is presently inadequate for many field situations. This is especially true for thinly interbedded deposits having highly contrasting properties, such as the alluvial sediments in the St. Francis Basin and Western Lowlands.

Evaluation of the liquefaction potential of sands is often done in the field by testing the sand in situ with the Standard Penetration Test[2] (SPT) blow count method. Factors that increase resistance to liquefaction, such as an increase in density, an increase in lateral confinement, and a more stable particle arrangement, also increase the SPT blow count; prior seismic strains and aging effects probably increase the penetration resistance (Seed, 1979).

The SPT method cannot be used indiscriminately, however. Recently published data strongly suggest that a given blow count value taken in the field is an equal measure of liquefaction susceptibility for sands having a $D_{50}$ ranging from 0.3 to about 2 mm (Tatsuoka and others, 1978); for the same blow count, finer sands are less susceptible (Tatsuoka and others, 1978; Tokimatsu and Yoshimi, 1981). Other problems are that sands having different relative densities are affected differently by large overburden pressures (Marcuson and Bieganousky, 1976), and the relation between blow count and confining pressure for a given relative density may not be identical for all sands (Aleksandar Vesic, Duke University, unpublished data presented at a seminar of the American Society of Civil Engineers, National Capital Section, Washington, D.C., February 6, 1981).

Even though the SPT test is supposed to be standardized, different field procedures are used. Some of these differences can significantly affect the measured blow count. One especially important field procedure is the manner of raising and lowering the 140-lb weight (63.5 kg) that is used to hammer the sampling system. In the past, a rope and drum system has been most often used throughout the world. In recent years, though, there has been a trend toward using a trigger-release mechanism, because this method is much less subject to operator-related error. Any comparison of SPT blow count to liquefaction potential must consider the method of raising and lowering the 140-lb weight.

Despite some shortcomings, the SPT method has been shown to be generally reliable. Field engineering evaluation of liquefaction potential (as evidenced by sand blow development) is commonly done in the United States by relating SPT data (rope and drum system) to the earthquake-induced shear stresses. Figure 10 shows results relating the two from sites throughout the world where strong earthquakes (surface wave magnitude ($M_S$) about 7.5) caused strong shaking. Points on the figure designated as "no liquefaction" are from sites where no sand blows were found, although liquefaction possibly occurred, but the effects were not present at the ground surface. Data in the figure are from studies of earthquakes in locales including California, Alaska, Japan, Chile, China, Argentina, and Guatemala. Chinese researchers have developed criteria based on an independent but similar methodology, which also makes use of rope and drum SPT data. Comparison of the Chinese

[2]The Standard Penetration Test is a field test conducted on materials in situ; a sampling tube is driven into the ground by dropping a 140-lb (63.5 kg) weight from a height of 30 in. (176.2 cm). The penetration resistance is reported in number of blows of the weight to drive the sampler 1 ft (30.5 cm).

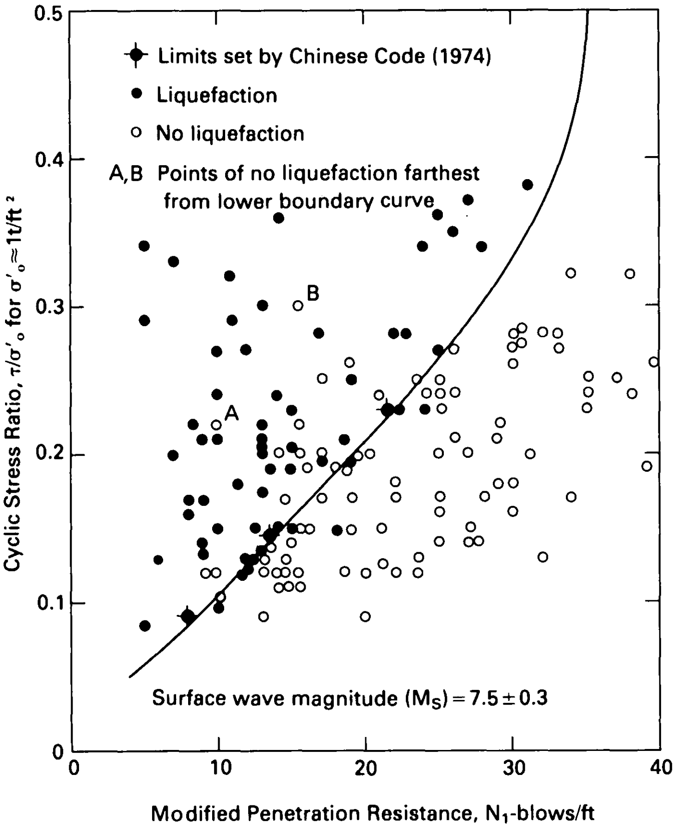



FIGURE 10.—Correlation between cyclic stress ratio causing liquefaction of sands ($D_{50} > 0.25$ mm) and Standard Penetration Resistance for level ground (modified from Seed and Idriss, 1981). $\tau$, weighted average, horizontal, earthquake-induced shear stress; $\sigma'_o$, initial effective overburden stress; $N_1$, Standard Penetration Test blows per foot, corrected for influence of overburden stress.

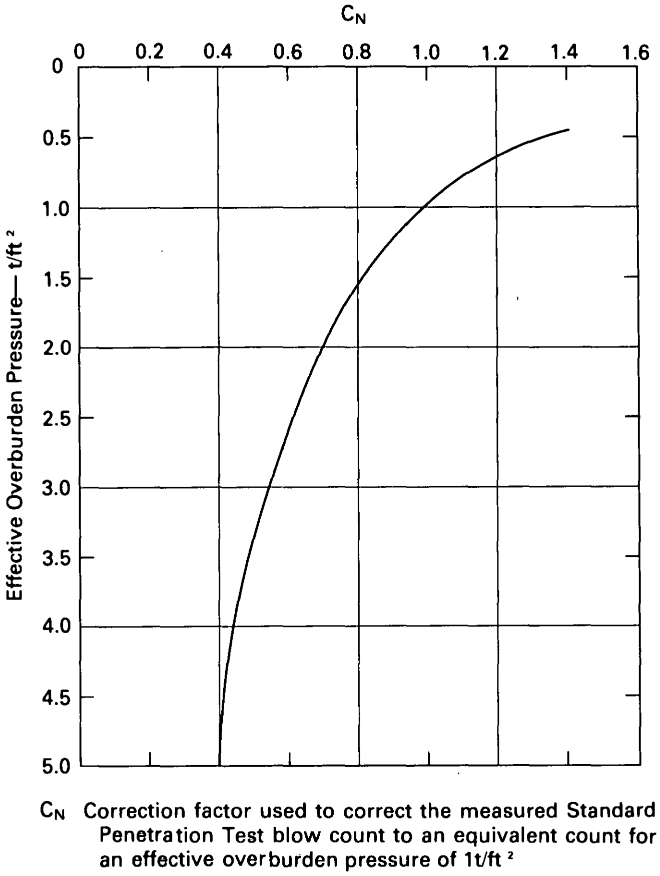



FIGURE 11.—Relationship between $C_N$ and effective overburden pressure (modified from Seed, 1979).

method with the data in figure 10 shows that the two yield almost exactly the same results (Ying and others, 1979). Seed and Idriss (1981) have also developed curves similar to the one on figure 10 for different magnitude earthquakes, for Richter magnitudes ($M_L$) ranging from about 5.25 to 6.75 and for surface wave magnitudes greater than about 6.75.

The earthquake-induced horizontal shear stress shown on figure 10 is a weighted average based on the maximum acceleration at the ground surface and corrected for the depth of the potentially liquefiable sand. $\sigma'_o$ is the initial effective overburden stress. $N_1$ is the average SPT blow count of the potentially liquefiable sand at the critical depth, corrected to an initial effective overburden stress equivalent to 1.0 t/ft$^2$ (1.02 kg/cm$^2$) by using the relation shown in figure 11.

From figure 10, it appears that the boundary reasonably defines a lower limit of cyclic stress ratios for potential liquefaction. Possible criticisms of the method include the following:

1. Few data exist for high cyclic stress ratios.
2. All significant factors may not be accounted for, such as the number of cycles of applied shear stress, the permeability of sediments in and above the zone liquefied during shaking, or topstratum thickness.
3. The SPT blow count is not always determined reliably in the field, and the interpretation of liquefaction potential can be influenced by the grain size.

The influence of silty sands on liquefaction potential was recently demonstrated by a study of the 1978 Miyagiken-Oki earthquakes ($M_S$=7.4) in Japan (Tokimatsu and Yoshimi, 1981). Figure 12 shows that for a given penetration resistance, silty sands are less vulnerable to liquefaction than coarser, fine to medium-grain sands. Figure 12 is particularly relevant to ground-failure studies of alluvial deposits severely shaken by the New Madrid earthquakes, because point-bar deposits in the upper part of the substratum are dominantly silty sand.

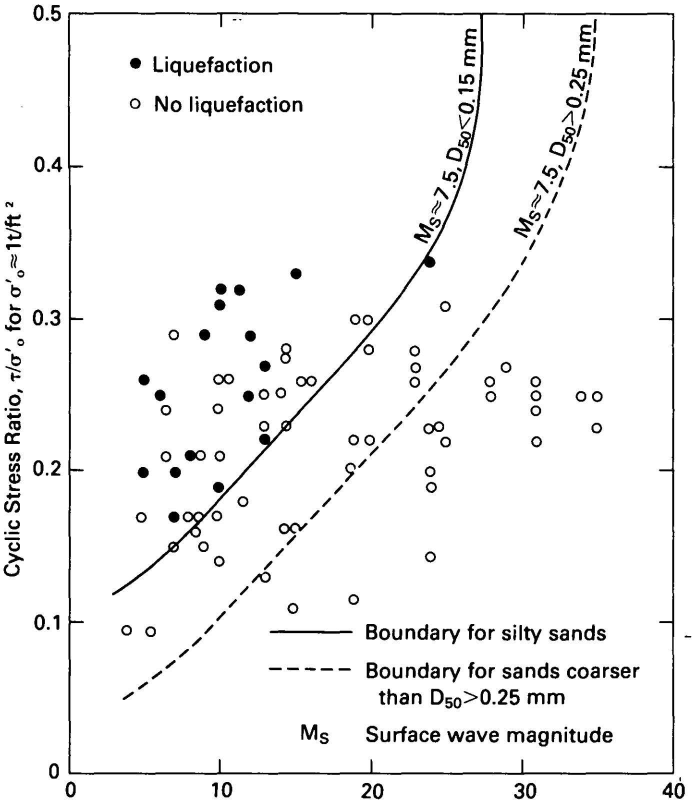



FIGURE 12.—Correlation between field cyclic stress ratio causing liquefaction of silty sands ($D_{50}$ < 0.15 mm) and Standard Penetration Resistance for level ground (modified from Seed and Idriss, 1981; data after Tokimatsu and Yoshimi, 1981).

There remains the question of the applicability of the method to the New Madrid region: major unknown seismic factors there are the peak ground accelerations and the number of cyclic stress applications. Quantitative measurements on strong earthquakes do not exist for New Madrid fault zone, but in recent years many data have been taken on the small earthquakes that frequently shake the region (Stauder and others, 1976). On the basis of these data and comparisons with earthquakes in California and China, Dr. Robert Herrmann of St. Louis University (oral commun., 1981) has expressed his opinion to the writer that, for very strong earthquakes, the peak accelerations and the number of cyclic stress applications on thick alluvium in the near field (within about 30 km of the earthquake focus) are probably about the same, irrespective of the geographic region.

Earthquakes in the northern Mississippi Embayment have a much lower attenuation (Krinitzsky, 1972; Nuttli, 1973a,b) than earthquakes at sites used for data in figure 10. These authors believe that due to the low attenuation characteristics in the New Madrid area, it is possible that at large epicentral (far field) distances the strong motion could continue as long as 1 or 2 minutes. Krinitzsky (1972) has speculated that at *large* epicentral distances the duration (and implicitly the number of cyclic stress applications) is likely to be four times that experienced in a Western United States earthquake of similar magnitude. Thus direct application of the data in figure 10 is questionable without a correction for the number of cyclic stress applications. Such a correction would lower the slope of the linear portion of the boundary, especially at lower cyclic stress ratios. Methods for making such corrections are reasonably well developed (Seed and others, 1975b; Annaki and Lee, 1977). Lack of specific knowledge about large earthquake behavior in the New Madrid region reduces the reliability of such a corrected boundary. However, even if the number of cycles is four times that of other areas, the effect only reduces the slope of the boundary about 5 to 10 percent (based on data presented by Seed and Idriss, 1981), assuming $M_S$ to be approximately 8.5 for the three major 1811-12 New Madrid earthquakes (Nuttli, 1980).

## EVALUATION OF LIQUEFACTION POTENTIAL IN THE VICINITY OF THE 1811-12 NEW MADRID EARTHQUAKES

Development of curves similar to those in figure 10 for the alluvial deposits of the St. Francis and Western Lowland Basins also requires a knowledge of approximate magnitudes of the 1811-12 earthquakes, at least for the major shocks. The three principal shocks, on December 16, 1811; January 23, 1812; and February 7, 1812 (Fuller, 1912), have estimated body-wave magnitudes ($m_b$) to be 7.2, 7.1, and 7.4, respectively (Nuttli, 1973a; 1979). These can be in error by a few tenths of a unit because of the lack of measurement methods in 1811-12. Respective surface-wave magnitudes ($M_S$) estimated by Nuttli (1980) are 8.6, 8.4, and 8.7. Table 1 shows the estimated values of $m_b$ for principal and weaker shocks associated with each of the three major earthquakes, the number of shocks, and the estimated locations of the three major earthquakes.

Unquestionably, the three major shocks caused most of the ground failure in the alluvial lowlands. If it is assumed as a first approximation that the $M_S$ value causing the most extensive ground failure is 8.5 and that a curve of the *form* of figure 10 is approximately valid for the region of the New Madrid earthquakes, then the bounds of possible solutions can be defined. Figure 13 shows (1) the curves for $M_S$ = 7.5 and 8.5 (from Seed and Idriss, 1981); (2) an upper bound, determined by drawing a similar-shaped curve on figure 10 to include all data points except A and B; and (3) a lower bound, which is $M_S$ = 9 + 5 percent (to account for the prolonged duration of shaking). Other possible solu-

TABLE 1.—*Estimated body-wave magnitudes, number of shocks, and locations of the 1811-12 earthquakes (from Nuttli, 1973a, 1979)*

| $m_b$ | Number of shocks |
|---|---|
| **December 16, 1811 (estimated epicenter at 36° N., 90° W.)** | |
| 7.2 | 1 |
| 6.7 | 2 |
| 6.3 | 4 |
| 5.8 | 5 |
| 5.5 | 24 |
| 5.0 | 27 |
| 4.3 | 485 |
| **January 23, 1812 (estimated epicenter at 36.3° N., 89.6° W.)** | |
| 7.1 | 1 |
| 6.7 | 1 |
| 6.3 | 1 |
| 5.8 | 11 |
| 5.5 | 8 |
| 5.0 | 9 |
| 4.3 | 133 |
| **February 17, 1812 (estimated epicenter at 36.5° N., 89.6° W.)** | |
| 7.4 | 1 |
| 6.7 | 2 |
| 6.3 | 5 |
| 5.8 | 19 |
| 5.5 | 33 |
| 5.0 | 53 |
| 4.3 | 1,049 |

tions lie on curves between the upper and lower bounds; the range of possible solutions is thought to be reasonably defined by curves 1 through 5.

In summary, the writer believes it is realistic to expect that a single curve or a narrow range of curves defines the liquefaction potential of the alluvial sediments of the Mississippi Valley during the three large 1811-12 earthquakes. Such a curve could be anywhere between the upper-bound and the lower-bound curves but is most probably bounded by curves 4 and 5 (fig. 13).

The cyclic stress ratio on the ordinate of figures 10, 12, and 13 is proportional to the horizontal acceleration during an earthquake (Seed, 1976). No data available accurately describe the accelerations in the St. Francis and Western Lowlands Basins during the 1811-12 earthquakes. Possibly the best estimates are by Nuttli and Hermann (1978; 1982). Their estimates make extensive use of very limited instrumental data from three recent earthquakes with $m_b$ values of 4.2, 4.5, and 5.0. The measured accelerations were extrapolated to the much stronger earthquakes of 1811-12. The relation they recommend for distances greater than 15 km from the epicenter is

$$\log_{10}a=0.55+0.50m_b-0.83\log_{10}R-0.0019R \quad (1)$$

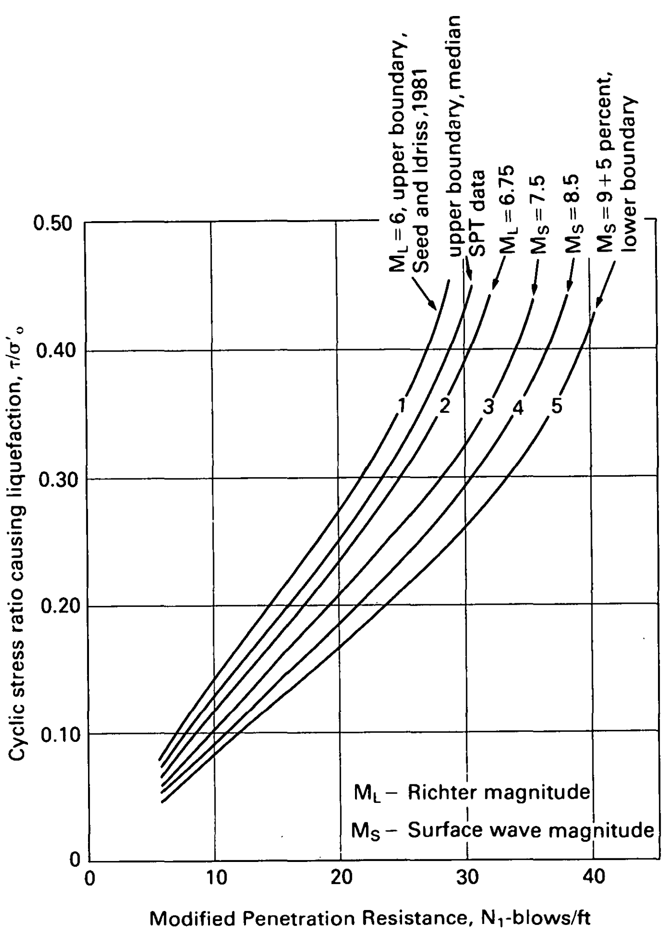



FIGURE 13.—Bounds between cyclic stress ratio causing liquefaction on level ground and penetration resistance of sand ($D_{50}$> 0.25 mm) for earthquake of February 7, 1812 (modified from Seed and Idriss, 1981).

where $a$ is the mean of the peak horizontal acceleration values on two horizontal components (in cm/s²), $m_b$ is the body-wave magnitude, and $R$ is the distance from the epicenter, in kilometers. The equation is intended to be applicable for rock or very rigid unconsolidated materials. The standard error of estimate corresponds to a factor of about 2.0 (Nuttli and Hermann, 1982), which is a very large error when applied to figure 13. Much more reliable estimates can be made for the attenuation of acceleration at epicentral distances of between 30 to 60 km on rock or very rigid, unconsolidated materials (Nuttli, 1973b; Nuttli and Hermann, 1978; 1982). For this range of distances, the attenuation is almost independent of $m_b$ for $m_b$ between about 4 and 7.4, and attenuation can be calculated from equation 1.

Evaluation of liquefaction potential during 1811-12 hinges on two independent types of data: a relation between sand properties and liquefaction (such as shown in figure 13) and the earthquake accelerations. The discussion about liquefaction evaluation up to this point has focused on what the writer considers as factual data or the least controversial interpretations that can be used, with various assumptions, to locate epicenters of the 1811-12 earthquakes and place bounds on the accelerations.

## GENERAL STATEMENT OF INVESTIGATION METHODOLOGY

The investigation consisted of the following: making a map delineating regions where liquefaction took place during 1811-12, as evidenced by sand blows and fissures; evaluating engineering properties that control sand blow development throughout the late Quaternary alluvial deposits of figure 5; and then relating the engineering and geologic properties to the distribution of liquefaction effects on the map.

Three sand blow maps were independently compiled prior to 1978: one by Fuller (1912) (fig. 3), one by Heyl and McKeown (1978), and one by Saucier (1977). Unfortunately, there are major disagreements between the three maps. Fuller shows little or no sand blow development in the meander belt (fig. 5) of the Mississippi River, east of the Mississippi River, and east of Sikeston Ridge. Heyl and McKeown show much more sand blow development than Fuller in the meander belt and east of the Mississippi River. Saucier shows much more sand blow development than that on either of these two maps, especially east of the Mississippi River and in the northern regions (Mississippi County, Mo., and west of Sikeston Ridge). Reasons for these differences could not be definitely established, but it is believed that the methods of compilation had an important bearing on the interpretations. Fuller mapped solely from ground observations and thus did not have the advantage of seeing patterns visible from aerial photographs (scale 1:20,000, vintage 1935-40). Saucier used only aerial photographs (scale 1:20,000, vintage 1935-40) but made no field checks. Heyl and McKeown also used aerial photographs (scale 1:80,000, vintage 1960's) with no field checks. Part of the discrepancy of the aerial-photograph-compiled maps is probably attributable to the photograph vintages. Much of the land had only been cleared recently for agriculture during the 1930's, and thus the earlier airphotos frequently show the sand blows more clearly because the ground surface was less disturbed by tilling. This is especially the case in Mississippi County, Mo., where most of the land has a sandy veneer that makes it difficult to distinguish sand blows under the best of circumstances.

Many features on aerial photographs appear very similar to sand blows, such as some kinds of sand dunes, point-bar deposits, and mima mounds (mounds of unknown origin). Because of major disagreements between all previously published maps, it was necessary to try to resolve the different interpretations. This was accomplished by using the oldest available aerial photographs on file at the U.S. National Archives, Washington, D.C., supplemented with extensive field checks. These photos were taken during 1937 through 1941, at a scale of 1:20,000 to 1:24,000.

During the study, the writer examined aerial photographs along the Ohio River valley from Cairo, Ill., to Paducah, Ky.; throughout the St. Francis Basin, including Sikeston Ridge; along valleys of many tributaries to the Mississippi River, including the Obion, Forked Deer, and Hatchie Rivers; and throughout the Western Lowlands approximately east of the Cache River. The writer also extensively consulted with many soil scientists of the U.S. Soil Conservation Survey in the quest for liquefaction-related features. Modern soil surveys have recently been completed throughout much of the St. Francis Basin and Western Lowlands, thus providing the opportunity to use the soil scientists' field observations.

Engineering properties that control liquefaction are assessed primarily from SPT data recorded on boring logs. The logs in most instances included blow counts in sandy materials, gradational information for coarse-grained materials, and some information on stratification. Approximately 300 logs were collected from the U.S. Army Corps of Engineers, Memphis District. About 75 more were collected from the Missouri State Highway Commission, Sikeston, Mo. About 70 logs were obtained from the Arkansas State Highway Commission, containing data about topstratum thicknesses and sand gradations. After compiling the logs and plotting their locations, 35 more borings were done with SPT tests to fill in gaps in the data; these tests were performed by a crew from the Memphis Corps of Engineers office, under the supervision of the writer. All SPT tests were done in basically the same manner, by using a rope and drum system.

## RESULTS

This section discusses the method of compiling the sand blow map and notes some characteristics of sand blows that were observed in the field. Presented separately is a map showing fissures more than 0.8 km long in the alluvium. Engineering data relevant to liquefaction are also presented, including SPT blow counts, sand sizes and gradations, and topstratum thicknesses. An isopach map shows thickness of post-Tertiary alluvium in the St. Francis Basin, and a map showing the regional development of sand blows is based on all available sources of information.

### SAND BLOW MAP

The sand blow map (pl. 1) shows (1) sand blow distribution and an evaluation of the intensity of development; (2) the relative difficulty of identifying 1811-12 earthquake-induced sand blows on various terranes and soils; and (3) the locations of inferred faults (from Zoback and others, 1980) and major geologic and geographic features in late Quaternary alluvium. Information on the map is restricted to the alluvial region encompassed by the St. Francis Basin.

Sand blows induced by the 1811-12 earthquakes were also commonplace in very young point-bar deposits along streams in the Western Lowlands (Fuller, 1912), and there are accounts of sand blows as far away as St. Louis, Mo., and the southernmost parts of the Wabash River valley (David Russ, personal commun., 1982). No attempt was made to locate the bound encompassing all sand blows. Historical accounts of sand blows outside the St. Francis Basin are rare, and present field verification would be impossible near the young point-bar deposits because of the effects of post-1811-12 floods. Rather, the map shows the bounds and intensities of sand blow production in the braided-stream deposits and in meander-belt deposits and terraces sufficiently far removed from the rivers to exclude stream bank failures and the very young point-bar deposits in and along the rivers.

The red-dotted rectangular areas on plate 1 show regions having sand blows, and the dot size is keyed to the percentage of the surface covered with sand blows. Each rectangular area conforms to the coverage of a single aerial photograph. The estimate of the percentage covered with sand is based on the total area of the single aerial photograph; some parts of the photo may have a greater or lesser percentage or may be forested. Estimates were not made on photos having more than half of the area in forests. The map has a "unit cell" aspect because it was not possible to view more than one photo at a time. The photos were on film strips that could be viewed only on film readers at the U.S. National Archives, Washington, D.C.

Figure 14 shows two aerial photographs of areas having more than 25 percent of the land covered with sand blows. Both fissures (linear white lines) and individual sand blows (isolated white spots) are clearly discernible. Figure 15 shows examples of aerial photographs for the range 10 to 25 percent, and figure 16 shows examples for 5 to 10 percent. Principal areas covered with vented sand are outlined on the photos. Figure 17 shows examples for 1 to 5 percent, with principal areas outlined. The examples in figures 16 and 17 clearly illustrate that it is increasingly difficult to detect sand blows and fissures as the percentage decreases and that these features are quite selectively developed, probably reflecting local geologic or topographic conditions.

Mima mounds cause some confusion in interpretation of aerial photographs. These mounds are of unknown origin and are commonly 0.5 m high at the center but can be as much as 1.5 m high. They typically are composed of unstratified sand or silty sand and are weakly cemented, which makes them noticeably more difficult to auger by hand than sand blows. Mima mounds are distinguishable on aerial photographs by their nearly circular shape, regularity of spacing, and presence of linear trends (fig. 18). They are especially commonplace in the extreme northern parts of the St. Francis Basin, between Sikeston Ridge and Crowley's Ridge. Where many mima mounds are associated with small percentages of vented sand, interpretation of aerial photographs can be very difficult.

A feature that appears similar on aerial photographs to mima mounds and sand blows occurs at the toes of some loess-covered hills that are along minor tributaries in western Tennessee. Here, white, circular areas having no relief are apparently caused by a localized mineralization in the soil. Because they contain no sand, these features are easily distinguished from sand blows in the field.

Examination of aerial photographs and field checks outside the St. Francis Basin were made on terraces along the Ohio River and the major tributaries east of the Mississippi River as far south as Memphis. Sand blows were found only on the terraces of the Obion River.

The writer also examined aerial photographs and made field checks in approximately the eastern half of the Western Lowlands, from the north end of the basin southward to the boundary of Craighead and Poinsett Counties, Ark. (pl. 1). No sand blows were found in the Western Lowlands, but some sand-filled cracks, doubtlessly a consequence of filling of earthquake-induced fissures, were located along some stream banks.

The map (pl. 1) also shows the relative difficulty in identifying sand blows and fissures by using aerial photographs and ground observations. Areas of difficulty are designated as one of four classes: impossible to extremely difficult, possible but very difficult, generally very difficult, or more difficult than average. Specific descriptions of the criteria are on plate 1. Also shown on the map are the interpreted faults, discussed earlier in connection with figures 4 and 7.

Detailed discussion of the distribution and characteristics of sand blows is in appendix C. This information is included to help explain interpretations by the writer, and it serves as documentation and a record for any future studies.


*A*

0 1 MILE

FIGURE 14.—Aerial photographs showing greater than 25 percent of the land surface covered with sand vented to the surface in response to earthquake shaking. *A*, Near Marked Tree, Ark. *B*, Near Portageville, Mo. Photographs are oriented approximately north-south.


*B*

0 1 MILE

FIGURE 14.—Continued.


*A*

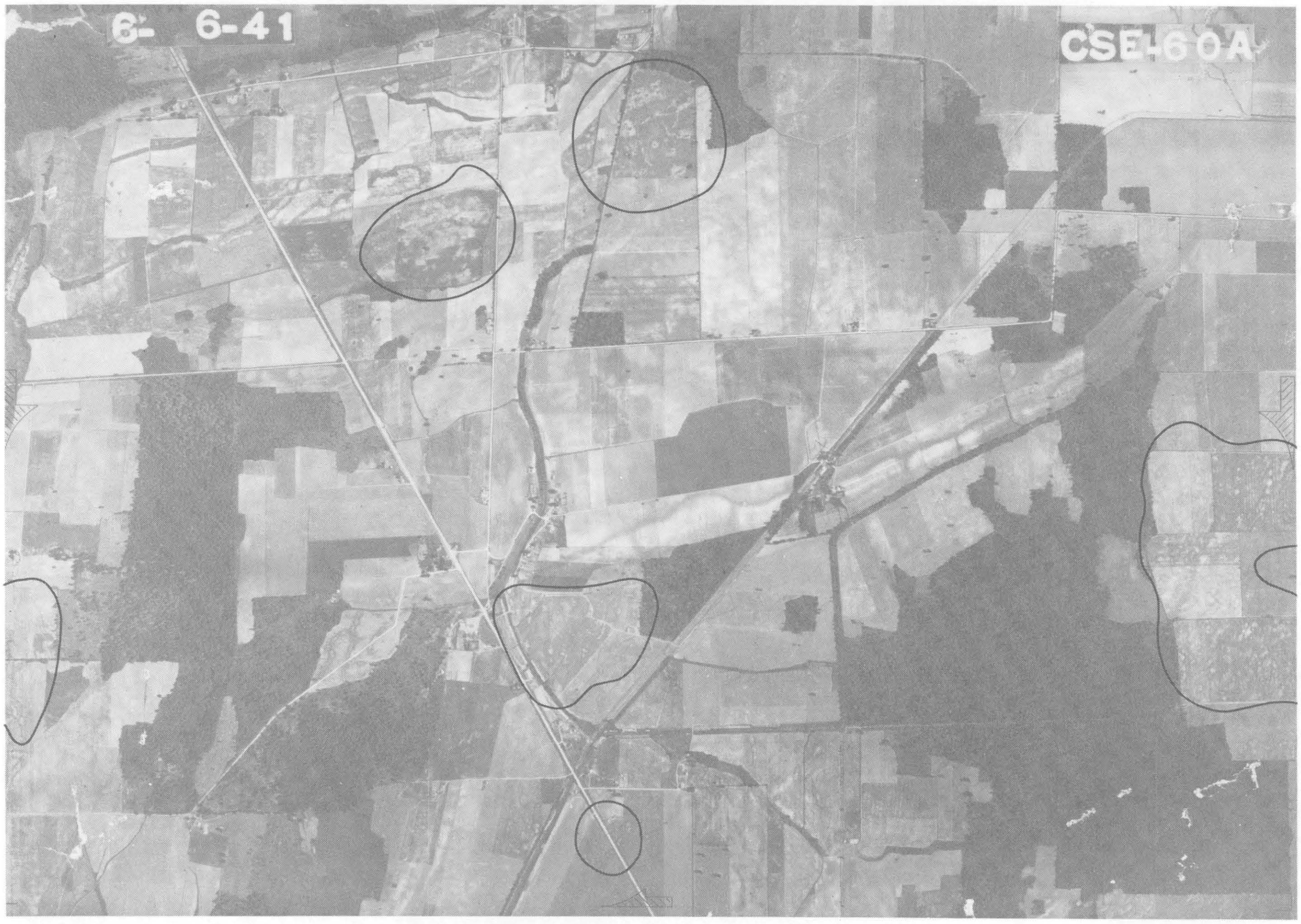
FIGURE 15.—Aerial photographs showing 10 to 25 percent of the land surface covered with sand vented to the surface in response to earthquake shaking. *A*, Near Marked Tree, Ark. *B*, Near Portageville, Mo. Photographs are oriented approximately north-south.


FIGURE 15.—Continued.


FIGURE 16.—Aerial photographs showing 5 to 10 percent of the land surface covered with sand vented to the surface in response to earthquake shaking. Principal areas of vented sand are outlined. *A*, Near Reelfoot Lake, Tenn. *B*, Near Blytheville, Ark. Photographs are oriented approximately north-south.


*B*


FIGURE 16.—Continued.




*A*

0 1 MILE

FIGURE 17.—Aerial photographs showing 1 to 5 percent of the land surface covered with sand vented to the surface in response to earthquake shaking. Principal areas of vented sand are outlined. *A*, Near Dyersburg, Tenn. *B*, Near Blytheville, Ark. Photographs are oriented approximately north-south.

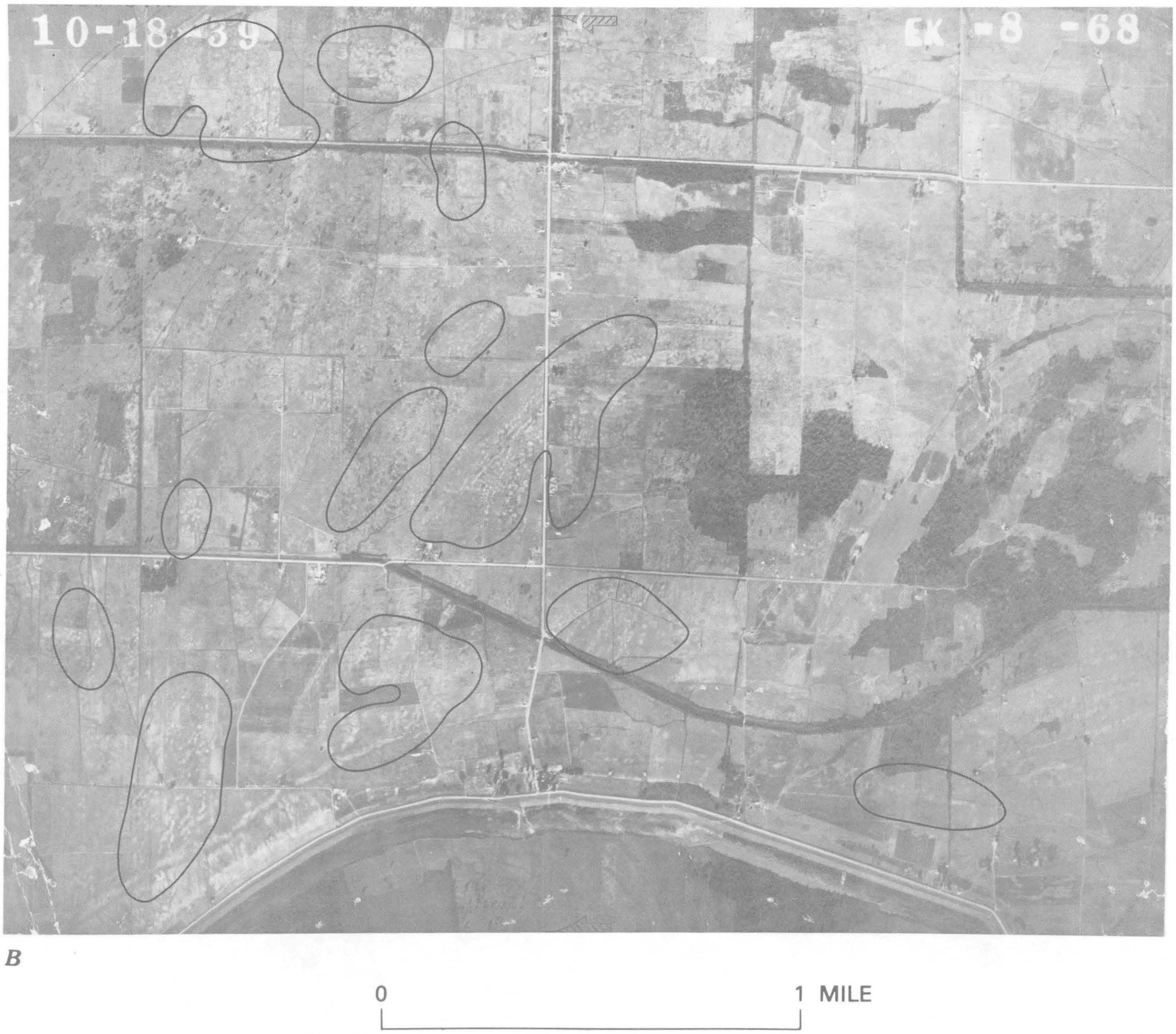



FIGURE 17.—Continued.

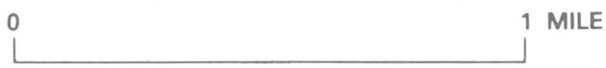




FIGURE 18.—Aerial photograph showing mima mounds near the boundary of Scott and Stoddard Counties, Mo. Photograph is oriented approximately north-south.

### FISSURES MAP

Plate 2 shows the most prominent earthquake-induced long fissures on alluvium of the St. Francis Basin. The plate is from an unpublished compilation by Warren Farrell, U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Miss., that was made from a mosaic of aerial photographs, vintage about 1935-40, scale 1:20,000 to 1:24,000. Only fissures longer than 0.8 km were plotted.

As a check of the compilation, the writer, using aerial photographic positives from the U.S. National Archives, plotted fissures on about half of a single 15-minute quadrangle. Fissures were defined as linear, continuous zones of expelled sand. Some differences are to be expected, because Farrell used a different set of photos than those used in this study. The interpreted long fissures on plate 2 generally agree with scattered checks by the writer, except on Sikeston Ridge and between Sikeston Ridge and Crowley's Ridge.

The fissures in the alluvial valley typically originated from two sources, as pointed out by Fuller (1912): as lateral spreads and as narrow cracks on level ground far from any stream banks. The fissures from lateral spreads can be quite wide, up to 0.5 m, yet have only a small volume of sand expelled to the ground surface. Conversely, the narrow fissures far from stream banks commonly are associated with much larger volumes of expelled sand.

Not shown on the plate are fissures in the alluvium in the Western Lowlands. A group of fissures near the confluence of Mingo Ditch and the St. Francis River, in Stoddard County, Mo., are typically sand filled and are up to 0.3 m wide (David Russ, personal commun., 1980). Other fissures are exposed along a courseway recently excavated for the St. Francis River, in Dunklin County, Mo., near the town of Wilhelmina. Here they commonly have a northeasterly strike.

Also shown on the plate is the location of a group of well-developed vertical joints, which cut through thick loess in an upland area in Obion County, Tenn. The loess probably lies on semilithified or stronger sediments. The joints are exposed in a small ditch about 1.5 km west of the town of Cloverdale and strike north-northwest. The joints pass northward into a stream bed striking the same direction. These joints are far from any regions having steep slopes and are probably tectonic in origin.

Some characteristics of the fissures map are noted for braided-stream alluvium and then for meander-belt alluvium. For both types of alluvium, the fissures are discussed from north to south.

Fissures are commonly observable in Mississippi County, Mo., in the regions of intense sand blows. The most easily observable features tend to be oriented northeasterly.

Plate 2 shows fissures present in the southernmost parts of Sikeston Ridge, but this is an area where no sand blows were found by the writer. Fissures here are obscure features on the aerial photographs and of questionable origin.

Plate 2 shows many fissures north of the railroad that goes through Parma, Mo., between Sikeston Ridge and Crowley's Ridge. The writer searched for the fissures on three sets of aerial photgraphs taken from the late 1930's to 1974 and could not find any recognizable earthquake-induced fissures, although some similar-appearing features are present at scattered localities. More field work is required in this area.

Between Portageville and Pascola, Mo., are numerous rather small fissures oriented north-northeast. At many places throughout these northern reaches of the braided-stream alluvium there is intense development of sand blows but no accompanying development of long fissures.

The most obvious and longest fissures in braided-stream alluvium are generally south of an east-west line approximately through Deering, Mo., and they are generally oriented northeasterly.

At most places throughout the braided-stream terrane, the fissures tend to follow the general orientation of braided-stream flow.

In the meander belt, a few long fissures are present in the region of intense sand blow development in Mississippi County, Mo., and they become abundant south of New Madrid. It is readily apparent that long fissures are much more common in the meander belt than on adjoining braided-stream alluvium. The fissures in the meander belt obviously have a preferred orientation that follows the depositional patterns of the meanders but have no preferred orientation with respect to the compass.

### ENGINEERING DATA

Plate 3 shows the locations of engineering field tests and borings in the St. Francis Basin and Western Lowlands. Numbers on the map are the locations of boring logs that have SPT blow counts on substratum sands; the logs also have a field evaluation of the engineering soil classification and some information about details of sediment layering. Numbers followed by the letter G denote logs that have the field evaluation of engineering soil classification and some information about layering, only. All logs are in appendix A.

The map also shows the boundaries of 10 Regions that are compared with one another later in the text for evaluation of factors relevant to sand blow development. Boundaries for the Regions were selected to include areas thought to be generally similar from a geologic-engineering viewpoint. Regions 1 through 5, 7, and 10 are either exclusively in areas of braided-stream alluvium or else in areas in which engineering data were taken almost exclusively in braided-stream alluvium. Regions 8 and 9 are in Mississippi River meander-belt alluvium, and Region 6 is dominantly in meander-belt alluvium of the St. Francis and Tyronza Rivers and other small rivers (which could not be shown on plate 1 because of map scale). Factors considered in delineating a region include distinguishing between (1) major terraces, (2) areas having significantly different topstratum thicknesses, and (3) areas having significant differences in SPT blow counts or substratum sand sizes in the probable zone of liquefaction during shaking (meaning depth from about 2 to 20 m). No subdivisions were made in the Western Lowlands because the data were taken at widely spaced data localities.

Plate 4 shows SPT blow counts as a function of depth for the 10 Regions. The blow counts are the counts measured in the field; the water table was typically 2 to 4 m below the ground surface. Shown for each Region are the median blow counts and first and third quartile blow counts at 5.0-ft (1.52 m) intervals of depth. (The first quartile is the bound between the lowermost 25 percent of blow count data and the uppermost 75 percent; the median is the bound between the lowermost 50 percent and uppermost 50 percent; the third quartile is the bound between the lowermost 75 percent and uppermost 25 percent). Median and quartile values are shown rather than mean and standard deviations, because large differences exist in a given geologic process even though the Regions of plate 3 are dominantly the result of a single geologic process, such as braided-stream or meander-belt deposition. Thus, from a statistician's perspective, use of mean and standard deviations is less desirable for modeling phenomena related to geology; in addition, liquefaction is not a continuum process, but rather there is either liquefaction or no liquefaction, which is again better related to median and quartile data. The data shown at each 5.0-ft depth interval represent all data within plus or minus 2.5 ft (1.76 m) of that depth. Also shown on plate 4 are median and first and third quartile values of topstratum thicknesses for each of the regions.

Plate 4, for example, shows the data for Region 1. The number of data points at each depth interval is shown above the third quartile. Results are not shown for less than 5 data points within a given depth interval, except for Region 7 where all data are shown. The SPT blow counts were taken in the same manner in all Regions for the 6- to 18-in. (15.2 to 45.7 cm) interval by using a rope and drum system. Appendix A has some logs with the SPT blow count reported as one-half the total for a 2-ft (0.61 m) interval; these are not shown on plate 4.

Plate 5 shows SPT blow counts of plate 4 corrected for an effective overburden stress of 1 t/ft$^2$ (1 kg/cm$^2$). Corrections were made by using figure 11. These corrected blow counts are synonomous with the $N_1$ values shown in figure 10. The corrections eliminate the influence of water table position and variable overburden stress on the field SPT blow counts and thus serve as a basis for regional comparisons. Median and first and third quartile values are shown for the $N_1$ values and topstratum thicknesses.

For Regions in braided-stream alluvium (Regions 1 through 5, 7, and 10), insufficient fine-grained materials (such as silt, silty sands, and very fine sand) are present in the substratum to significantly affect the results in plate 5. From plate 5, a cursory examination of data for braided-stream alluvium shows that median SPT counts in Region 1 (except at a depth of less than 12.5 ft (3.1 m), where there are limited data), Region 2, and possibly Region 7 are typically quite high and commonly exceed 30. Alternatively, Regions 3, 4, 5, and 10 have median counts much lower than 30 just beneath the topstratum.

Regions 6, 8, and 9 all lie in what is considered meander-belt alluvium. Insufficient blow count data are available for the shallowest depths in Regions 6 and 8 and for all depths in Region 9. Plate 5 shows no obvious differences in blow count values in the depths most susceptible to liquefaction in Regions 6 and 8. Because the upper part of the substratum of meander-belt alluvium frequently has very fine grained sand and silty sand, the $N_1$ values in plate 5 cannot be compared with braided-stream substratum blow counts. (A correction is made where required later for analysis.)

Plate 5 shows that the topstratum is thinnest on either the highest of the northernmost or the braided-stream deposits. The topstratum in Region 10 is no thicker than in many areas in which intense sand blow development exists. The topstratum is generally thicker on meander-belt than on braided-stream deposits but is still less than 3 to 5 m at many places.

Plate 6 shows the field evaluation of substratum sand size as a function of depth for the different Regions. The data shown on the plate are considered reliable because of the agreement of laboratory data with the field evaluation (see appendix A). No results are shown for Region 9 because of few data.

The data for substratum grain size in plate 6 show that west of Sikeston Ridge, the sands in the depths most susceptible to liquefaction during shaking are progressively finer from north to south in the braided-stream alluvium (from Region 2 to 3 to 4 and 5). Region 2 commonly has coarse to very coarse sand, whereas Regions 4 and 5 rarely contain such coarse materials and are mostly underlain by fine- or medium-sized sands. On the basis of grain size alone in braided-stream alluvium, because of the very high permeability of the coarse sands, the abundant, very coarse, clean sand layers in Region 2 would probably make sand blow formation much more difficult than in Region 3 and especially more difficult than in Regions 4 and 5.

Region 1 generally contains fine- or medium-grained sands and thus is probably more susceptible than Region 2 to having liquefied sand carried to the surface. Region 10 is made up primarily of sand ranging from very fine- to medium-grained sand and should be highly susceptible. Region 7 is probably dominantly fine sand and also highly susceptible.

In the meander belts, Regions 6 and 8 are both characterized by a dominantly fine-grained sand in the substratum. Because some of the very fine sands, especially those immediately beneath the topstratum, are so fine-grained or contain some silt and clay, they have some cohesion, which would make liquefaction more difficult than in coarser, clean sands. However, beneath these uppermost fine materials there are abundant fine, clean sands that are very susceptible to liquefaction.

#### ISOPACH MAP

An isopach map of post-Tertiary alluvial deposits in the St. Francis Basin shows that the alluvium is typically 30 to 60 m thick, though locally it is less than 20 m (pl. 7). All materials beneath this alluvium have abruptly higher SPT blow counts, suggesting that they behave as semilithified or lithified material and thus are "rocklike" from a seismologist's perspective and nonliquefiable.

#### REGIONAL SAND BLOW MAP

Plate 8 shows the approximate regional development of sand blow intensity in the St. Francis Basin that is based on all available sources of data. Four intensity classifications are shown: VH (very high), H (high), M (moderate), and L (low). VH designates areas generally having greater than 25 percent of the land covered with sand blows; H generally has between 10 to 25 percent; M generally has between 5 to 10 percent; and L generally has between 1 to 5 percent. The letter F designates areas in which forest cover obscures the sand blows, so no estimates of intensities were made there.

## ANALYSIS AND DISCUSSION OF RESULTS

The distribution of liquefaction effects is used to locate zones or centers of energy release. Because of the absence of accurate seismic data during 1811–12, it is only possible to locate energy-release centers, which may not coincide with epicenters. Energy-release centers are estimated for two of the three large earthquakes: the earthquake of December 16, 1811, and the earthquake of February 7, 1812. The analysis method does not permit an estimate for the January 23, 1812, earthquake.

An estimate is then made of accelerations in the alluvium, near the bounds of liquefaction shown on the regional sand blow map (pl. 8). Finally, the fissures map (pl. 2) is examined and an evaluation of local geologic controls on sand blow intensity is made.

#### LOCATIONS OF ENERGY-RELEASE CENTERS

It is assumed that the present-day SPT blow counts in the alluvium are about the same as they were before the 1811–12 earthquakes, for the 10 Regions shown on plate 3. This is certainly not strictly true for any given borehole location, because blow counts can be either reduced or increased (see appendix B) by an occurrence of liquefaction, depending on many factors; however, this premise must be approximately correct when considering a large geographic area (such as one of the Regions).

It is easy to demonstrate by use of this premise that the three major energy-release centers were east of Crowley's Ridge. Braided-stream alluvium of the Western Lowlands generally is at least as susceptible to liquefaction as some of the braided-stream Regions of the St. Francis Basin that have a high intensity of sand blow development. This conclusion is based on what the writer considers as the principal controls—SPT blow counts, topstratum thickness, sand size, and thickness of post-Tertiary alluvium. Table 2 shows data comparing controls on braided-stream alluvium in the Western Lowlands and St. Francis Basin; figure 5, a small-scale map, shows the Regions in the alluvium. The range of median values for Regions 1 through 5 (in the St. Francis Basin) is so large that direct comparison of all these Regions with the Western Lowlands is difficult; however, Regions 3 and 4 have median values that are very close to the values for the Western Lowlands. Regions 3 and 4 have moderate to very high coverage of the surface with sand blows, whereas sand blows are rare in braided-stream alluvium of the Western Lowlands. Thus some of the centers of energy release for the 1811–12 earthquakes must have been much closer to Regions 3 and 4 than to the Western Lowlands.

Farther south in the St. Francis Basin, Region 6 lies near the southern limits of moderate to high production of sand blows. Comparison in table 2 between Region 6 and the Western Lowlands again shows that there are not large differences in factors controlling sand blow production. Again, the energy-release center must lie much closer to Region 6 than to the Western

TABLE 2.—*Comparison of principal controls on production of sand blows between alluvium in the Western Lowlands and the St. Francis Basins*

| Area of alluvium (pl. 3) | Median[1] blow count, $N_1$ (pl. 5) | Median topstratum thickness (ft) (pl. 5) | Dominant sand size (pl. 6) | Thickness of post-Tertiary deposits (ft) (pl. 7; Smith and Saucier, 1971) | Intensity of sand blow development (pl. 8) |
|---|---|---|---|---|---|
| **Western Lowlands** | | | | | |
| Region 10 | 20[2] | 15 | Fine | 60 to 200; average about 120 | None. |
| **St. Francis Basin** | | | | | |
| Regions 1, 2, 3, 4, and 5 | 20 to 30 | 0 to 22 | Fine to coarse | 60 to 200; average about 125 | None to very high, average about moderate. |
| Regions 3 and 4 | 22 | 16 to 22 | Fine to medium | 90 to 175; average about 130 | Region 3: moderate to high; Region 4: moderate to very high. |
| Region 6 | About 20[3] | 18 | Fine to very fine | 120 to 200; average about 140 | Moderate to very high, average high. |

[1]The median values are for the uppermost 20 to 30 ft of substratum, where the values are typically significantly less than at greater depths and thus the most susceptible to liquefaction.

[2]Insufficient very fine and silty sands are present to significantly influence this value of $N_1$.

[3]Consideration of the abundant very fine and silty sands increases this value of $N_1$ to about 25 by use of the method recommended by Seed and Idriss (1981).

Lowlands. In summary, this crude evaluation of factors controlling sand blow development makes it apparent the energy-release centers for the three major earthquakes of 1811–12 were east of Crowley's Ridge.

It is now assumed that the epicenters determined by Nuttli (1979), shown on plates 8 and 9*A*, are approximately correct in the sense that one is in the south rather far removed from two to the north. It is also assumed that at least the southernmost one-third of the area with sand blows on plates 8 and 9*A* originated from this most southern earthquake. Then, a southern energy-release center can be located approximately.

Similar assumptions in the northern area place some bounds on the location of the most northern energy-release center.

### SOUTHERN ENERGY-RELEASE CENTER

An examination of the general distribution of sand blows on plate 9*A* suggests the southern energy-release center is east of Paragould, Ark., because only generally moderate intensity of sand blows is found in the St. Francis Basin in the vicinity of Paragould; the energy-release center is west of Osceola and Wilson, Ark., because low intensities are found farther east; the energy-release center is north of the southern boundary of sand blows; and the energy-release center (or linear zone) is in the region of very high intensity of sand blow development that extends from the general vicinity of the Craighead County–Mississippi County, Ark., boundary to the northeast. A more refined location can be determined by combining data from SPT blow counts (table 3), sand grain size (table 3), topstratum thickness (pl. 5), and depth of post-Tertiary alluvium (pl. 7).

Table 3 shows SPT $N_1$ values and dominant sand sizes for the Region near the southern energy-release center. The $N_1$ values are corrected for the influence of grain size on liquefaction potential for very fine sands, on the basis of the method outlined by Seed and others (1983). This is done by increasing the $N_1$ values by 7.5 for sands noted as being "very fine" or "silty" on the boring logs and then determining the $N_1$ values for the lower quartile, the median, and the upper quartile. Data are excluded for depths less than 10 feet (3 m), because the short rod lengths used during field penetration testing probably affected the blow counts (see appendix B).

TABLE 3.—*Standard Penetration Test $N_1$ values corrected for influence on liquefaction potential of silty and very fine grained sands according to the method of Seed and Idriss (1981). Data are corrected for Regions (pl. 3) near the southern energy-release center*

| Quartile | Depth range | Dominant sand size | $N_1$ | Comments |
|---|---|---|---|---|
| | | | | **Region 5[1]** |
| Lower ------ | 10–25 ft | Fine to medium | 17 | Use $N_1$=19. The $N_1$ value for this depth range is increased slightly by consideration of the influence of silty and very fine grained sands. |
| Median ----- | 10–20 ft | Fine to medium | 22 | Use $N_1$=26. The $N_1$ value for this depth range is increased slightly by consideration of the influence of silty and very fine grained sands. |
| Upper ------ | 10–25 ft | Fine to medium | 35 | Use $N_1$=35. The $N_1$ values for this depth range are not changed by consideration of the influence of silty and very fine grained sands. |
| | | | | **Region 6** |
| Lower ------ | 10–30 ft | Fine | 18 | The $N_1$ values for the depth range 20 to 30 ft are essentially equal to $N_1$ values for Region 8. For the depth range 15 to 20 ft for Region 6, the $N_1$ values are also essentially equal to $N_1$ values for Region 8, but the sands in Region 6 may be slightly coarser than in Region 8 (see pl. 5); thus Region 6 lower quartile $N_1$ values are equal to those for Region 8, for practical purposes. |
| Median ----- | 15–30 ft | Fine | 17–18 | The $N_1$ values for the depth range 15 to 30 ft in Region 6 vary in basically the same manner as Region 8. Thus Region 6 median $N_1$ values are equal to those for Region 8, for practical purposes. |
| Upper ------ | 20–40 ft | Fine | Highly variable[2] | |
| | | | | **Region 8[3]** (Representative of points A, B, F, H, and $H_{avg}$ on pl. 9) |
| Lower ------ | 10–25 ft | Very fine to fine | 10 | Use $N_1$=17.5. For the depth range 10 to 25 ft, many of the blow count data are for silty sands, very fine sands, and very fine to fine sands. The $N_1$ value of 10 for the lower quartile has been increased by 7.5 in order to have a liquefaction potential equivalent to sands with $D_{50}$>0.25 mm. For depth range 25 to 35 ft, the lower quartile $N_1$ is about 18 and the dominant sand size is fine, thus having about the same liquefaction potential presumed at shallower depths. |
| Median ----- | 10–25 ft | Very fine | 17–18 | Use $N_1$=25. For the depth range 10 to 25 ft, the median $N_1$ (17–18) was calculated using a weighted average for the different depths because of the lack of data at depth 12.5 ft; $N_1$ of 17–18 for these dominantly very fine sands has been increased by 7.5, in accordance with previous comment. |
| Upper ------ | 20–40 ft | Fine | 32–33 | For the upper quartile, the sands at depths less than 20 ft probably have about the same liquefaction potential as sands for the depth range 20 to 40 ft because of grain size effects. |
| | | | | **Region 10[3]** (Representative of points C, D, E, and G on pl. 9) |
| Lower ------ | 10–30 ft | Fine | 15 | The $N_1$ value for this depth range is not changed by consideration of data for silty sands and very fine sands because of the small percentage of data for such fine-grained sands. |
| Median ----- | 10–30 ft | Fine | 21 | The $N_1$ value for this depth range is slightly increased (by 1 to 2) by consideration of the data for silty sands and very fine sands. |
| Upper ------ | 10–30 ft | Fine | 27(?) | $N_1$ values for this quartile are highly variable for this depth range. |

[1]Sands beneath the depth ranges reported for Region 5 above are generally less susceptible to liquefaction.
[2]There are insufficient data for depths less than 10 ft to draw meaningful conclusions.
[3]Sands are generally less susceptible to liquefaction at depths greater than 35 to 40 ft, because of higher $N_1$ values.

Region 8 (see fig. 5) is presumed to have the same SPT blow counts as the Mississippi River meander-belt deposits farther south, in the vicinity of the towns of Osceola, Wilson, and Gilmore, and near Region 9 (Region 9 has insufficient data to be meaningful statistically). This is thought reasonable because all these deposits are the product of the same fluvial system. Region 5 is presumed to be representative of terrace deposits to the west that are on the same major terrace (see pl. 3); some uncertainty accompanies this assumption, but it is probably realistic. Region 6 is presumed to be representative of meander-belt areas for the St. Francis River and other smaller rivers, south of Region 6.

### Comparison of SPT Data

SPT data on table 3 show that the lower (or first) quartile $N_1$ values are remarkably close to one another for all Regions, especially Regions in the St. Francis Basin (Region 5, 6, and 8). Comparison of median data for the St. Francis Basin again shows that all Regions have the same $N_1$ values although Region 10 (the Western Lowlands) appears to be a little more susceptible to liquefaction than the Regions in St. Francis Basin.

Upper (or third) quartile data in table 3 are about the same for Regions 5 and 8, but again Region 10 is a little more susceptible to liquefaction than the St. Francis Basin. Generally, data for all quartiles consistently show Regions 5, 6, and 8 to have the same liquefaction potential and Region 10 to be slightly more susceptible.

Regardless of which quartile of SPT data is the most valid indicator of sand blow development, it must be concluded that all Regions in the St. Francis Basin have about the same liquefaction potential. On the basis of SPT data the southern energy-release center should be located near the center of the liquefied area (the border of sand blows shown on plates 8 and 9*A*) where the area is not restricted by local controls such as Crowley's Ridge or flooding effects.

### Influence of Sand Size, Topstratum Thickness, and Post-Tertiary Alluvial Thickness

Table 3 shows dominantly fine sands in all Regions, though they range from very fine grained to medium grained. The influence of grain size on liquefaction potential *during* shaking has already been accounted for by adjusting the $N_1$ values, but now liquefaction *after* shaking needs to be considered. The sands in the layer of interest throughout almost all the area of the southern energy-release center, especially near the borders, and sands in the Western Lowlands are all so fine-grained that extremely rapid dissipation of pore pressure after shaking precluded development of sand blows in very few places.

Regions 4 and 5 both have dominantly high-intensity sand blow development. Region 4 generally has a much thicker topstratum than Region 5; median values are about 7 m for Region 4 and 3 m for Region 5. In Regions 4 and 5, the range of topstratum thicknesses for the different quartiles exceeds the range for Regions 6 through 9, and 10 (the area encompassed by and near the southern energy-release center). Thus the topstratum could not have been so thick or have had other properties that severely impeded sand blow development. Futhermore, the topstratum is unquestionably thin enough in places in all Regions to allow extensive sand blow development.

Alluvium is generally 40 to 55 m thick in the large area of very highly intense sand blow development, near the Craighead County–Mississippi County boundary (pls. 7 and 8). The thickness varies over about the same range near the southern and southeastern border of sand blows, and localized areas with only 34 m of alluvium do not have noticeably higher sand blow development. Areas having locally high and very high sand blow development near Crowley's Ridge are above a thicker than average cover of alluvium, yet adjoining areas have a notably lower intensity of development over the same thickness of alluvium. It must be concluded that, throughout the area of the southern energy-release center, variations in sand blow intensity are not notably affected by the thickness of alluvium.

In summary, it is concluded that for the southern energy-release zone the regional development of sand blow intensity is not significantly affected by variations in SPT blow counts, sand size, topstratum thickness, or thickness of alluvium. Moreover, the southern to southeastern boundary of sand blows is defined by its proximity to the energy-release zone rather than by variations in geologic-engineering properties that control liquefaction.

### Location of Energy-Release Center

The energy center's release zone is now determined by a graphical method, which is based on the premise that the energy center is centrally located to the boundary of sand blows for locations on the boundary having the same liquefaction potential. This boundary is considered to be much more reliable than bounds between sand blow intensities (between very high and high intensities or high and medium intensities). The graphical method uses arcs drawn from points along or near the boundary of sand blows; factors affecting the proximity of the points to the energy center are discussed first.

The most reliable bound of sand blows controlled only by intensity of shaking is along the southern boundary. Points B, F, and A (see pl. 9*A*) have been selected to represent locations along an ideally smooth boundary that would result from an energy center extending northeastward from the area of high sand blow intensity near the Craighead County-Mississippi County border. Point H is another possible point along this bound, although the transition from high intensity to no sand blows seems unusually abrupt in that general vicinity; point $H_{avg}$ is thought to be better and was located by extrapolating an average width of the low and medium intensity areas to the southwest.

In the Western Lowlands, point D is in the braided-stream alluvium nearest to any energy center that is centered approximately in the large, southernmost very high intensity area of sand blows in the St. Francis Basin. A thorough aerial photograph and field examination was made in the Western Lowlands near point D and no sand blows were found. The field examination was made in a belt about 8 km wide, northward from point C to D (see pl. 9*A*) and then northwestward parallel to the western extremities of Crowley's Ridge for another 10 km. If sand blows are present in that general vicinity of the Western Lowlands, some should have been found within several kilometers of Crowley's Ridge. Although point D is the nearest possible point to the southern energy center, point G is probably a realistic outer boundary where sand blows should have been found, if they are present; this is based on experience in the St. Francis Basin, where sand blows in low intensity areas are commonly hundreds to thousands of meters apart in the areas of low sand blow intensity.

Farther north in the Western Lowlands, point E is in the general vicinity of the area closest to a potential energy center in the southernmost area of very high sand blow intensity in the St. Francis Basin.

In the St. Francis Basin, point I is near the border of sand blows, for an energy-center zone assumed to be trending northeastward from the large southernmost area of high sand blow intensity. Point J is unquestionably nearer the energy-center zone than points B, F, and A.

It is now assumed that a northeast-trending energy-center zone is located the same distance from points B, F, A, and H (or $H_{avg}$), and it is also assumed the arcs (the distance from border of sand blows to the energy center) from points G, D, E, I, and J should yield interpretations consistent with arcs from B, F, A, H, and $H_{avg}$. Arc lengths of 20 mi (32.3 km), 22 mi (35.5 km), 24 mi (38.7 km), and 28 mi (45.2 km) are assumed and evaluated.

*Arc length equals 20 mi (32.3 km)*.—Plate 9*B* shows arcs based on an assumed distance of 20 mi (32.3 km). Arcs from B, F, and A come close to intersecting at a common point (point O, named the centroid); arcs from D and G are about 4 mi (6 to 7 km) west of the centroid of the intersection of arcs from B, F, and A. Because the area near D and G is probably only slightly more susceptible to liquefaction than the area near points B, F, and A and because the arcs from B, F, and A nearly intersect at a common point, a preliminary evaluation suggests the centroid is a good candidate for the southern extremity of the energy-release zone.

An arc from J having the same radius falls very close to the arc from A; however, because J should be closer to the energy center than A, the radius should be larger. An arc from I exactly touches an arc from H but is west of an arc from $H_{avg}$, again suggesting that the radius should be larger. An arc from E is obviously far to the northwest of arcs from A and H, which does not aid in interpretation, except that a larger arc is doubtlessly acceptable.

*Arc length equals 22 mi (35.5 km)*.—Plate 9*C* shows arcs based on an assumed distance of 22 mi (35.5 km). Arcs from B, F, and A come closer to intersecting at a common point than for a radius of 20 mi (32.3 km); arcs from D and G are only slightly west of the centroid (point O) of arcs from B, F, and A. Thus point O is again a good candidate for the southern extremity of the energy-center zone on the basis of a preliminary evaluation.

An arc from J would fall southeast of an arc from A, as demonstrated by the arc O′–O″ with radius 22 mi (35.5 km) drawn from point O, and thus is compatible with J being closer to the energy-center zone than A, B, and F. The arc from I lies southeast of the arc from H and comes quite close to $H_{avg}$; this arc is acceptable. An arc from E is obviously northwest of arcs from A and F; this too is acceptable. For this length all arcs are acceptable.

*Arc length equals 24 mi (38.7 km)*.—Plate 9*D* shows the arcs based on an assumed distance of 24 mi (38.7 km). Arcs from B, F, and A all come close to intersecting at a common point, but arcs from D and G are, respectively, east of and essentially intersect the centroid, which implies that an arc length of 22 mi (35.5 km) is the better fit. An arc from J would be far to the southeast of O, as shown by the arc O′–O″, and would lie in the southeastern extremities of the southernmost large area of sand blows. This again demonstrates that an arc length of 22 mi (35.5 km) is the better fit. An arc from I, only slightly southeast of an arc from $H_{avg}$, is probably acceptable. An arc from E, northwest of O, is acceptable.

*Arc length equals 28 mi (45.2 km).*—Plate 9*E* shows arcs based on an assumed distance of 28 mi (45.2 km). Cursory inspection of plates 9*C*, *D*, and *E* shows that arcs from D and G are farther east of point O as the arc length increases beyond 22 mi (35.5 km). Plate 9*E* shows that an arc from J is obviously so far to the southeast that it is not a reasonable solution; similarly, the arc from I extends too far to the southeast to be a reasonable solution.

*Best-solution arc and length of epicentral zone.*—For arcs on plates 9*B* through 9*E*, the arc length of 22 mi (35.5 km) appears to be the best solution. Arc lengths less than 20 mi (32.3 km) lead to increasingly divergent solutions, as do lengths greater than 24 mi (38.7 km).

The arcs define both a southern extremity of an energy-center release zone and orientation for a northeastward extension. The question of the length of the energy-center zone remains. It is obvious from inspection of plate 8 that the bound of sand blows from the southern energy-release center can overlap with the energy-release center for the January 23, 1812, earthquake. This precludes using the distribution of sand blows to estimate the northeastern limit of the southern energy-release zone, and additional information is required. An estimate of length is given Nuttli (1980). On the basis of the energy required for an earthquake with $m_b$ of 7.2 and $M_S$ of 8.5 to 8.7 in the midcontinental United States, he calculates the energy-release zone to be 55 to 60 km long and 20 km wide. An energy-release zone 60 km long, plotted on plate 9*C*, is very close to Nuttli's (1979) estimated location for the center of the December 16, 1811, energy-center zone. However, Nuttli's center point is not at the midlength of the line proposed by the writer. Part of this discrepancy may arise from Nuttli's uncertainty in locating the center point, reported only to the nearest whole degree of longitude and latitude.

The writer believes the line of energy centers on plate 9*C* is accurate within 6 mi (10 km) of the actual energy-release zone. This line is shown on plate 11, where good agreement with the zone of concentrated modern seismicity is shown.

## NORTHERN ENERGY-RELEASE CENTER

In locating this energy-release zone, the northern and northwestern bounds of sand blows on plate 8 and 10*A* are assumed to be the result of the February 7, 1812, earthquake, which was centered somewhere in the general vicinity of the town of New Madrid (Nuttli, 1979). It can be seen from an inspection of plates 8 and 10*A* that sand blows caused by the January 23 earthquake overlap the area of sand blows caused by the February 7 earthquake and make it impossible to determine a southern limit of the February 7 energy-release zone. Plates 8 and 10*A* also show that upland areas limit development of sand blows to the southeast, east, and northeast of Nuttli's February 7 energy center. Thus, only the northernmost limit of the February 7 energy center can be determined by using sand blow distribution.

The points on the boundary that are considered reliable indicators of the liquefaction limits are S, T, and U shown on plate 10*A*. No sand blows were found in the vicinity of S in the Western Lowlands, but evidence of liquefaction is present at many scattered places in a large channelway many miles long, which was recently excavated for the St. Francis River. The channelway is in braided-stream alluvium, and the topstratum is uniformly about 6 m thick. The banks of the channelway have many (hundreds) near-vertical cracks, filled with sand, that are tapered and become wider with depth. The sand in the cracks, obviously injected from the underlying substratum sands, is almost certainly from earthquake-induced liquefaction in the substratum sand.

The boundary of sand blows is rather irregular in the general vicinity of points T and U. These points are thought to be reasonable approximations to the bound in Region 2 for an earthquake centered near New Madrid, for reasons discussed later, although locally sand blows are present even farther from this bound.

The reliability is less certain for points V and W. Point V is an area of numerous sand dunes, some of which are active. Thus, detection of sand blows is very difficult. Detection becomes increasingly difficult northward. Point W is in an area where flooding since 1811–12 has deposited a veneer of silty clay and scoured other places. The flood-related obscuration is increasingly more severe north and east of W. Thus, points V and W are considered approximations to the closest possible border of sand blows, in the northeastern braided-stream deposits and Mississippi River meander-belt deposits, respectively.

The influence of SPT blow counts (table 4), sand grain size (table 4), topstratum thickness (pl. 5), and depth of post-Tertiary alluvium (pl. 7) on the border of sand blows and pattern of intensities must be considered. Point S is in Region 10 (fig. 5), T can be considered to be in Region 2, U is in Region 2, V is in Region 1, and W is assumed to lie in an area that has the same properties as Region 8 (the Mississippi River meander-belt

TABLE 4.—*Standard Penetraton Test $N_1$ values corrected for influence on liquefaction potential of silty and very fine grained sands according to the method of Seed and Idriss (1981), range of possible distances from margins of sand blow development to energy-release center, and associated accelerations. $N_1$ data are corrected for Regions (pl. 3) near the northern energy-release center*

[--, not applicable solutions]

| Quartile | Depth range | Dominant sand size | $N_1$ | Cyclic stress curve number[1] (from fig. 13) | Cyclie stress ratio (from fig. 13) | $A_{max}$ (fraction of *g*) | Possible distance (*R*, in km) from control point along margin of sand blows on plate 10 to energy-release center | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | a | b | c | d | e | f | g |
| | | | | | **Region 1** (Representative of point V on pl. 9 and 10) | | | | | | | | |
| Lower -------- | 10-25 ft | Medium | 19[2] | 1 | 0.264 | 0.214 | 28.8 | 33.2 | 38.2 | 43.0 | 47.6 | 52.5 | 57.2 |
| | | | | 2 | .230 | .186 | 29.0 | 34.6 | 39.6 | 44.3 | 49.1 | 54.2 | 59.0 |
| | | | | 3 | .200 | .162 | 28.3 | 33.1 | 37.9 | 42.3 | 47.1 | 52.0 | 57.4 |
| | | | | 4 | .180 | .146 | 28.3 | 33.0 | 37.7 | 42.4 | 47.0 | 51.8 | 56.5 |
| | | | | 5 | .160 | .129 | 28.3 | 33.1 | 37.7 | 42.5 | 47.3 | 52.0 | 56.6 |
| Median ------- | 10-25 ft | Medium | 30[2] | 1 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | 2 | .400 | .324 | 28.7 | 33.2 | 38.0 | 42.6 | 47.8 | 52.0 | 56.8 |
| | | | | 3 | .332 | .267 | 28.5 | 33.4 | 38.0 | 43.0 | 47.8 | 52.0 | 57.3 |
| | | | | 4 | .295 | .239 | 28.3 | 33.2 | 38.0 | 42.5 | 47.3 | 52.0 | 56.9 |
| | | | | 5 | .263 | .213 | 28.9 | 33.5 | 38.4 | 43.0 | 47.7 | 52.6 | 57.5 |
| Upper -------- | 10-25 ft | Medium | 39[2] | 1 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | 2 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | 3 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | 4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | 5 | .400 | 0.324 | 26.8 | 31.7 | 36.0 | 40.5 | 44.9 | 49.2 | 53.9 |
| | | | | | **Region 2** (Representative of points T and U on pl. 9 and 10) | | | | | | | | |
| Lower -------- | 10-20 ft | Fine to coarse | 18[3] | 1 | 0.251 | 0.203 | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| | | | | 2 | .226 | .183 | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| | | | | 3 | .188 | .152 | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| | | | | 4 | .168 | .136 | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| | | | | 5 | .150 | .122 | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| Median ------- | 10-25 ft | Fine to coarse | 29[3] | 1 | off scale | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | 2 | .377 | .305 | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| | | | | 3 | .320 | .255 | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| | | | | 4 | .280 | .226 | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| | | | | 5 | .251 | .203 | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| Upper -------- | 10-30 ft | Fine to coarse | 37[3] | 1 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | 2 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | 3 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | 4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | 5 | 0.357 | 0.289 | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| | | | | | **Region 8[4]** (Representative of point W on pl. 9 and 10) | | | | | | | | |
| Lower -------- | 10-25 ft | Very fine to fine | 10[5] | 1 | 0.243 | 0.195 | 31.5 | 36.6 | 41.8 | 47.0 | 52.0 | 57.3 | 62.6 |
| | | | | 2 | .211 | .170 | 32.1 | 37.7 | 43.0 | 48.4 | 53.5 | 59.0 | 64.3 |
| | | | | 3 | .185 | .150 | 30.3 | 35.4 | 40.7 | 45.4 | 50.5 | 55.8 | 60.5 |
| | | | | 4 | .160 | .134 | 30.9 | 35.9 | 41.0 | 46.0 | 51.0 | 56.0 | 61.0 |
| | | | | 5 | .144 | .117 | 31.3 | 36.7 | 42.6 | 47.0 | 52.4 | 57.5 | 63.0 |

TABLE 4.—*Standard Penetraton Test $N_1$ values corrected for influence on liquefaction potential of silty and very fine grained sands according to the method of Seed and Idriss (1981); range of possible distances from margins of sand blow development to energy-release center, and associated accelerations. $N_1$ data are corrected for Regions (pl. 3) near the northern energy-release center*—Continued

[--, not applicable solutions]

| Quartile | Depth range | Dominant sand size | $N_1$ | Cyclic stress curve number[1] (from fig. 13) | Cyclie stress ratio (from fig. 13) | $A_{max}$ (fraction of *g*) | Possible distance (*R*, in km) from control point along margin of sand blows on plate 10 to energy-release center | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | a | b | c | d | e | f | g |
| | | | | **Region 8[4]—Continued** (Representative of point W on pl. 9 and 10) | | | | | | | | | |
| Median ------- | 10-25 ft | Very fine to fine | 17-18[6] | 1 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | 2 | 0.307 | 0.250 | 36.7 | 43.0 | 49.0 | 55.2 | 61.3 | 66.7 | 73.0 |
| | | | | 3 | .266 | .220 | 34.5 | 40.2 | 46.0 | 51.8 | 57.5 | 63.0 | 69.0 |
| | | | | 4 | .239 | .193 | 34.5 | 40.5 | 46.3 | 52.2 | 58.0 | 63.5 | 69.5 |
| | | | | 5 | .213 | .174 | 35.1 | 40.8 | 46.8 | 52.3 | 58.0 | 64.1 | 70.0 |
| Upper -------- | 20-40 ft | Fine | 32-33[7] | 1 | off scale | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | 2 | off scale | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | 3 | .380 | .310 | -- | -- | -- | -- | -- | -- | -- |
| | | | | 4 | .330 | .270 | -- | -- | -- | -- | -- | -- | -- |
| | | | | 5 | .292 | .235 | 29.9 | 34.8 | 39.8 | 44.8 | 49.8 | 54.8 | 59.8 |
| | | | | **Region 10[8]** (Representative of point S on pl. 9 and 10) | | | | | | | | | |
| Lower -------- | 10-30 ft | Fine | 15[9] | 1 | 0.210 | 0.170 | 36.0 | 41.8 | 47.8 | 53.6 | 59.2 | 65.4 | 71.5 |
| | | | | 2 | .177 | .146 | 37.2 | 43.7 | 49.8 | 56.0 | 62.0 | 68.3 | 74.5 |
| | | | | 3 | .155 | .126 | 35.9 | 42.0 | 48.0 | 53.8 | 59.5 | 66.1 | 72.0 |
| | | | | 4 | .140 | .113 | 36.3 | 42.4 | 48.3 | 54.2 | 60.0 | 66.0 | 72.1 |
| | | | | 5 | .125 | .101 | 36.1 | 42.3 | 48.1 | 54.2 | 60.1 | 66.1 | 72.7 |
| Median ------- | 10-30 ft | Fine | 21[10] | 1 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | 2 | .257 | .200 | 44.0 | 51.1 | 58.2 | 65.5 | 73.3 | 80.0 | 87.0 |
| | | | | 3 | .222 | .178 | 42.0 | 49.1 | 56.1 | 63.0 | 70.3 | 76.5 | 84.0 |
| | | | | 4 | .200 | .162 | 41.3 | 48.8 | 55.2 | 62.2 | 69.0 | 76.0 | 83.0 |
| | | | | 5 | .175 | .142 | 43.3 | 50.0 | 57.5 | 64.0 | 70.2 | 78.1 | 85.1 |
| Upper -------- | 10-30 ft | Fine | 27(?)[11] | 1 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | 2 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | 3 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | 4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | 5 | .232 | .186 | 46.0 | 53.7 | 61.0 | 69.0 | 76.5 | 84.0 | 92.0 |

[1]Curve number 1, upper bound; curve number 5, lower bound.

[2]Data at depths less than 10 ft were excluded because (1) too few data were available and (2) field measurement errors were probable because of use of short rod lengths.

[3]The $N_1$ value for this depth range is not changed by consideration of the influence of silty and very fine sands because of the relatively small proportion of such fine-grained sands.

[4]Sands in Region 8 are generally less susceptible to liquefaction at depths greater than 35 to 40 ft because of higher $N_1$ values.

[5]For the depth range 10 to 25 ft, many of the blow count data are for silty sands, very fine sands, and very fine to fine sands. The $N_1$ value of 10 for the lower quartile has been increased by 7.5 in order to have a presumed liquefaction potential equivalent to sands with $D_{50}$>0.25 mm. From depth range 25 to 35 ft, the lower quartile $N_1$ is about 18 and the dominant sand size is fine; thus, the sand has about the same liquefaction potential presumed at shallower depths.

[6]For the depth range 10 to 25 ft, the median $N_1$ (17–18) was calculated by using a weighted average for the different depths because of the lack of data at depth 12.5 ft; $N_1$ of 17–18 for these dominantly very fine sands has been increased by 7.5, in accordance with footnote 5.

[7]For the upper quartile, because of grain size effects, the sands at depths less than 20 ft probably have about the same liquefaction potential as sands for the depth range 20 to 40 ft.

[8]Sands in Region 10 at depths greater than 35 ft are generally less susceptible to liquefaction than at shallower depths.

[9]The $N_1$ value for this depth range is not changed by consideration of data for silty sands and very fine sands because of the small percentage of data for such fine-grained sands.

[10]The $N_1$ value for this depth range is slightly increased (by 1 to 2) by consideration of the data for silty sands and very fine sands.

[11]The $N_1$ values for this quartile are highly variable for this depth range.

deposits that are farther south). Table 4 shows SPT $N_1$ values and dominant sand sizes for these Regions. The $N_1$ values are again corrected for the influence of very fine or silty sands on liquefaction potential and data are excluded for depths less than 3 m.

### Comparison of SPT Data

Table 4 shows that $N_1$ values for the lower quartile are essentially the same for Regions 1, 2, and 8, but all of these have values somewhat higher than $N_1$ for Region 10. Consideration of $N_1$ data alone shows the energy center zone should *conceptually* be equidistant from the bounds of liquefaction in Regions 1, 2, and the Mississippi River alluvium in the vicinity of point W (Region 8) (provided the effects of flooding, sand dunes, etc., were eliminated). However, points T and U are on the outer bounds of sand blows for Region 2, point V is on the inner bound of sand blows for Region 1, and point W is on the inner bound for the Mississippi River alluvium. Points V and W are considered inner bounds because sand blows may well be present north of points V and W, farther away from the energy-release center. Therefore, the point or zone defined by the intersection of arcs of equal length from T, U, V, and W is not necessarily in the energy-center zone.

Comparison of $N_1$ values is now made for median data. Median values are nearly equal for Regions 1 and 2. $N_1$ values for these Regions are higher than for Region 8 and higher yet than for Region 10. That the border of liquefaction for Region 2 (for points T and U on plate 9) is closer than point S to the epicenter is shown by the median data and is in agreement in a qualitative sense with data for the lower quartile. There is some disagreement of the ordering of lower quartile and median data for Regions 1, 2, and 8.

For the upper quartile, $N_1$ values for Region 10 appear to be lowest of all Regions, but the larger scatter in the data for Region 10 makes comparisons meaningless.

In summary, it is apparent that SPT $N_1$ values are so variable between Regions and the border of liquefaction is so poorly defined that the method used to determine the zone of the southern energy center cannot be used for zone of the northern energy center. Any determination of the northern zone requires a method for determining arc length that is the distance from the energy center to the border of sand blows; this method is based on $N_1$ values. Before that is done, though, an examination is made of the influence of grain size, topstratum thickness, and alluvial thickness on production of sand blows.

### Influence of Sand Size, Topstratum Thickness, and Post-Tertiary Alluvial Thickness

All Regions on table 4 except Region 2 are sufficiently fine that sand blows could develop easily *after* earthquake shaking. In many places in Region 2 the sands are so coarse-grained that dissipation of pore pressure must have been very fast, and probably fast enough to restrict sand blow development. If this is true, in Region 2 the area of high sand blow intensity should be restricted for an earthquake centered near New Madrid. Certainly the area of high sand blow intensity is small. However, Region 2 has adequate fine sand for some sand blow development. Thus it seems probable that such large variations in grain sizes between Regions could lead to large variations in sand blow intensities for a given level of ground shaking.

Plate 5 shows that large variations also exist in topstratum thickness between Regions 1, 2, 8, and 10. However, the topstratum is thin enough near points T, U, and V that it could not have restricted sand blow production and definition of the limits of liquefaction. The topstratum is so variable in Region 8 that sand blows could develop easily at many sites near point W. Thus, variation in topstratum thickness does not seem to have an important role in defining the border of sand blows in the St. Francis Basin. The limits of liquefaction in Region 10 are almost certainly very close to point S.

Within Region 2 are large areas where the topstratum thickness is so great that sand blow production may have been greatly restricted. Near Little River (located a few kilometers west of Sikeston Ridge) the topstratum thickness is commonly 6 to 7 m, which may have been an impediment; however, by comparison with the area northwest of Blytheville, which has about 5 to 7 m of topstratum cover, this thickness does not necessarily prevent intense development of sand blows. Because of the thickness of topstratum that covers rather large parts of Region 2, in the interior and southern parts of Region 2 it is felt that conclusions about shaking intensity, except near the boundary of sand blows, would be extremely difficult to draw.

Plate 8 shows rather large differences in the thickness of post-Tertiary alluvium in the vicinity of the northern energy center. Locally the alluvium is only 15 to 23 m thick, but in many places it is about 30 m thick. In alluvium thicknesses in this range, accelerations in underlying bedrock or semilithified rocks can be amplified significantly. In a microzonation study of Memphis, Sharma and Kovacs (1980) showed that for sand thicknesses of about 100 ft (30 m) and for sands having properties similar to those in the St. Francis Basin, the peak acceleration is amplified about 15 to 30

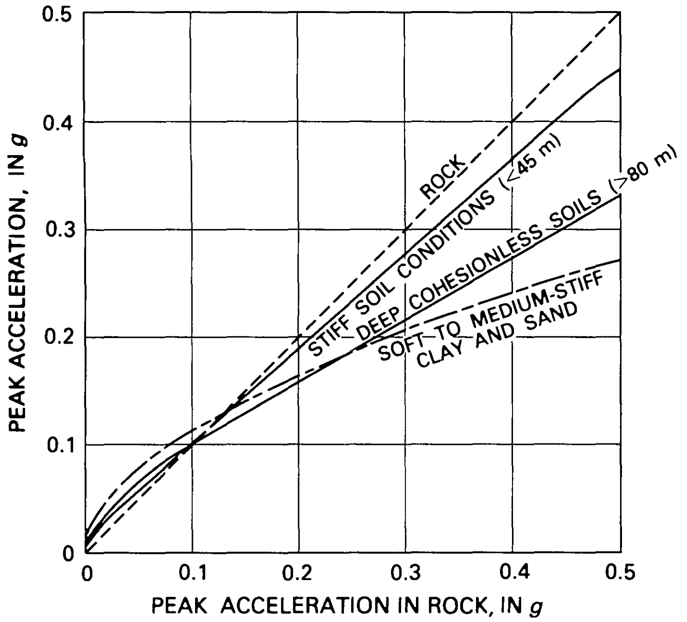



FIGURE 19.—Average effect of peak rock acceleration level on the peak ground acceleration for four site classifications (modified from Hays and others, 1978; based on data from Seed and others, 1976b).

percent for an earthquake acceleration in the underlying bedrock of about 0.15 to 0.2 *g*.[3] Thinner alluvium causes greater amplification.

Clearly, the thin alluvial cover probably amplifies bedrock accelerations in many places near the northern energy center. Two places where this was probably a significant factor in sand blow intensity (see pls. 7 and 8) are at the northwestern extremity of low sand blow development, between points T and U (thus precluding having a control point there) and about 20 to 25 km west of point S. The alluvium is about 30 m thick in many places and thus possibly experienced slight to moderate amplification. The thickness in the general vicinity of point S is about 35 m (Smith and Saucier, 1971).

Another factor to consider in even a rough estimate of amplification is the intensity of shaking. Figure 19 shows how the amplification typically varies as a function of bedrock acceleration and type of alluvium. Small bedrock accelerations are often amplified by deep, cohesionless soils, but large accelerations are diminished at higher levels (the crossover point may well be 0.2 to 0.25 *g* for deep, cohesionless soils (Hays, 1980; Hays, oral commun., 1982)). Thus it must be concluded that comparison of factors controlling ***high*** intensities of sand blow development is extremely complex and probably impossible. However, as will be shown, the acceleration levels near the bound of sand blows were probably sufficiently low that there were not large differences in peak accelerations in bedrock and alluvium at points S, T, U, V, and W.

In summary, sand sizes and topstratum thickness probably played an unimportant role in the areal location of the limits of liquefaction near points S, T, U, V, and W because adequate fine- to medium-grained sands are present to produce sand blows and because topstratum is locally thin enough to permit sand blows. In addition, points S, T, U, V, and W are all in areas where variations in alluvial thickness are so small that there are probably only minor differences between points in response characteristics to bedrock accelerations. Furthermore, arcs from S, T, and U may be used to place some bounds on the energy-center zone, provided that a method is devised to account for differences in liquefaction potential, as measured by SPT blow counts, and provided that the accelerations at the sites are not too high.

### DETERMINATION OF ARC LENGTH

Arc lengths (distances from the energy center to border of sand blows) for points S, T, U, V, and W are determined by the following steps:

1. $N_1$ values from table 3 are used with figure 13 to determine cyclic stress ratios in the range of possible solutions.
2. For each cyclic stress ratio, a realistic horizontal acceleration is determined.
3. A range of possible arc lengths is assumed for one point (such as T) on the border of sand blows.
4. A realistic function of acceleration attenuation is used in the general vicinity of the border of sand blows; this fixes all other arc lengths.
5. A graphical procedure, much like the one used to determine the southern energy center, places some bounds on the location of the northern energy center.

A detailed explanation of steps 1 through 4 follows.

For step 1, it is assumed that, on figure 13, curves 1 through 5 encompass the range of possible curves applicable to the February 7 earthquake. It is also assumed that one of these curves uniquely applies to the February 7 earthquake. Each of the curves in figure 13 is used in combination with $N_1$ values in table 4 to determine cyclic stress ratios required for the February 7 earthquake to cause marginal sand blow development at *all* control points (points S, T, U, V, and W) on the sand blow boundary.

[3]Sharma and Kovacs (1980) made calculations of acceleration amplification for both a basal stratum of sand and of gravel by using the computer program SHAKE. The writer believes the results for sand are most applicable to the St. Francis Basin. Sharma and Kovacs assumed the epicenter to be 50 km from Memphis, in the St. Francis Basin.

To illustrate how cyclic stress ratios are determined for step 1, from table 4, in Region 2 (for points T and U), the lower quartile value of $N_1$ is 18. For $N_1$ of 18, the cyclic stress ratio for curve 1 on figure 13 is 0.251, for curve 2 is 0.226, etc. The same procedure is used for $N_1$ data from each quartile. Some cyclic stress ratios in table 4 are designated either "off scale" or "not applicable." An off-scale example is for points T and U in Region 2, median ($N_1$ equal to 29), curve 1; from figure 13, $N_1$ equal to 29 falls to the right of curve 1 (or approaches where curve 1 is asymptotic to a vertical line and reaches a ridiculous ratio) and thus is not an acceptable cyclic stress ratio. Because liquefaction and sand blows must be present at all control points, that curve is automatically negated for that quartile. Thus combinations for curve 1, median, in Regions 10 (point S), 8 (point W), and 1 (point V) are designated "not applicable."

For step 2, the peak horizontal earthquake acceleration is calculated by using the equation from Seed (1979):

$$\tau = \frac{0.65\ \gamma\ h}{g}\ (A_{\max})\ r_d \tag{2}$$

where $\gamma$ is the total unit weight of soil, $h$ is the depth, $g$ is gravity acceleration, $A_{\max}$ is the maximum earthquake induced surface acceleration, and $r_d$ is a reduction factor that accounts for soil behaving as a deformable column. For a depth of 3 to 6 m, the depth at which much if not most liquefaction probably took place near the outer bounds of liquefaction, $r_d$ is taken to be 0.95. (Using greater depths only slightly decreases $r_d$.)

As a sample calculation, substituting the cyclic stress ratio ($\tau/\sigma_o'$) for points T and U in Region 2, lower quartile, yields

$$0.251\ \sigma_o' = \frac{0.65\ \gamma\ h}{g}\ (A_{\max})\ 0.95 \tag{3}$$

For the water table at the surface (which was surely commonplace at the time of the earthquakes), $\sigma_o'$ is $\gamma' h$, where $\gamma'$ is the effective unit weight of soil. The ratio $\gamma/\gamma'$ is very close to 2.0. Substituting again yields $A_{\max}$ equal to 0.203 $g$.

For step 3, the range of possible distances (or arc length solutions) from the energy center to the bound of sand blows is determined for points T and U in Region 2. This is done by striking preliminary arcs from T and U and noting where they fall in relation to intensity of sand blows on plate 8. The range is listed under the heading "(R,km)" in table 4 and varies from 30 to 60 km. Increments of 5 km are listed under columns a, b, c, etc. It will be seen later, when graphical constructions are shown, that this range is realistic.

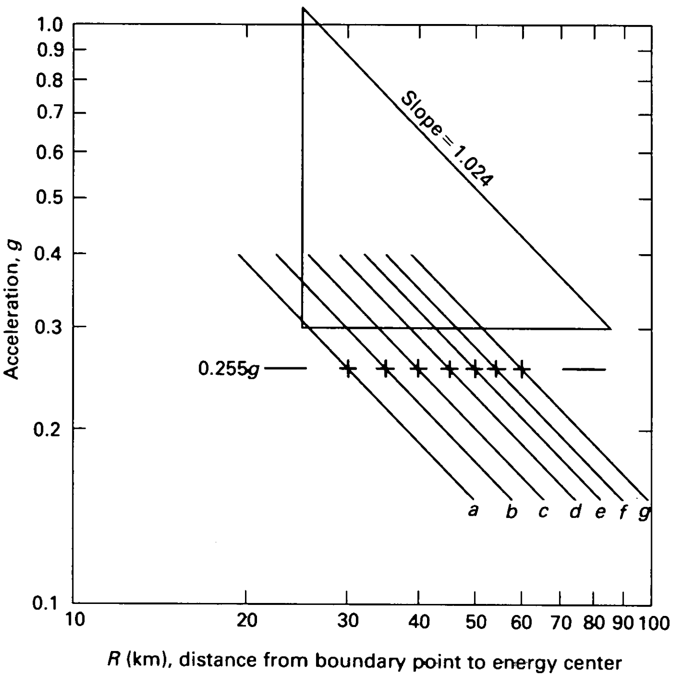



FIGURE 20.—Possible solution showing attenuation of acceleration near boundary of sand blows. For the example in table 4 of median $N_1$ data and cyclic stress curve 1, boundary points T and U have a maximum horizontal acceleration of 0.255 $g$. Distances ($R$) of 30, 35, 40, 45, 50, 55, and 60 km are assumed for points T and U. Lines *a* through *g* show how the acceleration attenuates as a function of distance from the energy center for $R$ equal to 30, 35,...60 km, respectively. For $m_b$ equal to 7.35, the arithmetic slope of the attenuation line is 1.024 (from Nuttli and Herrman, 1981).

For step 4, arc lengths for other points (S, V, and W) are determined by using the attenuation relation from equation 1; $m_b$ for equation 1 is assumed to be 7.35. The attenuation is basically independent of $m_b$ from 4 to 7.4, for the range of possible distances, $R$, of 30 to 60 km from the epicenter. Now, assuming a distance, $R$, for points T and U, using the acceleration determined previously for these points for a particular quartile and cyclic stress curve number, and knowing the attenuation relation, a series of figures is constructed (such as figure 20) to determine arc lengths for all other points. For example, figure 20 shows data for the median $N_1$ data, cyclic stress curve 3. A horizontal line is drawn for an acceleration at points T and V of 0.255 $g$, and then at distances ($R$) equal to 30 , 35, 40 km, etc., lines are drawn that show the acceleration as a function of the distance from the energy center. To illustrate, for points T and U having $R$ equal to 30 km and for an acceleration at point S of 0.178 $g$, $R$ at point S is equal to 42.0 km. (In table 4, the data for S are in Region 10 and distance ($R$) of 42.0 km is under column a, for cyclic stress curve 3, for median $N_1$ data.)

Equation 1 is strictly applicable for rock or very rigid unconsolidated materials, but the attenuation is believed realistic in the vicinity of the border of sand blows, near points S, T, U, V, and W, because here the acceleration in soil is shown later probably to be close to the value in rock (at least at the onset of liquefaction).

### Bounds on Energy-Release Center

Plate 10*B* shows arcs drawn from the boundary points for the lower quartile, cyclic stress curve number 1, for arc lengths, $R$, that are in columns b, d, and g (data are in table 4). Arcs for $R$ in columns a, c, e, and f are not shown, but their locations can be estimated from other arcs on plate 10*B*. Progressing from b to g, d is the best common solution for arcs drawn from points S, T, and U (see point L1 on pl. 11). (The best common solution for points S, T, and U is determined by the smallest triangular area.) Arcs from S, T, and U will intersect at a point slightly southeast of the triangular area defining the region of the best solution for $R$ equal to d.

For d, arcs from V and W lie northeast of the centroid of the triangle defined by arcs from S, T, and U. The best common solution of arcs from *all* boundary points (S, T, U, V, and W) is for $R$ equal to g (see point L2 on pl. 11). Longer arc lengths rapidly diverge.

Plate 10*C* shows results for arc lengths for the lower quartile, curve 3, for arc lengths again equal to b, d, and g. The smallest triangular area falls at almost the same location as for curve 1 on plate 10*B* (see point L1 on pl. 11); the best fit of arcs from all points (S, T, U, V, and W) is essentially the same as in plate 10*B* (see point L1 on pl. 11).

Plate 10*D* shows results for arc lengths for the lower quartile, curve 5, for arc lengths again equal to b, d, and g. Intersections again lie very close to those on plates 10*B* and *C*.

Arcs are not shown for the lower quartile, cyclic stress curves 2 and 4, but results are essentially the same as for curves 1, 3, and 5.

Plate 10*E* shows solutions for arcs associated with the median, curve 2, for arc lengths equal to a, b, and d. The common intersection of arcs from S, T, and U lies between arcs a and b. The location of the best solution for the intersection of arcs from all boundary points is rather subjective, but it lies southeast of arc length b (see point M1 on pl. 11). The best solution is probably defined best by arcs of lengths between b and d (see point M4 on pl. 11).

Plate 10*F* shows solutions for arcs associated with the median, curve 4, for arc lengths again equal to a, b, and d. The common intersection of arcs from S, T, and U is best determined by arc b (see point M2 on pl. 11), and the best common solution for arcs from all boundary points can be shown to lie in the general vicinity of arcs having lengths equal to c or d (see point M5 on pl. 11).

Solutions for other curves (1 and 3) associated with median $N_1$ data are nearly the same as for curves 2 and 4 (see zones M3 and M6 on pl. 11).

Plate 10*G* shows solutions for arc lengths associated with the upper quartile, curve 5, for arc lengths equal to a, b, and d. The common intersection of arcs from points S, T, and U is defined by arcs in column a, in table 4; on plate 11, this intersection is essentially the same as point M1. The best common solution for all boundary points is probably determined by arcs in column b, c, or d, in table 4; on plate 11, this solution is the same as M6 shifted about 5 km northeastward.

In summary, all arcs associated with the lower quartile yield about the same possible solutions for the energy center, and all arcs associated with the median also yield about the same possible solutions. Solutions for the upper quartile are about the same as for the median. But, the solutions for the median and upper quartile lie northwest of those for the lower quartile.

Because different quartiles yield different solutions, selection of the most appropriate quartile for defining the bounds of liquefaction is critical to interpretations. Use of the upper quartile as a criterion is, in essence, a statement requiring liquefaction of three-fourths of the total volume of sand (in the depth with SPT data). This is not reasonable and is ridiculously high near the border of sand blows. Even requiring that half the volume of sand (sand with $N_1$ values up to the median) be sites of liquefaction seems too severe. The writer believes that liquefaction of one-quarter of the volume of sand, and perhaps as little as one-eighth to one-sixteenth in the uppermost 10 to 15 m (the depth in tables 3 and 4 with SPT data) may be adequate. Many studies by different investigators prove that sand blows can be caused by liquefaction of a single stratum that is a small portion of the total sand mass near the ground surface.

$N_1$ values for the lowermost one-eighth of all data in Region 2, in the depth range 3 to 6 m, are basically the same as for the lower quartile (about 1 less); for the lowermost one-sixteenth they are about 2 to 3 less than the lower quartile. For Region 10, $N_1$ values for the lowermost one-eighth are 2 less than the lower quartile in the depth range 3 to 9 m; insufficient data are available to make conclusions for the lowermost one-sixteenth. Thus, requiring that only one-eighth of all points liquefy for development of sand blows causes only a very small shift of the energy center that is estimated by using lower quartile data.

The bounds on possible epicentral zones are probably best defined, at one extreme, by the solution that uses median $N_1$ values, and, at the other extreme, uses values in the general vicinity of the lower quartile solution.

It is presumed in the method of analysis that the accelerations at boundary points are not so large that the attenuation relations are greatly different from boundary point to boundary point. Table 4 shows that the range of possible accelerations (maximum horizontal, ground surface, on alluvium) for the boundary points T and U, lower quartile, is 0.122 to 0.203 *g*. For the lower quartile, the range for all boundary points is 0.101 to 0.214 *g*. As will be shown, the peak accelerations at all boundary points, by use of median $N_1$ data, almost certainly range between 0.25 to 0.15 *g*. These accelerations (0.1 to 0.25 *g*) lie in the range where accelerations on deep cohesionless alluvium are probably not very different from values in the underlying bedrock (as discussed earlier). Therefore, the attenuation relation used for figure 20 should be reasonably correct.

Whether the February 7, 1812, energy-center zone is best defined by the intersection of arcs from boundary points S, T, and U or by the zone that is nearest the common intersection of arcs from all boundary points (S, T, U, V, and W) remains to be determined. The method used here does not provide further guidance to this question. Consideration of the patterns of sand blow development and modern seismicity offers further interpretations. Quite possibly, zone M3 is the northern extremity of a northwest-trending energy-release zone, defined on plate 11 by the question marks in the region of most intense seismicity trending southeast from M3. Northeast of M3, the patterns of most intense seismicity and sand blow development suggest that a branch is defined by the question marks. This is the writer's preferred solution, although a similar solution from point L1 is almost as good.

The pattern of intensities in sand blow development southeast of M3 is highly variable, but floods have probably greatly obscured intensities here. Severe obscuring also probably has taken place in the region southeast of the line of question marks trending northeast from M3. This would greatly affect the intensity of sand blow development from energy-release centers at L1, L3, or M6, so these points cannot be eliminated as prospects.

If the limb of question marks extending northeast from M3 is a zone of energy release for the February 7 earthquake, because of the proximity of the sand blow boundary north and northwest of this limb, it appears that this limb did not release as much energy per unit length as the limb southeast of M3.

## ACCELERATIONS IN ALLUVIUM

The range of accelerations at the border of sand blows, from using all possible solution curves on figure 13 in combination with SPT data in table 4, is so large as to be meaningless. The range can be bracketed within reasonable bounds, though, if the 1811–12 earthquake magnitudes can be bounded within a fairly narrow range. The upper-bound magnitude according to Nuttli (1980) is $M_S$=8.7 for the February 7 earthquake and $M_S$=8.6 for the December 16 earthquake. According to Sylvester T. Algermissen (U.S. Geological Survey, oral commun., 1983), the largest earthquake had a $M_S$ magnitude of 8.6 ± 0.3. Using a magnitude $M_S$ of 9.0 and correcting figure 13 for the influence of an especially long duration earthquake yield curve 5 as a lower bound. From table 4, the acceleration at the border of sand blows in Region 2 (near points T and U, for example), is 0.122 *g* for lower quartile $N_1$ data and 0.203 *g* for median data. For point S, the acceleration is 0.101 *g* for lower quartile $N_1$ data and 0.142 *g* for median data.

For $M_S$ equal to 8.3, curve 4 on figure 13 is a reasonable upper bound, taking into account an especially long earthquake duration. From table 4, the acceleration at the border of sand blows in Region 2 is 0.136 *g* for lower quartile $N_1$ data and 0.226 *g* for median data. For point S, the acceleration is 0.113 *g* for lower quartile data and 0.162 *g* for median data.

Curve 3 on figure 13 is probably in the realm of being an extremely to absurdly conservative upper bound for the 1811–12 earthquakes. From table 4, for points T and U, median $N_1$ data, the acceleration is 0.225 *g* and for points S is 0.178 *g*. Assuming upper- and lower-bound $M_S$ magnitudes of 8.9 to 8.3 for the largest earthquake, the writer believes the peak horizontal accelerations probably did not much exceed 0.25 *g* at points T and U (the northern boundary of sand blows), and points B, F, A, and $H_{avg}$ (the southern boundary of sand blows). At points S and D, in the Western Lowlands, accelerations probably did not exceed 0.20 *g*. These accelerations should be accurate within 25 percent.

Sites generally best suited for back-calculating earthquake accelerations are outer margin locations of sand blow deposits, where liquefaction can cause only minor changes in pre- and postearthquake SPT data. No data were available along the margin, but about 10 SPT borings were at scattered sites near the southern epicenter, beyond the margin where no sand blow deposits were observed.

Five of the most relevant SPT borings are in table 5. This table lists numbers for logs in appendix A, and boring locations are shown on plate 3.

TABLE 5.—*Log data from field borings at selected locations in the Western Lowlands and the St. Francis Basins*

[NA, not applicable or not available]

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Field classification[1] and remarks | $N_1$[2] | $N_1$[3] adjusted |
|---|---|---|---|---|---|---|
| | | | | **Western Lowlands Basin** | | |
| | | | | Boring log no. 266 | | |
| | | 0.0 | 13.5 | silty clay | | |
| 15.0 | 16.5 | 13.5 | | thin lenses of f and m and silty sand and 1-in. lens of clay silt | 12 | 19–20 |
| 18.0 | 19.5 | | | m sand | 37 | 37 |
| 21.0 | 22.5 | | | f and m sand | 15 | 15 |
| 24.0 | 25.5 | | | f and m sand | 29 | 29 |
| 27.0 | 28.5 | | | f and m sand | 20 | 20 |
| 30.0 | 31.5 | | | f and m sand | 30 | 30 |
| 33.0 | 34.5 | | ≥34.5 | f and m sand | 29 | 29 |
| | | | | Boring log no. 267 | | |
| | | 0.0 | 12.0 | clayey silt | | |
| | | 12.0 | 16.0 | sandy silt, with trace clay | | |
| | | 16.0 | | f sand | 11 | 18–19 |
| 16.0 | 17.5 | | | f and m sand | 18 | 18 |
| 19.0 | 20.5 | | | f and m sand | 20 | 20 |
| 22.0 | 23.5 | | | f and m sand | 24 | 24 |
| 25.0 | 26.5 | | | f and m sand, with some 1/16-in. lenses of clayey silt | 16 | 16 |
| 28.0 | 29.5 | | | | | |
| 31.0 | 33.5 | | | f and m sand | 12 | 12 |
| 35.0 | 36.5 | | ≥36.5 | f and m sand | 18 | 18 |
| | | | | **St. Francis Basin** | | |
| | | | | Boring log no. 268 | | |
| | | 0.0 | 8.0 | silty clay | | |
| | | 8.0 | 10.5 | silt | | |
| 11.0 | 12.5 | 10.5 | | f sand | 12 | 19–20 |
| 14.0 | 15.5 | | | f sand | 41 | 48–49 |
| 17.0 | 18.5 | | | m sand in upper 6 in., layers of f to m sand in lower 12 in. | 26 | 26 |
| 20.0 | 21.5 | | | m sand, with layers of 1/2-in.-thick f sand | 56 | 56 |
| 23.0 | 24.5 | | | m sand, with lenses of f sand | 26 | 26 |
| 26.0 | 27.5 | | | m sand with gravel | 30 | 30 |
| 29.0 | 30.5 | | | m sand with gravel | 67 | 67 |
| 32.0 | 33.5 | | ≥37.5 | m sand with gravel | 63 | 63 |
| | | | | Boring log no. 269 | | |
| | | 0.0 | 18.0 | silty clay | | |
| 18.0 | 19.5 | 18.0 | | f sand, with 6-in.-thick lenses of sandy silt | NA | NA |
| 21.0 | 22.5 | | | sandy silt | NA | NA |
| 24.0 | 25.5 | | | lost sample | NA | NA |
| 27.0 | 28.5 | | | sandy silt, with 6-in. lens of clay | NA | NA |
| 30.0 | 31.5 | | | silty sand | 24 | 31–32 |
| 33.0 | 34.5 | | | clayey silt with 6-in. lens of clay | NA | NA |
| 36.0 | 37.5 | | ≥37.5 | sandy silt | NA | NA |
| | | | | Boring log no. 270 | | |
| | | 0.0 | 9.0 | silty clay | | |
| | | 9.0 | 11.0 | sandy silt | | |
| 10.0 | 11.5 | 11.0 | 11.5 | lean clay | NA | NA |
| | | 11.5 | 12.0 | sandy silt | | |
| 12.0 | 13.5 | 12.0 | 13.5 | silty sand with very few thin clayey lenses | NA | NA |
| | | 13.5 | 15.5 | silty sand | | |
| 15.0 | 16.5 | 15.5 | 16.0 | f sand | 10 | 17–18 |
| 19.0 | 21.0 | 19.0 | 21.0 | f and m sand | 9 | 9 |
| 21.0 | 22.5 | 21.0 | 24.5 | f and m sand with very thin clay lenses | 16 | 16 |
| 24.0 | 25.5 | 24.5 | ≥25.5 | f sand | 16 | 23–24 |

[1]f, fine; m, medium.

[2]$N_1$ values are Standard Penetration Test (SPT) blow counts, adjusted for an overburden stress of 1 t/ft$^2$.

[3]Where applicable, $N_1$ values are adjusted to account for influence of sand grain size on liquefaction potential by adding 7 to 8 to values in adjoining column. Many of the sands classified in the field as being fine have an average diameter of about 0.25 mm, on the basis of laboratory sieve testing of the composite sample from the SPT sampling tube. The samples in situ are typically alternating thin layers of very fine and fine to medium sand. Thus, adding 7 to 8 to the $N_1$ values for the samples designated as fine sand is conservative for back-calculating the southern energy-release center accelerations.

Table 5 has $N_1$ values and $N_1$ adjusted values. (The $N_1$ adjusted values account for fineness of grain size on the SPT method for evaluating liquefaction potential.) $N_1$ adjusted values are set equal to $N_1$ plus 7 or 8 for silty sand or sand samples having an average diameter of 0.25 mm or less. Thus, back-calculated threshold accelerations for marginal liquefaction may be slightly too high, on the basis of the blow count data in table 5. At some of the borings, though, the topstratum is so thick as to have probably restricted, but not prevented, sand blow development. The absence of any sand blows near these borings does not mean that marginal liquefaction did not take place but rather that not much more than marginal liquefaction could have occurred. At these boring sites, earthquake accelerations determined by using the smallest $N_1$ adjusted values are probably maximum possible accelerations; actual accelerations were probably somewhat smaller. For calculations of accelerations, it is assumed that the December 16 earthquake had a $M_S$ value of about 8.5 (Nuttli, 1983).

Three of the borings in table 5 are between Marked Tree and Memphis, in the St. Francis Basin; these borings are about 40 km south of the energy-center line for the December 16 earthquake. The smallest $N_1$ values that are relatively commonplace are about 17 to 20. Using the chart in figure 13 to determine the cyclic stress ratio for a $M_S$ value of 8.5 and then calculating the acceleration from equation 2 yields a peak horizontal acceleration of about 0.18 *g*. Two borings in the Western Lowlands (see table 5), 45 and 52 km from the energy-center line, yield peak horizontal accelerations of about 0.19 *g*. Thirty-two km north of the energy-center line, the data yield 0.19 *g*; the borings north of the energy-center line are from sites where it was rather difficult to detect sand blow deposits because of the generally sandy texture of surface soils. Much less confidence can be associated with these accelerations. On the basis of data from south of the energy-center line and from the Western Lowlands Basin, it is very probable that at 40 to 45 km from the southern energy center the peak horizontal accelerations at the ground surface were less than 0.20 *g*.

## LOCAL GEOLOGIC CONTROLS ON SAND BLOW DEVELOPMENT

The influence of what the writer considers the principal geologic controls, the substratum grain size and topstratum thickness, has already been touched upon briefly throughout the previous analyses. This section has a more detailed discussion of these factors, as well as a discussion of the influence of the topographic setting.

### SUBSTRATUM GRAIN SIZE

Data concerning the substratum grain size in plate 6 show that the sands in the depths most susceptible to liquefaction during shaking are progressively finer from north to south in the braided-stream alluvium (from Region 2 to 3 to 4 and 5). Region 2 commonly has coarse to very coarse sand, whereas Regions 4 and 5 rarely have such coarse materials and are most commonly underlain by fine- or medium-sized sands. Considering grain size alone, in braided-stream alluvium the abundant, very coarse, clean sand layers in Region 2 would undoubtedly cause sand blow development to be much more difficult than in Region 3 and especially more difficult in Regions 4 and 5 because of the very high permeability of the coarse sands. The high permeability would permit such a rapid dissipation of high pore pressure that there would only be a very limited duration during which sand could be carried to the surface.

Region 1 is generally made up of fine- or medium-grained sands and thus should be more susceptible than Region 2. Region 10 is made up primarily of sand ranging from very fine to medium grain and should be highly susceptible. Region 7 is probably dominantly fine sand, highly susceptible.

In the meander belts, Regions 6 and 8 are both dominantly fine grained. Some of the very fine sands, especially those immediately beneath the topstratum, also have some silt and clay and thus some cohesion, which would make liquefaction more difficult. However, the meander belt also has abundant fine, clean sands that are very susceptible.

Considering only the influence of grain size of the substratum, Region 2 is the only widespread area where intense sand blow development would be difficult.

Illustrative that coarse-grained sands in the St. Francis Basin's braided-stream alluvium are typically subject to much lower sand blow intensity are field relations near Big Lake. Intensity and thickness of sand blows are significantly diminished in the lowest terrace just north of and around Big Lake. These sand blows are composed primarily of very coarse sand and some small gravel. The topstratum in these lowlands is significantly thinner than eastward where sand blow development is much more intense, and, as will be shown, this thinner topstratum could not have been responsible for the lower intensity in the lowlands.

### TOPSTRATUM THICKNESS AND TEXTURE

The influence of these parameters is examined first by comparison of sand blow intensities over the Regions of plate 3 and then by examination of factors that caused localized abrupt changes. Data for these comparisons are on plate 5, in the 15-minute engineering geology maps of the St. Francis Basin (Saucier, 1964) and in the 15-minute engineering geology maps of the Western Lowlands (Smith and Saucier, 1971). Unpublished data collected by Warren Farrell (U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Miss.) and by the writer are also used.

The southern half of Region 5 is an area of very widespread intensity of sand blow development. The topstratum is typically thin, about 2 to 3 m, very sandy, and the sands have sufficient fine-grained materials to make them much less permeable than the substratum sands. Region 1 also typically has a very thin sandy topstratum, less than 2 m, where sand blows are intensely developed.

Sand blows are also very intense in Region 4, northwest of Blytheville, Ark. The topstratum there is typically about 5 to 7 m and very clay rich. Braided-stream Regions 2 and 3 typically have a topstratum rich in clay but thinner than that of Region 4, so the lower sand blow intensities that generally prevail over the more northern regions cannot be attributed to an excessively thick topstratum. Certainly, rather localized areas in Regions 2 and 3 have intense sand blow development; the intense sand blow development near Parma, Mo., has taken place where the topstratum is generally less than 3 m thick, is sandy, and has large proportions of silt and clay.

The area in which sand blow development is generally lower in intensity, extending southwesterly from near Lilbourn, Mo., and approximately paralleling the large drainage ditches as far south as Kennett, Mo., frequently has a significantly thicker (4 to 6 m) and more clay-rich topstratum than adjoining areas north and west. Near Lilbourn, the thickness is commonly 6 to 7 m. Comparison of topstratum thicknesses and textures near Lilbourn with the area northwest of Blytheville illustrates that about 5 to 7 m of clay-rich topstratum is insufficient to prevent intense blow development but may well be an impediment.

A topstratum thickness exceeding 10 m probably presents a rather formidable barrier to intense sand blow development. In Regions 6 and 8, the topstratum is commonly 10 m thick in the swales of former stream channels, which are localized sites where sand blow development is of low intensity. Also supportive that a thicker than 10 m topstratum is of lower intensity in sand blow development are field and aerial photographic observations in the vicinity of Marked Tree. In the Oak Donnick, a lowland south of Marked Tree, sand blows are typically more intense than they are west and north of the Oak Donnick; sand blow development is also more intense in the Oak Donnick than to the east in the general vicinity of the Tyronza River. Topstratum thickness is typically 2 to 4 m in the Oak Donnick, whereas north and west it is 4 to 5 m, and in the vicinity of the Tyronza River it is about 10 m. Variation in water table depth between these locales was almost certainly insignificant at the time of the earthquakes.

In summary, the writer concludes that *intense* sand blow development can occur where the topstratum is less than 5 to 6 m thick, if the ground shaking is very severe. A topstratum thickness of 10 m or more is an impediment to severe sand blow development. Topstratum texture has little bearing on sand blow development, provided that sufficient silt or clay is present to make the topstratum significantly less permeable than the substratum. The topstratum thickness in the Western Lowlands is insufficient to have prevented intense sand blow development at most places for a severe earthquake whose epicenter was beneath or just west of these lowlands.

However, at localities near the border of sand blows, a topstratum thicker than 4 to 5 m probably restricted development of sand blows. As previously discussed, this is illustrated near Wilhelmena, Mo. A similar feature occurs near Trumann, Ark., where the topstratum is about 4 m thick. In a large ditch exposure about 5 km west of Trumann, the lower half of the topstratum is severely fractured and intruded with large sand dikes and lenses injected from beneath. However, adjoining fields have only a low intensity of sand blow development on the ground surface.

## TOPOGRAPHIC SETTING

In the meander belt, greatest sand blow and fissure development tends to follow the ridges in a point-bar and swale sequence. Typically these ridges are localities where the topstratum is thinnest.

Local relief on braided-stream alluvium is generally much less, and no association with local topography was observed. The sand blow intensity is much lower on some of the uppermost and oldest braided-stream terraces, such as those just east of Jonesboro, Ark., and on Sikeston Ridge, but unquestionably some if not most of this lower intensity is due to obscuring by active sand dunes or extremely sandy soils at the surface.

These uppermost terraces are also the oldest braided-stream terraces in the St. Francis Basin, which may make them more resistant to liquefaction. In meander-belt deposits, sand blows are typically much less intense in the older meander belts (see fig. 5) of the Mississippi River, but it is not obvious that age has any relation to liquefaction here because the older belts are rather far from the probable energy centers of the strongest earthquakes.

### FISSURES MAP

The fissures map (pl. 2) is first discussed for braided-stream and then for meander-belt alluvium, progressing from north to south.

At most places throughout the braided-stream terrane, there are no obvious local controls on the fissure orientation, but important factors probably include variations in topstratum thickness and orientation of the small-stream meanders. The greatest fissure intensity seems to be associated in a general way with topstratum thickness: a comparison of Regions 3, 4, 5, and 7 (see plates 2, 3, and 5) shows that the regions having the thinnest topstratum tend to have the most long fissures.

In the meander belt, the fissures obviously follow the orientation of the stream meanders at most places and have no preferred azimuth.

In summary, fissure orientations are generally controlled by the local geologic setting rather than by energy-center location. The intensity of fissuring is related to proximity of the energy center only in a very general way, with local geologic controls being more important.

## CONCLUSIONS

1. An analysis of remnant liquefaction effects indicates that the southern terminus of the energy-center zone for the December 16, 1811, earthquake is about 25 km north-northeast of Marked Tree, Ark., and trends northeastward approximately along the line of epicenters defined by modern seismicity.
2. The remnant liquefaction effects indicate that the energy-center zone for the February 7, 1812, earthquake is in the vicinity of the modern seismicity, near New Madrid, Mo.
3. Areas having greatest concentrations of sand blows generally lie near faults beneath semilithified sediments in the St. Francis Basin. An exception is the lack of sand blows near the fault close to Lilbourn, Mo. The distribution of sand blows also generally agrees well with epicenters of small, recent earthquakes.
4. The diminished intensity of sand blows between Sikeston Ridge and Crowley's Ridge appears to be due in part to the coarse grain size and thus high permeability of substratum sands and in part to a higher resistance to liquefaction of substratum sands (as reflected by higher SPT blow counts).
5. The localized high intensity of sand blows west of Catron, Mo., probably reflects a region that was subjected to unusually severe earthquake shaking. Part of this high intensity of sand blow development might also be related to an unusually thin alluvial cover.
6. Sand blows are often most intensely developed over large regions where the topstratum thickness is less than about 6 to 7 m thick; a thicker topstratum inhibits sand blow development, and intense sand blow development is greatly inhibited where the thickness exceeds 10 m.
7. The texture of the topstratum has little influence on sand blow intensity, provided that the topstratum is significantly less permeable than the underlying clean sands that liquefy during shaking.
8. The orientation and intensity of long fissures (greater than 0.8 km) are largely controlled by very localized geologic and topographic factors; in meander-belt and braided-stream alluvial deposits, where concentrations of fissures are greatest, the orientation is generally parallel to former stream channels and has no relation with the probable direction of shaking.
9. The Western Lowlands are generally as susceptible to liquefaction as the St. Francis Basin and during 1811–12 probably did not experience earthquake-induced maximum horizontal surface accelerations in excess of 0.20 *g*. In the St. Francis Basin, at the southern limit of sand blow development, this acceleration probably did not exceed 0.25 *g*. At the northern extremity of sand blow development, in braided-stream alluvium northwest of New Madrid, this acceleration probably did not exceed 0.25 *g*. These upper limit estimates are probably accurate within 25 percent and are based on the assumption that the earthquake surface wave magnitudes ($M_S$) were in the range of 8.5 to 8.75.

## SUGGESTIONS FOR FURTHER RESEARCH

1. Standard Penetration Test blow counts could be taken at individual sites of sand blows, near the border of sand blows, to back-calculate earthquake accelerations. For verification of acceleration calculations, undisturbed samples could be collected (such as by freezing samples in-place) and tested in a laboratory.
2. An intensive search could be made to locate and date pre-1811–12 earthquake-induced liquefaction features in the alluvial lowlands. At many places in the St. Francis Basin, in the Western Lowlands, and along the Obion River, this could be done easily. The search would largely involve looking in drainage ditches for buried and truncated sand blows and fissures. Sand blows at the surface should also be dated at many places.

3. An intensive search could be made to locate and date joints through Pleistocene loess in uplands surrounding the Mississippi Embayment. Loess in the uplands is almost always on lithified or semilithified sediments; therefore, where located away from landslide-prone slopes, the joints probably indicate the presence of deep-seated movements. The search could be made by examination of outcrops in stream valleys and recently exposed road cuts.

## APPENDIX B: SUMMARY OF GEOTECHNICAL CONTROLS OF SAND LIQUEFACTION

Following is a summation of the present knowledge of geotechnical factors that are primary controls of sand liquefaction on level ground during earthquake shaking.

*Relative density.*—The relative density has a profound influence on susceptibility to liquefaction (Lee and Seed, 1967; Castro and Poulos, 1977). A soil having a low relative density is very loose and thus very susceptible, and the resistance to liquefaction increases as the relative density increases.

Relative density is defined as:

$$Dr = \frac{(e_{\max} - e)}{(e_{\max} - e_{\min})} \times 100$$

in which $e$ is the in-situ void ratio and $e_{\max}$ and $e_{\min}$ are the maximum and minimum void ratios, respectively, measured by standardized laboratory techniques.

*Initial static confining and shear stresses.*—Increasing confining pressure increases the resistance to liquefaction. Thus on level ground the resistance increases with greater depth of burial and decreases as the water table approaches the ground surface. An increase in the ratio of lateral to vertical confining pressure (the ratio $K_o$) also increases resistance to liquefaction (Lee and Seed, 1967; Seed, 1979). Alternatively, an increase in the initial horizontal shear stress decreases the susceptibility (Seed, 1979; Vaid and Finn, 1979).

*Particle size, shape, and gradation.*—Generally, very fine grained sands, silty sands, and medium-grained sands are among the most susceptible to liquefaction, on the basis of field evidence (Shannon and Wilson, Inc., and Agbabian-Jacobsen Associates, 1972). Some silts are also susceptible, on the basis of earthquake studies by T.L. Youd (U.S. Geological Survey, written commun., 1982). Laboratory data indicate that coarser materials may be equally as susceptible during shaking (Martin and others, 1978), but, during and after shaking, excess pore water pressure in coarse materials usually dissipates very quickly (except where confined by impermeable layers), thus greatly decreasing the opportunity for sand and water to vent to the ground surface. Coarser material also acts as a filter hampering transport of finer materials. The gradation of sandy materials, as measured by the uniformity coefficient, has minor influence on the liquefaction potential (Tatsuoka and others, 1978).

Insensitive clays (clays that are not weakened greatly by remolding) are not susceptible to liquefaction (Shannon and Wilson, Inc., and Agbabian-Jacobsen Associates, 1972). Seed and others (1983) suggest that the only clays susceptible to liquefaction have the following characteristics:

| | |
|---|---|
| percent finer than 0.005 mm | $<15$ percent |
| liquid limit | $<35$ percent |
| water content | $>0.9 \times$ liquid limit |

*Particle arrangement.*—Laboratory studies have shown that the method of specimen preparation and soil structure can have a significant influence on liquefaction for a given relative density (Ladd, 1977). These studies suggest that the geologic mode of deposition and postdepositional disturbances such as previous earthquakes can be important factors.

*Sediment age.*—Laboratory studies on reconstituted samples have shown that increasing age from several minutes to hundreds of days significantly decreases susceptibility to liquefaction (Casagrande, 1976; Mulilis and others, 1977). Supporting field evidence on the scale of geologic time has been presented by Youd and Hoose (1977). Probably the increase in resistance is due to some form of cementation or bonding at the contacts between sand particles.

*Previous seismic history.*—Laboratory data on reconstituted sands show that seismic strains, representative of small earthquake shocks that do not cause liquefaction, can significantly increase the subsequent resistance to liquefaction of medium-loose (relative density of about 55 percent) laboratory-prepared sands, even though no significant densification has taken place (Seed and others, 1977). They suggest this effect may result from changes in the sand grain arrangement, or possibly from an increase in the lateral confining pressures. From a conceptual model of packing changes in sand caused by earthquake shaking and from laboratory test data reported by others, Youd (1977) concluded that (1) drained prestraining generally produces a packing in sandy materials that is more resistant to liquefaction than the original packing; (2) undrained prestraining, not producing liquefaction, with subsequent pore pressure relief also produces a more liquefaction-resistant packing than the original packing. Field studies examining the influence of previous small earthquake strains are nonexistent to this writer's knowledge.

Reliable field data that compare the liquefaction potential of natural sand deposits *before* and *after* a severe earthquake, where the sands liquefied, are very limited. Important factors, often not reported in "before" and "after" studies, include (1) the occurrence of a slope stability failure or a level ground failure and (2) the time elapsed after the earthquake when the "after" data were taken. This latter point is particularly important because water can ooze from the ground several days after the quake and temporarily cause the sand to be very weak (much weaker than before the earthquake). After several weeks, though, when the pore pressures have dissipated and the sand has settled and stabilized, it can be *much* stronger than before the earthquake (Kishida, 1970). The only "before" and "after" data for level ground considered reliable by the writer are for two severe earthquakes in Japan: the Niigata Earthquake of 1964 (Ohsaki, 1966; Koizumi, 1966) and the Tokachioki Earthquake of 1968 (Kishida, 1970; Ohsaki, 1970). Their data, in the form of Standard Penetration Test blow counts, were taken at sites having liquefaction, as indicated primarily by sand blows. Koizumi (1966) found that, "in general, dense sands expanded had lower blow counts after the earthquake and loose sands contracted had higher blow counts after the earthquake." Exceptions to this generalization commonly took place close to the ground surface (from the ground surface to a depth of 2 to 5 m), where some loose sand was further weakened. (Possibly this weakening was caused by the upward flow of water through the sandy soils close to the ground surface as the water moved upward from an underlying zone liquefied during shaking.) Loose sands in the liquefied zone often had major increases in resistance to liquefaction, whereas the dense sands experienced relatively minor loosening.

It is probable that the intensity of liquefaction has an important bearing on subsequent liquefaction potential. On the basis of the Niigata studies cited above and more recent field data and model studies by the Chinese (Wang, 1981), it must be concluded that there can be very significant changes in density and liquefaction potential at places where severe liquefaction effects are present. However, it seems probable that the density and hence liquefaction potential of Holocene (weakly cemented) sediments is not much changed by an earthquake event that marginally liquefied sediments. (This presumes that a few months to a year have lapsed since the earthquake.) Supportive of this thesis are data reported by Seed and others (1981), in which the liquefaction potential was evaluated at a site where sand blows were only marginally developed a few months previously. Seed and his co-workers used the Standard Penetration Test method to evaluate the liquefaction potential; using the postearthquake measurements as being equal to those for preearthquake conditions, they concluded that sand blows should have been weakly developed.

Obviously, insufficient field studies have been made to form precise conclusions about the ways in which earthquakes affect the liquefaction susceptibility to subsequent earthquakes. However, Standard Penetration Test data have proven to be adequate for regional assessments.

*Stratification or layering details.*—Limited laboratory research and few field studies have been made to evaluate the influence of stratification or layering details on liquefaction. Virtually all laboratory studies have been on relatively homogeneous and isotropic samples. The only field method commonly used for evaluating liquefaction potential, the Standard Penetration Test method, tests a rather large volume of sediment and thus is insensitive to thin zones of potentially highly liquefiable material. Casagrande (1976) suggested that large stress concentrations may be induced during shaking along the boundaries of material having different stress-strain properties and cause localized liquefaction. It is probable that a single thin, weak stratum may be important to slope stability during shaking but relatively unimportant to the development of significant sand blows.

*Permeability of sands in and above liquefied zone.*—The influence of permeability on liquefaction has only recently been the subject of theoretical research and laboratory studies (Seed and others, 1976a; Finn and others, 1977). An important theoretical conclusion is that for uniform, cohesionless soils having $D_{20}$ greater than 0.7 mm (medium-sized sand), it is impossible for the pore pressure to be equal to the confining pressure very shortly after shaking has stopped (Seed, 1979) because the rate of pore pressure dissipation keeps pace with the rate of pore pressure generation, due to earthquake shaking. It seems likely that materials coarser than medium to coarse sands should not have intense sand blow development. This is corroborated by somewhat limited field observations (Shannon and Wilson, Inc., and Agbabian-Jacobsen Associates, 1972).

Casagrande (1976) has suggested that it is probably difficult for sand blows to develop in thinly interbedded sand and gravel deposits because of rapid pore pressure dissipation in the gravels. He also suggests that sand blows are probably best developed where thick sand deposits exist.

Youd (written commun., 1981) has observed that flow is concentrated at perforations in the impermeable layers, and thus it would seem possible that an impermeable layer above a liquefied zone would enhance sand blow development.

*Deformation characteristics, cohesion, and thickness of soils above liquefied zone.*—The writer is not aware of any studies having been made concerning the influence of the characteristics listed above on sand blow development. It would seem, though, that sand blows would be well developed where blocks of cohesive, impermeable material extend to or just beneath the top of the zone liquefied during shaking. For this situation, Seed (1979) suggests that the fountain height of sand and water can approach the thickness of the layer above the zone liquefied during shaking. A very thick, nonliquefiable cap might well extend beyond the depth most prone to liquefaction and in this way limit sand blow development. The thickness of material above the liquefied zone is likely to have a pronounced influence on the volume of sand carried to the ground surface.

## APPENDIX C: SAND BLOW MAP AND CHARACTERISTICS OF SAND BLOWS

This discussion of the sand blow map (pl. 1) is followed by discussion of characteristics of sand blows for the area shown on plate 1.

### SAND BLOW MAP

The sand blow map (pl. 1) shows only areas where sand blows were identified with the 1935–41 vintage aerial photographs and were verified with field checks. The regional distribution of sand blows is discussed first for braided-stream deposits and then for meander-belt deposits and terraces along the Obion River.

#### BRAIDED-STREAM DEPOSITS

Dense forest cover precluded estimates of sand blow development over areas encompassing hundreds of square kilometers at some places, especially along the St. Francis River and around Big Lake. This is especially true for the area shown as the St. Francis-Tyronza area on figure 3; field checks verified that sand blow development here is typically quite intense and is more realistically depicted in figure 3.

Plate 1 shows large areas of intense sand blow development on braided-stream alluvium in Mississippi County, Mo., in contrast to figure 3. Sand blows in Mississippi County are typically not as intensely developed as they are southwest of Sikeston Ridge, but the numerous field examinations verified that they are nonetheless commonplace, widespread, and well developed. Some of the sand blows observed on the aerial photographs in Mississippi County probably originated during the 1895 earthquakes when, according to newspaper accounts (Powell, 1975), hundreds of sand blows up to 10 ft (3 m) in diameter and covering an area at least 1 mi$^2$ (2.5 km$^2$) were developed 3 mi (5 km) south of Bertrand. Many small sand blows are visible on the aerial photographs in this general vicinity.

In extreme southern Stoddard County, east of Malden and west of New Madrid, Mo., plate 1 shows that sand blows are present but not intensely developed. It is possible that sand blows are intensely developed locally but are not distinguishable because of the sandy soils and mima mounds. South of a line extending approximately from Catron to Peach Orchard, Mo., the soils at the ground surface have more clay, and the darker tonal background in the fields makes it easier to distinguish sand blows.

The town of Malden, Mo., is on a very sandy terrace that has many large, active sand dunes. On this terrace about as far south as Kennett, Mo., the writer considers it impossible to distinguish sand blows by using aerial photographs, and no sand blows were found in limited field examinations. Few field studies were made here because the active dunes made field verification nearly impossible.

In the general vicinity of Portageville-Wardell-Swift, Mo., some sand blows are quite smeared, as by running water; nonetheless, many sand blows and fissures are evident throughout the area.

South of Caruth, Mo., plate 1 shows limited sand blow development in the region adjoining the ditches (the parallel linear features that terminate at Big Lake and the regions adjoining Big Lake). It is readily obvious in the field that sand blows in these regions are neither as large nor as numerous or extensive as those on the adjacent, slightly higher terraces, especially south of Hornersville, Mo. The 1916 soil survey of Mississippi County, Ark. (Hall and others, 1916), which shows areas of intense sand blows, also shows the region around Big Lake to have fewer blows than the adjoining higher land. Certainly great numbers of medium-sized sand blows exist in these lowlands, however.

On the braided-stream terrace east, southeast, and south of Big Lake, sand blows are easily recognizable and intensely developed.

South of Roseland, Ark., a wide channelway is confined between manmade levees in which flowing water has obviously obscured intense development of sand blows and fissures. South of Dunklin County, Mo., and west of Monette, Ark., the westward extent of sand blows is approximately the first north-south scarp line east of Jonesboro (shown on pl. 1). Field studies verified that sand blows are numerous and intense at many places throughout this area west of Monette and north to the State line. This also agrees with Fuller's map (fig. 3).

South of Black Oak, Ark., in Craighead County, sand blows extend at least to the first scarp west of Black Oak (shown on pl. 1) and are intensely developed at many places. Farther south in Poinsett County, Ark., sand blows are present up to the same scarp. Because of the forest cover, plate 1 has limited information south and southwest of Marked Tree.

Braided-stream deposits east of the Mississippi River encompass only a relatively small area near the Obion and Forked Deer Rivers (fig. 5). Plate 1 shows that sand blows are quite intense near the Obion River, but southward the forest cover is so dense that the old aerial photographs are of little value.

### MEANDER-BELT DEPOSITS

Sand blow development is discussed for meander-belt deposits west, then east, of the Mississippi River. The discussion considers deposits in the northernmost areas and progresses sequentially southward.

Plate 1 shows that it is extremely difficult to impossible to observe sand blows in most meander-belt deposits in Mississippi County, Mo. The forest cover was dense at many places during the 1930's, and flooding since 1811–12 has deposited a thin veneer of alluvium over much of the area. However, on the basis of field observations, the writer suspects that sand blow intensity is quite high for much of this obscured region. The writer was present while land leveling was being done on a large field in this region, and many large sand blows were uncovered as an approximately 10-cm-thick layer of clayey silt was scraped from slightly elevated mounds. The mounds were obviously covered sand blows. In the western extremities of meander-belt deposits where flooding effects have been less severe, many sand blows are still observable.

In New Madrid County east of Sikeston Ridge (see figs. 1 and 5), flooding effects are more severe and have made it virtually impossible to find sand blows. West of Sikeston Ridge in New Madrid County, sand blows in the meander belt have commonly been obscured, probably by flowing water. Sand blow development west of the ridge is commonly intense.

Plate 1 shows that in Pemiscot County, Mo., sand blow development is typically intense in areas not highly obscured by effects of flooding, except along the easternmost extremities of the meander belt, south of Hayti to Brasher. The soils in these easternmost parts are commonly sandy, and the aerial photographs show a smearing pattern. It is likely that floodwaters have obscured an intense development of sand blows at many places. Sandy soils are characteristic of large areas in the western part of the meander belt, but intense development is still obvious here.

For Mississippi County, Ark., much of the meander belt has intense development. Numerous field checks were made to verify plate 1 in this region. The areas with lowest intensities are typically in the eastern parts, where the sandy soils and sedimentation and scouring from previous flooding probably obscure much of the development. Sand blows occur sporadically in the southern part of the county, irrespective of any obscuring effects.

For areas west and south of Mississippi County, Ark., the forest cover was so extensive that data for plate 1 are quite scattered.

Sand blows are also commonplace in the meander belt east of the Mississippi River. Plate 1 shows sand blows in extreme western Kentucky, but their presence was not verified in the field. At many places in Lake County, Tenn., the aerial photographic tones appear smeared, as if by running water, perhaps explaining the absence of sand blows at some places. In the meander belt in Dyer County, Tenn., sand blows have a lower intensity than in the braided-stream alluvium. It is probable, however, that this lower intensity results in part from flood obscuration. South of Dyer County, sand debouched from the Forked Deer River and flooding has completely covered the surface since 1811–12 and left no evidence of sand blows.

### OBION RIVER TERRACES

Large sand blows are present on Obion River terraces east of Lane, Tenn., and small sand blows are present at least 5 km east of Lane. Blowlike sand features appear far up the Obion River valley, but no field checks were made east of Sharps Ferry.

## SAND BLOW CHARACTERISTICS

More than 1,000 holes were hand augered, and many tens of pits were dug to verify sand blows and to examine their characteristics. The holes were augered with an orchard auger, which permitted relatively representative and unmixed samples to be taken. Most of the augered holes were made in the course of east-west traverses across the St. Francis Basin, spaced about 10 mi apart.

The average height and thickness of sand blows is about 1 m, with a circumference of about 30 m. The maximum thickness of ejected sand is about 2 m. Unusually thick and extensive sand deposits are present in the vicinity of Blytheville, Ark., and in the region near the border of Dunklin County, Mo., and Mississippi County, Ark., between Little River and the St. Francis River; vented sand in these regions is so thick that

*A*

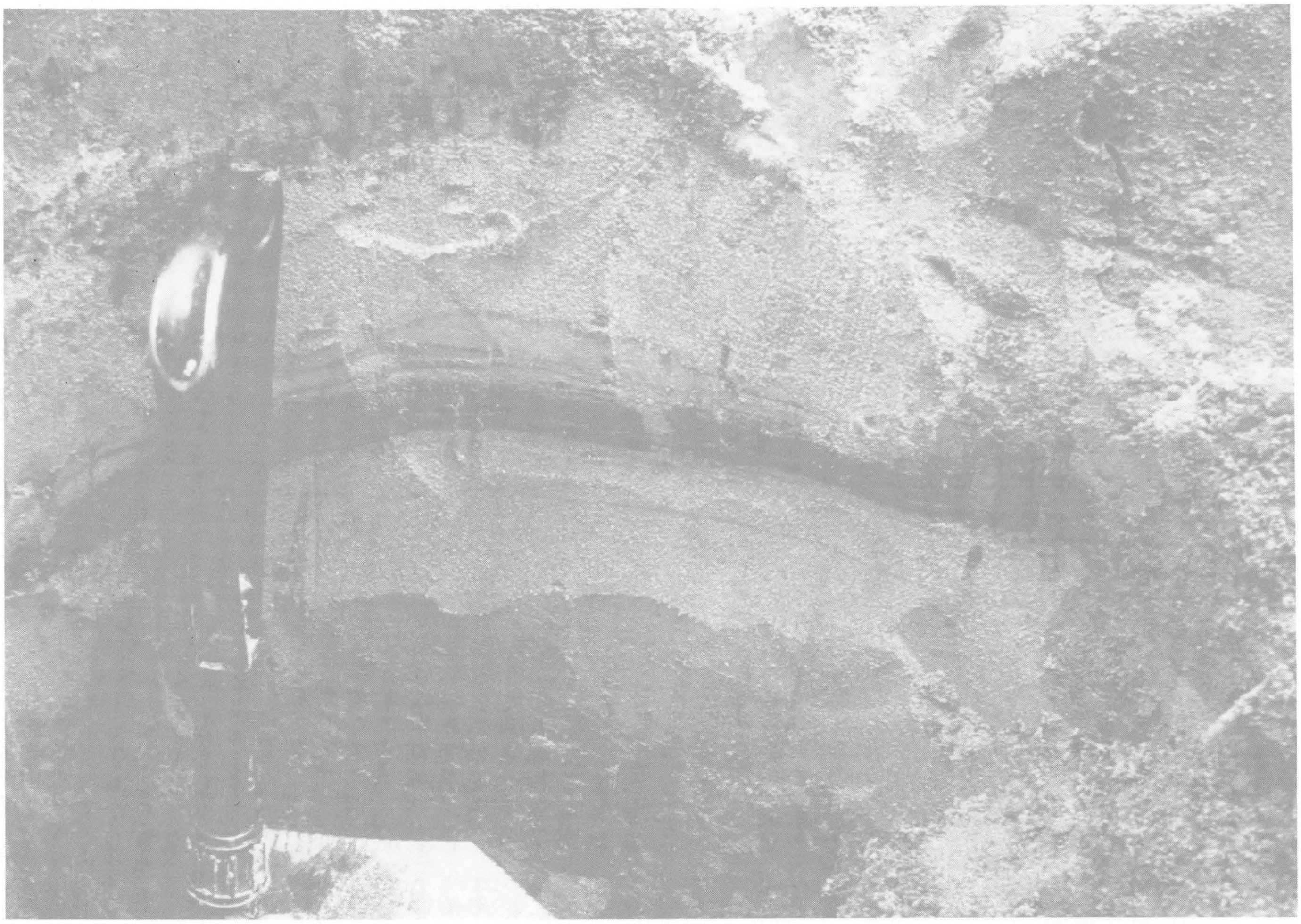
FIGURE C1.—Views of excavated sand blows showing multiple venting episodes (*A* and *B*) and fissure at the base of a sand blow (*C*). *A*, Near Reelfoot Lake, Tenn. White tabs show locations of organic-rich layers, which represent separate venting episodes of sand. *B*, Approximately midway between Charleston and East Prairie, Mo., showing at least two venting episodes of sand. *C*, Near Reelfoot Lake, Tenn., showing a fissure at the base of a sand blow.

either sand blows are so closely spaced that they have coalesced over large areas or else unusually large volumes of sand were vented from fissures. It is also likely that flowing water and wind action have reworked the upper 0.5 to 1 m of much of the vented sand; here there has been so much reworking that excavated pits are usually required for verification of sand blows.

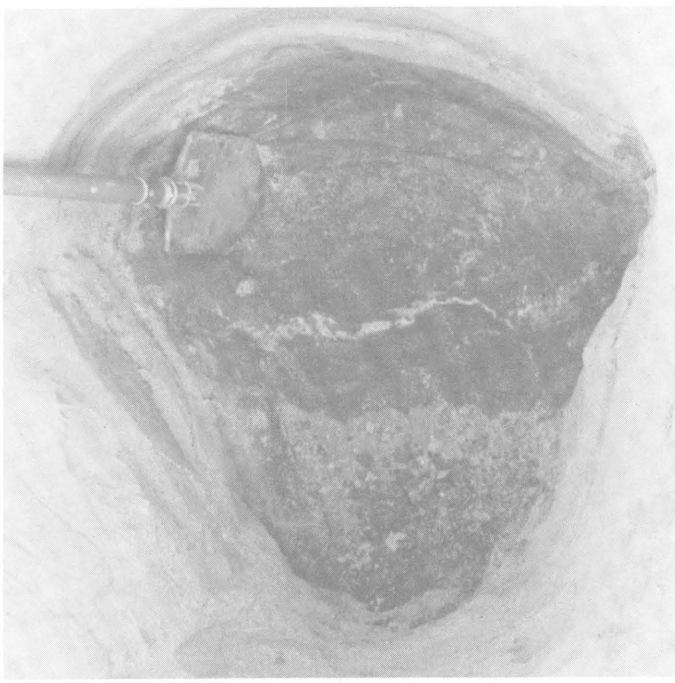
The thickness and diameter of sand blows tend to diminish as the percentage of ground covered by sand blows decreases. This is especially the case in the areas approximately south of Blytheville and in the northern extremities of the Lower Mississippi Valley between Sikeston Ridge and Crowley's Ridge. In these peripheral regions the thickness is commonly 0.4 m or less, which approaches the depth of plowing.

The sand blows are typically composed of two or more fining-upward sediment sequences, though as many as seven are present near Reelfoot Lake, Tenn. (fig. C1). The small blows typically have only one sequence. Fissures and vents through which the sand and water vented were found beneath some sand blows where pits were dug. The fissures are commonly less than 1 cm wide (fig. C1) and the vents several centimeters to 0.3 m wide.

Most often a sequence has the coarsest sands at the base, with the upper parts being very fine sand to clay-bearing and organic silt. The organic matter is made up of small pieces of coal or lignite and pieces of wood. In addition, a thin, 0.5- to 5-cm layer of debris is often between the lowermost vented sand and the top of the preearthquake sediment layer (usually the topstratum). This debris is dominantly plant matter and silty, very fine sand, which is covered by the vented sand. Some of the plant matter is wood that has been rounded by



*B*



*C*

stream action and thus probably came from the alluvial substratum. This layer of debris is often very decomposed, possibly because the topstratum impedes the downward flow of water and as a result makes a localized, seasonally perched water table having more optimal conditions for oxidation.

The sand at the base of a sequence is usually medium grained but can range from dominantly fine grained to coarse grained with some small gravels. An unusually large gravel, exceeding 3 cm in diameter, was incorporated in a coarse sand matrix in a sand blow near Tennemo, Tenn. The small sand blows in areas where sand blows are less abundant, approximately south of Blytheville, Ark., tend to be finer grained than most, with fine- to medium-grained sand at the base and with very fine sand and silt at the top. In contrast, the small sand blows between Sikeston Ridge and Crowley's Ridge tend to have medium- to coarse-grained sand at the base.

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# APPENDIX A

## APPENDIX A: FIELD AND LABORATORY DATA

This appendix contains boring logs of field data and field textural classifications, including laboratory texture data for some samples. Standard Penetration Test (SPT) blow counts are commonly presented for the coarse-grained (sandy) materials. In some cases office corrections have been made to the blow counts to account for the influence of the water table location and the overburden weight. These corrections are based on the assumption that the water table was at or near the ground surface when the 1811–12 earthquakes took place.

Almost all borings with SPT data are from tests by crews of the U.S. Army Corps of Engineers, Memphis District, Memphis, Tenn. In Missouri, some of the SPT data were taken by the Missouri State Highway Commission, Sikeston, Mo. SPT tests by these different agencies were conducted in basically the same manner, in that they used a rope and drop with two wraps of the rope around the drum to lift the drop hammer. Both agencies conducted the test using drilling mud in a hole 3 to 6 in. (8 to 15 cm) in diameter, NX rods, and a standard sampling tube. The penetration blow count was measured over the 6- to 18-in. (15.2 to 45.7 cm) range.

The boring number is indexed to a location shown on plate 3. At some places, other borings were made within several tens of meters, and these are designated on the logs by the lettered suffix.

The log for field boring typically notes the depth to the water table that was measured at the time the boring was made. The topstratum thickness noted on the log is an office interpretation by the writer of the thickness of the uppermost fine-grained alluvium overlying clean alluvial sand. Topstratum was considered to include all materials classified by the Unified Classification System as clays or silts, including sandy silts, because they were all considered to have cohesion sufficient to make them not susceptible or only very weakly susceptible to liquefaction, whereas clean sands can be quite susceptible. For some boring logs, two topstratum thicknesses are noted, with the second in parenthesis. This system was used where there are layers of liquefiable (coarse-grained) and nonliquefiable (fine-grained) alluvium. Such layered alluvium is commonly present in meander-belt deposits. The number in parenthesis is the depth to the bottom of the lowermost fine-grained alluvium. Where two thicknesses are cited, at least one layer of coarse-grained alluvium greater than 1.3 m thick is beneath the uppermost fine-grained layer and above the lowermost fine-grained alluvium.

The sample depth is shown on the log. The topstratum was usually sampled with a box auger, and the testing and sampling system was changed to the SPT method when coarse-grained alluvium was first encountered. The sample range was commonly 18 in. (45.7 cm) for the SPT method. The stratum depth is a field interpretation of the depths of fine-grained and coarse-grained layers of alluvium.

The classification and remarks column includes a field evaluation of the textural classification according to the Unified System and typically has comments about the grain size, color, and presence of organic matter, coal, wood, and lignite, and sometimes details of sediment layering. The Unified Classification uses letters that are abbreviations of certain soil characteristics, listed below:

| First letter | Second letter |
|---|---|
| G, gravel | W, well graded |
| S, sand | P, poorly graded |
| M, silt | M, silty |
| C, clay | C, clayey |
| O, organic | L, low plasticity |
| Pt, peat | H, high plasticity |

Colors are abbreviated as gr (gray), br (brown), and bl (black); hyphenation is used as a substitute for the word "to," and the symbol "&" is a substitute for the word "and." "Occ" is a contraction of occasional. Sands are usually described as c (coarse), m (medium), f (fine), or vf (very fine). Coarse sands range in size between the No. 4 to 10 sieves; medium sands range between the No. 10 to 40 sieves; and fine sands range between the No. 40 to 200 sieves. Sands described as very fine are a subjective subclassification of fine sand.

The N column presents the SPT blow counts; $C_N$ is the multiplication factor used to equate the blow counts to an effective overburden stress of 1 t/ft$^2$ (0.976 kg/cm$^2$) and $N_1$ is the product of N times $C_N$. The relation between $C_N$ and overburden pressure is shown in figure 11 and is the relation recommended by Seed (1979). A more recent relation, recommended by Seed and Idriss (1981), yields basically the same results for depths less than 10 m, which are the depths of major concern in the analyses in this paper.

A small proportion of the Army Corps of Engineers blow count data was collected over a 70-cm penetration interval and thus deviated from the conventional method. Borings made by using this technique are always cited, and the blow counts per 70-cm interval were halved to provide some measure of comparison with the conventional method.

In "Laboratory classification information" is included the laboratory textural classification, the sieve diameter in millimeters at which 50 percent by weight is finer ($D_{50}$), the diameter at which 10 percent by weight is finer ($D_{10}$), and the uniformity coefficient (Cu), which is the ratio of $D_{60}$ divided by $D_{10}$.

Borings with a suffix "G" (these follow log number 353) have the field evaluation of soil classification and some information about state of compactness.

FIELD BORING LOG NO. 1

Depth to water table (ft): 9.4 — Topstratum thickness (ft): 8

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 1.0 | 0.0 | 1.5 | CL, sandy clay, br | | | | | | | |
| 3.5 | 4.0 | 1.5 | 4.3 | SM, silty sand, br | | | | | | | |
| 5.0 | 6.5 | 4.3 | 8.0 | CL, sandy clay, moist, br-gr | 14 | | | | | | |
| 8.0 | 9.5 | 8.0 | | SP, f sand, moist, gr | 23 | 1.34 | 31 | f sand | 0.28 | 0.18 | 1.7 |
| 11.0 | 12.5 | | | SP, f sand, gr w/some coal | 27 | 1.24 | 34 | | | | |
| 14.0 | 15.5 | | | SP, vf sand, gr | 30 | 1.18 | 35 | f sand | 0.25 | 0.19 | 1.5 |
| 17.0 | 18.5 | | | SP, vf sand, gr | 45 | 1.11 | 50 | f sand | 0.23 | 0.16 | 1.6 |
| 20.0 | 21.5 | | | SP, vf sand, gr, w/some coal | 26 | 1.05 | 27 | | | | |
| 23.0 | 24.5 | | | SP, vf sand, gr, w/some coal; f gravel at 24.4 | 31 | 1.00 | 31 | | | | |
| 26.0 | 27.5 | | | SP, vf sand, gr | 34 | 0.95 | 32 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, vf sand, gr, w/some f gravel | 50 | 0.92 | 46 | | | | |

FIELD BORING LOG NO. 2

Depth to water table (ft): 7.8 — Topstratum thickness (ft): 8

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 1.0 | 0.0 | 1.0 | SM, silty sand, br | | | | | | | |
| 3.5 | 4.0 | 1.0 | | CL, sandy clay, br | | | | | | | |
| 5.0 | 6.5 | | 8.0 | CL, sand clay,, br, w/some ironstone | 6 | | | | | | |
| 8.0 | 9.5 | 8.0 | | SM, silty vf sand, gr | 2 | 1.40 | 3 | | | | |
| 11.0 | 12.5 | | | SP, vf sand, gr | 29 | 1.28 | 37 | f sand | 0.20 | 0.14 | 1.6 |
| 14.0 | 15.5 | | | SP, vf sand, gr | 30 | 1.20 | 36 | | | | |
| 17.0 | 18.5 | | | SP, f sand, gr, w/some coal | 17 | 1.16 | 20 | f sand | 0.31 | 0.18 | 1.9 |
| 20.0 | 21.5 | | | SP, f sand, gr, w/some f gravel | 30 | 1.08 | 32 | | | | |
| 23.0 | 24.5 | | | SP, f to m sand, gr, w/some f gravel | 43 | 1.04 | 45 | | | | |
| 26.0 | 27.5 | | | SP, f to m sand, gr, w/some f gravel | 70 | 0.97 | 68 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand, gr | 38 | 0.93 | 35 | | | | |

FIELD BORING LOG NO. 3

Depth to water table (ft): 12.1 — Topstratum thickness (ft): 1

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 1.0 | 0.0 | 1.0 | SC, clayey f sand, br, moist | | | | | | | |
| 3.5 | 4.0 | 1.0 | | SM, silty f sand, br, moist | | | | | | | |
| 5.0 | 6.5 | | | SM, silty f sand, br, dry | 23 | >1.40 | >32 | | | | |
| 8.0 | 9.5 | | 10.5 | SM, silty f sand, br, moist | 16 | 1.33 | 21 | | | | |
| 11.0 | 12.5 | 10.5 | 12.0 | CL, sandy clay, br-gr | 6 | | | | | | |
| 14.0 | 15.5 | 12.0 | | SP, vf sand, gr, w/coal at 15.2-15.3 | 12 | 1.11 | 13 | f sand | 0.17 | 0.094 | 2.0 |
| 17.0 | 18.5 | | | SP, vf sand, gr, w/occ. thin silt buses | 18 | 1.06 | 19 | f sand | 0.19 | 0.078 | 2.8 |
| 20.0 | 21.5 | | | SP, vf sand, gr, w/occ. thin coal lenses | 36 | 1.00 | 36 | | | | |
| 23.0 | 24.5 | | | SP, vf sand, gr, w/occ. thin coal lenses | 28 | 0.96 | 27 | | | | |
| 26.0 | 27.5 | | | SP, f to m sand, gr, w/some f gravel | 45 | 0.92 | 41 | f sand | 0.42 | 0.19 | 2.4 |
| 29.0 | 30.5 | | ≥30.5 | SP, f to m sand, gr | 41 | 0.88 | 36 | f sand | 0.32 | 0.16 | 2.4 |

FIELD BORING LOG NO. 4

Depth to water table (ft): 8.5 — Topstratum thickness (ft): 8

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 1.0 | 0.0 | 1.0 | SC, clayey sand, br | | | | | | | |
| 3.5 | 4.0 | 1.0 | | CL, sandy clay, br-gr | | | | | | | |
| 5.0 | 6.5 | | 7.8 | CL, sandy clay, br-gr | 12 | | | | | | |
| 8.0 | 9.5 | 7.8 | 12.1 | SM, silty sand, br-gr | 9 | 1.34 | 12 | | | | |
| 11.0 | 12.5 | 12.1 | | SP, f sand, gr | 18 | 1.26 | 23 | f sand | 0.20 | 0.12 | 1.8 |
| 14.0 | 15.5 | | | SP, f sand, gr | 34 | 1.18 | 40 | | | | |
| 17.0 | 18.5 | | | SP, f sand, gr, w/some coal lenses | 33 | 1.12 | 37 | f sand | 0.32 | 0.19 | 1.8 |
| 20.0 | 21.5 | | | SP, f sand, gr, w/some coal lenses | 29 | 1.06 | 31 | | | | |
| 23.0 | 24.5 | | | SP, f to m sand, gr, w/some f gravel | 36 | 1.03 | 37 | f sand | 0.42 | 0.19 | 2.6 |
| 26.0 | 27.5 | | | SP, f sand, gr | 36 | 0.96 | 35 | f sand | 0.32 | 0.15 | 2.5 |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand, gr | 46 | 0.93 | 43 | | | | |

FIELD BORING LOG NO. 5

Depth to water table (ft): 10.1 — Topstratum thickness (ft): 8.5

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 1.0 | 0.0 | | CL, sandy clay, br | | | | | | | |
| 3.5 | 4.0 | | | CL, sandy clay, br | | | | | | | |
| 5.0 | 6.5 | | 8.5 | CL, sandy clay, br | 9 | | | | | | |
| 8.0 | 9.5 | 8.5 | | SM, silty f sand, br-gr | 10 | 1.32 | 13 | | | | |
| 11.0 | 12.5 | | | SM, silty f sand, gr, w/occ thin clay lenses | 11 | 1.22 | 13 | | | | |
| 14.0 | 15.5 | | 15.5 | SM, silty f sand, gr, w/occ thin clay lenses | 5 | 1.16 | 6 | | | | |
| 17.0 | 18.5 | 15.3 | | SP, f sand, gr | 25 | 1.10 | 27 | f sand | 0.30 | 0.18 | 1.9 |
| 20.0 | 21.5 | | | SP, f sand, gr, w/occ coal lenses | 30 | 1.06 | 32 | | | | |
| 23.0 | 24.5 | | | SP, f sand, gr, w/some f gravel | 44 | 0.99 | 44 | f sand | 0.39 | 0.23 | 1.9 |
| 26.0 | 27.5 | | | SP, f sand, gr | 35 | 0.94 | 33 | f sand | 0.26 | 0.18 | 1.7 |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand, gr | 49 | 0.91 | 45 | | | | |

FIELD BORING LOG NO. 6

Depth to water table (ft): 11.5 — Topstratum thickness (ft): 4

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 1.0 | 0.0 | 1.0 | SC, clayey sand, br | | | | | | | |
| 3.5 | 4.0 | 1.0 | 5.2 | CL, sandy clay, br-gr | | | | | | | |
| 5.0 | 6.5 | 5.2 | 8.0 | SM, silty sand, br-gr | 8 | ≥1.40 | ≥12 | f sand | 0.23 | 0.13 | 2.1 |
| 8.0 | 9.5 | 8.0 | | SP, f sand, moist, br | 5 | 1.36 | 7 | | | | |
| 11.0 | 12.5 | | 14.0 | SP, f sand, br-gr, w/cbol & clay lenses | 6 | 1.21 | 7 | | | | |
| 14.0 | 15.5 | 14.0 | 15.1 | SC, clayey sand, br-gr | 11 | | | | | | |
| 17.0 | 18.5 | 15.1 | 17.4 | SM, silty f sand, w/thin clay lenses | 23 | 1.08 | 25 | f sand | 0.18 | 0.085 | 2.5 |
| 20.0 | 21.5 | 17.4 | | SP, f sand, gr, w/occ coal lenses | 31 | 1.03 | 32 | f sand | 0.34 | 0.15 | 2.7 |
| 23.0 | 24.5 | | | SP, f sand, gr, w/coal at 24.2-24.4 | 32 | 0.97 | 31 | f sand | 0.33 | 0.17 | 2.2 |
| 26.0 | 27.5 | | | SP, f sand, gr, w/some fine gravel | 47 | 0.94 | 44 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand, gr | NA | | | | | | |

FIELD BORING LOG NO. 7

Depth to water table (ft): 12.6 — Topstratum thickness (ft): 1

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 1.0 | 0.0 | 1.0 | CH, clay, br | | | | | | | |
| 3.5 | 4.0 | 1.0 | 5.1 | SM, silty sand, br | | | | | | | |
| 5.0 | | 5.1 | 6.3 | SP, f sand, moist, br | 6 | >1.4 | >8 | | | | |
| | 6.5 | 6.3 | 8.3 | SC, clayey f sand, moist, br | | | | | | | |
| 8.0 | 9.5 | 8.3 | 11.1 | SP, f sand, moist, br | 8 | 1.36 | 11 | | | | |
| 11.0 | 12.5 | 11.1 | 12.5 | CL, sandy clay, br | 6 | | | | | | |
| 14.0 | | 12.5 | 14.3 | SM, silty f sand, br | | | | | | | |
| | 15.5 | 14.3 | 15.1 | CL, sandy clay, br | 8 | | | | | | |
| 17.0 | | 15.1 | 17.0 | SM, silty f sand, br | | | | | | | |
| | 18.5 | 17.0 | 17.6 | CL, sandy clay, gr | 22 | | | | | | |
| 20.0 | 21.5 | 17.6 | | SP, f sand, gr, w/coal at 21.3-21.5 | 13 | 1.00 | 13 | f sand | 0.38 | 0.20 | 2.1 |
| 23.0 | 24.5 | | | SP, f sand, gr | 8 | 0.96 | 8 | | | | |
| 26.0 | 27.5 | | | SP, f to m sand, gr, w/some coal | 7 | 0.93 | 7 | | | | |
| 29.0 | 30.5 | | >30.5 | SP, f to m sand, gr, w/some coal | 16 | 0.90 | 14 | | | | |

FIELD BORING LOG NO. 8

Depth to water table (ft): 10.4 — Topstratum thickness (ft): 11

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 1.0 | 0.0 | | SC, clayey sand, br | | | | | | | |
| 3.5 | 4.0 | | 5.0 | SC, clayey sand, br | | | | | | | |
| 5.0 | 6.5 | 5.0 | 8.0 | CH, clay, br | 10 | | | | | | |
| 8.0 | 9.5 | 8.0 | 11.0 | CL, silty clay, br, moist | 8 | | | | | | |
| 11.0 | 12.5 | 11.0 | | SP, f sand, br-gr | 34 | 1.20 | 41 | f sand | 0.32 | 0.19 | 2.0 |
| 14.0 | 15.5 | | | SP, f sand, gr w/some coal | 14 | 1.13 | 16 | | | | |
| 17.0 | 18.5 | | | SP, f sand, gr | 7 | 1.08 | 8 | f sand | 0.31 | 0.18 | 1.9 |
| 20.0 | 21.5 | | | SP, f to m sand, gr | 39 | 1.04 | 41 | m sand | 0.47 | 0.25 | 2.0 |
| 23.0 | 24.5 | | | SP, f to m sand, gr w/some coal | 52 | 0.98 | 51 | | | | |
| 26.0 | 27.5 | | | SP, f to m sand, gr | 38 | 0.94 | 36 | f sand | 0.26 | 0.18 | 1.6 |
| 29.0 | 30.5 | | ≥30.5 | SP, m sand, gr, w/some coal and f gravel | 22 | 0.91 | 20 | m sand | 0.57 | 0.21 | 3.2 |

FIELD BORING LOG NO. 9

Depth to water table (ft) 7.6 — Topstratum thickness (ft) 8 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 1.0 | 0.0 | | CH, clay, br | | | | | | | |
| 3.5 | 4.0 | | 5.1 | CH, clay, br | | | | | | | |
| 5.0 | 6.5 | 5.1 | 8.0 | SC, clayey sand, br w/some coal | 4 | | | | | | |
| 8.0 | 9.5 | 8.0 | | SP, fine sand, gr | 11 | 1.40 | 15 | f sand | 0.28 | 0.15 | 2.1 |
| 11.0 | 12.5 | | | SP, fine sand, gr | 25 | 1.28 | 32 | | | | |
| 14.0 | 15.5 | | | SP, fine sand, gr | 14 | 1.20 | 17 | | | | |
| 17.0 | 18.5 | | | SP, fine sand, gr | 9 | 1.14 | 10 | f sand | 0.30 | 0.16 | 2.2 |
| 20.0 | 21.5 | | | SP, f to m sand, gr | 20 | 1.08 | 22 | f sand | 0.42 | 0.24 | 2.0 |
| 23.0 | 24.5 | | | SP, f to m sand, gr w/some coal | 17 | 1.02 | 17 | | | | |
| 26.0 | 27.5 | | | SP, f sand, gr | 10 | 0.98 | 9 | f sand | 0.31 | 0.18 | 1.9 |
| 29.0 | 30.5 | | ≥30.5 | SP, f to m sand, gr w/some f gravel | 6 | 0.94 | 6 | | | | |

FIELD BORING LOG NO. 10

Depth to water table (ft) 7.8 — Topstratum thickness (ft) 8 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 1.0 | 0.0 | | CL, sandy clay, br | | | | | | | |
| 3.5 | 4.0 | | 5.3 | CL, sandy clay, br | | | | | | | |
| 5.0 | 6.5 | 5.3 | 8.0 | SC, clayey f sand, br-gr, wet | 5 | | | | | | |
| 8.0 | 9.5 | 8.0 | | SP, f sand, gr, some coal at 8.1 | 11 | 1.40 | 15 | | | | |
| 11.0 | 12.5 | | | SP, f sand, gr, some coal at 12.2 | 16 | 1.28 | 20 | f sand | 0.23 | 0.17 | 1.5 |
| 14.0 | 15.5 | | | SP, f sand, gr, coal at 15.2-15.3 | 17 | 1.21 | 21 | | | | |
| 17.0 | 18.5 | | | SP, f to m sand, gr, w/f gravel at 18.1-18.2 | 31 | 1.13 | 35 | f sand | 0.42 | 0.19 | 2.6 |
| 20.0 | 21.5 | | | SP, f to m sand, gr, some f gravel | 22 | 1.08 | 24 | f sand | 0.41 | 0.19 | 2.5 |
| 23.0 | 24.5 | | | SP, f to m sand, gr, some f gravel | 39 | 1.03 | 40 | m sand | 0.50 | 0.14 | 4.1 |
| 26.0 | 27.5 | | | SP, f to m sand, gr | 46 | 0.98 | 45 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f to m sand, gr | 39 | 0.94 | 37 | m sand | 0.42 | 0.21 | 2.3 |

FIELD BORING LOG NO. 11

Depth to water table (ft) 7.6 — Topstratum thickness (ft) 8 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 1.0 | 0.0 | 1.0 | SC, clayey sand, br | | | | | | | |
| 3.5 | 4.0 | 1.0 | | CL, sandy clay, br, moist | | | | | | | |
| 5.0 | 6.5 | | 7.6 | CL, sandy clay, br, moist | 6 | | | | | | |
| 8.0 | 9.5 | 7.6 | | SP, f sand, br-gr, some coal at 8.3 | 17 | 1.40 | 24 | | | | |
| 11.0 | 12.5 | | | SP, f sand, gr | 24 | 1.29 | 31 | f sand | 0.23 | 0.12 | 2.2 |
| 14.0 | 15.5 | | | SP, f sand, gr, w/coal at 15.2-15.3 | 14 | 1.20 | 17 | | | | |
| 17.0 | 18.5 | | | SP, f sand, gr, w/some coal and clay lenses at 17.2-17.4 | 21 | 1.13 | 24 | | | | |
| 20.0 | 21.5 | | | SP, f sand, gr | 32 | 1.08 | 34 | f sand | 0.30 | 0.18 | 1.8 |
| 23.0 | 24.5 | | | SP, f to m sand, gr, w/some f gravel | 14 | 1.03 | 14 | | | | |
| 26.0 | 27.5 | | | SP, f to m sand, gr | 22 | 0.98 | 22 | f sand | 0.41 | 0.18 | 2.6 |
| 29.0 | 30.5 | | ≥30.5 | SP, f to m sand, gr | 16 | 0.94 | 15 | | | | |

FIELD BORING LOG NO. 12

Depth to water table (ft) 7.0 — Topstratum thickness (ft) 7.5 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 1.0 | 0.0 | 2.5 | CL, sandy clay, br | | | | | | | |
| 3.5 | 4.0 | 2.5 | 5.0 | SM, silty f sand, br, moist | | | | | | | |
| 5.0 | 6.5 | 5.0 | 7.5 | SC, clayey sand, wet | 14 | | | | | | |
| 8.0 | 9.5 | 7.5 | | SP, f sand, gr-br, w/thin silt lenses at 9.3 | 5 | 1.40 | 7 | f sand | 0.23 | 0.12 | 2.2 |
| 11.0 | 12.5 | | | SP, f sand, gr-br, w/some coal | 21 | 1.28 | 25 | | | | |
| 14.0 | 15.5 | | | SP, f sand, gr-br | 30 | 1.22 | 37 | | | | |
| 17.0 | 18.5 | | | SP, v f sand, gr | 21 | 1.14 | 24 | | | | |
| 20.0 | 21.5 | | | SP, f to m sand, gr, w/occ f gravel | 49 | 1.08 | 53 | f sand | 0.35 | 0.19 | 2.0 |
| 23.0 | 24.5 | | | SP, f to m sand, gr, w/occ f gravel | 44 | 1.03 | 45 | | | | |
| 26.0 | 27.5 | | | SP, f to m sand, gr | 58 | 0.97 | 56 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f to m sand, gr, w/coal at 29.4-29.8 | 32 | 0.94 | 30 | | | | |

FIELD BORING LOG NO. 13

Depth to water table (ft) 9.3 — Topstratum thickness (ft) 7 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 1.0 | 0.0 | 1.0 | SC, clayey sand, br, moist | | | | | | | |
| 3.5 | 4.0 | 1.0 | | CL, sandy clay, br, moist | | | | | | | |
| 5.0 | 6.5 | | 7.0 | CL, sandy clay, br, moist | 6 | | | | | | |
| 8.0 | 9.5 | 7.0 | | SP, f sand, br, wet | 17 | 1.34 | 23 | | | | |
| 11.0 | 12.5 | | | SP, f sand, gr, w/some f gravel at 12.3 | 12 | 1.26 | 16 | f sand | 0.31 | 0.20 | 1.9 |
| 14.0 | 15.5 | | | SP, f sand, gr | 24 | 1.19 | 29 | | | | |
| 17.0 | 18.5 | | | SP, f sand, gr, w/thin clay lens at 17.3 | 16 | 1.12 | 18 | | | | |
| 20.0 | 21.5 | | | CH, clay, gr, w/silty lenses | 14 | 1.06 | 15 | | | | |
| 23.0 | 24.5 | | | SP, f sand, gr | 38 | 1.01 | 38 | | | | |
| 26.0 | 27.5 | | | SP, f sand, gr, w/occ thin coal lens | 34 | 0.96 | 33 | silty sand | 0.175 | 0.13 | 1.5 |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand, gr | 25 | 0.92 | 23 | | | | |

FEILD BORING LOG No. 14

Depth to water table (ft) 7.8 — Topstratum thickness (ft) 8 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 1.0 | 0.0 | 1.0 | SM, silty f snd, br, moist | | | | | | | |
| 3.5 | 4.0 | 1.0 | | CL, sandy clay, br | | | | | | | |
| 5.0 | 6.5 | | 7.8 | CL, sandy clay, br | 7 | | | | | | |
| 8.9 | | 7.8 | 8.9 | SP, f sand, br, w/thin clay lenses | 10 | 1.40 | 14 | | | | |
| | 9.5 | 8.9 | | SP, f sand, gr | NA | | | | | | |
| 11.0 | 12.5 | | | SP, f sand, gr | 33 | 1.28 | 42 | f sand | 0.165 | 0.11 | 1.6 |
| 14.0 | 15.5 | | | SP, f sand, gr, w/some coal at 14.2 | 30 | 1.20 | 36 | | | | |
| 17.0 | 18.5 | | | SP, f sand, gr | 18 | 1.14 | 21 | f sand | 0.26 | 0.16 | 1.7 |
| 20.0 | 21.5 | | | SP, f to m sand, gr | 14 | 1.09 | 15 | | | | |
| 23.0 | 24.5 | | | SP, f to m sand, gr, w/some f gravel at 23.2-23.8 | 48 | 1.03 | 49 | f sand | 0.41 | 0.22 | 2.1 |
| 26.0 | 27.5 | | | SP, f sand, gr, w/coal lens at 27.3 | 29 | 0.98 | 28 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand, gr | 51 | 0.94 | 48 | | | | |

FIELD BORING LOG NO. 15

Depth to water table (ft) 11.2 — Topstratum thickness (ft) 8 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 1.0 | 0.0 | | SM, silty f sand, br, moist | | | | | | | |
| 3.5 | 4.0 | | 5.0 | SM, silty f sand, br, moist | | | | | | | |
| 5.0 | 6.5 | 5.0 | 8.0 | SC, clayey f sand, br, w/silty clay lenses | 3 | | | | | | |
| 8.0 | 9.5 | 8.0 | | SM, silty f sand, wet, br | 10 | 1.34 | 13 | | | | |
| 11.0 | 12.5 | | 14.0 | SM, silty f sand, wet, gr | 14 | 1.21 | 17 | | | | |
| 14.0 | 15.5 | 14.0 | | SP, f sand, br | 18 | 1.12 | 20 | | | | |
| 17.0 | 18.5 | | | SP, f sand, gr | 29 | 1.08 | 31 | f sand | 0.30 | 0.16 | 2.1 |
| 20.0 | 21.5 | | | SP, f sand, gr | 18 | 1.02 | 18 | | | | |
| 23.0 | 24.5 | | | SP, f sand, gr, w/thin silty lens at 24.0 | 14 | 0.98 | 14 | | | | |
| 26.0 | 27.5 | | | SP, f to m sand, gr | 54 | 0.93 | 50 | f sand | 0.35 | 0.17 | 2.4 |
| 29.0 | 30.5 | | ≥30.5 | SP, f to m sand, gr, w/occ coarse sand lenses | 39 | 0.90 | 35 | | | | |

FIELD BORING LOG NO. 16

Depth to water table (ft) 7.5 — Topstratum thickness (ft) 10 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 6.0 | silty clay, br | | | | | | | |
| | | 6.0 | 10.0 | silty sand, gr, | | | | f sand | 0.25 | 0.04 | 6.7 |
| 10.0 | 12.0 | 10.0 | | f sand, gr | 16 | | | f sand | 0.32 | 0.18 | 2.1 |
| 12.5 | 14.5 | | | f sand, gr | 20 | | | f sand | 0.32 | 0.20 | 1.7 |
| 15.0 | 17.0 | | | f sand, gr | 23 | | | | | | |
| 17.5 | 19.5 | | | f sand, gr | 20 | | | | | | |
| 20.0 | 22.5 | | | m sand, gr | 21 | | | m sand | 0.46 | 0.27 | 1.8 |
| 22.5 | 24.5 | | | m sand, gr | 17 | | | | | | |
| 25.5 | 27.5 | | | m sand, gr | 18 | | | | | | |
| 28.0 | 30.0 | | | m sand, gr | 20 | | | m sand | 0.50 | 0.28 | 2.0 |
| 30.5 | 32.5 | | | m sand, gr | 24 | | | | | | |
| 33.0 | 35.0 | | | f sand, gr | 17 | | | | | | |
| 35.5 | 37.5 | | | f sand, gr | 16 | | | | | | |

FIELD BORING LOG NO. 16 --Continued

Depth to water table (ft) 7.5 Topstratum thickness (ft) 10

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 38.0 | 40.0 | | | f sand, gr | 19 | | | f sand | 0.22 | 0.13 | 1.9 |
| 40.5 | 42.5 | | | f sand, gr | 17 | | | | | | |
| 43.0 | 45.0 | | | f sand, gr | 17 | | | | | | |
| 45.5 | 47.5 | | | f sand, gr | 17 | | | | | | |
| 48.0 | 50.0 | | | f sand, gr | 18 | | | | | | |
| 50.0 | 52.5 | | | f sand, gr | 21 | | | | | | |
| 52.5 | 54.5 | | | f sand, gr | 30 | | | | | | |
| 55.0 | 57.0 | | | f sand, gr | 30 | | | f sand | 0.23 | 0.16 | 1.7 |
| 57.5 | 59.5 | | | m sand, gr | 33 | | | | | | |
| 60.0 | 62.0 | | | m sand, gr | 37 | | | m sand | 0.45 | 0.19 | 2.6 |
| 62.5 | 64.5 | | | m sand, gr | 35 | | | m sand | 0.61 | 0.27 | 2.6 |
| 65.0 | 67.0 | | | m sand, gr | 36 | | | | | | |

FIELD BORING LOG NO. 17

Depth to water table (ft) 5.0 Topstratum thickness (ft) 6

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 2.5 | clayey sand, br | | | | | | | |
| | | 2.5 | 5.0 | sandy clay, gr-br | | | | | | | |
| | | 5.0 | 6.0 | clayey sand, gr-br | | | | | | | |
| | | 6.0 | 8.0 | silty sand, gr-br | NA | | | f sand | 0.23 | 0.16 | 1.6 |
| 9.0 | 11.0 | 8.0 | | f sand, gr | 19 | | | | | | |
| 12.0 | 14.0 | | | f sand, gr | 21 | | | f sand | 0.35 | 0.20 | 1.8 |
| 15.0 | 17.0 | | | f sand, gr | 23 | | | | | | |
| 17.5 | 19.5 | | | f sand, gr | 20 | | | | | | |
| 20.0 | 22.5 | | | f sand, gr | 18 | | | | | | |
| 22.5 | 24.5 | | | f sand, gr | 19 | | | | | | |
| 25.0 | 27.0 | | | f sand, gr | 15 | | | | | | |
| 27.5 | 29.5 | | | f sand, gr | 19 | | | | | | |
| 30.0 | 32.0 | | | f sand, gr | 19 | | | | | | |
| 32.5 | 34.5 | | | f sand, gr | 15 | | | silty sand | 0.12 | 0.035 | 3.7 |
| 35.0 | 37.0 | | | m sand, gr | 19 | | | | | | |
| 37.5 | 39.5 | | | m sand, gr | 23 | | | | | | |
| 40.0 | 42.0 | | | m sand, gr | 20 | | | | | | |
| 42.5 | 44.5 | | | m sand, gr | 21 | | | m sand | 0.65 | 0.19 | 4.2 |
| 45.0 | 47.0 | | | m sand, gr | 23 | | | | | | |
| 47.5 | 49.5 | | | m sand, gr | 26 | | | | | | |
| 50.0 | 52.0 | | | m sand, gr | 24 | | | | | | |
| 52.5 | 54.5 | | | m sand, gr | 26 | | | | | | |
| 55.0 | 57.0 | | | m sand, gr | 31 | | | | | | |
| 57.5 | 59.5 | | | m sand, gr | 34 | | | | | | |
| 60.0 | 62.0 | | | m sand, gr | 30 | | | | | | |
| 62.5 | 64.5 | | | m sand, gr | 42 | | | m sand | 0.81 | 0.41 | 2.3 |
| 65.0 | 67.0 | | | m sand, gr | 37 | | | | | | |
| 67.5 | 69.5 | | | m sand, gr | 40 | | | | | | |
| 70.0 | 72.0 | | | m sand, gr | 42 | | | | | | |

FIELD BORING LOG NO. 18

Depth to water table (ft) 9.3 Topstratum thickness (ft) 9

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.0 | clayey sand, br, moist | | | | | | | |
| | | 9.0 | 15.0 | silty sand, br | NA | | | f sand | 0.35 | 0.19 | 2.0 |
| 13.0 | 15.0 | 15.0 | | f sand, gr | 15 | | | | | | |
| 15.0 | 17.0 | | | f sand, gr | 26 | | | | | | |
| 17.5 | 19.5 | | | f sand, gr | 20 | | | | | | |
| 20.0 | 22.0 | | | f sand, gr | 26 | | | | | | |
| 22.5 | 24.5 | | | f sand, gr | 17 | | | | | | |
| 25.0 | 27.0 | | | f sand, gr | 25 | | | | | | |
| 27.5 | 29.5 | | | f sand, gr | 26 | | | | | | |
| 30.0 | 32.0 | | | f sand, gr | 22 | | | | | | |
| 32.5 | 34.5 | | | f sand, gr | 19 | | | f sand | 0.26 | 0.18 | 1.5 |
| 35.0 | 37.0 | | | f sand, gr | 16 | | | | | | |
| 37.5 | 39.5 | | | f sand, gr | 15 | | | | | | |
| 40.0 | 42.0 | | | f sand, gr | 18 | | | | | | |
| 42.5 | 45.0 | | | m sand, gr | 24 | | | | | | |
| 45.5 | 47.5 | | | m sand, gr | 25 | | | | | | |
| 50.0 | 52.0 | | | m sand, gr | 27 | | | | | | |
| 52.5 | 54.5 | | | f sand, gr | 28 | | | | | | |
| 55.0 | 57.0 | | | m sand, gr | 34 | | | m sand | 0.61 | 0.20 | 3.5 |
| 57.5 | 59.5 | | | m sand, gr | 40 | | | | | | |
| 60.0 | 62.0 | | | m sand, gr | 33 | | | | | | |
| 62.5 | 64.5 | | | m sand, gr | 34 | | | | | | |
| 65.0 | 67.0 | | | m sand, gr | 35 | | | | | | |
| 68.0 | 70.0 | | ≥70.0 | m sand, gr | 36 | | | | | | |

FIELD BORING LOG NO. 19

Depth to water table (ft) 7.5 Topstratum thickness (ft) 8

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1.0 | 4.0 | silty clay, br, crumbly | | | | | | | |
| | | 4.0 | 5.0 | silty clay, br, moist | | | | | | | |
| | | 5.0 | 8.0 | silty clay, br, w/lenses of silt and sand | | | | | | | |
| | | 8.0 | 10.5 | silty sand, gr | NA | | | silty sand | 0.17 | 0.09 | 2.1 |
| 10.5 | 12.5 | 10.5 | | f sand, gr | 25 | | | | | | |
| 12.5 | 14.5 | | | f sand, gr | 23 | | | f sand | 0.32 | 0.15 | 2.5 |
| 15.0 | 17.0 | | | f sand, gr | 17 | | | | | | |
| 17.5 | 19.5 | | | f sand, gr | 17 | | | | | | |
| 20.0 | 22.0 | | | f sand, gr | 19 | | | | | | |
| 22.5 | 24.5 | | | f sand, gr | 20 | | | | | | |
| 25.0 | 27.0 | | | f sand, gr | 22 | | | | | | |
| 27.5 | 29.5 | | | f sand, gr | 19 | | | | | | |
| 30.0 | 32.0 | | | f sand, gr | 20 | | | | | | |
| 32.5 | 34.5 | | | f sand, gr | 19 | | | | | | |
| 35.0 | 37.0 | | | f sand, gr | 28 | | | | | | |
| 37.5 | 39.5 | | | f sand, gr | 30 | | | f sand | 0.38 | 0.19 | 2.2 |
| 40.0 | 42.0 | | | f sand, gr | 29 | | | | | | |

FIELD BORING LOG NO. 20

Depth to water table (ft) 7.5 Topstratum thickness (ft) 8

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1.0 | 3.5 | lean clay, br | | | | | | | |
| | | 3.5 | 5.0 | silty clay, br, w/silt lens | | | | | | | |
| | | 5.0 | 8.0 | silty clay, br, w/silty sand lens | | | | | | | |
| | | 8.0 | 10.0 | silty sand, gr, wet | NA | | | f sand | 0.20 | 0.0055 | 4.0 |
| 10.0 | 12.0 | 10.0 | | m sand, gr | 12 | | | | | | |
| 12.5 | 14.5 | | | m sand, gr | 15 | | | f sand | 0.38 | 0.22 | 1.8 |
| 15.0 | 17.0 | | | m sand, gr | 16 | | | | | | |
| 17.5 | 19.5 | | | m sand, gr | 15 | | | | | | |
| 20.0 | 22.0 | | | m sand, gr | 22 | | | | | | |
| 22.5 | 24.5 | | | m sand, gr | 29 | | | | | | |
| 25.0 | 27.0 | | | m sand, gr | 31 | | | | | | |
| 27.5 | 29.5 | | | m sand, gr | 28 | | | | | | |
| 30.0 | 32.0 | | | m sand, gr | 30 | | | | | | |
| 32.5 | 34.5 | | | m sand, gr | 27 | | | f sand | 0.31 | 0.19 | 1.9 |
| 35.0 | 37.0 | | | m sand, gr | 24 | | | | | | |
| 37.5 | 39.5 | | | m sand, gr | 22 | | | | | | |
| 40.0 | 42.0 | | | m sand, gr | 24 | | | | | | |
| 42.5 | 44.5 | | | m sand, gr | 22 | | | | | | |
| 45.0 | 47.0 | | | m sand, gr | 25 | | | | | | |
| 47.5 | 49.5 | | | m sand, gr | 23 | | | | | | |
| 50.0 | 52.5 | | | m sand, gr | 27 | | | m sand | 0.62 | 0.31 | 2.3 |
| 52.5 | 54.5 | | | m sand, gr | 23 | | | | | | |
| 55.0 | 57.0 | | | m sand, gr | 27 | | | | | | |
| 57.5 | 59.5 | | | m sand, gr | 28 | | | | | | |
| 60.0 | 62.0 | | | m sand, gr | 28 | | | | | | |
| 62.5 | 64.5 | | ≥64.5 | m sand, gr | 27 | | | | | | |

FIELD BORING LOG NO. 21

Depth to water table (ft) 9.7 Topstratum thickness (ft) 12

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1.0 | 3.5 | silty clay, br, w/sand lens | | | | | | | |
| | | 3.5 | 5.0 | sandy clay, br | | | | silty sand | 0.18 | 0.0017 | 11.2 |
| | | 5.0 | 8.0 | sandy silt, br, dry | | | | | | | |
| | | 8.0 | 11.5 | sandy clay, br, and silty sand | | | | | | | |
| 12.5 | 14.5 | 11.5 | | f sand, gr | 25 | | | f sand | 0.28 | 0.17 | 1.8 |
| 15.0 | 17.0 | | | f sand, gr | 27 | | | | | | |
| 17.5 | 19.5 | | | f sand, gr | 24 | | | | | | |
| 20.0 | 22.0 | | | m sand, gr | 30 | | | f sand | 0.37 | 0.17 | 2.3 |
| 22.5 | 24.5 | | | m sand, gr | 28 | | | | | | |
| 25.0 | 27.0 | | | m sand, gr | 18 | | | | | | |
| 27.5 | 29.5 | | | m sand, gr | 20 | | | | | | |
| 30.0 | 32.0 | | | m sand, gr | 18 | | | | | | |
| 32.5 | 34.5 | | | m sand, gr | 15 | | | | | | |
| 35.0 | 37.0 | | | m sand, gr | 18 | | | | | | |
| 37.5 | 39.5 | | | m sand, gr | 28 | | | | | | |
| 40.0 | 42.0 | | | m sand, gr | 36 | | | | | | |
| 42.5 | 44.5 | | | m sand, gr | 34 | | | | | | |
| 45.0 | 47.0 | | | m sand, gr | 35 | | | | | | |
| 47.5 | 49.5 | | | m sand, gr | 38 | | | | | | |
| 50.0 | 52.0 | | | m sand, gr | 41 | | | | | | |
| 52.5 | 54.5 | | | m sand, gr | 39 | | | | | | |
| 55.0 | 57.0 | | | m sand, gr | 37 | | | | | | |
| 57.5 | 59.5 | | | m sand, gr | 40 | | | m sand | 0.70 | 0.38 | 2.3 |
| 60.0 | 62.0 | | | m sand, gr | 38 | | | | | | |
| 62.5 | 64.5 | | | m sand, gr | 41 | | | | | | |
| 65.0 | 67.0 | | | m sand, gr | 38 | | | | | | |

FIELD BORING LOG NO.22

Depth to water table (ft) 7.0 Topstratum thickness (ft) 8

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | silty clay, br | | | | | | | |
| | | 5.0 | 7.5 | silty clay, br, and silty sand, wet | | | | | | | |
| | | 7.5 | 11.5 | silty sand, br-gr | NA | | | f sand | 0.21 | 0.068 | 3.4 |
| 11.5 | 13.5 | 11.5 | | f sand, br-gr | 18 | | | | | | |
| 15.0 | 17.0 | | | m sand, br-gr | 21 | | | f sand | 0.38 | 0.21 | 2.0 |
| 17.5 | 19.5 | | | m sand, br-gr | 25 | | | | | | |
| 20.0 | 22.0 | | | m sand, br-gr | 23 | | | | | | |
| 22.5 | 24.5 | | | m sand, br-gr | 25 | | | | | | |
| 25.0 | 27.0 | | | m sand, br-gr | 24 | | | | | | |
| 27.5 | 29.5 | | | m sand, br-gr | 25 | | | | | | |
| 30.0 | 32.0 | | | m sand, br-gr | 30 | | | | | | |
| 32.5 | 34.5 | | | m sand, br-gr | 28 | | | | | | |
| 35.0 | 37.0 | | | m sand, br-gr | 20 | | | f sand | 0.28 | 0.17 | 1.6 |
| 37.5 | 39.5 | | | m sand, br-gr | 18 | | | | | | |
| 40.0 | 42.0 | | | m sand, br-gr | 23 | | | | | | |
| 42.5 | 44.5 | | | m sand, br-gr | 24 | | | | | | |
| 45.0 | 47.0 | | | m sand, br-gr | 23 | | | | | | |
| 47.5 | 49.5 | | | m sand, br-gr | 26 | | | m sand | 0.82 | 0.38 | 2.9 |
| 50.0 | 52.0 | | | m sand, br-gr | 25 | | | | | | |
| 52.5 | 54.5 | | | m sand, br-gr | 27 | | | | | | |
| 55.0 | 57.0 | | | m sand, br-gr | 27 | | | | | | |
| 57.5 | 59.5 | | | m sand, br-gr | 24 | | | | | | |
| 60.0 | 62.0 | | | m sand, br-gr | 26 | | | m sand | 0.48 | 0.25 | 2.1 |
| 62.5 | 64.5 | | | m sand, br-gr | 31 | | | | | | |
| 65.0 | 67.0 | | | m sand, br-gr | 38 | | | | | | |

FIELD BORING LOG NO.23

Depth to water table (ft) 9.5 Topstratum thickness (ft) 11

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.5 | sandy clay, br | | | | | | | |
| | | 3.5 | 5.0 | silty clay, br | | | | | | | |
| | | 5.0 | 8.0 | clay, br | | | | | | | |
| | | 8.0 | 11.0 | sandy clay, br | | | | | | | |
| | | 11.0 | 15.0 | sandy silt, gr, wet | | | | silty sand | 0.19 | 0.04 | 5.7 |
| 15.0 | 17.0 | 15.0 | | m sand, gr | 25 | | | | | | |
| 17.5 | 19.5 | | | m sand, gr | 28 | | | f sand | 0.30 | 0.17 | 1.9 |
| 20.0 | 22.0 | | | m sand, gr | 30 | | | | | | |
| 22.5 | 24.5 | | | m sand, gr | 32 | | | | | | |
| 25.0 | 27.0 | | | m sand, gr | 30 | | | | | | |
| 27.5 | 29.5 | | | m sand, gr | 31 | | | | | | |
| 30.0 | 32.0 | | | m sand, gr | 32 | | | f sand | 0.42 | 0.21 | 2.8 |
| 32.5 | 34.5 | | | m sand, gr | 30 | | | | | | |
| 35.0 | 37.0 | | | m sand, gr | 29 | | | | | | |
| 37.5 | 39.5 | | | m sand, gr | 31 | | | m sand | 0.48 | 0.29 | 1.8 |
| 40.0 | 42.0 | | | m sand, gr | 35 | | | | | | |

FIELD BORING LOG NO.24

Depth to water table (ft) 5.5 Topstratum thickness (ft) 10

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.5 | sandy silt, br | | | | | | | |
| | | 3.5 | 5.0 | sandy clay, br | | | | | | | |
| | | 5.0 | 8.0 | sandy clay, br, and silty sand | | | | | | | |
| 11.5 | 13.5 | 10.0 | | m sand, gr | 12 | | | | | | |
| 15.0 | 17.0 | | | m sand, gr | 15 | | | | | | |
| 17.5 | 19.5 | | | m sand, gr | 17 | | | | | | |
| 20.0 | 22.0 | | | f sand, gr | 32 | | | f sand | 0.30 | 0.19 | 1.7 |
| 22.5 | 24.5 | | | m sand, gr | 18 | | | | | | |
| 25.0 | 27.0 | | | m sand, gr | 22 | | | | | | |
| 27.5 | 29.5 | | | f sand, gr | 30 | | | | | | |
| 30.0 | 32.0 | | | f sand, gr | 32 | | | | | | |
| 32.5 | 34.5 | | | f sand, gr | 28 | | | | | | |
| 35.0 | 37.0 | | | m sand, gr | 30 | | | | | | |
| 37.5 | 39.5 | | | m sand, gr | 27 | | | | | | |
| 40.0 | 42.0 | | | m sand, gr | 30 | | | | | | |
| 42.5 | 44.5 | | | m sand, gr | 31 | | | | | | |
| 45.0 | 47.0 | | | m sand, gr | 28 | | | | | | |
| 47.5 | 49.5 | | | f sand, gr | 30 | | | | | | |
| 50.0 | 52.0 | | | f sand, gr | 28 | | | f sand | 0.25 | 0.16 | 1.7 |
| 52.5 | 54.5 | | | f sand, gr | 32 | | | | | | |
| 55.0 | 57.0 | | | f sand, gr | 34 | | | | | | |
| 57.5 | 59.5 | | | f sand, gr | 30 | | | | | | |
| 60.0 | 62.0 | | | m sand, gr | 44 | | | | | | |
| 62.5 | 64.5 | | | m sand, gr | 45 | | | | | | |
| 65.0 | 67.0 | | | m sand, gr | 50 | | | f sand | 0.31 | 0.16 | 2.2 |
| 67.5 | 69.5 | | | m sand, gr | 48 | | | | | | |
| 70.0 | 72.0 | | | m sand, gr | 47 | | | | | | |

FIELD BORING LOG NO.25

Depth to water table (ft) 7.8 Topstratum thickness (ft) 5

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N [1/] | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.5 | sandy silt, br | | | | | | | |
| | | 3.5 | 5.0 | silty clay, br, w/sand lens | | | | | | | |
| | | 5.0 | 10.0 | silty sand, br-gr | NA | | | silty sand | 0.21 | 0.0056 | 3.7 |
| 10.0 | 12.0 | 10.0 | | f sand, gr | 16 | | | | | | |
| 12.5 | 14.5 | | | f sand, gr | 18 | | | | | | |
| 15.0 | 17.0 | | | f sand, gr | 12 | | | f sand | 0.36 | 0.18 | 2.2 |
| 17.5 | 19.5 | | | m sand, gr | 16 | | | | | | |
| 20.0 | 22.0 | | | m sand, gr | 26 | | | | | | |
| 22.5 | 24.5 | | | m sand, gr | 38 | | | | | | |
| 25.0 | 27.0 | | | m sand, gr | 25 | | | | | | |
| 27.5 | 29.5 | | | m sand, gr | 23 | | | | | | |
| 30.0 | 32.0 | | | f sand, gr | 25 | | | | | | |
| 32.5 | 34.5 | | | m sand, gr | 25 | | | | | | |
| 35.0 | 37.0 | | | m sand, gr | 26 | | | | | | |
| 37.5 | 39.5 | | | m sand, gr | 23 | | | | | | |
| 40.0 | 42.0 | | | f sand, gr | 38 | | | | | | |
| 42.5 | 44.5 | | | m sand, gr | 32 | | | m sand | 0.50 | 0.22 | 2.4 |
| 45.0 | 47.0 | | | m sand, gr | 35 | | | | | | |
| 47.5 | 49.5 | | | f sand, gr | 35 | | | | | | |
| 50.0 | 52.0 | | | f sand, gr | 35 | | | | | | |
| 52.5 | 54.5 | | | f sand, gr | 40 | | | | | | |
| 55.0 | 57.0 | | | f sand, gr | 38 | | | | | | |
| 57.5 | 59.5 | | | f sand, gr | 40 | | | | | | |
| 60.0 | 62.0 | | | f sand, gr | 38 | | | m sand | 0.71 | 0.29 | 2.7 |
| 63.0 | 65.0 | | ≥65.0 | f sand, gr | 41 | | | | | | |

FIELD BORING LOG NO.26

Depth to water table (ft) 7.5 Topstratum thickness (ft) 12

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N [1/] | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | silty clay, br | | | | | | | |
| | | 5.0 | 10.0 | silty clay, gr | | | | | | | |
| | | 10.0 | 12.5 | sandy clay, gr | | | | | | | |
| 12.5 | 14.5 | 12.5 | | silty sand, gr | 15 | | | | | | |
| 15.0 | 17.0 | | | silty sand, gr | 16 | | | | | | |
| 17.5 | 19.5 | | | silty sand, gr | 15 | | | f sand | 0.28 | 0.10 | 3.0 |
| 20.0 | 22.0 | | | f sand, gr | 25 | | | | | | |
| 22.5 | 24.5 | | | f sand, gr | 18 | | | | | | |
| 25.0 | 27.0 | | | f sand, gr | 34 | | | | | | |
| 27.5 | 29.5 | | | f sand, gr | 30 | | | | | | |
| 30.0 | 32.0 | | | f sand, gr | 38 | | | | | | |
| 32.5 | 34.5 | | | f sand, gr | 40 | | | | | | |
| 35.0 | 37.0 | | | f sand, gr | 38 | | | f sand | 0.31 | 0.18 | 1.9 |
| 37.5 | 39.5 | | | f sand, gr | 41 | | | | | | |
| 40.0 | 42.0 | | | f sand, gr | 42 | | | | | | |

FIELD BORING LOG NO.27

Depth to water table (ft) 5.1 Topstratum thickness (ft) 10

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N [1/] | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.5 | clay, br | | | | | | | |
| 6.9 | 7.5 | 8.5 | 10.0 | silty sand, gr, w/clay balls | | | | f sand | 0.21 | 0.08 | 2.9 |
| 10.0 | 12.0 | 10.0 | | f sand, gr | 20 | | | | | | |
| 12.5 | 14.5 | | | f sand, gr | 21 | | | | | | |
| 15.0 | 17.0 | | | f sand, gr | 25 | | | | | | |
| 17.5 | 19.5 | | | f sand, gr | 21 | | | | | | |
| 20.0 | 22.0 | | | f sand, gr | 22 | | | | | | |
| 22.5 | 24.5 | | | f sand, gr | 20 | | | | | | |
| 25.0 | 27.0 | | | f sand, gr | 22 | | | f sand | 0.30 | 0.16 | 2.1 |
| 27.5 | 29.5 | | | f sand, gr | 19 | | | | | | |
| 30.0 | 32.0 | | | f sand, gr | 19 | | | | | | |
| 32.5 | 34.5 | | | f sand, gr | 22 | | | | | | |
| 35.0 | 37.0 | | | f sand, gr | 24 | | | | | | |
| 37.5 | 39.5 | | | f sand, gr | 19 | | | | | | |
| 40.0 | 42.0 | | | f sand, gr | 18 | | | f sand | 0.34 | 0.20 | 1.9 |
| 43.0 | 45.0 | | ≥45.0 | f sand, gr | 19 | | | | | | |

FIELD BORING LOG NO. 28

Depth to water table (ft): 6.0 — Topstratum thickness (ft): 8

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N [1/] | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 4.0 | sandy clay, br | | | | | | | |
| | | 4.0 | 8.0 | sandy clay, br, and silty sand | | | | | | | |
| 10.0 | 10.5 | 8.0 | | f sand, gr | | | | f sand | 0.19 | 0.081 | 2.7 |
| 12.0 | 14.0 | | | f sand, gr | 13 | | | | | | |
| 15.0 | 17.0 | | | f sand, gr | 23 | | | | | | |
| 17.5 | 19.5 | | | f sand, gr | 18 | | | | | | |
| 20.0 | 22.0 | | | f sand, gr | 17 | | | | | | |
| 22.5 | 24.5 | | | f sand, gr | 18 | | | | | | |
| 25.0 | 27.0 | | | m sand, gr | 20 | | | | | | |
| 27.5 | 29.5 | | | m sand, gr | 21 | | | m sand | 0.49 | 0.26 | 2.1 |
| 30.0 | 32.0 | | | m sand, gr | 25 | | | | | | |
| 32.5 | 34.5 | | | m sand, gr | 27 | | | | | | |
| 35.0 | 37.0 | | | f sand, gr | 22 | | | | | | |
| 37.5 | 39.5 | | | f sand, gr | 33 | | | | | | |
| 40.0 | 42.0 | | | f sand, gr | 30 | | | m sand | 0.43 | 0.30 | 1.6 |
| 42.5 | 44.5 | | | f sand, gr | 23 | | | | | | |
| 45.0 | 47.0 | | | m sand, gr | 30 | | | | | | |
| 47.5 | 49.5 | | | m sand, gr | 31 | | | | | | |
| 50.0 | 52.0 | | | m sand, gr | 34 | | | | | | |
| 55.0 | 57.0 | | | f sand | | | | f sand | 0.21 | 0.13 | 1.8 |
| 57.5 | 59.5 | | | f sand | | | | f sand | 0.42 | 0.18 | 2.7 |

FIELD BORING LOG NO. 29

Depth to water table (ft): 4.1 — Topstratum thickness (ft): 7

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N [1/] | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.5 | silty clay, br, w/sand lens | | | | | | | |
| | | 3.5 | 5.0 | plastic clay, br | | | | | | | |
| | | 5.0 | 7.0 | silty sand, br | | | | | | | |
| 7.5 | 9.5 | 7.0 | | silty sand, br-gr | 10 | | | | | | |
| 10.0 | 12.0 | | | silty sand, br-gr | 13 | | | | | | |
| 12.5 | 14.5 | | | f sand, gr | 15 | | | f sand | 0.20 | 0.12 | 1.9 |
| 15.0 | 17.0 | | | f sand, gr | 16 | | | | | | |
| 17.5 | 19.5 | | | f sand, gr | 14 | | | | | | |
| 20.0 | 22.0 | | | f sand, gr | 23 | | | | | | |
| 22.5 | 24.5 | | | f sand, gr | 25 | | | | | | |
| 25.0 | 27.0 | | | f sand, gr | 23 | | | | | | |
| 27.5 | 29.5 | | | f sand, gr | 24 | | | | | | |
| 30.0 | 32.0 | | | f sand, gr | 23 | | | | | | |
| 32.5 | 34.5 | | | f sand, gr | 31 | | | | | | |
| 35.0 | 37.0 | | | f sand, gr | 36 | | | f sand | 0.42 | 0.19 | 2.5 |
| 37.5 | 39.5 | | | f sand, gr | 34 | | | | | | |
| 40.0 | 42.0 | | | f sand, gr | 39 | | | | | | |
| 42.5 | 44.5 | | | f sand, gr | 16 | | | | | | |
| 45.0 | 47.0 | | | f sand, gr | 18 | | | | | | |
| 47.5 | 49.5 | | | f sand, gr | 18 | | | | | | |
| 50.0 | 52.0 | | | f sand, gr | 16 | | | | | | |
| 65.0 | 67.0 | | | m sand | NA | | | m sand | 0.50 | 0.22 | 2.5 |
| 67.5 | 69.5 | | | f sand | NA | | | f sand | 0.25 | 0.17 | 1.6 |

FIELD BORING LOG NO. 30

Depth to water table (ft): NA — Topstratum thickness (ft): 34

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 26.0 | highly plastic clay, gr | | | | | | | |
| | | 26.0 | 33.5 | highly plastic clay, gr, w/thin silt lenses | | | | | | | |
| 34.0 | 35.5 | 34.0 | | m sand, gr | 16 | | | m sand | 0.57 | 0.31 | 2.1 |
| 37.0 | 38.5 | | | f sand, gr | 29 | | | | | | |
| 40.0 | 41.5 | | | m sand, gr | 33 | | | | | | |
| 43.0 | 44.5 | | | m sand, gr | 58 | | | | | | |
| 46.0 | 47.5 | | | m sand, gr | 44 | | | | | | |
| 50.0 | 51.5 | | ≥51.5 | m sand, gr | 36 | | | | | | |

FIELD BORING LOG NO. 31

Depth to water table (ft): 6.5 — Topstratum thickness (ft): 19

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.5 | plastic clay, br-gr | | | | | | | |
| | | 14.5 | 16.5 | clay, br to gr, wet | | | | | | | |
| 19.0 | 20.5 | 16.5 | | f sand, gr | 23 | 1.12 | 26 | m sand | .44 | .13 | 3.7 |
| 22.0 | 23.5 | | | f sand, gr, w/thin silt lens | 17 | 1.06 | 18 | f sand | .42 | .18 | 2.8 |
| 25.0 | 26.5 | | | m sand, gr | 29 | 1.02 | 30 | | | | |
| 28.0 | 29.5 | | | m sand, gr | 12 | 0.96 | 12 | | | | |
| 31.0 | 32.5 | | | m sand, gr | 16 | 0.92 | 15 | | | | |
| 34.0 | 35.5 | | | m sand, gr | 29 | 0.89 | 26 | | | | |
| 37.0 | 38.5 | | | m sand, gr | 47 | 0.86 | 40 | m sand | .60 | .27 | 2.7 |
| 40.0 | 41.5 | | | m sand, gr | 66 | 0.83 | 55 | | | | |
| 43.0 | 44.5 | | | m sand, gr | 59 | 0.80 | 47 | | | | |
| 46.0 | 47.5 | | | m sand, gr | 45 | 0.78 | 35 | | | | |
| 49.0 | 50.5 | | | m sand, gr | 14 | 0.76 | 11 | | | | |
| 52.0 | 53.5 | | | m sand, gr | 50 | 0.74 | 37 | | | | |
| 55.0 | 56.5 | | | m sand, gr | 104 | 0.72 | 72 | m sand | .58 | .28 | 2.2 |
| 60.0 | 61.5 | | | m sand, gr | 65 | 0.70 | 45 | | | | |
| 67.5 | 69.0 | | ≥69.0 | m sand, gr | 81 | 0.66 | 54 | | | | |

FIELD BORING LOG NO. 32

Depth to water table (ft): 6 — Topstratum thickness (ft): 16

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.5 | plastic clay, br-gr | | | | | | | |
| | | 9.5 | 11.0 | f sand, gr, sat | | | | | | | |
| 13.0 | 14.5 | 11.0 | 15.0 | sandy clay, br, and silty clay, gr | 3 | | | | | | |
| 16.0 | 17.5 | 15.0 | | f sand, gr, w/thin lens of silty clay | 23 | 1.20 | 28 | | | | |
| 19.0 | 20.5 | | | f sand, gr | 35 | 1.13 | 40 | f sand | 0.41 | 0.22 | 2.1 |
| 22.0 | 23.5 | | | m sand, gr | 39 | 1.07 | 42 | | | | |
| 25.0 | 26.5 | | | m sand, gr | 13 | 1.02 | 13 | | | | |
| 28.0 | 29.5 | | | m sand, gr | 22 | 0.98 | 22 | | | | |
| 31.0 | 32.5 | | | m sand, gr | 29 | 0.94 | 27 | f sand | 0.42 | 0.31 | 1.9 |
| 34.0 | 35.5 | | | m sand, gr | 31 | 0.90 | 28 | | | | |
| 37.0 | 38.5 | | | m sand, gr | 31 | 0.87 | 27 | | | | |
| 40.0 | 41.5 | | | m sand, gr | 52 | 0.83 | 43 | | | | |
| 44.5 | 46.0 | | ≥46.0 | m sand, gr | 63 | 0.80 | 50 | | | | |

FIELD BORING LOG NO. 33

Depth to water table (ft): NA — Topstratum thickness (ft): 26

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | plastic clay, gr-br | | | | | | | |
| | | 5.0 | 8.0 | silty sand, br | | | | | | | |
| | | 8.0 | 25.0 | plastic clay, gr-br | | | | | | | |
| 26.0 | 27.5 | 25.0 | | f sand, gr | 12 | | | | | | |
| 28.0 | 29.5 | | | f sand, gr, w/plastic clay lens | 30 | | | | | | |
| 31.0 | 32.5 | | | f sand, gr | 22 | | | | | | |
| 34.0 | 35.5 | | | f sand, gr | 37 | | | | | | |
| 37.0 | 38.5 | | | f sand, gr | 35 | | | | | | |
| 40.0 | 41.5 | | | f sand, gr | 45 | | | | | | |
| 43.0 | 44.5 | | | m sand, gr | 18 | | | | | | |
| 46.0 | 47.5 | | | m sand, gr | 15 | | | | | | |
| 50.0 | 51.5 | | ≥51.5 | m sand, gr | 79 | | | | | | |

FIELD BORING LOG NO. 34

Depth to water table (ft): ≤21.5 — Topstratum thickness (ft): 22

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 21.5 | plastic clay, gr-br | | | | | | | |
| 22.0 | 23.5 | 21.5 | | f sand, gr | 12 | | | | | | |
| 25.0 | 26.5 | | | f sand, gr | 39 | | | | | | |
| 28.0 | 29.5 | | | f sand, gr | 30 | | | | | | |
| 31.0 | 32.5 | | | m sand, gr | 41 | | | | | | |
| 34.0 | 35.5 | | | m sand, gr | 34 | | | | | | |
| 37.0 | 38.5 | | | m sand, gr | 32 | | | | | | |
| 40.0 | 41.5 | | | m sand, gr | 42 | | | | | | |
| 44.0 | 45.5 | | | m sand, gr | 19 | | | | | | |
| 48.5 | 50.0 | | ≥50.0 | m sand, gr | 38 | | | | | | |

FIELD BORING LOG NO. 35

Depth to water table (ft): 6.3 — Topstratum thickness (ft): 23 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 21.0 | plastic clay, br-gr | | | | | | | |
| | | 21.0 | 23.0 | silty clay, gr, w/silt lens | | | | | | | |
| 23.0 | 24.5 | 23.0 | | f sand, gr | 14 | 1.04 | 15 | | | | |
| 26.0 | 27.5 | | | f sand, gr | 23 | 1.00 | 23 | | | | |
| 29.0 | 30.5 | | | f sand, gr | 34 | 0.95 | 32 | | | | |
| 32.0 | 33.5 | | | f sand, gr | 55 | 0.91 | 50 | | | | |
| 35.0 | 36.5 | | | f sand, gr | 76 | 0.88 | 67 | | | | |
| 38.0 | 39.5 | | | f sand, gr | 26 | 0.86 | 22 | | | | |
| 41.5 | 43.0 | | ≥43.0 | f sand, gr | 36 | 0.83 | 30 | | | | |

FIELD BORING LOG NO. 36

Depth to water table (ft): 9.0 — Topstratum thickness (ft): 20 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.0 | clay, br and gr | | | | | | | |
| | | 14.0 | 20.0 | plastic clay and silty clay layers, br-gr | | | | | | | |
| | | 20.0 | | m sand, gr (loose to 26.0) | | | | | | | |
| 26.0 | 27.5 | | | m sand w/clay lens, gr | 23 | 0.96 | 22 | | | | |
| 29.0 | 30.5 | | | m sand w/clay lens, gr | 12 | 0.92 | 11 | | | | |
| 31.0 | 33.5 | | | m sand, gr | 40 | 0.89 | 36 | | | | |
| 35.0 | 36.5 | | | m sand, gr | 33 | 0.86 | 28 | | | | |
| 38.0 | 39.5 | | | m sand, gr | 37 | 0.83 | 31 | | | | |
| 41.0 | 42.5 | | | m sand, gr | 40 | 0.80 | 32 | | | | |
| 44.0 | 45.5 | | | m sand, gr | 54 | 0.78 | 42 | | | | |
| 47.0 | 48.5 | | | m sand, gr | NA | | | | | | |
| 50.0 | 51.5 | | | m sand, gr | NA | | | | | | |
| 53.0 | 54.5 | | ≥54.5 | m sand, gr | 45 | 0.72 | 32 | | | | |

FIELD BORING LOG NO. 37

Depth to water table (ft): 8.0 — Topstratum thickness (ft): 25 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | plastic clay, br | | | | | | | |
| | | 5.0 | 6.5 | sandy silt, br | | | | | | | |
| | | 6.5 | 19.0 | plastic clay, br-gr | | | | | | | |
| | | 19.0 | 20.5 | sandy silt, gr-br, w/clay lenses | 5 | | | | | | |
| | | 20.5 | 25.5 | silty clay, gr-br, w/silt lenses | | | | | | | |
| | | 25.0 | 31.0 | m sand and silt, gr, soft | NA | | | | | | |
| 31.0 | 32.5 | 31.0 | | f sand, gr | NA | | | | | | |
| 34.0 | 35.5 | | | m sand, gr | 9 | 0.88 | 8 | | | | |
| 37.0 | 38.5 | | | m sand, gr | 37 | 0.85 | 31 | | | | |
| 40.0 | 41.5 | | | m sand, gr | 46 | 0.82 | 37 | | | | |
| 43.0 | 44.5 | | | m sand, gr | 83 | 0.79 | 66 | | | | |
| 46.0 | 47.5 | | | m sand, gr | 61 | 0.77 | 47 | | | | |
| 49.0 | 50.5 | | | m sand, gr | 46 | 0.75 | 35 | | | | |
| 52.0 | 53.5 | | | m sand, gr | 52 | 0.73 | 38 | | | | |
| 55.0 | 56.5 | | | m sand, gr | 63 | 0.71 | 45 | | | | |
| 59.0 | 60.5 | | | m sand, gr | 57 | 0.69 | 39 | | | | |
| 65.0 | 66.5 | | | m sand, gr | 71 | 0.66 | 47 | | | | |

FIELD BORING LOG NO. 38

Depth to water table (ft): <23 — Topstratum thickness (ft): 23 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.0 | plastic clay, br | | | | | | | |
| | | 8.0 | 18.5 | plastic clay, br-gr, w/thin lenses of silt | | | | | | | |
| | | 18.5 | 22.5 | plastic clay, br-gr, w/thin lens of f sand | | | | | | | |
| 23.0 | 24.5 | 22.5 | | m sand, br-gr | 18 | | | | | | |
| 26.0 | 27.5 | | | m sand, br-gr | 25 | | | | | | |
| 29.0 | 30.5 | | | m sand, br-gr | 45 | | | | | | |
| 32.0 | 33.5 | | | m sand, br-gr | 21 | | | | | | |
| 35.0 | 36.5 | | | m sand, gr | 22 | | | | | | |
| 38.0 | 39.5 | | | m sand, gr | 20 | | | | | | |
| 41.0 | 42.5 | | | m sand, gr | 43 | | | | | | |
| 44.0 | 45.5 | | | m sand, gr | 41 | | | | | | |
| 47.0 | 48.5 | | | m sand, gr | 54 | | | | | | |
| 50.0 | 51.5 | | | m sand, gr | 54 | | | | | | |
| 53.0 | 54.5 | | | m sand, gr | 66 | | | | | | |
| 56.0 | 57.5 | | | m sand, gr | 62 | | | | | | |
| 59.0 | 60.5 | | | m sand, gr | 43 | | | | | | |
| 64.0 | 65.5 | | ≥65.5 | m sand, gr | 62 | | | | | | |

FIELD BORING LOG NO. 39

Depth to water table (ft): <30 — Topstratum thickness (ft): 22 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.0 | plastic clay, gr-br | | | | | | | |
| | | 3.0 | 4.5 | f sand, br | | | | | | | |
| | | 4.5 | 20.0 | plastic clay, gr-br | | | | | | | |
| 20.0 | 21.5 | 20.0 | 21.5 | silty clay, gr-br, w/sand lenses | 11 | | | | | | |
| 22.0 | 23.5 | 21.5 | | f sand, gr | 55 | | | | | | |
| 25.0 | 26.5 | | | f sand, gr | 44 | | | | | | |
| 28.0 | 29.5 | | | f sand, gr | 36 | | | | | | |
| 31.0 | 32.5 | | | f sand, gr | 29 | | | | | | |
| 34.0 | 35.5 | | | f sand, gr | 35 | | | | | | |
| 37.0 | 38.5 | | | m sand, gr | 23 | | | | | | |
| 40.0 | 41.5 | | | m sand, gr | 34 | | | | | | |
| 43.0 | 44.5 | | | m sand, gr | 24 | | | | | | |
| 46.0 | 47.5 | | | m sand, gr | 66 | | | | | | |
| 49.0 | 50.5 | | | m sand, gr | >100 | | | | | | |
| 54.0 | 55.5 | | | m sand, gr | >100 | | | | | | |
| 59.0 | 60.5 | | | m sand, gr | >100 | | | | | | |

FIELD BORING LOG NO. 40

Depth to water table (ft): 8.3 — Topstratum thickness (ft): 26 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.0 | plastic clay, gr-br | | | | | | | |
| | | 3.0 | 4.0 | sand and clay | | | | | | | |
| | | 4.0 | 23.0 | plastic clay, gr-br | | | | | | | |
| | | 23.0 | 26.0 | silty clay and sand, gr | | | | | | | |
| 26.0 | 27.5 | | | f sand, gr | 35 | 0.97 | 34 | | | | |
| 29.0 | 30.5 | | | f sand, gr | 33 | 0.94 | 31 | | | | |
| 32.0 | 33.5 | | | f sand, gr | 33 | 0.90 | 30 | | | | |
| 35.0 | 36.5 | | | m sand, gr | 45 | 0.87 | 39 | | | | |
| 38.0 | 39.5 | | | m sand, gr | 18 | 0.83 | 15 | | | | |
| 41.0 | 42.5 | | | m sand, gr | 25 | 0.80 | 20 | | | | |
| 44.0 | 45.5 | | | m sand, gr | 31 | 0.78 | 24 | | | | |
| 47.0 | 48.5 | | | m sand, gr | 48 | 0.76 | 36 | | | | |
| 50.0 | 51.5 | | | m sand, gr | 36 | 0.74 | 27 | | | | |
| 53.0 | 54.5 | | | m sand, gr | 55 | 0.72 | 40 | | | | |
| 56.0 | 57.5 | | | m sand, gr | 52 | 0.70 | 36 | | | | |
| 59.5 | 61.0 | | ≥61.0 | m sand, gr | 68 | 0.68 | 46 | | | | |

FIELD BORING LOG NO. 41

Depth to water table (ft): 5.0 — Topstratum thickness (ft): 14 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 13.5 | plastic clay, gr-br | | | | | | | |
| | | 13.5 | 16.0 | sand and silt, br-gr | NA | | | | | | |
| 17.0 | 18.5 | 16.0 | | f sand, gr | 12 | 1.20 | 14 | | | | |
| 20.0 | 21.5 | | | f sand, gr | 8 | 1.14 | 9 | | | | |
| 23.0 | 24.5 | | | f sand, gr | 18 | 1.07 | 19 | | | | |
| 26.0 | 27.5 | | | f sand, gr | 28 | 1.02 | 29 | | | | |
| 29.0 | 30.5 | | | f sand, gr | 38 | 0.98 | 37 | | | | |
| 32.0 | 33.5 | | | f sand, gr | 27 | 0.94 | 25 | | | | |
| 35.0 | 36.5 | | | f sand, gr | 44 | 0.90 | 40 | | | | |
| 38.0 | 39.5 | | | f sand, gr | >100 | 0.87 | >87 | | | | |
| 41.0 | 42.5 | | | m sand, gr | 65 | 0.84 | 55 | | | | |
| 44.0 | 45.5 | | | m sand, gr | 45 | 0.81 | 36 | | | | |
| 47.0 | 48.5 | | | m sand, gr | 77 | 0.78 | 60 | | | | |
| 50.0 | 51.5 | | | m sand, gr | 58 | 0.76 | 44 | | | | |
| 53.0 | 54.5 | | | m sand, gr | 62 | 0.74 | 46 | | | | |
| 56.0 | 57.5 | | | m sand, gr | NA | | | | | | |
| 60.0 | 62.0 | | ≥62.0 | m sand, gr | NA | | | | | | |

FIELD BORING LOG NO. 42

Depth to water table (ft): 5.7 — Topstratum thickness (ft): 15 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.0 | plastic clay, br-gr | | | | | | | |
| | | 3.0 | 4.0 | sandy clay, br-gr | | | | | | | |
| | | 4.0 | 10.5 | plastic clay, gr-br | | | | | | | |
| | | 10.5 | 14.0 | sandy clay, br, soft | | | | | | | |
| 14.0 | 15.5 | 14.0 | 15.5 | silt and f sand, br-gr | NA | | | | | | |
| 17.0 | 18.5 | 15.5 | | f sand, gr | 7 | 1.18 | 8 | | | | |
| 20.0 | 21.5 | | | f sand, gr | 20 | 1.12 | 22 | | | | |
| 23.0 | 24.5 | | | f sand, gr | 12 | 1.06 | 13 | | | | |
| 26.0 | 27.5 | | | f sand, gr | 26 | 1.01 | 26 | | | | |
| 29.0 | 30.5 | | | f sand, gr | 40 | 0.96 | 38 | | | | |
| 32.0 | 33.5 | | | f sand, gr | 42 | 0.93 | 39 | | | | |
| 35.0 | 36.5 | | | f sand, gr | 36 | 0.90 | 32 | | | | |
| 38.0 | 39.5 | | | f sand, gr | 71 | 0.86 | 61 | | | | |
| 41.0 | 42.5 | | | f sand, gr | 26 | 0.83 | 22 | | | | |
| 44.0 | 45.5 | | | f sand, gr | 19 | 0.81 | 15 | | | | |
| 47.0 | 48.5 | | | f sand, gr | 27 | 0.78 | 21 | | | | |
| 50.0 | 51.5 | | | m sand, gr | 52 | 0.76 | 40 | | | | |
| 53.0 | 54.5 | | | m sand, gr | 58 | 0.74 | 43 | | | | |
| 56.0 | 57.5 | | | m sand, gr | 52 | 0.72 | 37 | | | | |
| 59.0 | 61.5 | | | m sand, gr | 61 | 0.69 | 42 | | | | |

FIELD BORING LOG NO. 43

Depth to water table (ft): 4.7 — Topstratum thickness (ft): 16

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | plastic clay, br | | | | | | | |
| | | 5.0 | 16.0 | plastic clay, br-gr | | | | | | | |
| | | 16.0 | | f sand, gr, mixed w/ silt, soft | NA | | | | | | |
| 20.0 | 21.5 | | | f sand, gr, mixed w/ silt, soft | 10 | 1.13 | 11 | | | | |
| 23.0 | 24.5 | | | f sand, gr, mixed w/ silt, soft | 9 | 1.07 | 10 | | | | |
| 26.0 | 27.5 | | | f sand, gr, mixed w/ silt, soft | 34 | 1.02 | 35 | | | | |
| 29.0 | 30.5 | | | f sand, gr, mixed w/ silt, soft | 25 | 0.97 | 24 | | | | |
| 32.0 | 33.5 | | | m sand, gr | 34 | 0.93 | 32 | | | | |
| 35.0 | 36.5 | | | m sand, gr | 45 | 0.90 | 41 | | | | |
| 38.0 | 39.5 | | | m sand, gr | 72 | 0.86 | 62 | | | | |
| 41.0 | 42.5 | | | m sand, gr | 50 | 0.84 | 42 | | | | |
| 44.0 | 45.5 | | | m sand, gr | 30 | 0.81 | 24 | | | | |
| 47.0 | 48.5 | | | m sand, gr | 60 | 0.79 | 47 | | | | |
| 50.0 | 51.5 | | | m sand, gr | 60 | 0.77 | 46 | | | | |
| 53.0 | 54.5 | | | m sand, gr | 49 | 0.75 | 37 | | | | |
| 56.0 | 57.5 | | | m sand, gr | 49 | 0.73 | 36 | | | | |
| 59.5 | 61.0 | ≥61.0 | | m sand, gr | 58 | 0.70 | 41 | | | | |

FIELD BORING LOG NO. 44

Depth to water table (ft): ≤23 — Topstratum thickness (ft): 23

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 19.5 | plastic clay, br-gr | | | | | | | |
| | | 19.5 | 23.0 | sandy clay, br-gr | | | | | | | |
| | | 23.0 | | f sand, gr | NA | | | | | | |
| 29.0 | 30.5 | | | f sand, gr | 23 | | | | | | |
| 32.0 | 33.5 | | | f sand, gr | 34 | | | | | | |
| 35.0 | 36.5 | | | f sand, gr | 34 | | | | | | |
| 38.0 | 39.5 | | | f sand, gr | 42 | | | | | | |
| 41.0 | 42.5 | | | f sand, gr | 41 | | | | | | |
| 44.0 | 45.5 | | | m sand, gr | 30 | | | | | | |
| 48.0 | 49.5 | | | m sand, gr | 35 | | | | | | |
| 51.0 | 52.5 | | | m sand, gr | 51 | | | | | | |
| 54.0 | 55.5 | | | f sand, gr | NA | | | | | | |
| 57.0 | 58.5 | | | f sand, gr | 49 | | | | | | |
| 59.5 | 61.0 | | | f sand, gr | 48 | | | | | | |

FIELD BORING LOG NO. 45

Depth to water table (ft): 8.6 — Topstratum thickness (ft): 18

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | sandy clay, br | | | | | | | |
| | | 5.0 | 13.1 | sandy ,br,w/clay lenses | | | | | | | |
| | | 13.1 | 18.0 | clay, gr | | | | | | | |
| | | 18.0 | | f to m sand, gr,w/silt lenses | NA | | | | | | |
| 22.0 | 23.5 | | | m to c sand, gr | 27 | 1.03 | 28 | | | | |
| 26.5 | 28.0 | ≥28.0 | | f to m sand, gr | 38 | 0.95 | 36 | | | | |

FIELD BORING LOG NO. 46

Depth to water table (ft): 14.8 — Topstratum thickness (ft): 24

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 13.7 | CL, sandy clay, br-gr | | | | | | | |
| | | 13.7 | 19.0 | SM, silty f sand br-gr | | | | | | | |
| | | 19.0 | 19.5 | SP, f sand, br-gr | | | | | | | |
| | | 19.5 | 20.8 | silty clay and clayey silt | | | | | | | |
| | | 20.8 | 24.0 | CL, silty clay, gr | | | | | | | |
| 24.5 | 26.0 | 24.0 | | SP, f sand, gr, w/occ silt lenses | 27 | 0.91 | 25 | | | | |
| 31.0 | 32.5 | | | SP, f sand, gr, w/occ | 23 | 0.85 | 20 | | | | |
| 37.5 | 39.0 | ≥39.0 | | SP, f sand, gr | 74 | 0.78 | 58 | | | | |

FIELD BORING LOG NO. 47

Depth to water table (ft): 7.6 — Topstratum thickness (ft): 8

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | clay,br | | | | | | | |
| | | 5.0 | 13.0 | silty clay, br-gr | | | | | | | |
| | | 13.0 | 20.5 | plastic clay, br-gr | | | | | | | |
| | | 20.5 | 26.3 | silty clay, br-gr | | | | | | | |
| | | 26.3 | 32.0 | ML, clayey silt, gr | | | | | | | |
| | | 32.0 | 33.1 | ML,clayey silt, gr, w/ sand lenses | | | | | | | |
| | | 33.1 | | SP, f sand, gr | NA | | | | | | |
| 34.5 | 36.0 | | | SP, f sand, gr | 22 | 0.79 | 17 | | | | |
| 41.5 | 43.0 | ≥43.0 | | SP, f sand, gr | 51 | 0.74 | 38 | | | | |

FIELD BORING LOG NO. 48

Depth to water table (ft): 16.4 — Topstratum thickness (ft): 32

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 10.0 | ML,silt, br | | | | | | | |
| | | 10.0 | 16.5 | CL, sandy clay, br-gr | | | | | | | |
| | | 16.5 | 22.5 | ML, clayey silt, br-gr | | | | | | | |
| | | 22.5 | 31.6 | CL, silty clay, gr | | | | | | | |
| | | 31.6 | | SP, f sand, br-gr | NA | | | | | | |
| 37.5 | 39.0 | | | SP, f sand, br-gr | 48 | 0.78 | 37 | | | | |
| 44.0 | 45.5 | ≥45.5 | | SP, f sand, br-gr | 86 | 0.73 | 63 | | | | |

FIELD BORING LOG NO. 49

Depth to water table (ft): 12.1 — Topstratum thickness (ft): 23

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 7.0 | ML, silt and vf sand, br | | | | | | | |
| | | 7.0 | 10.5 | SM, silty sand, br | | | | | | | |
| | | 10.5 | 20.0 | CL, clay, gr | | | | | | | |
| | | 20.0 | 23.0 | ML, clayey silt, gr w/ f sand lenses | | | | | | | |
| 23.0 | 24.5 | 23.0 | | SP, f sand, gr | 14 | 0.96 | 13 | | | | |
| 29.5 | 31.0 | ≥31.0 | | SP, f sand, gr | 46 | 0.89 | 41 | | | | |

FIELD BORING LOG NO. 50

Depth to water table (ft): 12.7 — Topstratum thickness (ft): 32

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.0 | CL, sandy clay, br | | | | | | | |
| | | 8.0 | 10.5 | CH, plastic clay, br-gr | | | | | | | |
| | | 10.5 | 11.3 | f sand, br | | | | | | | |
| | | 11.3 | 14.0 | CH, plastic clay, br-gr | | | | | | | |
| | | 14.0 | 23.0 | ML, clayey silt, br-gr | | | | | | | |
| 26.0 | 27.5 | 23.0 | 27.1 | ML, silt w/f sand lenses | 12 | | | | | | |
| | | 27.1 | 28.0 | CH, plastic clay, gr | | | | | | | |
| | | 28.0 | 31.9 | ML, silt and vf sand | | | | | | | |
| | | 31.9 | | SP, f sand, gr | NA | | | | | | |
| 38.0 | 39.5 | | | SP, f sand, gr | 61 | 0.81 | 49 | | | | |
| 44.5 | 46.0 | | | SP, f sand, gr | 49 | 0.75 | 37 | | | | |

FIELD BORING LOG NO. 51

Depth to water table (ft): 16.9 — Topstratum thickness (ft): 24

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 2.8 | fine sand, br | | | | | | | |
| | | 2.8 | 4.0 | CL, sandy clay, br | | | | | | | |
| | | 4.0 | 13.5 | ML, clayey silt, br | | | | | | | |
| | | 13.5 | 17.0 | CH, plastic clay, br-gr | | | | | | | |
| | | 17.0 | 23.0 | ML, clayey silt, br-gr | | | | | | | |
| | | 23.0 | | SP, f sand, br-gr | NA | | | | | | |
| 30.0 | 31.5 | | | SP, f sand, br-gr | 32 | 0.84 | 27 | | | | |
| 36.5 | 38.0 | ≥38.0 | | SP, f sand, br-gr | 22 | 0.78 | 17 | | | | |

FIELD BORING LOG NO.52

Depth to water table (ft) 12.1 Topstratum thickness (ft) 18

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 1.0 | CL, sandy clay, br | | | | | | | |
| | | 1.0 | 16.0 | CH, plastic clay, br-gr with sand lenses | | | | | | | |
| | | 16.0 | 18.5 | f sand, w/clay balls | | | | | | | |
| 17.0 | 18.5 | 18.5 | | f sand, gr, w/silt lenses | 9 | 1.06 | 10 | | | | |
| 23.0 | 25.0 | | | SP, f sand, gr | 34 | 0.95 | 32 | | | | |
| 30.0 | 31.5 | | ≥31.5 | SP, f sand, gr | 31 | 0.89 | 28 | | | | |

FIELD BORING LOG NO.53

Depth to water table (ft) <10.5 Topstratum thickness (ft) 11

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 2.0 | SM, silty sand, br w/ f gravel | | | | | | | |
| | | 2.0 | 6.8 | CH, plastic clay, br-gr | | | | | | | |
| | | 6.8 | 10.5 | CL, sandy clay, br-gr | | | | | | | |
| | | 10.5 | | SP, f sand, gr-br | NA | | | | | | |
| 11.0 | 12.5 | | | SP, f sand, gr-br, w/ organic (coal?) | 15 | | | | | | |
| 17.5 | 19.0 | | | SP, f sand, gr-br, w/ organic (coal?) | 19 | | | | | | |
| 24.0 | 25.5 | | | SP, f sand, gr-br, w/ organic (coal?) | 14 | | | | | | |
| 30.5 | 32.0 | | | SP, f sand, gr-br | 27 | | | | | | |

FIELD BORING LOG NO.54

Depth to water table (ft) 12.7 Topstratum thickness (ft) 21

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 1.5 | CL, sandy clay, gr-br | | | | | | | |
| | | 1.5 | 16.5 | CH, plastic clay, gr | | | | | | | |
| | | 16.5 | 21.0 | CL, silty clay, gr | | | | | | | |
| 21.0 | 22.5 | 21.0 | | SP, f sand, gr | 25 | 0.98 | 25 | | | | |
| 27.5 | 29.0 | | | SP, f sand, gr | 37 | 0.90 | 33 | | | | |
| 34.0 | 35.5 | | | SP, f sand, gr | 26 | 0.82 | 21 | | | | |

FIELD BORING LOG NO.55

Depth to water table (ft) 13.4 Topstratum thickness (ft) 17

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 1.5 | SM, silty f sand, br | | | | | | | |
| | | 1.5 | 5.0 | SP, f sand, br | | | | | | | |
| | | 5.0 | 7.5 | SM, silty sand | | | | | | | |
| | | 7.5 | 17.0 | CL and sandy clay, wood at 13.5 | | | | | | | |
| | | 17.0 | | SP, f sand, gr | NA | | | | | | |
| 18.5 | 20.0 | | | SP, f sand, gr | 11 | 1.01 | 11 | | | | |
| 25.0 | 26.5 | | | SP, f sand, gr | 52 | 0.92 | 48 | | | | |
| 31.5 | 33.0 | | ≥33.0 | SP, f sand, gr | 73 | 0.85 | 62 | | | | |

FIELD BORING LOG NO.56

Depth to water table (ft) 11.1 Topstratum thickness (ft) 17

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 2.0 | CH, plastic clay, gr-br | | | | | | |
| | | 2.0 | 2.5 | SP, f sand, br | | | | | | |
| | | 2.5 | 16.5 | plastic clay and silty clay layers | | | | | | |
| | | 16.5 | | SP, f sand, gr-br | NA | | | | | |
| 21.5 | 23.0 | | | SP, f sand, gr-br | 29 | 0.99 | 29 | | | |
| 28.0 | 29.5 | | ≥29.0 | SP, f sand, f sand,gr-br | 30 | 0.90 | 27 | | | |

FIELD BORING LOG NO.57

Depth to water table (ft) 14.0 Topstratum thickness (ft) 31

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 1.0 | CL, sandy clay, gr-br | | | | | | | |
| | | 1.0 | 13.5 | CH, plastic clay, gr-br | | | | | | | |
| | | 13.5 | 15.2 | ML, clayey silt, gr | | | | | | | |
| | | 15.2 | 30.5 | silty clay to clayey silt, gr | | | | | | | |
| | | 30.5 | | SP, f sand, gr | NA | | | | | | |
| 35.5 | 37.0 | | | SP, f sand, gr | 66 | 0.81 | 53 | | | | |
| 42.0 | 43.5 | | ≥43.5 | SP, f sand, gr | 45 | 0.76 | 34 | | | | |

FIELD BORING LOG NO.58

Depth to water table (ft) <17.0 Topstratum thickness (ft) 26(46)

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.2 | silt and vf sand, br | | | | | | | |
| | | 3.2 | 10.5 | silty clay and clayey silt layers | | | | | | | |
| | | 10.5 | 14.0 | silt and vf sand, gr-br | | | | | | | |
| | | 14.0 | 20.0 | ML, clayey silt | | | | | | | |
| | | 20.0 | 26.0 | silt and vf sand and clayey silt | | | | | | | |
| | | 26.0 | 31.5 | silt and vf sand, gr, wet | NA | | | | | | |
| 31.5 | 33.0 | 31.5 | 33.0 | silt and vf sand, gr, sat | 14 | | | | | | |
| 38.0 | 39.0 | | | silt and vf sand, gr sat | 35 | | | | | | |
| 44.5 | 46.0 | | | silt and vf sand, gr sat | 52 | | | | | | |
| 51.0 | 52.5 | | ≥52.5 | silt and vf sand, gr sat | 60 | | | | | | |

FIELD BORING LOG NO.59

Depth to water table (ft) 11.7 Topstratum thickness (ft) 25

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.0 | CL, silty clay, gr-br | | | | | | | |
| | | 17.0 | 24.5 | ML, clayey silt, gr | | | | | | | |
| | | 24.5 | | SP, f sand, gr, w/f to c lenses sand | NA | | | | | | |
| 30.5 | 32.0 | | | SP, f sand, gr, w/f to c lenses sand | 15 | 0.87 | 13 | | | | |
| 37.0 | 38.5 | | ≥38.5 | SP, f sand, gr, w/some c sand | 53 | 0.82 | 43 | | | | |

FIELD BORING LOG NO.60

Depth to water table (ft) 14.5 Topstratum thickness (ft) 12(22)

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 2.5 | CH, plastic clay, br-gr | | | | | | | |
| | | 2.5 | 4.5 | SP, f sand, br | | | | | | | |
| | | 4.5 | 12.3 | clay, br-gr | | | | | | | |
| | | 12.3 | 15.3 | SP, f sand, br | 4 | 1.10 | 4 | | | | |
| | | 15.3 | 21.3 | silty clay to clayey silt, br-gr | | | | | | | |
| 22.0 | 23.5 | 21.3 | 23.4 | ML, silt, gr, w/f sand lenses | 8 | | | | | | |
| | | 23.4 | | SP, f sand, gr | NA | | | | | | |
| 28.5 | 30.0 | | | SP, f sand, gr, w/some f grand | 21 | 0.87 | 18 | | | | |
| 35.0 | 36.5 | | ≥36.5 | SP, f sand, gr, w/some f grand | 27 | 0.81 | 22 | | | | |

FIELD BORING LOG NO. 61

Depth to water table (ft): 8.7 — Topstratum thickness (ft): 17

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.0 | silt and vf sand, br | | | | | | | |
| | | 3.0 | 5.0 | CH, clay, br | | | | | | | |
| | | 5.0 | 8.7 | sandy clay and clayey silt layers, br | | | | | | | |
| | | 8.7 | 9.0 | SM, silty f sand, br | | | | | | | |
| | | 9.0 | 16.5 | clayey silt, gr | | | | | | | |
| 17.0 | 18.5 | 16.5 | | SM, silty sand, gr-br | 16 | 1.12 | 18 | | | | |
| 23.5 | 25.0 | | | SM, silty sand, gr-br | 21 | 1.00 | 21 | | | | |
| 30.0 | 31.5 | | | SP, f sand, gr, w/ f gravel | 45 | 0.85 | 38 | | | | |
| 36.5 | 38.0 | | ≥38.0 | SP, f sand, gr | | | | | | | |

FIELD BORING LOG NO. 62

Depth to water table (ft): 11.9 — Topstratum thickness (ft): 20

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 11.0 | clayey silt and silty clay layers, br | | | | | | | |
| | | 11.0 | 13.5 | silty sand, br, w/ silty clay lenses | | | | | | | |
| | | 13.5 | 17.0 | clayey silt, gr, w/ thin sand lenses | | | | | | | |
| 17.0 | 18.5 | 17.0 | 18.5 | SM, silty f sand, gr | 18 | 1.06 | 19 | | | | |
| 23.0 | 25.0 | | | SP, f sand, gr | 48 | 0.96 | 46 | | | | |
| 30.0 | 31.5 | | ≥31.5 | SP, f sand, gr | 39 | 0.88 | 34 | | | | |

FIELD BORING LOG NO. 63

Depth to water table (ft): 10.2 — Topstratum thickness (ft): 14

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 2.0 | clayey f sand, br | | | | | | | |
| | | 2.0 | 14.0 | silty sand and silty clay | | | | | | | |
| 14.0 | 16.5 | 14.0 | | SM, silty f sand, gr | NA | | | | | | |
| 17.0 | 18.0 | | | SM, silty f sand, gr, w/thin silt lenses | NA | | | | | | |
| 23.0 | 24.5 | | | SM, silty f sand, gr | 12 | 0.99 | 12 | | | | |
| 29.5 | 31.0 | | ≥31.0 | SP, f sand, gr, w/ some f gravel | 32 | 0.90 | 29 | | | | |

FIELD BORING LOG NO. 64

Depth to water table (ft): 8.8 — Topstratum thickness (ft): 11

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 7.5 | silty clay,br-gr | | | | | | | |
| | | 7.5 | 11.0 | clayey silt, silt, tvf sand layers | | | | | | | |
| | | 11.0 | | SM, silty f sand, gr | NA | | | | | | |
| 14.0 | 15.5 | | 20.5 | SM, silty f sand, gr | 11 | 1.19 | 13 | | | | |
| 20.5 | 22.0 | | | SP, f sand, gr | 30 | 1.05 | 32 | | | | |
| 27.0 | 28.5 | | ≥28.5 | SP, f sand, gr | 16 | 0.95 | 15 | | | | |

FIELD BORING LOG NO. 65

Depth to water table (ft): 10.9 — Topstratum thickness (ft): 24

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 13.5 | silty clay and sandy clay layers, br-gr | | | | | | | |
| | | 13.5 | 17.0 | silt and vf sand,gr, w/clayey silt lenses | | | | | | | |
| 17.0 | 18.5 | 17.0 | 24.0 | ML, silt, gr w/f sand | 29 | | | | | | |
| 23.5 | 25.0 | | | SP, f sand, gr | 17 | 0.97 | 16 | | | | |
| 30.0 | 31.5 | | | SP, m sand, gr | 17 | 0.90 | 15 | | | | |
| 36.5 | 38.0 | | ≥38.0 | SP, f sand, gr | 37 | 0.83 | 31 | | | | |

FIELD BORING LOG NO. 66

Depth to water table (ft): 7.5 — Topstratum thickness (ft): 10

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 10.0 | clayey silt and silty clay layers, br-gr | | | | | | | |
| | | 10.0 | | SM, silty f sand, br | NA | | | | | | |
| 12.0 | 13.5 | | | SP, f sand, gr | 8 | 1.26 | 10 | silty sand | 0.12 | 0.044 | 2.9 |
| 18.5 | 20.0 | | | SP, f sand, gr | 21 | 1.11 | 23 | f sand | 0.21 | 0.14 | 1.6 |
| 25.0 | 26.5 | | | SP, f sand, gr | 13 | 1.00 | 13 | | | | |
| 31.5 | 33.0 | | ≥33.0 | SP, f sand, gr | 36 | 0.90 | 32 | | | | |

FIELD BORING LOG NO. 67

Depth to water table (ft): 11.4 — Topstratum thickness (ft): 17

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | ML, sandy silt, br | | | | | | | |
| | | 5.0 | 14.0 | clayey silt, w/sand and silt lenses | | | | | | | |
| 17.0 | 19.5 | 17.0 | | silt and vf sand, gr | NA | | | | | | |
| 20.0 | 22.5 | | 22.5 | silty sands and sand layers | NA | | | | | | |
| 27.5 | 29.0 | 22.5 | | SP, f sand, gr | 32 | 1.05 | 34 | f sand | 0.26 | 0.16 | 1.7 |
| 34.0 | 35.5 | | ≥35.5 | SP, f sand, gr, w/some | 32 | 0.85 | 27 | m sand | 0.52 | 0.19 | 3.0 |

FIELD BORING LOG NO. 68

Depth to water table (ft): 5.7 — Topstratum thickness (ft): 8.5

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.5 | ML, clayey silt, br | | | | | | | |
| | | 8.5 | | SP, f sand, br | NA | | | | | | |
| 11.0 | 12.5 | | | SP, f sand, gr | 25 | 1.32 | 33 | | | | |
| 17.5 | 19.0 | | | SP, f sand, gr | 5 | 1.14 | 6 | | | | |
| 24.0 | 25.5 | | | SP, f sand, gr | 25 | 1.03 | 26 | | | | |
| 30.5 | 32.0 | | ≥32.0 | SP, f sand, gr. | 9 | 0.94 | 8 | | | | |

FIELD BORING LOG NO. 69

Depth to water table (ft): 6.2 — Topstratum thickness (ft): 14

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.0 | clayey silt, silty clay and clay layers | | | | | | | |
| 14.0 | 15.5 | 14.0 | 15.5 | SP, f sand, br-gr, w/ silt lenses | 18 | 1.24 | 22 | | | | |
| 20.5 | 22.0 | | | SP, f sand, br-gr | 30 | 1.09 | 33 | | | | |
| 27.0 | 28.5 | | ≥28.5 | SP, f sand, gr | 39 | 0.97 | 38 | | | | |

FIELD BORING LOG NO. 70

Depth to water table (ft): <10.5 — Topstratum thickness (ft): 18.5

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.0 | silt and vf sand, br | | | | | | | |
| | | 3.0 | 8.0 | silty sand and clayey silt layers | | | | | | | |
| | | 8.0 | 18.5 | clayey silt, gr, w/ thin sand lenses | | | | | | | |
| | | 18.5 | | SP, vf sand, gr | NA | | | | | | |
| 23.5 | 25.0 | | | SP, vf sand, gr | 16 | | | | | | |
| 30.0 | 31.5 | | ≥31.5 | SP, f sand, gr | 52 | | | | | | |

FIELD BORING LOG NO. 71

Depth to water table (ft): NA — Topstratum thickness (ft): 20.5

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.0 | CL, sandy clay, br, moist | | | | | | | |
| | | 8.0 | 10.5 | sandy clay, br-rd-gr, moist | | | | | | | |
| | | 10.5 | 16.0 | CL, silty clay, gr | | | | | | | |
| | | 16.0 | 20.5 | CL, sandy clay | | | | | | | |
| | | 20.5 | | SP, c sand, gr | NA | | | | | | |
| 23.0 | 24.5 | | | SP, c sand, gr | 28 | | | | | | |
| 28.0 | 29.5 | | | SP, c sand, gr | 36 | | | | | | |
| 33.0 | 34.5 | | | SP, c sand, gr | 68 | | | | | | |
| 38.0 | 39.5 | | | SP, c sand, gr | 25 | | | | | | |
| 43.0 | 44.5 | | | SP, coal rich sand w/ gravel, gr | 68 | | | | | | |
| 48.0 | 50.0 | | ≥50.0 | SP, sand w/gravel, gr | 52 | | | | | | |

FIELD BORING LOG NO. 72

Depth to water table (ft): 15.5 — Topstratum thickness (ft): 20.0

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.5 | CH, clay, br, moist | | | | | | | |
| | | 3.5 | 11.0 | CH, clay, br-gr, moist | | | | | | | |
| | | 11.0 | 20.0 | CL, sandy clay, br-gr, moist | | | | | | | |
| 20.0 | 22.5 | 20.0 | | SP, sand and sand w/ coal, gr | NA | | | | | | |
| 23.0 | 24.5 | | | SP, c sand, gr | 15 | 0.92 | 14 | | | | |
| 28.0 | 29.5 | | | SP, c sand, gr | 38 | 0.86 | 33 | m sand | 0.44 | 0.14 | 3.6 |
| 33.0 | 34.5 | | | SP, sand w/gravel, gr | 27 | 0.81 | 22 | | | | |
| 38.0 | 39.5 | | | SP, sand w/gravel, gr | 22 | 0.78 | 17 | | | | |
| 43.0 | 44.5 | | | sand w/gravel and coal, multicolored | 61 | 0.74 | 45 | | | | |
| 48.5 | 50.0 | | ≥50.0 | sand w/ gravel and coal, | >100 | 0.71 | >71 | m sand | 0.63 | | 3.6 |

FIELD BORING LOG NO. 73

Depth to water table (ft): 16.2 — Topstratum thickness (ft): 22.5

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 4.0 | silty clay, gr-br, moist | | | | | | | |
| | | 4.0 | 11.0 | clay, moist | | | | | | | |
| | | 11.0 | 22.5 | silty clay, gr-br, moist | | | | | | | |
| 23.0 | 24.5 | 22.5 | 28.0 | SM, silty sand, multi- | 4 | 0.90 | 4 | | | | |
| 28.0 | 29.5 | 28.0 | 31.0 | SM, silty sand, gr | 0 | | 0 | | | | |
| 33.0 | 34.5 | 31.0 | | SP, c sand, multi- | 38 | 0.80 | 30 | m sand | 0.50 | 0.26 | 2.1 |
| 38.0 | 39.5 | | | SP, c sand, gr | 27 | 0.77 | 21 | | | | |
| 43.0 | 44.5 | | | SP, sand and gravel, gr | 57 | 0.73 | 42 | | | | |
| 48.0 | 50.0 | | ≥50.0 | SP, sand and gravel, gr | 30 | 0.70 | 21 | f sand | 0.31 | 0.15 | 2.4 |

FIELD BORING LOG NO. 74

Depth to water table (ft): 7.2 — Topstratum thickness (ft): 22.0

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.5 | sandy clay, br, moist | | | | | | | |
| | | 3.5 | 11.0 | sandy clay, br-gr, moist | | | | | | | |
| | | 11.0 | 14.0 | fat clay, br-gr, moist | | | | | | | |
| | | 14.0 | 20.0 | fat clay w/gr silt, br-gr | | | | | | | |
| | | 20.0 | 22.0 | clay, gr | | | | | | | |
| 25.0 | 26.5 | 22.0 | | f sand, gr | 38 | 1.00 | 38 | | | | |
| 30.0 | 31.5 | | | f sand, gr | 34 | 0.92 | 31 | | | | |
| 35.0 | 36.5 | | | f sand, gr | 32 | 0.88 | 28 | | | | |
| 40.0 | 41.5 | | | f sand, gr | 89 | 0.82 | 73 | | | | |
| 44.5 | 46.0 | | | f and m sand, gr | >100 | 0.78 | >78 | | | | |
| 48.5 | 50.0 | | ≥50.0 | f sand, gr-br | >100 | 0.75 | .75 | | | | |

FIELD BORING LOG NO. 75

Depth to water table (ft): 10.5 — Topstratum thickness (ft): 24.8

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 2.0 | silty clay, br, moist | | | | | | | |
| | | 2.0 | 5.0 | sandy clay, br-gr, moist | | | | | | | |
| | | 5.0 | 14.0 | CL, silty clay, br-gr, moist | | | | | | | |
| | | 14.0 | 17.0 | clayey silt, br-gr | | | | | | | |
| | | 17.0 | 19.0 | SM, silty sand, gr | | | | | | | |
| | | 19.0 | 24.8 | clayey silt, gr | | | | | | | |
| | | 24.8 | | SP, sand, gr | NA | | | | | | |
| 29.0 | 30.5 | | | SP, sand, gr | 33 | 0.90 | 30 | | | | |
| 34.0 | 35.5 | | | SP, sand, gr | 40 | 0.86 | 34 | | | | |
| 39.0 | 40.5 | | | SP, sand, gr | 48 | 0.82 | 39 | | | | |
| 44.0 | 45.5 | | | SP, coal-rich sand, gr | 37 | 0.78 | 29 | | | | |
| 49.0 | 50.5 | | ≥50.5 | SP, coal-rich sand, gr | 36 | 0.74 | 27 | | | | |

FIELD BORING LOG NO. 76

Depth to water table (ft): 9.5 — Topstratum thickness (ft): 14.0(78.5)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 1.0 | CL, sandy clay, br, moist | | | | | | | |
| | | 1.0 | 5.0 | CL, silty clay, gr, moist | | | | | | | |
| | | 5.0 | 8.0 | CH, clay, gr | | | | | | | |
| | | 8.0 | 11.0 | CL, silty clay, gr | | | | | | | |
| | | 11.0 | 14.0 | CH, soft clay w/silty sand lenses, gr | | | | | | | |
| | | 14.0 | 18.2 | SP, f sand, gr | NA | | | | | | |
| 17.0 | 18.5 | 18.2 | | SM, silty f sand w/ | 4 | 1.10 | 4 | | | | |
| 20.0 | 21.5 | | | SM, silty vf sand, gr | 7 | 1.05 | 7 | | | | |
| 23.0 | 24.5 | | 26.4 | SM, silty vf sand w/ clay lenses | 5 | 1.01 | 5 | | | | |
| 26.0 | 27.5 | 26.4 | | SP, f sand, gr | 28 | 0.96 | 27 | | | | |
| 29.0 | 30.5 | | | SP, f sand, gr | 27 | 0.92 | 25 | | | | |
| 34.0 | 35.5 | | 39.0 | SP, vf sand, gr | 28 | 0.86 | 24 | | | | |
| 39.0 | 40.5 | 39.0 | 44.0 | SM, silty vf sand, gr | 26 | 0.82 | 21 | | | | |
| 44.0 | 45.5 | 44.0 | 47.0 | ML, clayey silt w/ gr clay streaks | 7 | | | | | | |
| 47.0 | 48.5 | 47.0 | 53.0 | ML, clayey silt, gr | 6 | | | | | | |

FIELD BORING LOG NO. 77

Depth to water table (ft): NA — Topstratum thickness (ft): 28.5(46.0)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.5 | CL, silty clay, br, moist | | | | | | | |
| | | 3.5 | 4.0 | CL, sandy clay, br-gr, moist | | | | | | | |
| | | 4.0 | 10.0 | layerd SP, sand and sandy clay, tan-gr | | | | | | | |
| | | 10.0 | 19.5 | CL silty clay, br-gr | | | | | | | |
| | | 19.5 | 22.0 | SM, silty sand, br-gr | | | | | | | |
| | | 22.0 | 28.5 | CL, silty clay, gr | | | | | | | |
| | | 28.5 | | SM, silty sand, gr | NA | | | | | | |
| 31.0 | 32.5 | | | SM, silty sand, gr | 20 | | | | | | |
| 36.0 | 37.5 | | 40.0 | SM, silty sand, gr | 20 | | | | | | |
| 41.0 | 42.5 | 40.0 | 43.0 | CL, silty clay, gr | 2 | | | | | | |
| | | 43.0 | 46.0 | Layered CL, silty clay and SP, sand | NA | | | | | | |
| 48.0 | 49.5 | 46.0 | | SM, silty sand, gr | 13 | | | | | | |
| 51.0 | 52.5 | | ≥54.0 | SM, silty sand, gr | 11 | | | | | | |

FIELD BORING LOG NO. 78

Depth to water table (ft): 14.6 — Topstratum thickness (ft): 16.0

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | CL, silty clay, br | | | | | | | |
| | | 5.0 | 11.0 | CL, silty clay, br-gr | | | | | | | |
| | | 11.0 | 16.0 | clayey silt,gr | | | | | | | |
| 17.0 | 18.5 | 16.0 | 18.5 | SM, silty sand, gr | NA | | | | | | |
| 19.0 | 20.5 | 18.5 | | SP, sand, gr | 29 | 0.98 | 28 | | | | |
| 24.0 | 25.5 | | | SP, sand, gr | 16 | 0.92 | 15 | | | | |
| 29.0 | 30.5 | | | SP, sand, gr | 48 | 0.86 | 41 | | | | |
| 34.0 | 35.5 | | | SP, sand, gr | 22 | 0.82 | 18 | | | | |
| 39.0 | 40.5 | | 44.0 | SP, sand, gr | 40 | 0.78 | 31 | | | | |
| 44.0 | 45.5 | 44.0 | 49.0 | SP, coal-rich c sand, gr | 53 | 0.74 | 39 | | | | |
| 49.0 | 50.5 | 49.0 | ≥50.0 | mixture SP, coal-rich sand, and gravel | 26 | 0.71 | 18 | | | | |

FIELD BORING LOG NO. 79

Depth to water table (ft) 8.5 — Topstratum thickness (ft) 14.0(34.0)

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.0 | CH, clay, br-gr, moist | | | | | | | |
| | | 8.0 | 14.0 | CL, silty clay, br-g, moist | | | | | | | |
| | | 14.0 | 21.0 | sandy silt, gr | NA | | | | | | |
| 22.0 | 23.5 | 21.0 | | SM, silty sand, gr | 15 | 1.04 | 16 | | | | |
| 25.0 | 26.5 | | 28.0 | SM, silty sand, gr | 16 | 0.98 | 16 | | | | |
| 30.0 | 31.5 | 28.0 | 34.0 | CL, silty clay, gr | 2 | | | | | | |
| | | 34.0 | 38.0 | SM, silty sand, gr | NA | | | | | | |
| 43.0 | 44.5 | 38.0 | | SP, f sand, gr | 56 | 0.79 | 44 | | | | |
| 48.5 | 50.0 | | 50.0 | SP, c sand w/coal | 36 | 0.76 | 27 | | | | |

FIELD BORING LOG NO. 80

Depth to water table (ft) NA — Topstratum thickness (ft) 18.5(29.5)

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 7.5 | CL, silty clay | | | | | | | |
| | | 7.5 | 11.0 | SM, silty sand, gr | | | | | | | |
| | | 11.0 | 18.5 | clay and sandy clay layers | | | | | | | |
| | | 18.5 | 24.5 | sand, gr | NA | | | | | | |
| | | 24.5 | 29.5 | sandy silt and clay layers | | | | | | | |
| 30.0 | 31.5 | 29.5 | | c sand, multicolored | 28 | | | | | | |
| 35.0 | 36.5 | | | c sand, multicolored | 20 | | | | | | |
| 40.0 | 41.5 | | | c sand, multicolored | 44 | | | | | | |
| 45.0 | 46.5 | | | c sand, multicolored | 28 | | | | | | |
| 50.0 | 51.0 | | ≥51.5 | c sand, multicolored | 37 | | | | | | |

FIELD BORING LOG NO. 81

Depth to water table (ft) 16 — Topstratum thickness (ft) 6(24)

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 6.0 | sandy clay and silty clay layers | | | | | | | |
| | | 6.0 | | sand, tan | NA | | | | | | |
| 11.0 | 12.5 | | | SM, silty f sand, gr | 8 | 1.20 | 10 | | | | |
| 16.0 | 17.5 | | 19.0 | SM, silty f sand, gr | 13 | 1.01 | 13 | | | | |
| 21.0 | 22.5 | 19.0 | 24.0 | clayey f sand | 7 | 0.92 | 6 | | | | |
| 26.0 | 27.5 | 24.0 | | silty f sand, gr | 16 | 0.88 | 14 | | | | |
| 31.0 | 32.5 | | 34.0 | silty f sand, gr | 22 | 0.82 | 18 | | | | |
| 36.0 | 37.5 | 34.0 | | SP, f sand, tan-gr | 42 | 0.78 | 33 | | | | |
| 41.0 | 42.5 | | | SP, f sand, tan-gr | 26 | 0.75 | 19 | | | | |
| 46.0 | 47.5 | | | SP, f sand, tan-gr | 54 | 0.72 | 39 | | | | |
| 51.0 | 52.5 | | | SP, c sand, tan-gr | 41 | 0.69 | 28 | | | | |

FIELD BORING LOG NO. 82

Depth to water table (ft) 14.8 — Topstratum thickness (ft) 17

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.0 | sandy clay and silty clay layers | | | | | | | |
| | | 14.0 | 17.0 | CH, plastic clay | | | | | | | |
| | | 17.0 | 23.0 | SM, silty f sand, gr | NA | | | | | | |
| 23.0 | 24.5 | 23.0 | | SP, m sand, gr | 24 | 0.93 | 22 | | | | |
| 28.0 | 29.5 | | | SP, m to c sand, w/f gravel, gr | 18 | 0.88 | 16 | | | | |
| 33.0 | 34.5 | | | SP, m to c sand, w/f gravel, gr | 30 | 0.83 | 25 | | | | |
| 38.0 | 39.5 | | | SP, m sand, gr | 26 | 0.78 | 20 | | | | |
| 43.0 | 44.5 | | | SP, f to m sand, w/f gravel | 16 | 0.74 | 12 | | | | |
| 48.0 | 49.5 | | ≥49.5 | SP, g sand, w/some coal | 32 | 0.72 | 23 | | | | |

FIELD BORING LOG NO. 83

Depth to water table (ft) 7.1 — Topstratum thickness (ft) 35

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | silty sand w/sandy clay lenses, br | | | | | | | |
| | | 5.0 | 11.0 | SP, f sand w/sandy clay lenses, br | | | | | | | |
| | | 11.0 | 23.0 | ML, clayey silt w/f sand lenses, gr | | | | | | | |
| | | 23.0 | 35.0 | CH, plastic clay w/thin f sand lenses, gr | | | | | | | |
| | | 35.0 | | SP, f sand, gr | NA | | | | | | |
| 38.0 | 39.5 | | | SP, f sand, gr, w/ organics | 4 | 0.86 | 3 | | | | |
| 41.0 | 42.5 | | | SP, f sand, gr, w/some f gravel | 19 | 0.82 | 16 | | | | |
| 46.0 | 47.5 | | | SP, f sand, gr | 27 | 0.78 | 21 | | | | |
| 50.0 | 51.5 | | ≥51.5 | SP, f sand, gr | 31 | 0.75 | 23 | | | | |

FIELD BORING LOG NO. 84

Depth to water table (ft) 9.1 — Topstratum thickness (ft) 20

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.0 | silty clay and silty sand layers, br | | | | | | | |
| | | 8.0 | 11.0 | plastic clay, gr | | | | | | | |
| | | 11.0 | 16.5 | SM, silty sand, br | | | | | | | |
| | | 16.5 | 20.0 | clayey silt, br-gr | | | | | | | |
| | | 20.0 | 23.5 | SM, silty sand, br | NA | | | | | | |
| | | 23.5 | | SP, sand and gravel, gr | NA | | | | | | |
| 28.0 | 29.5 | | | SP, sand w/lignite lens gr | NA | | | | | | |
| 33.0 | 34.5 | | | sand and silty sand layers, gr | 10 | 0.88 | 9 | | | | |
| 38.0 | 39.5 | | | SM, silty sand, gr | 12 | 0.83 | 10 | | | | |
| 43.0 | 44.5 | | | SP, lignitic sand, gr | 30 | 0.78 | 23 | | | | |
| 48.0 | 49.5 | | ≥49.5 | SP, lignitic sand, gr | 36 | 0.75 | 27 | | | | |

FIELD BORING LOG NO. 85

Depth to water table (ft) NA — Topstratum thickness (ft) 41

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 10.5 | sandy clay, tan and br | | | | | | | |
| | | 10.5 | 38.0 | clayey silt grding to sandy silt at depth, gr and br | | | | | | | |
| | | 38.0 | 40.5 | sandy silt w/sand lens, gr | | | | | | | |
| 41.0 | 42.5 | 40.5 | | sand w/gravel | NA | | | | | | |
| 44.0 | 45.5 | | | sand w/organics, tan | 50 | | | | | | |
| 49.0 | 50.5 | | | lignitic sand, tan | 58 | | | | | | |
| 54.0 | 55.5 | | ≥55.5 | lignitic sand, tan | 64 | | | | | | |

FIELD BORING LOG NO. 86

Depth to water table (ft) 11.6 — Topstratum thickness (ft) 25

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 19.5 | silty clay, br | | | | | | | |
| | | 19.5 | 25.0 | clayey silt, br | | | | | | | |
| 25.0 | 26.5 | 25.0 | | SP, f sand, br | 27 | 0.94 | 25 | | | | |
| 30.0 | 31.5 | | | SP, f sand, br | 42 | 0.89 | 37 | | | | |
| 35.0 | 36.5 | | | SP, vf sand, br | 31 | 0.84 | 26 | | | | |
| 40.0 | 41.5 | | | SP, f sand, br | 21 | 0.79 | 17 | | | | |
| 45.5 | 46.5 | | | SP, f sand, br | 41 | 0.76 | 31 | | | | |
| 50.0 | 51.5 | ≥51.5 | | SP, m sand w/f gravel, br | 31 | 0.73 | 23 | | | | |

FIELD BORING LOG NO.87

Depth to water table (ft): 12.9 Topstratum thickness (ft): 25

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | $N$ | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 23.0 | plastic clay | | | | | | | |
| | | 23.0 | 24.5 | clayey silt | | | | | | | |
| 24.5 | 26.0 | 24.5 | | SP, f sand w/some f gravel, gr | 19 | 0.94 | 18 | | | | |
| 29.5 | 31.0 | | | SP, f sand, gr | 5 | 0.88 | 4 | | | | |
| 34.5 | 36.0 | | | SP, f sand, gr | 20 | 0.83 | 17 | | | | |
| 39.5 | 41.0 | | | SP, f sand w/some f gravel, gr | 39 | 0.78 | 30 | | | | |
| 44.5 | 46.0 | | | SP, f sand w/some f gravel, gr | 58 | 0.75 | 43 | | | | |
| 49.5 | 51.0 | | ≥51.0 | SP, f sand w/some f gravel, gr | 79 | 0.72 | 57 | | | | |

FIELD BORING LOG NO.88

Depth to water table (ft): NA Topstratum thickness (ft): 12

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | $N$ | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 12.0 | silty clay to clayey silt, br and gr | | | | | | | |
| 13.0 | 14.5 | 12.0 | | SP, f sand w/occ clay lenses, br | 9 | | | | | | |
| 17.0 | 18.5 | | | SP, f sand w/occ clay lenses, gr | 23 | | | | | | |
| 20.0 | 21.5 | | | SP, f sand w/occ clay lenses, gr | 30 | | | | | | |
| 23.0 | 24.5 | | | SP, f sand, gr | 40 | | | | | | |
| 26.0 | 27.5 | | | SP, f sand w/organics, gr | 13 | | | | | | |
| 29.0 | 30.5 | | | SP, sand w/occ f gravel, gr | 71 | | | | | | |
| 32.0 | 33.5 | | | SP, f sand, gr | 60 | | | | | | |
| 35.0 | 36.5 | | | SP, f sand and organic w/occ f gravel, gr | 49 | | | | | | |
| 38.0 | 39.5 | | | SP, f sand, gr | 42 | | | | | | |
| 41.0 | 42.5 | | | SP, f sand, gr | 52 | | | | | | |
| 44.0 | 45.5 | | | SP, f sand w/organic, gr | 48 | | | | | | |
| 47.0 | 48.5 | | | SP, vf sand, gr | 52 | | | | | | |
| 50.0 | 51.5 | | ≥51.5 | SP, vf sand, gr | 45 | | | | | | |

FIELD BORING LOG NO.89

Depth to water table (ft): 8.2 Topstratum thickness (ft): 18(51)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | $N$ | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 18.0 | silty clay grading to sandy clay at depth | | | | | | | |
| 19.0 | 20.5 | 18.0 | | SM, silty sand, gr | 7 | 1.08 | 8 | | | | |
| 22.0 | 23.5 | | | SM, silty sand, gr | 10 | 1.03 | 10 | | | | |
| 25.0 | 26.5 | | 26.5 | SM, silty sand, gr | 13 | 0.98 | 13 | | | | |
| 28.0 | 29.5 | 26.5 | 31.0 | CL, silty clay, gr | | | | | | | |
| 32.0 | 33.5 | 31.0 | 34.0 | SM, silty sand, gr | 15 | 0.90 | 13 | | | | |
| | | 34.0 | 51.0 | CL, silty clay, gr | | | | | | | |
| 55.0 | 56.5 | 51.0 | | SP, multicolored lignitic and sand | 37 | 0.71 | 26 | | | | |
| 60.0 | 61.5 | | ≥61.5 | SP, sand w/gravel | 85 | 0.69 | 59 | | | | |

FIELD BORING LOG NO.90

Depth to water table (ft): 4.6 Topstratum thickness (ft): 32

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | $N$ | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.0 | clay and sand, br-gr | | | | | | | |
| | | 3.0 | 17.0 | plastic clay, br-gr | | | | | | | |
| | | 17.0 | 32.0 | silt w/clay, gr | | | | | | | |
| 29.0 | 31.4 | 32.0 | | f sand, gr | NA | | | | | | |
| 35.0 | 36.5 | | | f sand, gr | 29 | 0.90 | 26 | | | | |
| 38.0 | 36.5 | | | f sand, gr | 61 | 0.87 | 53 | | | | |
| 44.0 | 45.5 | | | f sand, gr | 22 | 0.82 | 18 | | | | |
| 48.5 | 50.0 | | | f sand, gr | 39 | 0.78 | 30 | | | | |

FIELD BORING LOG NO.91

Depth to water table (ft): 4.2 Topstratum thickness (ft): 49.5

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | $N$ | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | silty clay, br-gr | | | | | | | |
| | | 5.0 | 14.0 | sandy clay, br-gr | | | | | | | |
| | | 14.0 | 23.0 | plastic clay, gr | | | | | | | |
| 45.5 | 46.5 | 23.0 | 49.5 | plastic clay, w/lenses of silt and sand, gr | | | | | | | |
| 50.0 | 51.5 | 49.5 | | sand, br | 9 | 0.78 | 7 | f sand | 0.30 | 0.17 | 2.2 |
| 53.0 | 54.5 | | | sand, br | 56 | 0.74 | 41 | f sand | 0.30 | 0.16 | 2.6 |
| 53.0 | 60.5 | | ≥60.5 | sand, gr | 72 | 0.71 | 51 | | | | |

FIELD BORING LOG NO.92

Depth to water table (ft): 7.7 Topstratum thickness (ft): 28.5

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | $N$ | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.0 | silty clay, br-gr | | | | | | | |
| | | 3.0 | 5.0 | plastic clay, br-gr | | | | | | | |
| | | 5.0 | 17.0 | plastic clay, w/silt, br-gr | | | | | | | |
| | | 17.0 | 28.5 | plastic clay, gr | | | | | | | |
| 29.0 | 30.5 | 28.5 | 32.0 | silty sand, gr | 51 | 0.94 | 48 | | | | |
| 32.0 | 33.5 | 32.0 | 35.0 | silt, gr | 41 | 0.90 | 37 | | | | |
| 35.0 | 36.5 | | | f sand, gr | 73 | 0.87 | 63 | | | | |
| 40.0 | 41.5 | | | m sand, br-gr | 94 | 0.84 | 79 | | | | |
| 45.0 | 46.5 | | | f sand, gr | 50 | 0.78 | 39 | | | | |
| 48.5 | 50.0 | | ≥50.0 | f sand, gr | 90 | 0.76 | 68 | | | | |

FIELD BORING LOG NO.93

Depth to water table (ft): 4.9 Topstratum thickness (ft): 5

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | $N$ | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | silt, sand and clay | | | | | | | |
| | | 5.0 | 7.5 | sand,br | NA | | | | | | |
| | | 7.5 | 19.0 | silty sand, br | NA | | | | | | |
| 19.0 | 20.5 | 19.0 | | f sand, br | 13 | 1.16 | 15 | | | | |
| 22.0 | 23.5 | | | f sand, br | 12 | 1.08 | 13 | | | | |
| 25.0 | 26.5 | | | f sand, br-gr | 22 | 1.04 | 23 | | | | |
| 28.0 | 29.5 | | | f sand, gr | 24 | 0.98 | 23 | | | | |
| 33.0 | 34.5 | | | f sand, br-gr | 44 | 0.92 | 40 | | | | |
| 38.0 | 39.5 | | | f sand, br-gr | 56 | 0.87 | 49 | | | | |
| 48.5 | 50.0 | | ≥50.0 | f sand, br-gr | 31 | 0.78 | 24 | | | | |

FIELD BORING LOG NO.94

Depth to water table (ft): 7.2 Topstratum thickness (ft): 36.5

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | $N$ | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.0 | clay, silt and sand, br | | | | | | | |
| | | 3.0 | 5.0 | clay, br | | | | | | | |
| | | 5.0 | 23.0 | plastic clay, w/some silt lenses, br-gr | | | | | | | |
| | | 23.0 | 32.0 | silty clay, gr | | | | | | | |
| | | 32.0 | 36.6 | silt, gr | | | | | | | |
| 38.0 | 39.5 | 36.6 | | sand, br-gr | 37 | 0.85 | 31 | | | | |
| 42.0 | 43.5 | | | f sand, gr | 88 | 0.82 | 72 | | | | |
| 46.5 | 48.0 | | ≥48.0 | f sand, gr | >100 | 0.77 | >77 | | | | |

FIELD BORING LOG NO.95

Depth to water table (ft): 13.6 Topstratum thickness (ft): 24(41)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | $N$ | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.0 | clay and silt, br | | | | | | | |
| | | 3.0 | 5.0 | silt, br | | | | | | | |
| | | 5.0 | 17.0 | silty clay, br | | | | | | | |
| | | 17.0 | 21.0 | silty clay, gr | | | | | | | |
| | | 21.0 | 26.0 | sand, gr | NA | | | | | | |
| 26.0 | 27.5 | 26.0 | 29.0 | sandy silt, gr | 22 | 0.90 | 20 | | | | |
| 29.0 | 30.5 | 29.0 | 32.0 | silty sand, gr | 24 | 0.87 | 21 | | | | |
| 32.0 | 33.5 | 32.0 | 35.0 | silt, gr | 18 | 0.78 | 14 | | | | |
| 35.0 | 36.5 | 35.0 | 38.0 | sand and silt, gr | 33 | 0.81 | 27 | | | | |
| 38.0 | 39.5 | 38.0 | 41.0 | clay , sand and silt | 18 | 0.78 | 14 | | | | |
| 41.0 | 42.5 | 41.0 | | f sand, gr | >100 | 0.76 | >76 | | | | |
| 44.0 | 45.5 | | 48.5 | f sand, gr | 79 | 0.74 | 58 | | | | |
| 48.5 | 50.0 | 48.5 | ≥50.0 | m sand, gr | >100 | 0.72 | >72 | | | | |

FIELD BORING LOG NO. 96

Depth to water table (ft): <14.1 | Topstratum thickness (ft): 37.5 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 11.0 | clay and silty clay layers, br | | | | | | | |
| | | 11.0 | 17.0 | plastic clay, gr | | | | | | | |
| | | 17.0 | 23.0 | plastic clay and silt layers, gr | | | | | | | |
| | | 23.0 | 32.0 | silt, w/sand lenses, gr | | | | | | | |
| | | 32.0 | 35.0 | silt, w/clay lenses, gr | | | | | | | |
| | | 35.0 | 38.0 | silt, w/sand lenses, gr | | | | | | | |
| | | 38.0 | | f sand, gr | NA | | | | | | |
| 45.5 | 46.5 | | ≥47.0 | m sand, gr | >100 | | | | | | |

FIELD BORING LOG NO. 97

Depth to water table (ft): <12.0 | Topstratum thickness (ft): 17(>32) | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 7.0 | sand, silt and gravel, br | | | | | | | |
| | | 7.0 | 17.0 | sandy and silty clay layers, br-gr | | | | | | | |
| 17.0 | 18.5 | 17.0 | 20.0 | f sand, gr | 43 | | | | | | |
| 20.0 | 21.5 | 20.0 | 23.0 | sandy silt, gr | 17 | | | | | | |
| 23.0 | 24.5 | 23.0 | 26.0 | silty sand, gr | 13 | | | | | | |
| 26.0 | 27.5 | 26.0 | 30.5 | sand, w/lenses of silt and clay | 25 | | | | | | |
| 30.5 | 32.0 | 30.5 | ≥32.0 | clay, w/lenses of silt, gr | 18 | | | | | | |

FIELD BORING LOG NO. 98

Depth to water table (ft): 6.6 | Topstratum thickness (ft): 13(27) | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 10.0 | sandy silt, br | | | | | | | |
| | | 10.0 | 13.0 | lean clay, br | | | | | | | |
| | | 13.0 | 17.0 | silty sand, br, sat | NA | | | | | | |
| 17.0 | 18.5 | 17.0 | 20.0 | f sand, br | 26 | 1.18 | 31 | | | | |
| 20.0 | 21.5 | 20.0 | 24.0 | f sand, gr | 12 | 1.10 | 13 | | | | |
| 25.0 | 26.5 | 24.0 | 27.0 | plastic clay, gr | 4 | | | | | | |
| 27.0 | 28.5 | 27.0 | | f sand, gr | 30 | 0.97 | 29 | | | | |
| 30.0 | 31.5 | | | f sand, gr | 53 | 0.94 | 50 | | | | |
| 35.0 | 36.5 | | | f sand, br-gr | 24 | 0.89 | 21 | | | | |
| 40.0 | 41.5 | | | f sand, br-gr | 46 | 0.84 | 39 | | | | |
| 45.0 | 46.5 | | | f sand, br-gr | 46 | 0.80 | 37 | | | | |
| 48.5 | 50.0 | | ≥50.0 | f sand, br-gr | 41 | 0.77 | 32 | | | | |

FIELD BORING LOG NO. 99

Depth to water table (ft): 8.0 | Topstratum thickness (ft): 26 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.0 | silty clay, br | | | | | | | |
| 17.0 | 18.5 | 8.0 | 20.0 | silt, br | 23 | | | | | | |
| 20.0 | 21.5 | 20.0 | 23.0 | silt w/clay lenses | 22 | | | | | | |
| 23.0 | 24.5 | 23.0 | 26.0 | plastic clay, w/silt, gr | 12 | | | | | | |
| 26.0 | 27.5 | 26.0 | | f sand, br-gr | 27 | 0.97 | 26 | | | | |
| 30.0 | 31.5 | | | f sand, br-gr | 66 | 0.92 | 61 | | | | |
| 34.5 | 36.0 | | ≥36.0 | m sand, br-gr | 54 | 0.87 | 47 | | | | |

FIELD BORING LOG NO. 100

Depth to water table (ft): 8.2 | Topstratum thickness (ft): 3(22) | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 2.9 | clay, sand, and gravel, br | | | | | | | |
| | | 2.9 | 3.0 | sand and old wood, br | | | | | | | |
| | | 3.0 | 7.0 | sand, br | | | | | | | |
| | | 7.0 | 10.0 | clay, silt and sand, br-gr | | | | | | | |
| 19.0 | 20.5 | 10.0 | 22.0 | silt, gr | 3 | | | | | | |
| 22.0 | 23.5 | 22.0 | 26.0 | silty sand, gr | 33 | 1.04 | 34 | | | | |
| 26.0 | 27.5 | 26.0 | | sand, gr | 58 | 0.97 | 56 | | | | |
| 30.5 | 32.0 | | 34.5 | f sand, gr | 29 | 0.92 | 27 | | | | |
| 34.5 | 36.0 | 34.5 | ≥36.0 | sand and silt, w/wood, gr | 34 | 0.88 | 30 | | | | |

FIELD BORING LOG NO. 101

Depth to water table (ft): 15.5 | Topstratum thickness (ft): 22 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 2.0 | clay w/ gravels and organic mtl | | | | | | | |
| | | 2.0 | 9.0 | silty clay, br-gr | | | | | | | |
| 11.0 | 12.5 | 9.0 | | CL, sandy clay, br-gr | 8 | | | | | | |
| 14.0 | 15.5 | | 16.0 | CL, sandy clay, br-gr | 7 | | | | | | |
| 17.0 | 18.5 | 16.0 | 19.0 | plastic clay w/ sand lenses, gr | 6 | | | | | | |
| 20.0 | 21.5 | 19.0 | 22.0 | sand w/clay binder, br | 4 | | | | | | |
| 23.0 | 24.5 | 22.0 | | SP, f sand, gr | 22 | 0.92 | 20 | | | | |
| 26.0 | 27.5 | | 28.0 | SP, f sand, gr | 8 | 0.89 | 7 | | | | |
| 29.0 | 30.5 | 28.0 | 31.0 | SP, f sand, gr | 17 | 0.86 | 15 | | | | |
| 32.0 | 33.5 | 31.0 | | SP, c sand, gr | 37 | 0.83 | 31 | | | | |
| 35.0 | 36.5 | | ≥36.5 | SP, c sand, gr | 100 | 0.80 | >80 | | | | |

FIELD BORING LOG NO. 102

Depth to water table (ft): 18.0 | Topstratum thickness (ft): 61 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 16.0 | CL, silty clay, br-gr | | | | | | | |
| | | 16.0 | 28.0 | CL, sandy clay, gr | | | | | | | |
| | | 28.0 | 43.0 | CL, silty clay, w/organics, gr | | | | | | | |
| 44.0 | 45.5 | 43.0 | | CH, plastic clay, gr | 2 | | | | | | |
| 47.0 | 48.5 | | | CH, plastic clay, gr | 3 | | | | | | |
| 50.0 | 51.5 | | | CH, plastic clay, gr | 2 | | | | | | |
| 53.0 | 54.5 | | | CH, plastic clay, gr | 3 | | | | | | |
| 56.0 | 57.5 | | | CH, plastic clay, gr | 2 | | | | | | |
| 59.0 | 60.5 | | 61.0 | CH, plastic clay, gr | 3 | | | | | | |
| 62.0 | 63.5 | 61.0 | | SP, sand, gr | 69 | 0.62 | 43 | | | | |
| 65.0 | 66.5 | | ≥66.5 | SP, sand, gr | 52 | 0.60 | 31 | | | | |

FIELD BORING LOG NO. 103

Depth to water table (ft): 8.0 | Topstratum thickness (ft): 11 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.2 | CL, sandy clay, br-gr | | | | | | | |
| 8.0 | 9.5 | 8.2 | 11.0 | CL, silty clay, gr | 3 | | | | | | |
| 11.0 | 12.5 | 11.0 | | SM, silty sand, gr | 18 | 1.26 | 23 | | | | |
| 14.0 | 15.5 | | | SM, silty sand, gr | 22 | 1.20 | 26 | | | | |
| 17.0 | 18.5 | | 19.0 | SM, silty sand, gr | 21 | 1.12 | 23 | | | | |
| 20.0 | 21.5 | 19.0 | 22.0 | SP, c sand, gr | 39 | 1.06 | 41 | | | | |
| 23.0 | 24.5 | 22.0 | 25.5 | SM, silty sand, gr | 27 | 1.02 | 28 | | | | |
| 26.0 | 27.5 | 25.5 | | SP, sand, gr | 46 | 0.96 | 44 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, sand, gr | 39 | 0.92 | 36 | | | | |

FIELD BORING LOG NO. 104

Depth to water table (ft): >15.5 | Topstratum thickness (ft): 18(31) | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 7.0 | CL, silty clay | | | | | | | |
| | | 7.0 | 14.0 | CL, sandy clay, br-gr | | | | | | | |
| | | 14.0 | 16.0 | sandy clay and sand layers | | | | | | | |
| 17.0 | 18.5 | 16.0 | | silty clay and silty sand layers | 14 | | | | | | |
| 20.0 | 21.5 | | | SM, silty sand, gr | 18 | | | | | | |
| 23.0 | 24.5 | | | SM, silty sand, gr | 13 | | | | | | |
| 26.0 | 27.5 | | 28.0 | SM, silty sand, gr | 7 | | | | | | |
| 29.0 | 30.5 | 28.0 | 31.0 | CL, silty clay, gr | 6 | | | | | | |
| 32.0 | 33.5 | 31.0 | | SP, sand, gr | 39 | | | | | | |
| 35.0 | 36.5 | | ≥36.5 | SP, sand, gr | 11 | | | | | | |

FIELD BORING LOG NO.105

Depth to water table (ft): ≤18.5 | Topstratum thickness (ft): 23(42) | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | silty clay, br | | | | | | | |
| | | 5.0 | 11.5 | clayey silt and silty clay layers, br | | | | | | | |
| | | 11.5 | 21.2 | CH, plastic clay, soft, gr | | | | | | | |
| 20.0 | 21.5 | 21.2 | 23.2 | ML, clayey silt, gr | 3 | | | | | | |
| 23.0 | 24.5 | 23.2 | | SP, f sand, gr | 11 | | | | | | |
| 26.0 | 27.5 | | 29.0 | SP, f sand, gr | 14 | | | | | | |
| 32.0 | 33.5 | 29.0 | 35.5 | CH, plastic clay, soft | 2 | | | | | | |
| 35.0 | 36.5 | 35.5 | 38.0 | SM, silty sand w/silt lenses, gr | 16 | | | | | | |
| 41.0 | 42.5 | 38.0 | 42.5 | clayey silt , clay and silty sand lenses | 4 | | | | | | |
| 44.0 | 45.5 | 42.5 | | silty sand, gr | 6 | | | | | | |
| 47.0 | 48.5 | | | silty sand, gr | 12 | | | | | | |
| 50.0 | 51.5 | | 53.0 | silty sand, gr | 13 | | | | | | |
| 53.0 | 54.5 | 53.0 | 56.2 | ML, clayey silt, gr | 3 | | | | | | |
| 56.0 | 57.5 | 56.2 | | SM, silty sand, gr | 13 | | | | | | |
| 59.0 | 60.5 | | | SM, silty sand, gr | 10 | | | | | | |
| 62.0 | 63.5 | | | SP, m sand w/f gravel, gr | 37 | | | | | | |
| 65.5 | 67.0 | | ≥67.0 | SP, m sand w/f gravel, gr | 49 | | | | | | |

FIELD BORING LOG NO.106

Depth to water table (ft): 8.6 | Topstratum thickness (ft): 14(26) | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.3 | sandy clay and silty clay layers | | | | | | | |
| | | 9.3 | 10.5 | ML, clayey silt, br | | | | | | | |
| | | 10.5 | 14.0 | CH, plastic clay, br | | | | | | | |
| 14.0 | 15.5 | 14.0 | | SM, silty sand w/clay | 4 | 1.18 | 5 | | | | |
| 17.0 | 18.5 | | | silty vf sand, gr | 11 | 1.12 | 12 | | | | |
| 20.0 | 21.5 | | 23.0 | silty vf sand w/ clayey | 6 | 1.06 | 6 | | | | |
| | | 23.0 | 23.4 | CH, plastic clay | | | | | | | |
| 23.0 | 24.5 | 23.4 | 26.0 | silty vf sand w/clayey | 4 | 1.01 | 4 | | | | |
| 26.0 | 27.5 | | | SP, f sand, gr | 38 | 0.96 | 36 | | | | |
| 29.0 | 30.5 | | | SP, f to m sand, w/some organics | 32 | 0.93 | 30 | | | | |
| 32.0 | 33.5 | | ≥33.5 | SP, f to m sand, w/some | 26 | 0.90 | 23 | | | | |

FIELD BORING LOG NO.107

Depth to water table (ft): 12.1 | Topstratum thickness (ft): 27.5 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | CL, silty clay and sand clay | | | | | | | |
| | | 5.0 | 8.0 | CH, plastic clay w/silty lens, br | | | | | | | |
| | | 8.0 | 20.0 | silty clay and clayey silt layers, gr | | | | | | | |
| | | 20.0 | 23.3 | CH, plastic clay, gr | | | | | | | |
| 23.0 | 24.5 | 23.3 | | silty sand w/thin | 7 | 0.97 | 7 | | | | |
| 26.0 | 27.5 | | 27.5 | SP, f sand | 11 | 0.93 | 10 | | | | |
| 29.0 | 30.5 | 27.5 | 32.0 | silty sand, w/occ clay | 24 | 0.90 | 22 | | | | |
| 32.0 | 33.5 | | | SP, vf sand, gr | 21 | 0.86 | 18 | | | | |
| 35.0 | 36.5 | | | SP, f sand, gr | 38 | 0.83 | 31 | | | | |
| 38.0 | 39.5 | | | SP, f sand, gr | 27 | 0.81 | 22 | | | | |

FIELD BORING LOG NO.108

Depth to water table (ft): 15.3 | Topstratum thickness (ft): 14(23) | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 1.0 | silty sand, br | | | | | | | |
| | | 1.0 | 12.3 | sandy clay, silty clay and clayey silt layers | | | | | | | |
| | | 12.3 | 14.0 | silty sand, gr | NA | | | | | | |
| 14.0 | 15.5 | 14.0 | | SP, f sand, br | 10 | 1.08 | 11 | | | | |
| 17.0 | 18.5 | | 18.4 | SP, f sand, gr | 13 | 1.00 | 13 | | | | |
| 20.0 | 21.5 | 18.4 | 23.0 | ML, clayey silt, gr | 13 | | | | | | |
| 23.0 | 24.5 | 23.0 | | SM, silty sand w/clayey | 18 | 0.92 | 17 | | | | |
| 26.0 | 27.5 | | | SM, silty vf sand, w/ organic lens | 19 | 0.89 | 17 | | | | |
| 29.0 | 30.5 | | | SM, silty vf sand, w/ organic lens | 20 | 0.86 | 17 | | | | |
| 32.0 | 33.5 | | | SM, silty vf sand, w/ organic lens | 24 | 0.83 | 20 | | | | |
| 35.0 | 36.5 | | | SM, silty vf sand, w/ organic lens | 28 | 0.79 | 22 | | | | |
| 38.0 | 39.5 | | | SM, silty vf sand, w/ organic lens | 16 | 0.76 | 12 | | | | |
| 41.0 | 42.5 | | | SM, silty vf sand, w/ organic lens | 24 | 0.74 | 18 | | | | |
| 44.0 | 45.5 | | ≥45.5 | SM, silty vf sand, w/ organic lens | 33 | 0.73 | 24 | | | | |

FIELD BORING LOG NO.109

Depth to water table (ft): ≤20 | Topstratum thickness (ft): 23 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.4 | sandy clay, br | | | | | | | |
| | | 5.4 | 8.0 | plastic clay, br | | | | | | | |
| | | 8.0 | 17.0 | silty clay and clayey silt lenses, gr | | | | | | | |
| 17.0 | 18.5 | 17.0 | | ML, clayey sillt, gr-br | 5 | | | | | | |
| 20.0 | 21.5 | | 23.0 | ML, clayey silt, gr | 6 | | | | | | |
| 23.0 | 24.5 | 23.0 | 26.0 | SM, silty vf sand, gr | 14 | | | | | | |
| 26.0 | 27.5 | 26.0 | | SP, f sand, gr | 50 | | | | | | |
| 29.5 | 31.0 | | ≥31.0 | SP, f sand, gr | 34 | | | | | | |

FIELD BORING LOG NO.110

Depth to water table (ft): 18.2 | Topstratum thickness (ft): 44.5 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.4 | silty sand and and, br-yellow | | | | | | | |
| | | 5.4 | | sandy clay, clayey silt | | | | | | | |
| 32.0 | 33.5 | | | silty clay layers | 11 | | | | | | |
| 35.0 | 36.5 | | 38.0 | silty clay layers | 17 | | | | | | |
| 38.0 | 39.5 | 38.0 | 41.5 | SP, f to m sand w/some f gravel, gr | 40 | 0.81 | 32 | | | | |
| 41.5 | 43.0 | | | sandy clay, gr | 10 | | | | | | |
| 44.5 | 46.0 | | | SP, f sand w/some f gravel, gr | 27 | 0.75 | 20 | | | | |
| 47.5 | 49.0 | | ≥49.0 | SP, f sand w/some f gravel, gr | 34 | 0.72 | 25 | | | | |

FIELD BORING LOG NO.111

Depth to water table (ft): 13.2 | Topstratum thickness (ft): 15.5 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | clayey sand, br | | | | | | | |
| 5.0 | 6.5 | 5.0 | 8.0 | sandy clay w/sand lens | 7 | | | | | | |
| 8.0 | 9.5 | 8.0 | 11.0 | SM, silty sand w/clayey sand lens | 7 | 1.32 | 9 | | | | |
| 11.0 | 12.5 | 11.0 | 15.3 | ML, clayey silt, gr | 3 | | | | | | |
| | | 15.3 | 17.0 | SM, silty sand, gr | NA | | | | | | |
| 17.0 | 18.5 | 17.0 | 20.0 | SP, f sand, gr | 22 | 1.04 | 23 | | | | |
| 20.0 | 21.5 | 20.0 | 23.0 | SM, silty vf sand, gr | 23 | 0.98 | 22 | | | | |
| 23.0 | 24.5 | 23.0 | | SP, f sand, gr | 16 | 0.94 | 15 | | | | |
| 26.0 | 27.5 | | | SP, f sand, gr | 14 | 0.91 | 13 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand, gr | 31 | 0.88 | 27 | | | | |

FIELD BORING LOG NO.112

Depth to water table (ft): 16.3 | Topstratum thickness (ft): 15 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | sandy clay, br | | | | | | | |
| | | 5.0 | 8.0 | CH, plastic clay, br | | | | | | | |
| | | 8.0 | 11.0 | CL, sandy clay, br | | | | | | | |
| | | 11.0 | 14.0 | CH, plastic clay, gr | | | | | | | |
| | | 14.0 | 14.9 | ML, clayey silt, gr | | | | | | | |
| | | 14.9 | 17.0 | SM, silty vf sand, br | NA | | | | | | |
| 17.0 | 18.5 | 17.0 | 20.0 | SP, vf sand, br | 8 | 0.98 | 8 | | | | |
| 20.0 | 21.5 | 20.0 | 23.0 | SM, silty sand w/occ thin clay lens | 6 | 0.94 | 6 | | | | |
| 23.0 | 24.5 | 23.0 | | SP, vf sand, gr | 16 | 0.90 | 14 | | | | |
| 26.0 | 27.5 | | | SP, vf sand, gr | 25 | 0.87 | 22 | | | | |
| 29.0 | 30.5 | | | SP, f sand, gr | 42 | 0.84 | 35 | | | | |
| 32.0 | 33.5 | | ≥33.5 | SP, f sand, w/occ thin coal lens | 24 | 0.81 | 19 | | | | |

FIELD BORING LOG NO.113

Depth to water table (ft): 14.0 | Topstratum thickness (ft): 31 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.5 | CH, plastic clay, br-gr | | | | | | | |
| | | 14.5 | 16.0 | CL, silty clay, gr | | | | | | | |
| | | 16.0 | 18.0 | SM, silty sand, gr | | | | | | | |
| | | 18.0 | 22.0 | CL, silty clay, gr | | | | | | | |
| 23.0 | 24.5 | 22.0 | | SM, silty sand, gr | 1 | 0.94 | 1 | | | | |
| 26.0 | 27.5 | | 28.0 | SM, silty sand, gr | 15 | 0.90 | 13 | | | | |
| 29.0 | 30.5 | 28.0 | 31.0 | CL, silty clay, gr | 8 | | | | | | |
| 32.0 | 33.5 | 31.0 | | SM, silty sand, gr | 19 | 0.84 | 16 | | | | |
| 35.0 | 36.5 | | 37.0 | SM, silty sand, gr | 17 | 0.81 | 14 | | | | |
| 38.0 | 39.5 | 37.0 | | SP, sand, gr | 48 | 0.78 | 37 | | | | |
| 41.5 | 43.0 | | 43.0 | SP, sand, gr | 34 | 0.76 | 26 | | | | |

FIELD BORING LOG NO. 114

Depth to water table (ft) 12.9 Topstratum thickness (ft) 36.5

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1.0 | | CH, plastic clay w/lenses | | | | | | | |
| | | | 14.0 | of silty sand and f sand, | NA | | | | | | |
| | | | | br | | | | | | | |
| 14.0 | 15.5 | 14.0 | 17.0 | SM, silty vf sand | 0 | | 0 | | | | |
| 17.0 | 18.5 | 17.0 | | CH, plastic clay, gr | 0 | | 0 | | | | |
| 20.0 | 21.5 | | 23.0 | CH, plastic clay, gr | 0 | | 0 | | | | |
| | | 23.0 | | clayey silt, clay, and | | | | | | | |
| 32.0 | 33.5 | | 36.5 | silty clay layers, gr | 0 | | 0 | | | | |
| 38.0 | 39.5 | 36.5 | | SP, f sand, gr | 22 | 0.79 | 17 | f sand | 0.23 | 0.13 | 2.0 |
| 41.0 | 42.5 | | ≥42.5 | SP, f sand, gr | 64 | 0.76 | 49 | f sand | 0.28 | 0.14 | 2.1 |

FIELD BORING LOG NO. 115

Depth to water table (ft) 18.5 Topstratum thickness (ft) 31

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 15.0 | plastic clay, br-gr | | | | | | | |
| | | 15.0 | 25.0 | sandy silt, gr | | | | | | | |
| | | 25.0 | 28.0 | plastic clay w/silt lens | | | | | | | |
| 28.0 | 29.5 | 28.0 | 31.0 | silt, gr | 15 | | | | | | |
| 31.0 | 32.5 | | | sandy silt, gr | 22 | 0.81 | 18 | | | | |
| 34.0 | 35.5 | | | f sand, gr | 30 | 0.78 | 23 | | | | |
| 37.0 | 38.5 | | | m sand, w/gravel, br-gr | 32 | 0.76 | 24 | | | | |
| 41.5 | 43.0 | | ≥43.0 | m sand, w/gravel, br-gr | 64 | 0.73 | 47 | | | | |

FIELD BORING LOG NO. 116

Depth to water table (ft) NA Topstratum thickness (ft) 18.5

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.0 | silty clay and plastic | | | | | | | |
| | | | | clay layers | | | | | | | |
| | | 9.0 | 12.5 | silt, br | | | | | | | |
| | | 12.5 | 18.5 | clay, br-gr | | | | | | | |
| | | 18.5 | 21.5 | sandy silt, gr | | | | | | | |
| | | 21.5 | 25.0 | f sand, gr | NA | | | | | | |
| 25.0 | 26.5 | 25.0 | 30.0 | silt w/sand lens, gr | 68 | | | | | | |
| 30.0 | 31.5 | 30.0 | | sand, gr | 70 | | | | | | |
| 35.5 | 37.0 | | ≥37.0 | sand, gr | 50 | | | | | | |

FIELD BORING LOG NO. 117

Depth to water table (ft) 8.0 Topstratum thickness (ft) 32

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 15.0 | plastic clay | | | | | | | |
| | | 15.0 | 24.0 | silty clay, gr | | | | | | | |
| | | 24.0 | 26.0 | clay, silt and sand | | | | | | | |
| | | 26.0 | 32.0 | silt, gr | | | | | | | |
| 34.0 | 35.5 | 32.0 | | f sand, gr | 51 | 0.88 | 45 | | | | |
| 39.5 | 42.0 | | ≥42.0 | f sand, gr | 61 | 0.82 | 50 | silty | 0.17 | 0.025 | 7.6 |

FIELD BORING LOG NO. 118

Depth to water table (ft) 21.0 Topstratum thickness (ft) 14

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 6.0 | clay, sand and silt, br | | | | | | | |
| | | 6.0 | 12.5 | plastic clay, br-gr | | | | | | | |
| | | 12.5 | 14.0 | clay ans silt, br-gr | | | | | | | |
| 15.5 | 16.0 | 14.0 | | f sand, br | NA | | | f sand | 0.28 | 0.20 | 1.5 |
| 19.0 | 20.5 | | | f sand,br | 67 | 0.91 | 61 | | | | |
| 23.0 | 24.5 | | | f sand, gr | 91 | 0.86 | 78 | f sand | 0.21 | 0.14 | 1.6 |
| 27.0 | 28.5 | | | f sand, gr | 64 | 0.82 | 52 | | | | |
| 30.5 | 32.0 | | | f sand, gr | 59 | 0.79 | 47 | | | | |

FIELD BORING LOG NO. 119

Depth to water table (ft) 12 Topstratum thickness (ft) 5(42)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | lean clay, br | | | | | | | |
| 6.5 | 7.0 | 5.0 | 12.0 | f sand, br | NA | | | f sand | 0.29 | 0.19 | 1.6 |
| | | 12.0 | 15.0 | silty sand, br | NA | | | | | | |
| | | 15.0 | | f sand | NA | | | | | | |
| 19.0 | 20.5 | | 24.0 | f sand | 58 | 1.03 | 60 | m sand | 0.49 | 0.44 | 1.2 |
| | | 24.0 | 42.0 | clay, silt and sand, gr | | | | | | | |
| 42.0 | 43.5 | 42.0 | | m sand, br-gr | 33 | 0.77 | 25 | m sand | 0.45 | 0.16 | 3.5 |
| 48.0 | 49.5 | | 49.5 | m sand, br-gr | >100 | 0.73 | >73 | m sand | 1.8 | 0.20 | 11.0 |

FIELD BORING LOG NO. 120

Depth to water table (ft) 15 Topstratum thickness (ft) 14.5(35)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.5 | CL, silty clay, br | | | | | | | |
| | | 5.5 | 14.4 | ML, clayey silt | | | | | | | |
| 14.0 | 15.5 | 14.4 | | SM, silty vf sand, gr | 20 | 1.08 | 22 | | | | |
| 17.0 | 18.5 | | 20.0 | SM, silty vf sand, gr | 13 | 1.02 | 13 | | | | |
| 20.1 | 21.5 | 20.0 | 23.0 | SP, vf sand, gr | 40 | 0.97 | 39 | | | | |
| 23.0 | 24.5 | 23.0 | 26.0 | SM, silty vf sand, gr | 10 | 0.92 | 9 | | | | |
| 26.0 | 27.5 | 26.0 | 29.0 | ML, clayey silt | 13 | | | | | | |
| 29.0 | 30.5 | 29.0 | 32.0 | SM, silty vf snad, gr | 5 | 0.87 | 4 | | | | |
| 32.0 | 33.5 | 32.0 | 33.1 | CH, plastic clay | | | | | | | |
| 35.0 | 36.5 | 35.3 | | sand w/clay lens | 22 | 0.79 | 17 | | | | |
| 38.0 | 39.5 | 35.3 | | SP, m sand w/f gravel, | 33 | 0.77 | 25 | | | | |
| 41.0 | 42.5 | | ≥42.5 | SP, m sand w/f gravel | 54 | 0.75 | 40 | | | | |

FIELD BORING LOG NO. 121A

Depth to water table (ft) 9.2 Topstratum thickness (ft) 9

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 1.5 | SM, silty f sand, br | | | | | | | |
| | | 1.5 | 5.0 | SL, clayey sand, br | | | | | | | |
| 5.0 | 6.5 | 5.0 | 8.5 | CL, sandy clay, gr and br | 15 | | | | | | |
| 8.0 | 9.5 | 8.5 | 11.0 | SM, silty sand, gr and | 16 | 1.32 | 21 | silty sand | 0.13 | 0.0.31 | 4.5 |
| 11.0 | 12.5 | 11.0 | 14.0 | silty sand and f sand | 11 | 1.24 | 14 | f sand | 0.22 | 0.089 | 2.8 |
| 14.0 | 15.5 | 14.0 | | SP, f sand, gr | 40 | 1.16 | 46 | | | | |
| 17.0 | 18.5 | | | SP, f sand, gr | 31 | 1.10 | 34 | | | | |
| 20.0 | 21.5 | | | SP, f sand, gr | 29 | 1.04 | 30 | | | | |
| 23.0 | 24.5 | | | SP, f sand, gr | 20 | 1.00 | 20 | | | | |
| 26.0 | 27.5 | | | SP, f sand w/some organics | 20 | 0.96 | 19 | f sand | 0.27 | 0.18 | 1.7 |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand w/ some organics | 37 | 0.92 | 34 | | | | |

FIELD BORING LOG NO. 121B

Depth to water table (ft) 9.5 Topstratum thickness (ft) 0

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | SM, silty f sand, br | NA | | | | | | |
| | | 5.0 | 8.0 | SP, f sand, br | NA | | | | | | |
| 8.0 | 9.5 | 8.0 | 11.0 | SM, silty f sand, tan | 15 | 1.34 | 20 | | | | |
| 11.0 | 12.5 | 11.0 | | SP, f sand, gr | 16 | 1.24 | 20 | | | | |
| 14.0 | 15.5 | | | SP, f sand w/organic, gr | 24 | 1.17 | 28 | | | | |
| 17.0 | 18.5 | | | SP, f sand, gr | 25 | 1.10 | 27 | | | | |
| 20.0 | 21.5 | | | SP, f sand, gr | 30 | 1.03 | 31 | | | | |
| 23.0 | 24.5 | | | SP, f sand, gr | 38 | 1.00 | 38 | | | | |
| 26.0 | 27.5 | | | SP, f sand, gr | 28 | 0.95 | 26 | | | | |
| 29.0 | 30.5 | | | SP, f sand, gr | 21 | 0.92 | 19 | | | | |

FIELD BORING LOG NO.122

Depth to water table (ft) 2.6 Topstratum thickness (ft) 22

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 11.9 | plastic clay, gr and br | | | | | | | |
| 11.0 | 12.5 | 11.9 | 12.2 | SP, f sand, gr and br | | | | | | | |
| 14.0 | 15.5 | 12.2 | 17.0 | CL, sandy clay, gr | 7 | | | | | | |
| 17.0 | 18.5 | 17.0 | 22.0 | silty sand w/clay lens | 2 | 1.22 | 2 | | | | |
| 22.0 | 23.5 | 22.0 | | SP f sand w/occ thin | 20 | 1.11 | 22 | | | | |
| 28.5 | 30.0 | | ≥30.0 | SP, f sand, gr | 22 | 1.02 | 22 | f sand | 0.26 | 0.19 | 1.4 |

FIELD BORING LOG NO.123

Depth to water table (ft) 16.7 Topstratum thickness (ft) 29

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 29.0 | plastic clay, gr and br | | | | | | | |
| 29.0 | 30.5 | 29.0 | | SP, f sand, gr | 4 | 0.84 | 3 | f sand | 0.33 | 0.21 | 1.8 |
| 32.0 | 33.5 | | | SP, f sand, gr | 48 | 0.82 | 39 | f sand | 0.36 | 0.19 | 2.1 |
| 37.0 | 38.5 | | ≥38.5 | SP, f sand w/some coarse sand, gr | 34 | 0.79 | 27 | | | | |

FIELD BORING LOG NO.124

Depth to water table (ft) 12.0 Topstratum thickness (ft) 18

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.9 | plastic clay, br and gr | | | | | | | |
| 11.0 | 12.5 | 14.9 | 17.5 | CL, sandy clay, gr and br | 12 | | | | | | |
| 17.0 | 18.5 | 17.5 | 18.3 | SC, clayey f sand, gr and br | 15 | | | | | | |
| 20.0 | 21.5 | 18.3 | | SP, f sand, br | 17 | 1.02 | 17 | | | | |
| 25.0 | 26.5 | | | SP, f sand, br | 36 | 0.95 | 34 | | | | |
| 30.0 | 31.5 | | ≥30.5 | SP, f sand w/organic lens, gr | 31 | 0.88 | 27 | | | | |

FIELD BORING LOG NO.125

Depth to water table (ft) 16.7 Topstratum thickness (ft) 20

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.7 | plastic clay, gr and br | | | | | | | |
| | | 14.7 | 17.2 | CL, sandy clay, gr and br | | | | | | | |
| 17.0 | 18.5 | 17.2 | 20.0 | SC, clayey f sand, gr and br | 10 | | | | | | |
| 20.0 | 21.5 | 20.0 | | SP, f sand w/ silt and organic lenses, tan | 19 | 0.94 | 18 | | | | |
| 23.0 | 24.5 | | | SP, f sand w/organic lens,gr | 45 | 0.90 | 40 | f sand | 0.19[ | 0.099 | 2.2 |
| 26.0 | 27.5 | | | SP, f sand w/organic lens, gr | 42 | 0.87 | 37 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand w/organic lens, gr | 28 | 0.84 | 24 | f sand | 0.18 | 0.094 | 2.0 |

FIELD BORING LOG NO.126

Depth to water table (ft) NA Topstratum thickness (ft) 20

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 18.0 | clay and sandy clay, gr and br | | | | | | | |
| 17.0 | 18.5 | 18.0 | 20.0 | SC, clayey sand, gr and br | 12 | | | | | | |
| 20.0 | 21.5 | 20.0 | | SP, f sand, gr | 23 | | | f sand | 0.29 | 0.12 | 2.7 |
| 25.0 | 26.5 | | | SP, f sand, gr | 32 | | | | | | |
| 30.0 | 31.5 | | ≥31.5 | SP, f sand, tan | 44 | | | | | | |

FIELD BORING LOG NO.127

Depth to water table (ft) 9.7 Topstratum thickness (ft) 23

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 11.0 | clayey sand, br and gr | | | | | | | |
| | | 11.0 | 13.5 | SM, silty sand, br and gr | | | | | | | |
| | | 13.5 | 23.0 | sandy and silty clay layers, br and gr | | | | | | | |
| | | 23.0 | 25.5 | SM, silty sand, br | NA | | | | | | |
| 30.0 | 31.5 | 25.5 | | SP, f sand, tan | 32 | 0.91 | 29 | f sand | 0.18 | 0.089 | 2.2 |
| 35.0 | 36.5 | | ≥36.5 | SP, f sand w/organics, gr | 43 | 0.86 | 37 | f sand | 0.38 | 0.17 | 2.5 |

FIELD BORING LOG NO.128

Depth to water table (ft) NA Topstratum thickness (ft) 28

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 26.0 | plastic clay and silty clay layers, gr and br | | | | | | | |
| 26.0 | 27.5 | 26.0 | 27.3 | SC, clayey f sand, gr | 9 | | | | | | |
| 29.0 | 30.5 | | | SP, f sand, gr | 35 | | | f sand | 0.40 | 0.21 | 2.1 |
| 32.0 | 33.5 | | ≥33.5 | SP, f sand w/organic lens, gr | 37 | | | | | | |

FIELD BORING LOG NO.129

Depth to water table (ft) 23.1 Topstratum thickness (ft) 36

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 29.0 | plastic clay, gr and br | | | | | | | |
| 29.0 | 30.5 | 29.0 | 30.5 | CL, silty clay, gr | 4 | | | | | | |
| 32.0 | 33.5 | 30.5 | 32.8 | SM, silty sand, gr | 3 | 0.77 | 2 | | | | |
| 35.0 | 36.5 | 32.8 | 36.3 | clay and clayey silt and silty sand layers gr | 16 | 0.74 | 12 | | | | |
| 38.0 | 39.5 | 36.3 | | SP, f sand w/m sand | >100 | 0.72 | >72 | f sand | 0.40 | 0.19 | 2.4 |
| 41.0 | 42.5 | | ≥42.5 | SP, f sand w/some organics, gr | 58 | 0.70 | 40 | | | | |

FIELD BORING LOG NO.130

Depth to water table (ft) 14.5 Topstratum thickness (ft) 32

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 11.8 | plastic clay, br and gr | | | | | | | |
| | | 11.8 | 16.5 | CL, silty clay, gr and br | | | | | | | |
| | | 16.5 | 26.0 | ML, clayey silt, w/lenses of sand and clay, gr | | | | | | | |
| 26.0 | 27.5 | 26.0 | | ML, clayey silt, gr | 3 | | | | | | |
| 29.0 | 30.5 | | 32.1 | ML, clayey silt, gr | 3 | | | | | | |
| 32.0 | 33.5 | 32.1 | | SP, f sand, gr | 31 | 0.84 | 26 | | | | |
| 35.0 | 36.5 | | | SP, f sand w/some | 20 | 0.81 | 16 | | | | |
| 38.0 | 39.5 | | ≥39.5 | SP, f to c sand, gr | 37 | 0.78 | 29 | | | | |

FIELD BORING LOG NO.131

Depth to water table (ft) 20.6 Topstratum thickness (ft) 26

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 23.8 | plastic clay and sandy clay layers, gr and br | | | | | | | |
| 23.0 | 24.5 | 23.8 | 26.0 | CL, sandy clay, gr and br | 17 | | | | | | |
| 26.0 | 27.5 | | | SP, f sand, tan | 15 | 0.84 | 13 | m sand | 0.49 | 0.29 | 1.8 |
| 29.5 | 31.0 | | ≥31.0 | SP, f sand, tan | 36 | 0.81 | 29 | | | | |

FIELD BORING LOG NO. 132

Depth to water table (ft): <18.8 — Topstratum thickness (ft): 35 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 31.5 | plastic clay, gr and br | | | | | | | |
| | | 31.0 | 35.0 | ML, clayey silt w/thin sand lens, gr and br | | | | | | | |
| | | 35.0 | 38.0 | SM, silty f sand, gr | NA | | | sand silty | 0.15 | 0.034 | 5.0 |
| 38.0 | 39.5 | 38.0 | | SP, m sand w/some f gravel, gr | 11 | | | m sand | 0.50 | 0.29 | 1.9 |
| 41.0 | 42.5 | | ≥42.5 | SP, f sand, gr | 66 | | | | | | |

FIELD BORING LOG NO. 133

Depth to water table (ft): <8.0 — Topstratum thickness (ft): 8(29.5) — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | sandy clay, br and gr | | | | | | | |
| 5.0 | 6.5 | 5.0 | 8.0 | ML, clayey silt w/thin sand lens, br and gr | 4 | | | | | | |
| 8.0 | 9.5 | 8.0 | 11.0 | SM, silty vf sand, br | 3 | | | | | | |
| 11.0 | 12.5 | 11.0 | 12.5 | SP, vf sand, br and gr | 7 | | | | | | |
| 14.0 | 15.5 | 12.5 | 15.5 | SM, silty sand, w/clayey silt lens, gr | 1 | | | | | | |
| | | 15.5 | 29.5 | clay silt and silty clay layers, gr | | | | | | | |
| 29.0 | 30.5 | 29.5 | | SP, f sand w/some gravel,gr | 11 | | | | | | |
| 32.0 | 33.5 | | | SP, f sand, gr and br | 48 | | | f sand | 0.41 | 0.19 | 2.5 |
| 35.0 | 36.5 | | ≥36.5 | SP, f sand w/some f gravel, gr | 70 | | | | | | |

FIELD BORING LOG NO. 134

Depth to water table (ft): 13.8 — Topstratum thickness (ft): 33 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 29.0 | plastic clay, gr and br | | | | | | | |
| 29.0 | 30.5 | 29.0 | 32.0 | plastic clay w/thin sand lens, gr | 2 | | | | | | |
| 32.0 | 33.5 | 32.0 | 33.0 | ML, clayey silt w/clay lens, gr | 25 | | | | | | |
| 35.0 | 36.5 | 33.0 | | SP, f to m sand w/some f gravel, gr | 26 | 0.82 | 21 | m sand | 0.58 | 0.23 | 2.8 |
| 38.0 | 39.5 | | ≥39.5 | SP, f sand w/ some | 21 | 0.79 | 17 | f sand | 0.40 | 0.12 | 4.1 |

FIELD BORING LOG NO. 135

Depth to water table (ft): 13.3 — Topstratum thickness (ft): 30.5 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 29.0 | plastic clay and sandy clay layers, w/occ sand lenses | | | | | | | |
| 29.0 | 30.5 | 29.0 | 30.5 | clayey sand and sandy clay layers, gr and br | 22 | | | | | | |
| 32.0 | 33.5 | 30.5 | | SP, f to m sand, gr and tan | 25 | 0.84 | 21 | | | | |
| 35.0 | 36.5 | | ≥36.5 | SP, f to m sand w/some | 25 | 0.81 | 20 | m sand | 0.46 | 0.21 | 2.5 |

FIELD BORING LOG NO. 136

Depth to water table (ft): NA — Topstratum thickness (ft): 30 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 28.7 | plastic clay and clay-rich layers, gr and br | | | | | | | |
| | | 28.7 | 30.0 | SC, clayey f sand, gr and br | | | | | | | |
| 32.0 | 33.5 | 30.0 | | SP, f sand, gr and tan | 41 | | | | | | |
| 35.0 | 36.5 | | 36.5 | SP, f sand, gr and tan | 45 | | | | | | |

FIELD BORING LOG NO. 137

Depth to water table (ft): 26.5 — Topstratum thickness (ft): 37 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 6.5 | clay and silty clay layers | | | | | | | |
| | | 6.5 | 30.0 | plastic clay, gr and br | | | | | | | |
| 32.0 | 33.5 | 30.0 | 32.2 | silty clay and clayey silt layers, w/f sand lens | 3 | | | | | | |
| 35.0 | 36.5 | 32.2 | 36.3 | clayey silt w/thin f sand lens | 13 | | | | | | |
| 38.0 | 39.5 | 36.3 | 39.5 | SP, f sand w/occ thin lenses of clay, gr | 41 | 0.71 | 29 | | | | |
| 41.0 | 42.5 | | ≥42.5 | SP, f sand, gr | 23 | 0.68 | 16 | f sand | 0.31 | 0.16 | 2.2 |

FIELD BORING LOG NO. 138

Depth to water table (ft): <23.9 — Topstratum thickness (ft): 24 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.5 | plastic clay | | | | | | | |
| | | 3.5 | 5.0 | sandy clay, br and gr | | | | | | | |
| | | 8.0 | 23.0 | plastic clay, br and gr | | | | | | | |
| | | 23. | 24.4 | sandy clay and sand layers | | | | | | | |
| 26.0 | 27.5 | 24.4 | | silty sand and sand layers | 19 | | | | | | |
| 29.0 | 30.5 | | | SP, f sand w/silty lens | 23 | | | | | | |
| 32.0 | 33.5 | | | SP, f sand w/some organics, tan and gr | 49 | | | f sand | 0.31 | 0.12 | 3.0 |

FIELD BORING LOG NO. 139

Depth to water table (ft): <18.5 — Topstratum thickness (ft): 31 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 6.4 | plastic clay | | | | | | | |
| | | 6.4 | 11.1 | silty sand and silty | | | | | | | |
| | | 11.1 | 26.6 | plastic clay | | | | | | | |
| 26.0 | 27.5 | 26.6 | 29.0 | CL, silty clay, gr and br | 9 | | | | | | |
| 29.0 | 30.5 | 29.0 | 30.5 | ML, clayey silt, gr and br | 12 | | | | | | |
| 32.0 | 33.5 | 30.5 | | SP, f sand, gr | 50 | | | f sand | 0.37 | 0.17 | 2.4 |
| 35.0 | 36.5 | | 36.5 | SP, f sand, gr | 51 | | | | | | |

FIELD BORING LOG NO. 140

Depth to water table (ft): <8.9 — Topstratum thickness (ft): 9 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 1.0 | silt and vf sand | | | | | | | |
| 5.0 | 6.5 | 1.0 | 7.0 | silty clay, br and gr | 10 | | | | | | |
| 8.0 | 9.5 | 7.0 | 8.9 | ML, clayey silt, br and gr | 2 | | | | | | |
| 11.0 | 12.5 | 8.9 | | silt and vf sand, gr | 2 | | | | | | |
| 14.0 | 15.5 | | | silt and vf sand, gr | 2 | | | | | | |
| 17.0 | 18.5 | | | silt and vf sand, gr | 0 | | | | | | |
| 20.0 | 21.5 | | | silt and vf sand, gr | 14 | | | | | | |
| 23.0 | 24.5 | | | silt and vf sand, gr | 6 | | | | | | |
| 26.0 | 27.5 | 8.9 | 29.0 | silt and vf sand, gr | 8 | | | | | | |
| 29.0 | 30.5 | 29.0 | | SP, vf sand, gr | 21 | | | | | | |
| 32.5 | 34.0 | | ≥34.0 | SP, vf sand, gr | 24 | | | | | | |

FIELD BORING LOG NO. 141

Depth to water table (ft): 5.2 | Topstratum thickness (ft): 4(26)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. (Laboratory Classification) | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.8 | sandy clay | | | | | | | |
| 5.0 | 6.5 | 3.8 | 8.4 | SM, silty sand, br | 8 | >1.4 | >12 | | | | |
| 8.0 | 9.5 | 8.4 | 11.0 | SP, f sand, gr | 16 | >1.4 | >20 | | | | |
| | | 11.0 | 11.3 | CL, silty clay, br | | | | | | | |
| 11.0 | 12.5 | 11.3 | 14.1 | SP, f sand, gr | 9 | 1.36 | 12 | | | | |
| | | 14.1 | 14.1 | CL, silty clay, br | | | | | | | |
| 14.0 | 15.5 | 14.3 | | SP, f sand, gr | 23 | 1.22 | 28 | | | | |
| 17.0 | 18.5 | | 20.2 | SP, f sand, gr | 21 | 1.16 | 24 | | | | |
| | | 20.2 | 20.4 | SC, clayey sand w/ f gravel | | | | | | | |
| 20.0 | 21.5 | 20.4 | | SP, f to m sand, gr | 25 | 1.11 | 28 | | | | |
| 23.0 | 24.5 | | 26.2 | SP, f to m sand, gr | 27 | 1.03 | 28 | | | | |
| | | 26.2 | 26.4 | CL, silty clay, gr | | | | | | | |
| 26.0 | 27.5 | 26.4 | | SP, m sand w/f gravel, gr | 25 | 0.99 | 25 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, m to c sand w/ some f gravel, gr | 47 | 0.95 | 45 | | | | |

FIELD BORING LOG NO. 142

Depth to water table (ft): NA | Topstratum thickness (ft): 0(18)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. (Laboratory Classification) | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | | SM, silty f sand, br | | | | | | | |
| 5.0 | 6.5 | | | SM, silty f sand, br | 5 | | | | | | |
| 8.0 | 9.5 | | 9.5 | SM, silty f sand, br | 9 | | | | | | |
| 11.0 | 12.5 | 9.5 | | CL, silty clay, gr and br | 4 | | | | | | |
| 14.0 | 15.5 | | 18.3 | CL, silty clay w/ organics | 5 | | | | | | |
| | | 18.3 | | SP, f sand, gr | NA | | | | | | |
| 20.0 | 21.5 | | | SP, f sand w/siltys, streaks, gr | 17 | | | | | | |
| 23.0 | 24.5 | | | SP, f sand w/silty streaks, gr | 16 | | | | | | |
| 26.0 | 27.5 | | | SP, vf sand, gr | 23 | | | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand, gr | 51 | | | | | | |

FIELD BORING LOG NO. 143

Depth to water table (ft): NA | Topstratum thickness (ft): 0(18)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. (Laboratory Classification) | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 6.3 | SM, silty f sand, br | | | | | | | |
| 17.0 | 18.5 | 6.3 | 18.2 | clayey silt and silty | 13 | | | | | | |
| 20.0 | 21.5 | 18.2 | 23.0 | SM, silty f sand, gr | 7 | | | | | | |
| 23.0 | 24.5 | | | SP, vf sand, gr | 22 | | | | | | |
| 26.0 | 27.5 | | | SP,vf sand w/silt streak, gr | 12 | | | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, vf sand, gr | 47 | | | f sand | 0.31 | 0.19 | 1.8 |

FIELD BORING LOG NO. 144

Depth to water table (ft): <14.0 | Topstratum thickness (ft): 0

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. (Laboratory Classification) | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.0 | 6.5 | 0.0 | 7.7 | SM, silty sand w/pieces wood | 8 | | | | | | |
| | | 7.7 | 8.0 | CL, silty clay, br and gr | | | | | | | |
| 11.0 | 12.5 | 8.0 | | SM, silty f sand, br | 16 | | | | | | |
| 14.0 | 15.5 | | | SM, silty f sand, br | 18 | | | | | | |
| 17.0 | 18.5 | | | SM, silty f sand, br and gr | 20 | | | | | | |
| 20.0 | 21.5 | | | SP, f sand, gr | 22 | | | | | | |
| 23.0 | 24.5 | | | SP, f sand, gr | 22 | | | f sand | 0.40 | 0.12 | 3.8 |
| 26.0 | 27.5 | | 29.0 | SP, f sand, gr | 35 | | | | | | |
| | | 29.0 | 29.5 | CL, silty clay, gr | | | | | | | |
| 29.0 | 30.5 | 29.5 | >30.5 | SP, f sand, gr | 33 | | | | | | |

FIELD BORING LOG NO. 145

Depth to water table (ft): <23.6 | Topstratum thickness (ft): 24

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. (Laboratory Classification) | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 2.5 | silty sand, br | | | | | | | |
| 20.0 | 21.5 | 2.5 | 23.1 | plastic clay, gr and br | 12 | | | | | | |
| | | 23.1 | 23.6 | SM, silty sand w/ clay lens, gr | | | | | | | |
| 23.0 | 24.5 | 23.6 | | SP, f sand, gr | 19 | | | f sand | 0.37 | 0.17 | 2.4 |
| 29.0 | 30.5 | | ≥30.5 | SP, f to m sand w/ organics, gr | 40 | | | | | | |

FIELD BORING LOG NO. 146

Depth to water table (ft): <24.5 | Topstratum thickness (ft): 26

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. (Laboratory Classification) | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 23.0 | layers of clay, silty clay and snady clay | | | | | | | |
| 23.0 | 24.5 | 23.0 | 26.0 | CL, sandy clay, gr and br | 8 | | | | | | |
| 26.0 | 27.5 | 26.0 | 29.0 | SM, silty f sand, gr and br | 13 | | | | | | |
| 29.0 | 30.5 | | | SP, f sand w/thin clay lens, gr | 21 | | | | | | |
| 32.0 | 33.5 | | ≥33.5 | SP, f sand w/thin clay lens and organics, gr | 24 | | | | | | |

FIELD BORING LOG NO. 147

Depth to water table (ft): NA | Topstratum thickness (ft): 40

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. (Laboratory Classification) | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 36.5 | layers of very soft silt, silty clay and clayey silt | | | | | | | |
| | | 36.5 | 39.0 | SP, f sand, gr | | | | | | | |
| | | 39.0 | 39.5 | CH, plastic clay, gr | | | | | | | |
| 39.0 | 40.5 | 39.5 | | SP, f sand, gr | 34 | | | | | | |
| 42.0 | 43.5 | | | SP, f sand w/some f gravel, gr | 22 | | | | | | |
| 45.0 | 46.5 | | ≥46.5 | SP, f to m sand w/some f gravel, gr | 64 | | | m sand | 0.58 | 0.27 | 2.3 |

FIELD BORING LOG NO. 148

Depth to water table (ft): 12.3 | Topstratum thickness (ft): 12(17)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. (Laboratory Classification) | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.5 | SM, silty f sand, br | NA | | | | | | |
| 5.0 | 6.5 | 3.5 | 8.0 | SP, f snd w/thin clay lens, tan | 6 | | | | | | |
| | | 8.0 | 12.3 | silty clay and clayey silt, br and gr | | | | | | | |
| 14.0 | 15.5 | 12.3 | 17.0 | silt and vf sand, gr | 6 | 1.12 | 7 | | | | |
| 17.0 | 18.5 | 17.0 | 18.2 | SP, f sand, gr | 13 | 1.05 | 14 | | | | |
| | | 18.2 | 20.6 | SM, silty sand w/clay lens, gr | NA | | | | | | |
| 20.0 | 21.5 | 20.6 | 23.0 | SP, f sand, tan | 9 | 1.00 | 9 | | | | |
| 23.0 | 24.5 | 23.0 | 24.5 | SP, f sand w/occ clay fragments, tan and gr | 22 | 0.95 | 21 | | | | |
| 26.0 | 27.5 | 24.5 | | SP, f sand, gr | 39 | 0.92 | 36 | f sand | 0.27 | 0.19 | 1.5 |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand w/some organis, gr | 26 | 0.89 | 23 | | | | |

### FIELD BORING LOG NO. 149

Depth to water table (ft): 11.5 Topstratum thickness (ft): 17

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 14.0 | 15.5 | 0.0 | 17.0 | silty clay and clayey silt layers, br and gr | 9 | | | | | | |
| 17.0 | 18.5 | 17.0 | | SP, f sand, gr | 19 | 1.06 | 20 | f sand | 0.31 | 0.16 | 2.2 |
| 20.0 | 21.5 | | | SP, vf sand, w/thin clayey sand lens | 23 | 1.02 | 23 | | | | |
| 23.0 | 24.5 | | | SP, vf sand, w/thin clayey sand lens | 54 | 0.96 | 52 | | | | |
| 26.0 | 27.5 | | | SP, f sand, gr | 49 | 0.93 | 46 | f sand | 0.31 | 0.17 | 2.1 |
| 29.0 | 30.5 | | ≥30.5 | SP, vf sand w/thin clay lens, gr | 23 | 0.89 | 20 | | | | |

### FIELD BORING LOG NO. 150

Depth to water table (ft): ≤17 Topstratum thickness (ft): 0(17)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.0 | 6.5 | 0.0 | | SP, f sand, moist to wet, tan | 23 | | | | | | |
| 8.0 | 9.5 | | | SP, f sand, moist to wet, tan and gr | 25 | | | f sand | 0.27 | 0.14 | 2.1 |
| 11.0 | 12.5 | | 12.4 | SP, f sand w/thin clay lens, gr | 14 | | | | | | |
| | | 12.4 | 17.2 | ML, clayey silt | | | | | | | |
| 17.0 | 18.5 | 17.2 | | SP, f sand w/thin clay lens, gr | 14 | | | | | | |
| 20.0 | 21.5 | | | SP, f sand, gr | 15 | | | f sand | 0.26 | 0.15 | 1.9 |
| 23.0 | 24.5 | | | silt and vf sand, gr | 15 | | | | | | |
| 26.0 | 27.5 | | | SP, m sand w/some f gravel, gr | 25 | | | m sand | 0.63 | 0.18 | 4.1 |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand w/some f gravel and organics | 37 | | | | | | |

### FIELD BORING LOG NO. 151

Depth to water table (ft): ≤4.5 Topstratum thickness (ft): 3(17)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.2 | sandy clay, br | | | | | | | |
| 5.0 | 6.5 | 3.2 | 8.0 | SM, silty sand w/occ clay balls, br | 16 | | | | | | |
| 11.0 | 12.5 | 8.0 | 14.0 | clayey silt, gr and br | 8 | | | | | | |
| 14.0 | 15.5 | 14.0 | | SP, f snd w/thin clay lens, gr | 20 | | | | | | |
| 17.0 | 18.5 | | | SP, f sand w/some f gravel, gr | 21 | | | | | | |
| 20.0 | 21.5 | | | SP, f sand, gr | 42 | | | | | | |
| 23.0 | 24.5 | | | SP, f sand w/some f gravel, gr | 63 | | | | | | |
| 26.0 | 27.5 | | | SP, f sand w/some organics, gr | 81 | | | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand, gr | 64 | | | | | | |

### FIELD BORING LOG NO. 152

Depth to water table (ft): 15 Topstratum thickness (ft): 15

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11.0 | 12.5 | 0.0 | 14.6 | sandy and silty clay layers | 3 | | | | | | |
| 14.0 | 15.5 | 14.6 | | SP, f sand, gr | 15 | 1.06 | 16 | | | | |
| 17.0 | 18.5 | | | SP, f sand w/occ small pieces of clay, gr | 19 | 1.02 | 19 | | | | |
| 20.0 | 21.5 | | | SP, f sand w/occ small pieces of clay, gr | 17 | 0.96 | 16 | | | | |
| 23.0 | 24.5 | | | SP, f sand w/occ small pieces of clay, gr | 19 | 0.92 | 17 | | | | |
| 26.0 | 27.5 | | | SP, f sand w/occ small pieces of clay, gr | 25 | 0.89 | 22 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand w/occ small pieces of clay, gr | 46 | 0.86 | 40 | | | | |

### FIELD BORING LOG NO. 153

Depth to water table (ft): ≤12.5 Topstratum thickness (ft): 8

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 1.0 | silty f sand, br | | | | | | | |
| | | 1.0 | 8.0 | clayey f sand, br | | | | | | | |
| 8.0 | 9.5 | 8.0 | | SP, f sand, tan | 40 | | | | | | |
| 11.0 | 12.5 | | | SP, f sand, tan | 35 | | | | | | |
| 14.0 | 15.5 | | | SP, f sand, tan | 28 | | | | | | |
| 17.0 | 18.5 | | | SP, f sand, tan | 42 | | | | | | |
| 20.0 | 21.5 | | | SP, f sand w/occ small pieces clay, gr | 26 | | | | | | |
| 23.0 | 24.5 | | | SP, f sand w/clay lens and organics, gr | 21 | | | | | | |
| 26.0 | 27.5 | | | SP, f sand w/clay lens and organics, gr | 35 | | | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, c sand w/clay lens, gr | 19 | | | | | | |

### FIELD BORING LOG NO. 154

Depth to water table (ft): 8.1 Topstratum thickness (ft): 17

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 10.5 | sandy clay, silty clay and silty sand layers | | | | | | | |
| 8.0 | 9.5 | 10.5 | 14.0 | SP, f sand w/clayey silt lens, gr | 6 | | | | | | |
| | | 14.0 | 17.0 | clayey silt w/lenses of sand and organics | | | | | | | |
| 17.0 | 18.5 | 17.0 | | SP, f sand, gr | 27 | 1.12 | 30 | | | | |
| 20.0 | 1.5 | | | SP, f sand w/clayey lens, gr | 11 | 1.06 | 12 | | | | |
| 23.0 | 24.5 | | | SP, f to c sand w/occ clayey lenses | 30 | 1.02 | 31 | | | | |
| 26.0 | 27.5 | | | SP, f to c sand w/occ clayey lenses | 29 | 0.96 | 28 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, c sand w/clayey lens, gr | 28 | 0.93 | 26 | | | | |

### FIELD BORING LOG NO. 155

Depth to water table (ft): 10.5 Topstratum thickness (ft): 14

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11.0 | 12.5 | 0.0 | 14.3 | sandy clay, silty clay and clayey silt layers | 6 | | | | | | |
| 14.0 | 15.5 | 14.3 | 15.3 | SM, silty sand, gr | 15 | 1.16 | 17 | | | | |
| 17.0 | 18.5 | 15.3 | | SP, f sand, gr | 32 | 1.10 | 35 | | | | |
| 20.0 | 21.5 | | | SP, f sand w/thin clay lens, gr | 21 | 1.04 | 22 | | | | |
| 23.0 | 24.5 | | | SP, f sand w/thin clay lens, gr | 29 | 0.99 | 29 | | | | |
| 26.0 | 27.5 | | | SP, f sand w/thin clay lens, gr | 19 | 0.95 | 18 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand w/thin clay lens, gr | 23 | 0.91 | 21 | | | | |

### FIELD BORING LOG NO. 156

Depth to water table (ft): 11.4 Topstratum thickness (ft): 0(12)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.0 | 6.5 | 0.0 | 8.0 | silty f sand, br and tan | 4 | >1.4 | >6 | | | | |
| 8.0 | 9.5 | 8.0 | 10.0 | SP, sand w/organic lens, tan | 7 | 1.32 | 9 | | | | |
| | | 10.0 | 11.7 | clayey silt w/organic, gr | | | | | | | |
| 14.0 | 15.5 | 11.7 | | SP, sand, yellow and tan | 6 | 1.12 | 7 | | | | |
| 17.0 | 18.5 | | | SP, f sand w/silt and organic lens, tan | 25 | 1.06 | 26 | | | | |
| 20.0 | 21.5 | | | SP f sand w/organic lens, gr | 44 | 1.02 | 45 | | | | |
| 23.0 | 24.5 | | | SP, f sand and f gravel w/some organic, gr | 65 | 0.97 | 63 | | | | |
| 26.0 | 27.5 | | | SP, f to m sand, gr | 54 | 0.92 | 49 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, m to c sand, gr | 35 | 0.89 | 31 | | | | |

FIELD BORING LOG NO. 157

Depth to water table (ft): <25.5 Topstratum thickness (ft): 23

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | | clay, clayey silt, silty clay and | | | | | | | |
| 20.0 | 21.5 | | 23.0 | sandy clay layers | 7 | | | | | | |
| 23.0 | 24.5 | 23.0 | 25.5 | silt and vf sand, gr and br | 13 | | | | | | |
| 26.0 | 27.5 | 25.5 | | SP, f sand, gr | 43 | | | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand, gr | 65 | | | | | | |

FIELD BORING LOG NO. 158

Depth to water table (ft): <13.5 Topstratum thickness (ft): 1(8)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 1.0 | clayey f sand | | | | | | | |
| 5.0 | 6.5 | 1.0 | 7.0 | silty sand, br | 8 | | | | | | |
| | | 7.0 | 8.5 | clayey sand, br and tan | | | | | | | |
| 10.0 | 11.5 | 8.5 | | SP, f sand, tan | 36 | | | | | | |
| 13.0 | 14.5 | | | SP, f sand w/clay lenses from 4.0-4.5 | 13 | | | | | | |
| 16.0 | 17.5 | | | SM, silty f sand w/ occ thin silty lenses | 19 | | | | | | |
| 19.0 | 20.5 | | | SP, f sand w/occ silty lenses and some organic | 36 | | | | | | |
| 22.0 | 23.5 | | | SP, f sand w/occ silty lenses and some organic | 33 | | | | | | |
| 25.0 | 26.5 | | | SP, f sand w/occ silty lenses and some organic | 28 | | | | | | |
| 28.5 | 30.0 | | | SP, f sand w/occ silty lenses and some organic | 47 | | | | | | |

FIELD BORING LOG NO. 159

Depth to water table (ft): 11.2 Topstratum thickness (ft): 0(18)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | SM, silty f sand, br | NA | | | | | | |
| 5.0 | 6.5 | 5.0 | 6.5 | SP, f sand w/some organic, tan | 8 | >1.4 | >12 | f sand | 0.38 | 0.21 | 1.9 |
| 8.0 | 9.5 | 6.5 | 11.0 | SM, silty f sand w/ some organic, br | 11 | 1.36 | 15 | | | | |
| 11.0 | 12.5 | 11.0 | | SP, f sand, tan and gr | 17 | 1.20 | 20 | f sand | 0.40 | 0.18 | 2.7 |
| 14.0 | 15.5 | | 17.0 | SP, f sand, tan and gr | 27 | 1.12 | 30 | | | | |
| 17.0 | 18.5 | 17.0 | 18.4 | CH, plastic clay, gr | 10 | | | f sand | 0.38 | 0.15 | 3.0 |
| 20.0 | 21.5 | 18.4 | | SP, f sand w/some f gravel, br | 24 | 1.01 | 24 | | | | |
| 23.0 | 24.5 | | | SP, f sand, gr | 27 | 0.97 | 26 | | | | |
| 26.0 | 27.5 | | 29.0 | SP, f sand, gr | 49 | 0.93 | 46 | | | | |
| | | 29.0 | 30.3 | Cl, sandy clay | | | | | | | |
| 32.0 | 33.5 | 30.3 | | SP, f sand, gr | 48 | 0.86 | 41 | f sand | 0.40 | 0.18 | 2.5 |
| 35.0 | 36.5 | | ≥36.5 | SP, f to m sand, gr | 36 | 0.83 | 30 | f sand | 0.41 | 0.17 | 2.9 |

FIELD BORING LOG NO. 160

Depth to water table (ft): 10.7 Topstratum thickness (ft): 14

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.5 | clayey sand | | | | | | | |
| 5.0 | 6.5 | 3.5 | 8.0 | SM, silty f sand, br | 5 | | | | | | |
| 11.0 | 12.5 | 8.0 | 14.3 | CL, silty clay | 3 | | | | | | |
| 14.0 | 15.5 | 14.3 | | SP, f sand, tan | 9 | 1.16 | 10 | | | | |
| 17.0 | 18.5 | | | SP, f sand w/occ thin silty lenses and organic | 17 | 1.08 | 18 | | | | |
| 20.0 | 21.5 | | | SP, f sand w/occ thin silty lenses and organic | 9 | 1.02 | 9 | m sand | 0.48 | 0.29 | 1.7 |
| 23.0 | 24.5 | | | SP, f sand w/occ thin silty lenses and organic | 24 | 0.98 | 24 | | | | |
| 26.0 | 27.5 | | | SP, f sand, w/some organic | 28 | 0.94 | 26 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f c sand w/f gravel | 15 | 0.91 | 14 | | | | |

FIELD BORING LOG NO. 161

Depth to water table (ft): <11.2 Topstratum thickness (ft): 8

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | | silty sand, silty clay and clayey | | | | | | | |
| 5.0 | 6.5 | | 8.0 | silt layers | 4 | | | | | | |
| 8.0 | 9.5 | 8.0 | | SM, silty f sand, tan | 12 | | | | | | |
| 11.0 | 12.5 | | | SM, silty f sand, tan | 7 | | | | | | |
| 15.0 | 16.5 | | | SM, silty vf sand, gr | 14 | | | | | | |
| 18.0 | 19.5 | | | SM, silty vf sand, gr | 6 | | | | | | |
| 21.0 | 22.5 | | | SM, silty vf sand, gr | 18 | | | | | | |
| 24.0 | 25.5 | | | SM, silty vf sand w/ thin clay lens, gr | 16 | | | | | | |
| 27.0 | 28.5 | | | SP, vf sand, gr | 21 | | | | | | |
| 30.0 | 31.5 | | ≥31.5 | SP, vf sand w/occ thin clay lenses, gr | 27 | | | | | | |

FIELD BORING LOG NO. 162

Depth to water table (ft): <30.5 Topstratum thickness (ft): 47

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 42.0 | clay, sandy clay, silty clay and clayey silt layers | | | | | | | |
| 43.0 | 44.5 | 42.0 | 46.0 | SM, silty vf sand w/ thin clay lens | 30 | | | silty sand | 0.085 | 0.018 | 5.2 |
| | | 46.0 | 46.6 | CH, plastic clay, gr | | | | | | | |
| 46.0 | 47.5 | 46.6 | | SP, f sand, gr | 65 | | | | | | |
| 49.0 | 50.0 | | ≥50.5 | SP, f sand, gr | 31 | | | f sand | 0.31 | 0.15 | 2.5 |

FIELD BORING LOG NO. 163A

Depth to water table (ft): 10.7 Topstratum thickness (ft): 27

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 26.5 | clay and silty clay layers | | | | | | | |
| 26.0 | 27.5 | 26.5 | | silty sand, gr | 34 | 0.94 | 32 | | | | |
| 29.0 | 30.5 | | | silty sand, gr | 38 | 0.91 | 35 | | | | |
| 32.0 | 33.5 | | | silty sand, gr | 23 | 0.87 | 20 | | | | |
| 35.0 | 36.5 | | | f sand, gr | 29 | 0.84 | 24 | | | | |
| 38.0 | 39.5 | | | f sand, gr | 39 | 0.82 | 32 | | | | |
| 41.0 | 42.5 | | | f sand, gr | 35 | 0.79 | 28 | | | | |
| 44.0 | 45.5 | | | f sand, gr | 89 | 0.77 | 68 | f sand | 0.17 | 0.099 | 1.8 |
| 47.0 | 48.5 | | | f sand, gr | 75 | 0.75 | 56 | | | | |
| 48.5 | 50.0 | | ≥50.0 | f sand, gr | 75 | 0.74 | 55 | | | | |

FIELD BORING LOG NO. 163B

Depth to water table (ft): 10.7 Topstratum thickness (ft): 16(42)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.0 | plastic clay | | | | | | | |
| 11.0 | 12.5 | 8.0 | 16.0 | sandy silt, br | | | | silty sand | 0.11 | 0.005 | 2.6 |
| 16.0 | 17.5 | 16.0 | 19.0 | silty sand, br | 8 | 1.15 | 9 | f sand | 0.15 | 0.085 | 1.9 |
| 19.0 | 21.5 | 19.0 | 22.0 | sandy silt, gr | | | | silty sand | 0.084 | 0.01 | 12.0 |
| 22.0 | 23.5 | 22.0 | 25.0 | f sand, gr | 28 | 1.04 | 29 | silty | 0.14 | 0.0085 | 1.8 |
| 26.0 | 27.5 | 25.0 | 28.5 | silty sand, gr | 38 | 0.98 | 37 | | | | |
| | | 28.5 | 33.0 | clay and silt layers, gr | | | | | | | |
| 33.0 | 34.5 | 33.0 | | sandy silt, gr | 41 | 0.89 | 36 | silty sand | 0.17 | 0.024 | 7.5 |
| 36.0 | 37.5 | | | sandy silt, gr | 42 | 0.86 | 36 | | | | |
| 39.0 | 40.5 | | 42.0 | sandy silt, gr | 71 | 0.83 | 59 | | | | |
| 42.0 | 43.5 | 42.0 | | silty sand, gr | 94 | 0.80 | 75 | | | | |
| 45.0 | 46.5 | | | f sand, gr | >100 | 0.78 | >78 | f sand | 0.16 | 0.082 | 2.2 |
| 48.0 | 49.5 | | | f sand, gr | 92 | 0.76 | 70 | | | | |
| 52.0 | 53.5 | | | f sand, gr | 64 | 0.74 | 47 | | | | |
| 54.5 | 56.0 | | ≥56.0 | f sand, gr | 47 | 0.72 | 34 | | | | |

FIELD BORING LOG NO.164

Depth to water table (ft) 8.9 Topstratum thickness (ft) 20 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.0 | silty clay | | | | | | | |
| | | 14.0 | 26.0 | sandy silt, gr | | | | | | | |
| 26.0 | 28.0 | 26.0 | | f sand, gr | 12 | | | | | | |
| 28.0 | 30.0 | | | f sand, gr | 8 | | | | | | |
| 30.0 | 32.0 | | | m sand, gr | 30 | | | | | | |
| 32.5 | 34.5 | | | m sand, gr | 35 | | | | | | |
| 35.0 | 37.0 | | | m sand, gr | 32 | | | | | | |
| 37.5 | 39.5 | | | m sand, gr | 33 | | | | | | |
| 40.0 | 42.0 | | | f sand, gr | 31 | | | | | | |
| 42.5 | 44.5 | | | f sand, gr | 28 | | | | | | |
| 45.0 | 47.0 | | | m sand, gr | NA | | | | | | |
| 47.0 | 49.0 | | | m sand, gr | 34 | | | | | | |
| 50.0 | 52.0 | | | m sand, gr | 35 | | | | | | |
| 52.5 | 54.5 | | | m sand, gr | 37 | | | | | | |
| 55.0 | 57.0 | | | m sand, gr | 36 | | | | | | |
| 57.5 | 59.5 | | | m sand, gr | 38 | | | | | | |
| 60.0 | 62.0 | | | m sand, gr | 41 | | | | | | |
| 62.5 | 64.5 | | | m sand, gr | 43 | | | | | | |
| 65.0 | 67.0 | | | m sand, gr | 31 | | | | | | |
| 67.5 | 69.5 | | | m sand, gr | 35 | | | | | | |
| 70.0 | 72.0 | | | m sand, gr | 44 | | | | | | |
| 72.5 | 74.5 | | | m sand, gr | 34 | | | | | | |
| 75.0 | 77.0 | | | m sand, gr | 35 | | | | | | |

FIELD BORING LOG NO.165

Depth to water table (ft` 10.1 Topstratum thickness (ft) 14 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.0 | clay and silty clay | | | | | | | |
| 17.0 | 19.0 | 14.0 | | f sand, gr | 35 | | | | | | |
| 20.0 | 22.0 | | | f sand, gr | 42 | | | | | | |
| 22.5 | 24.5 | | | f sand, gr | 44 | | | | | | |
| 25.0 | 27.0 | | | f sand, gr | 45 | | | | | | |
| 27.5 | 29.5 | | | f sand, gr | 46 | | | | | | |
| 30.0 | 32.0 | | | f sand, gr | 40 | | | | | | |
| 32.5 | 34.5 | | | f sand, gr | 45 | | | | | | |
| 35.0 | 37.0 | | | f sand, gr | 50 | | | | | | |
| 37.5 | 39.5 | | | f sand, gr | 51 | | | | | | |
| 40.0 | 42.0 | | | f sand, gr | 60 | | | | | | |
| 42.5 | 44.5 | | | f sand, gr | 65 | | | | | | |
| 45.0 | 47.0 | | | f sand, gr | 45 | | | | | | |
| 47.5 | 49.5 | | | f sand, gr | 45 | | | | | | |
| 50.0 | 52.0 | | | f sand, gr | 35 | | | | | | |
| 52.5 | 54.5 | | | f sand, gr | 50 | | | | | | |
| 55.0 | 57.0 | | | f sand, gr | 39 | | | | | | |
| 57.5 | 59.5 | | | m sand, gr | 37 | | | | | | |
| 60.0 | 62.0 | | | m sand, gr | 31 | | | | | | |
| 63.0 | 65.0 | | ≥65.0 | m sand, gr | 32 | | | | | | |

FIELD BORING LOG NO.166

Depth to water table (ft) 8.5 Topstratum thickness (ft) 23 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 23.0 | clay, silty clay and silty sand layers | | | | | | | |
| 30.0 | 32.0 | 23.0 | | f sand, gr | 28 | | | | | | |
| 32.5 | 34.5 | | | f sand, gr | 28 | | | | | | |
| 35.0 | 37.0 | | | m sand, gr | 28 | | | | | | |
| 37.5 | 39.5 | | | m sand, gr | 28 | | | | | | |
| 40.0 | 42.0 | | | m sand, gr | 31 | | | | | | |
| 42.5 | 44.5 | | | m sand, gr | 29 | | | | | | |
| 45.0 | 47.0 | | | m sand, gr | 31 | | | | | | |
| 47.5 | 49.5 | | | m sand, gr | 22 | | | | | | |
| 50.0 | 52.0 | | | silty sand, gr | 30 | | | | | | |
| 52.5 | 54.5 | | | silty sand, gr | 41 | | | | | | |
| 55.0 | 57.0 | | | silty sand, gr | 36 | | | | | | |
| 57.5 | 59.5 | | | f to m sand, gr | 35 | | | | | | |
| 60.0 | 62.0 | | | f to m sand, gr | 37 | | | | | | |
| 62.5 | 64.5 | | | f to m sand, gr | 50 | | | | | | |
| 65.0 | 67.0 | | | f to m sand, gr | 50 | | | | | | |
| 68.0 | 70.0 | | ≥70.0 | m sand | 32 | | | | | | |

FIELD BORING LOG NO.167

Depth to water table (ft) 9.8 Topstratum thickness (ft) 33 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 29.5 | plastic clay | | | | | | | |
| | | 29.5 | 33.0 | silty clay and sandy silt, gr | | | | | | | |
| 37.5 | 39.5 | 33.0 | | f sand, gr | 21 | | | | | | |
| 40.0 | 42.0 | | | f sand, gr | 26 | | | | | | |
| 42.5 | 44.5 | | | f sand, gr | 33 | | | | | | |
| 45.0 | 47.0 | | | f sand, gr | 38 | | | | | | |
| 47.5 | 49.5 | | | f sand, gr | 25 | | | | | | |
| 50.0 | 52.0 | | | m sand, gr | 25 | | | | | | |
| 52.5 | 54.5 | | | m sand, gr | 50 | | | | | | |
| 55.0 | 57.0 | | | m sand, gr | 30 | | | | | | |
| 57.5 | 59.5 | | | m sand, gr | 27 | | | | | | |
| 60.0 | 62.0 | | | m sand, gr | 39 | | | | | | |
| 62.5 | 64.5 | | | m sand, gr | 30 | | | | | | |
| 65.0 | 67.0 | | | m sand, gr | 33 | | | | | | |
| 68.0 | 70.0 | | | m sand, gr | 33 | | | | | | |

FIELD BORING LOG NO.168

Depth to water table (ft) 5.0 Topstratum thickness (ft) ≥50 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 1.0 | gravelly clay, br | | | | | | | |
| | | 1.0 | 33.0 | clayey silt and silty clay, br and gr | | | | | | | |
| 35.0 | 36.5 | 33.0 | 36.5 | clayey sand, gr | 7 | | | | | | |
| 39.0 | 40.5 | | | sandy clay, gr | 9 | | | | | | |
| 41.0 | 42.5 | | | silty clay, gr and br | 11 | | | | | | |
| 44.0 | 45.5 | | | silty clay, gr and br | 29 | | | | | | |
| 48.5 | 50.0 | | ≥50.0 | sandy clay, gr and br | 17 | | | | | | |

FIELD BORING LOG NO.169

Depth to water table (ft) 14.0 Topstratum thickness (ft) 38,(>60) — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 13.5 | silty clay, br and gr | | | | | | | |
| | | 13.5 | 19.5 | clayey silt, gr | | | | | | | |
| | | 19.5 | 35.0 | silty clay, br | | | | | | | |
| | | 35.0 | 38.0 | silt, gr | | | | | | | |
| | | 38.0 | 44.0 | silty sand, gr | | | | | | | |
| 49.5 | 50.0 | 44.0 | | clay and silty clay, gr and bl | 20 | | | | | | |
| 51.5 | 53.0 | | 53.0 | clay and silty clay, gr and bl | 30 | | | | | | |
| 58.5 | 60.0 | 53.0 | ≥60.0 | silt, gr | 86 | | | | | | |

FIELD BORING LOG NO.170

Depth to water table (ft) 20.0 Topstratum thickness (ft) 26 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 25.5 | silty clay, br and gr | | | | | | | |
| 26.0 | 28.5 | 25.5 | | f sand, br | NA | | | | | | |
| 29.5 | 30.0 | | | f sand, br | NA | | | | | | |
| 31.5 | 33.0 | | ≥33.0 | f sand, gr and br | 7 | 0.79 | 6 | | | | |

FIELD BORING LOG NO.171

Depth to water table (ft) 18.0 Topstratum thickness (ft) 29 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 25.5 | silty clay, br and gr | | | | | | | |
| 26.0 | 28.5 | 25.0 | | silt, br, w/lenses of sand | | | | | | | |
| 29.0 | 30.5 | | | sandy silt, gr | 1 | | | | | | |
| 33.0 | 34.5 | | | f sand, br | 30 | 0.84 | 25 | | | | |
| 39.5 | 41.0 | | ≥41.0 | f sand, br | 14 | 0.78 | 11 | | | | |

### FIELD BORING LOG NO. 172

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 14 | 26 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 19.5 | silty clay, br and gr | | | | | | | |
| 20.0 | 22.5 | 19.5 | | clayey sand, gr | | | | | | | |
| 23.0 | 24.5 | | 26.0 | f sand, gr, w/lenses gr clay | 3 | 0.93 | 3 | | | | |
| 26.0 | 27.5 | 26.0 | | f sand, gr | 13 | 0.90 | 12 | f sand | 0.17 | 0.078 | 2.6 |
| 29.5 | 31.0 | | ≥31.0 | f sand, gr | 14 | 0.87 | 12 | f sand | 0.21 | 0.11 | 2.1 |

### FIELD BORING LOG NO. 173

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 15 | 14 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.0 | silty clay, br and gr | | | | | | | |
| 14.0 | 14.5 | 14.0 | | silty sand, br, w/ lenses of sandy silt | NA | | | | | | |
| 15.0 | 15.5 | | | f sand, gr | NA | | | f sand | 0.19 | 0.11 | 2.0 |
| 19.0 | 20.5 | | | f sand,gr | 32 | 0.97 | 31 | f sand | 0.28 | 0.19 | 1.6 |
| 22.0 | 23.5 | | | f sand, gr | 26 | 0.93 | 24 | | | | |
| 24.0 | 25.5 | | | f sand, gr | 27 | 0.90 | 24 | | | | |
| 29.5 | 31.0 | | ≥31.0 | f sand, gr | 23 | 0.86 | 20 | | | | |

### FIELD BORING LOG NO. 174

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 11.0 | 8 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 4.0 | silty clay, gr and br | | | | | | | |
| | | 4.0 | 8.0 | clayey silt, gr | | | | | | | |
| 8.0 | 10.5 | 8.0 | | f sand, br | NA | | | | | | |
| 10.5 | 11.0 | | | f sand, br | NA | | | | | | |
| 11.0 | 12.5 | | | f sand, br | 10 | 1.18 | 12 | silty sand | 0.12 | 0.029 | 4.5 |
| 14.0 | 15.5 | | | f sand, gr | 53 | 1.13 | 60 | | | | |
| 17.0 | 18.5 | | | f sand, gr | 25 | 1.08 | 27 | | | | |
| 20.0 | 21.5 | | | f sand, gr | 45 | 1.03 | 46 | | | | |
| 25.0 | 26.5 | | | f sand, gr | 47 | 0.96 | 45 | | | | |
| 28.5 | 30.0 | | ≥30.0 | f sand, gr | 38 | 0.93 | 35 | f sand | 0.26 | 0.16 | 1.7 |

### FIELD BORING LOG NO. 175

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 12.5 | 11 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 7.5 | silty clay, br and gr | | | | | | | |
| | | 7.5 | 11.0 | silt, br and gr | | | | | | | |
| 15.0 | 16.5 | 11.0 | | silty f sand, br | 10 | 1.09 | 11 | | | | |
| 18.0 | 19.5 | | | f sand, br | 22 | 1.03 | 23 | | | | |
| 21.0 | 22.5 | | | f sand, gr | 23 | 0.98 | 23 | f sand | 0.22 | 0.12 | 2.0 |
| 25.0 | 26.5 | | | f sand, gr | 28 | 0.94 | 26 | | | | |
| 28.5 | 30.0 | | ≥30.0 | f sand, gr | 30 | 0.89 | 27 | | | | |

### FIELD BORING LOG NO. 176

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 5.9 | >50 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 38.0 | silty clay, br | | | | | | | |
| 38.0 | 39.5 | 38.0 | 39.5 | silty sand, br | 20 | | | | | | |
| 44.0 | 45.5 | 39.5 | | silty clay, br, w/sand lenses | | | | | | | |
| 48.5 | 50.0 | | >50.0 | silty sand, br w/sand lenses | | | | | | | |

### FIELD BORING LOG NO. 177

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| NA | >61 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 41.0 | silty clay, br and gr | | | | | | | |
| 41.0 | 42.5 | 41.0 | 44.0 | silty sand, gr | 29 | | | | | | |
| | | 44.0 | ≥61.0 | clayey sand and sandy clay, gr | | | | | | | |

### FIELD BORING LOG NO. 178

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 3.6 | 33 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 26.5 | silty clay, br and gr | | | | | | | |
| 29.0 | 30.5 | 26.5 | 30.5 | silt, gr, w/lenses of sand | 20 | | | | | | |
| 33.0 | 34.5 | | | f sand, gr | 16 | 0.94 | 15 | | | | |
| 37.5 | 39.0 | | ≥39.0 | f sand, gr | 36 | 0.89 | 32 | | | | |

### FIELD BORING LOG NO. 179

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 21 | 36.5 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 28.0 | silty clay, br and gr | | | | | | | |
| 30.5 | 31.0 | 28.0 | | clayey silt, gr | | | | | | | |
| 33.5 | 34.0 | | 36.5 | silt, gr | | | | | | | |
| 36.5 | 40.0 | 36.5 | | sand, br | NA | | | | | | |
| 43.5 | 45.0 | | ≥45.0 | sand, br | 15 | 0.71 | 11 | | | | |

### FIELD BORING LOG NO. 180

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 19.5 | 25 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 21.5 | silty clay, br and gr | | | | | | | |
| | | 21.5 | 25.0 | clayey silt and sandy silt | | | | | | | |
| 28.0 | 29.5 | 25.0 | | f sand, gr | 19 | 0.83 | 16 | f sand | 0.26 | 0.13 | 2.2 |
| 33.0 | 35.0 | | ≥35.0 | f sand, gr | 24 | 0.77 | 18 | | | | |

### FIELD BORING LOG NO. 181

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 14.8 | 12 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 12.0 | silty clay, gr and br | | | | | | | |
| 12.5 | 13.0 | 12.0 | | silty f sand, gr | NA | | | | | | |
| 15.5 | 16.0 | | | silty f sand, gr | NA | | | | | | |
| 18.5 | 19.0 | | | silty f sand, gr | NA | | | | | | |
| 22.0 | 23.5 | | | f sand, gr | 32 | 0.94 | 30 | f sand | 0.25 | 0.12 | 2.2 |
| 25.0 | 26.5 | | | f sand, gr | 23 | 0.90 | 21 | | | | |
| 29.5 | 31.0 | | ≥31.0 | f sand, gr | 25 | 0.86 | 22 | | | | |

### FIELD BORING LOG NO. 182

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 6.7 | 11 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 11.0 | sandy clay, clayey sand and clayey silt lenses | | | | | | | |
| 11.0 | 12.5 | 11.0 | | SM, silty vf sand | 5 | 1.30 | 7 | | | | |
| 14.0 | 15.5 | | | SM, silty vf sand | 6 | 1.22 | 7 | | | | |
| 17.0 | 18.5 | | | SM, silty vf sand | 9 | 1.15 | 10 | | | | |
| 20.0 | 21.5 | | | SM, silty vf sand | 9 | 1.08 | 10 | | | | |
| 23.0 | 24.5 | | | SM, silty vf sand | 17 | 1.04 | 18 | | | | |
| 26.0 | 27.5 | | | silty vf sand w/clayey silt streaks | 2 | 1.00 | 2 | | | | |
| 29.0 | 30.5 | | ≥30.5 | silty vf sand w/clayey silt streaks | 10 | 0.95 | 10 | | | | |

FIELD BORING LOG NO. 183

Depth to water table (ft): 2.0 Topstratum thickness (ft): ≥31

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20.0 | 21.5 | 0.0 | | silty clay and clayey silt, br and gr | 4 | | | | | | |
| 23.0 | 24.5 | | 26.0 | silty clay and clayey silt, br and gr | 8 | | | | | | |
| 26.0 | 27.5 | 26.0 | | CH, clay, gr | 8 | | | | | | |
| 29.0 | 30.5 | | ≥30.5 | CH, clay, gr | 9 | | | | | | |

FIELD BORING LOG NO. 184

Depth to water table (ft): 10.0 Topstratum thickness (ft): 26

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 22.0 | CH, clay | | | | | | | |
| 23.0 | 24.5 | 22.0 | 26.0 | silt, gr | 9 | | | | | | |
| 26.0 | 27.5 | 26.0 | 29.0 | silty sand, gr | 37 | 0.94 | 35 | | | | |
| 29.0 | 30.5 | | | f sand, gr | 66 | 0.90 | 59 | | | | |
| 32.5 | 34.0 | | ≥34.0 | f sand, gr | 66 | 0.87 | 57 | | | | |

FIELD BORING LOG NO. 185

Depth to water table (ft): 9.1 Topstratum thickness (ft): 73

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 41.0 | CH, clay | | | | | | | |
| 41.0 | 42.5 | 41.0 | 43.0 | f sand, gr | 19 | | | f sand | 0.28 | 0.17 | 1.8 |
| | | 43.0 | 47.0 | silt w/clay lens | | | | | | | |
| 69.5 | 70.2 | 47.0 | 73.0 | ckatm gr | | | | m sand | 0.69 | 0.39 | 2.0 |
| 73.0 | 74.5 | 73.0 | | m sand, gr | 14 | 0.61 | 10 | m sand | 0.59 | 0.32 | 2.3 |
| 77.5 | 79.0 | | ≥79.0 | m sand, gr | 37 | 0.59 | 22 | | | | |

FIELD BORING LOG NO. 186

Depth to water table (ft): 7.5 Topstratum thickness (ft): 30

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 29.5 | silty clay | | | | | | | |
| 31.0 | 32.5 | 29.5 | | m sand, br | 31 | 0.93 | 29 | f sand | 0.42 | 0.29 | 1.6 |
| 38.5 | 40.0 | | ≥40.0 | m sand, br | 45 | 0.85 | 38 | | | | |

FIELD BORING LOG NO. 187

Depth to water table (ft): 4.1 Topstratum thickness (ft): 22

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 21.5 | silty clay | | | | | | | |
| 22.0 | 23.5 | | | f sand, br | 57 | 1.10 | 64 | f sand | 0.28 | 0.10 | 3.1 |
| 27.0 | 28.5 | | ≥28.5 | f sand, br | 45 | 1.02 | 46 | f sand | 0.34 | 0.16 | 2.3 |

FIELD BORING LOG NO. 188

Depth to water table (ft): 10.2 Topstratum thickness (ft): 11

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 11.0 | sandy clay and clayey sand | | | | | | | |
| 11.0 | 11.5 | 11.0 | | silty sand | NA | | | | | | |
| 12.5 | 13.0 | | | m sand | NA | | | | | | |
| 16.0 | 17.5 | | | m sand | 57 | 1.10 | 63 | | | | |
| 19.0 | 20.5 | | | m sand | 39 | 1.05 | 41 | | | | |
| 22.0 | 23.5 | | | m sand | 34 | 1.01 | 34 | | | | |
| 25.0 | 26.5 | | | f sand | 17 | 0.95 | 16 | | | | |
| 28.0 | 29.5 | | | m sand | 32 | 0.92 | 30 | | | | |
| 31.0 | 32.5 | | | m sand | 29 | 0.89 | 26 | | | | |
| 34.0 | 35.5 | | | m sand w/clay balls | 19 | 0.86 | 16 | | | | |
| 37.0 | 38.5 | | | f sand | 24 | 0.82 | 20 | | | | |
| 40.0 | 41.5 | | | f sand | 46 | 0.79 | 36 | | | | |
| 43.0 | 44.5 | | | f sand | 45 | 0.77 | 35 | | | | |
| 46.0 | 47.5 | | | f sand | 28 | 0.75 | 21 | | | | |
| 51.0 | 52.5 | | | f sand w/gravel | 38 | 0.73 | 28 | | | | |
| 54.0 | 56.0 | | ≥56.0 | f sand w/gravel | 80 | 0.70 | 56 | | | | |

FIELD BORING LOG NO. 189

Depth to water table (ft): 16.7 Topstratum thickness (ft): 31

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 28.5 | highly plastic clay | | | | | | | |
| | | 28.5 | 30.5 | sandy silt | | | | | | | |
| 32.0 | 33.5 | 30.5 | | m sand | 19 | 0.82 | 16 | | | | |
| 36.0 | 37.5 | | | m sand | 24 | 0.78 | 19 | | | | |
| 42.5 | 44.0 | | ≥44.0 | m sand | 31 | 0.74 | 23 | | | | |

FIELD BORING LOG NO. 190

Depth to water table (ft): 5.5 Topstratum thickness (ft): 29

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 26.0 | silty clay | | | | | | | |
| 26.0 | 28.0 | 26.0 | 29.0 | m sand w/plastic clay | | | | | | | |
| 29.0 | 29.5 | 29.0 | | m sand | NA | | | | | | |
| 30.0 | 31.5 | | | m sand | NA | | | | | | |
| 34.0 | 35.5 | | | m sand | 31 | 0.90 | 28 | | | | |
| 39.0 | 40.5 | | ≥40.5 | m sand | 31 | 0.86 | 27 | | | | |

FIELD BORING LOG NO. 191

Depth to water table (ft): NA Topstratum thickness (ft): 32

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 28.5 | clay | | | | | | | |
| | | 28.5 | 31.5 | clay w/f sand lenses | | | | | | | |
| 32.0 | 33.5 | 31.5 | | f sand | 40 | | | | | | |
| 36.0 | 37.5 | | | f sand | 55 | | | | | | |
| 40.0 | 41.5 | | ≥41.5 | f sand | 50 | | | | | | |

FIELD BORING LOG NO. 192

Depth to water table (ft): 10.7 Topstratum thickness (ft): 13

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 11.0 | clay | | | | | | | |
| | | 11.0 | 12.5 | sandy silt | | | | | | | |
| 13.0 | 13.5 | 12.5 | | m sand | NA | | | | | | |
| 15.0 | 16.5 | | | m sand | 21 | 1.12 | 24 | m sand | 0.46 | 0.29 | 1.7 |
| 19.0 | 20.5 | | | f sand | 17 | 1.05 | 18 | f sand | 0.40 | 0.15 | 3.2 |
| 23.0 | 24.5 | | | f sand | 25 | 0.98 | 25 | | | | |
| 27.0 | 28.5 | | | f sand | 32 | 0.93 | 30 | f sand | 0.23 | 0.08 | 3.5 |
| 32.0 | 33.5 | | | silty sand | 39 | 0.88 | 34 | | | | |
| 37.0 | 38.5 | | | m sand | 39 | 0.83 | 32 | m sand | 0.47 | 0.24 | 2.0 |
| 42.0 | 43.5 | | | m sand | 40 | 0.78 | 31 | | | | |
| 47.5 | 49.0 | | ≥49.0 | m sand | 52 | 0.74 | 38 | | | | |

FIELD BORING LOG NO. 193

Depth to water table (ft): 11.2 Topstratum thickness (ft): 9

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | silt | | | | | | | |
| | | 5.0 | 9.0 | sandy silt | | | | | | | |
| | | 9.0 | 15.0 | silty sand | NA | | | | | | |
| 16.0 | 17.5 | 15.0 | | f sand | 18 | 1.10 | 20 | | | | |
| 20.0 | 21.5 | | | f sand | 16 | 1.02 | 16 | | | | |
| 24.0 | 25.5 | | | f sand | 51 | 0.96 | 49 | | | | |
| 28.0 | 29.5 | | | f sand | 72 | 0.91 | 65 | | | | |
| 33.0 | 34.5 | | | f sand | 36 | 0.86 | 31 | | | | |
| 38.5 | 40.0 | | ≥40.0 | f sand | 65 | 0.81 | 53 | | | | |

FIELD BORING LOG NO. 194

Depth to water table (ft) 9.5 Topstratum thickness (ft) 9

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.0 | sandy clay | | | | | | | |
| 10.0 | 11.5 | 9.0 | | silty sand | 7 | 1.26 | 9 | f sand | 0.32 | 0.093 | 3.6 |
| 14.0 | 15.5 | | | silty sand | 16 | 1.16 | 19 | | | | |
| 16.0 | 17.5 | | | silty sand | 21 | 1.12 | 24 | | | | |
| 20.0 | 21.5 | | | m sand w/lens of clay | 34 | 1.05 | 36 | | | | |
| 24.0 | 25.5 | | | m sand | 40 | 0.98 | 39 | f sand | 0.39 | 0.13 | 3.5 |
| 29.0 | 30.5 | | | f sand | 22 | 0.93 | 20 | | | | |
| 34.5 | 36.0 | | ≥36.0 | f sand | 32 | 0.86 | 28 | | | | |

FIELD BORING LOG NO. 195

Depth to water table (ft) 6.0 Topstratum thickness (ft) 14

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.0 | clay | | | | | | | |
| | | 8.0 | 13.5 | clay w/silt and sand lenses | | | | | | | |
| 14.0 | 15.5 | 13.5 | | m sand | 18 | 1.24 | 22 | | | | |
| 18.0 | 19.5 | | | m sand w/lean clay | 20 | 1.15 | 23 | | | | |
| 22.0 | 23.5 | | | m sand | 30 | 1.08 | 32 | | | | |
| 26.0 | 27.5 | | | m sand w/clay balls and lignite | 25 | 1.01 | 25 | | | | |
| 30.0 | 31.5 | | | m sand | 21 | 0.95 | 20 | | | | |
| 35.0 | 36.5 | | | m sand w/clay balls | 34 | 0.90 | 30 | | | | |
| 41.5 | 43.0 | | ≥43.0 | m sand | 34 | 0.82 | 28 | | | | |

FIELD BORING LOG NO. 196

Depth to water table (ft) 11.2 Topstratum thickness (ft) 67

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 67.0 | clay | | | | | | | |
| 67.0 | 67.5 | 67.0 | | m sand | NA | | | | | | |
| 69.0 | 69.5 | | | m sand | NA | | | | | | |
| 73.0 | 74.5 | | | m sand | 30 | 0.61 | 18 | | | | |
| 77.5 | 79.0 | | 79.0 | m sand | 36 | 0.59 | 21 | | | | |

FIELD BORING LOG NO. 197

Depth to water table (ft) 8.6 Topstratum thickness (ft) 19

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 2.5 | sandy clay | | | | | | | |
| | | 2.5 | 8.0 | clay | | | | | | | |
| 8.0 | 9.5 | 8.0 | | sandy silt | 9 | | | | | | |
| 12.0 | 13.5 | | | sandy silt | 7 | | | | | | |
| 15.0 | 16.5 | | | sandy silt | 12 | | | | | | |
| 19.0 | 20.5 | | | f sand | 16 | 1.08 | 17 | | | | |
| 23.0 | 24.5 | | | f sand w/lignite | 23 | 1.02 | 23 | | | | |
| 27.0 | 28.5 | | | m sand | 51 | 0.96 | 49 | | | | |
| 31.0 | 32.5 | | | m sand | 35 | 0.92 | 32 | | | | |
| 36.5 | 38.0 | | ≥38.0 | m sand | 32 | 0.86 | 27 | | | | |

FIELD BORING LOG NO. 198

Depth to water table (ft) 9.0 Topstratum thickness (ft) 23

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 18.0 | clay | | | | | | | |
| | | 18.0 | 20.0 | clay and sandy clay | | | | | | | |
| 20.0 | 21.5 | 20.0 | 23.0 | m sand w/lean clay | 27 | 1.06 | 29 | | | | |
| 23.0 | 24.5 | 23.0 | | m sand | 49 | 1.02 | 50 | m sand | 0.46 | 0.19 | 3.0 |
| 28.0 | 29.5 | | | m sand | 40 | 0.94 | 38 | | | | |
| 33.0 | 34.5 | | | gravelly sand | 80 | 0.88 | 70 | m sand | 0.73 | 0.22 | 5.5 |
| 38.0 | 39.5 | | | gravelly sand | 70 | 0.83 | 58 | f gravel | 7.0 | 1.90 | 4.1 |
| 43.5 | 45.0 | | ≥45.0 | gravelly sand | NA | | | | | | |

FIELD BORING LOG NO. 199

Depth to water table (ft) 10.3 Topstratum thickness (ft) 28

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 28.0 | clay | | | | | | | |
| 28.0 | 29.5 | 28.0 | | m sand | 25 | 0.92 | 23 | m sand | 0.48 | 0.28 | 2.0 |
| 32.0 | 33.5 | | | m sand | 70 | 0.88 | 62 | | | | |
| 37.0 | 38.5 | | | m sand | 49 | 0.83 | 41 | | | | |
| 42.5 | 44.0 | | ≥44.0 | m sand | 49 | 0.78 | 38 | | | | |

FIELD BORING LOG NO. 200

Depth to water table (ft) 11.0 Topstratum thickness (ft) 26

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.0 | clay | | | | | | | |
| | | 14.0 | 16.5 | clay w/m sand | | | | | | | |
| 17.0 | 18.5 | 16.5 | 18.5 | f sand | 8 | | | f sand | 0.40 | 0.18 | 2.5 |
| | | 18.5 | 22.0 | sandy clay | | | | | | | |
| | | 22.0 | 25.5 | clayey sand w/m sand | | | | | | | |
| 26.0 | 27.5 | 25.5 | | m sand | 11 | 0.92 | 10 | m sand | 0.45 | 0.20 | 2.5 |
| 31.0 | 32.5 | | | m sand | 36 | 0.88 | 32 | | | | |
| 36.0 | 37.5 | | | m sand | 26 | 0.83 | 22 | | | | |
| 42.5 | 44.0 | | ≥44.0 | m sand | 39 | 0.77 | 30 | m sand | 0.50 | 0.14 | 4.9 |

FIELD BORING LOG NO. 201

Depth to water table (ft) 14.0 Topstratum thickness (ft) 20

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 20.0 | clay and silty clay layers | | | | | | | |
| 20.0 | 21.5 | 20.0 | 23.0 | f sand w/clay balls | 21 | 0.98 | 21 | | | | |
| 24.0 | 25.5 | 23.0 | | f sand | 25 | 0.92 | 23 | | | | |
| 28.0 | 29.5 | | | f sand | 55 | 0.88 | 48 | f sand | 0.31 | 0.15 | 2.4 |
| 33.0 | 34.5 | | | m sand | 50 | 0.83 | 42 | m sand | 0.46 | 0.18 | 2.9 |
| 38.0 | 39.5 | | | m sand | 52 | 0.79 | 41 | | | | |
| 43.5 | 45.0 | | ≥45.0 | m sand | 54 | 0.75 | 41 | | | | |

FIELD BORING LOG NO. 202

Depth to water table (ft) 7.5 Topstratum thickness (ft) 23

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 10.5 | clay | | | | | | | |
| | | 10.5 | 13.5 | clay w/f sand | | | | | | | |
| 14.0 | 15.5 | 13.5 | 17.0 | f sand | 21 | 1.21 | 25 | f sand | 0.31 | 0.17 | 2.1 |
| | | 17.0 | 21.0 | clay | | | | | | | |
| 21.0 | 22.5 | 21.0 | | m sand w/clay lens | 11 | | | | | | |
| 24.0 | 25.5 | | | m sand | 51 | 1.02 | 52 | f sand | 0.38 | 0.15 | 2.8 |
| 29.0 | 30.5 | | | m sand | 27 | 0.96 | 26 | f sand | 0.38 | 0.17 | 2.5 |
| 34.0 | 35.5 | | | m sand | 33 | 0.88 | 29 | | | | |
| 39.5 | 41.0 | | | m sand | 36 | 0.83 | 30 | | | | |

FIELD BORING LOG NO. 203

Depth to water table (ft) 7.0 Topstratum thickness (ft) 20

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 16.0 | clay and silty clay layers | | | | | | | |
| | | 16.0 | | m sand w/clay lens | | | | | | | |
| 19.0 | 20.5 | | 22.0 | m sand w/clay lens | 11 | 1.09 | 12 | | | | |
| 23.0 | 24.5 | 22.0 | | f sand | 29 | 1.03 | 30 | | | | |
| 27.0 | 28.5 | | | f sand | 19 | 0.96 | 18 | f sand | 0.30 | 0.14 | 2.5 |
| 32.0 | 33.5 | | | f sand | 35 | 0.90 | 31 | f sand | 0.42 | 0.18 | 2.8 |
| 37.5 | 39.0 | | ≥39.0 | m sand | 32 | 0.84 | 27 | | | | |

### FIELD BORING LOG NO. 204

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 10.8 | 22 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 20.0 | clay | | | | | | | |
| 20.0 | 21.0 | 20.0 | 22.0 | sand and clay | 9 | | | | | | |
| 24.0 | 25.5 | 22.0 | | m sand | 45 | 0.96 | 43 | m sand | 0.43 | 0.19 | 2.6 |
| 28.0 | 29.5 | | | m sand | 36 | 0.92 | 33 | m sand | 0.50 | 0.23 | 2.5 |
| 33.0 | 34.5 | | | m sand | 44 | 0.86 | 38 | | | | |
| 38.5 | 40.0 | | ≥40.0 | m sand | 44 | 0.82 | 36 | | | | |

### FIELD BORING LOG NO. 205

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 10.8 | 20 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 17.0 | clay | | | | | | | |
| | | 17.0 | | clay w/silty sand lens | | | | | | | |
| | | | 20.0 | sand w/clay lens | | | | | | | |
| 24.0 | 25.5 | 20.0 | | f sand w/clay lens | 9 | | | | | | |
| 29.0 | 30.5 | | | m sand | 39 | 0.90 | 35 | m sand | 0.48 | 0.18 | 3.1 |
| 34.0 | 35.5 | | | f sand | 69 | 0.85 | 59 | f sand | 0.36 | 0.13 | 2.9 |
| 39.5 | 41.0 | | ≥41.0 | m sand | 73 | 0.81 | 59 | | | | |

### FIELD BORING LOG NO. 206

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 15.2 | 25 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 19.5 | clay | | | | | | | |
| | | 19.5 | 24.8 | clay w/sand lenses | | | | | | | |
| 26.0 | 27.5 | 24.8 | 27.5 | silty sand | 12 | 0.89 | 11 | | | | |
| 29.0 | 30.5 | | | silt w/sand lens | 50 | 0.85 | 42 | | | | |
| 34.0 | 35.5 | | | m sand | 26 | 0.81 | 21 | | | | |
| 39.5 | 41.0 | | 41.0 | m sand | 54 | 0.77 | 42 | | | | |

### FIELD BORING LOG NO. 207

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| NA | 20 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 16.5 | clay | | | | | | | |
| | | 16.5 | 20.0 | clay w/sandy silt | | | | | | | |
| 20.0 | 20.5 | 20.0 | | f sand w/sandy silt | NA | | | f sand | 0.29 | 0.16 | 2.0 |
| 23.0 | 25.5 | | | f sand w/clay lenses | NA | | | | | | |
| 27.0 | 28.5 | | | f sand w/clay lenses | 10 | | | | | | |
| 31.0 | 32.5 | | | f sand | 27 | | | f sand | 0.37 | 0.17 | 2.6 |
| 36.0 | 37.5 | | | f sand | 45 | | | f sand | 0.37 | 0.15 | 2.7 |
| 40.0 | 41.5 | | ≥41.5 | f sand | 45 | | | m sand | 0.52 | 0.22 | 3.0 |

### FIELD BORING LOG NO. 208

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 7 | 9 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.0 | clay | | | | | | | |
| | | 9.0 | | m sand | NA | | | | | | |
| 13.0 | 14.5 | | | m sand | 53 | 1.24 | 61 | m sand | 0.62 | 0.23 | 3.4 |
| 16.0 | 17.5 | | | m sand | 38 | 1.16 | 44 | | | | |
| 19.0 | 20.5 | | | m sand | 40 | 1.10 | 44 | m sand | 0.56 | 0.21 | 3.3 |
| 22.0 | 23.5 | | | m sand | 30 | 1.04 | 31 | | | | |
| 26.0 | 27.5 | | | m sand | 27 | 0.98 | 26 | m sand | 1.0 | 0.29 | 5.2 |
| 30.0 | 31.5 | | | m sand | 68 | 0.93 | 63 | m sand | 1.1 | 0.40 | 5.0 |
| 34.5 | 36.0 | | ≥36.0 | m sand | 70 | 0.88 | 62 | m sand | 0.50 | 0.29 | 1.9 |

### FIELD BORING LOG NO. 209

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 9.5 | 22 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.0 | clay | | | | | | | |
| | | 9.0 | 21.5 | clay w/thin sand lenses | | | | | | | |
| 23.0 | 24.5 | 21.5 | | m sand | 39 | 1.00 | 39 | m sand | 0.48 | 0.24 | 2.3 |
| 27.0 | 28.5 | | | m sand | 39 | 0.94 | 37 | m sand | 0.68 | 0.28 | 3.2 |
| 30.5 | 32.0 | | ≥32.0 | m sand | 41 | 0.90 | 37 | | | | |

### FIELD BORING LOG NO. 210

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 10.5 | 10 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 10.0 | clayey sand and silty clay layers | | | | | | | |
| 10.0 | 11.5 | 10.0 | | m sand | NA | | | m sand | 0.48 | 0.30 | 1.7 |
| 13.0 | 14.5 | | | m sand | NA | | | | | | |
| 14.0 | 15.5 | | | m sand | 21 | 1.14 | 24 | m sand | 0.42 | 0.30 | 1.6 |
| 17.0 | 18.5 | | | m sand | 28 | 1.08 | 30 | m sand | 0.51 | 0.22 | 2.6 |
| 20.0 | 21.5 | | | m sand | 17 | 1.02 | 17 | | | | |
| 24.0 | 25.5 | | | m sand | 11 | 0.96 | 11 | | | | |
| 29.0 | 30.5 | | | m sand | 18 | 0.90 | 16 | m sand | 0.51 | 0.22 | 2.7 |
| 34.5 | 36.0 | | ≥36.0 | m sand | 16 | 0.85 | 14 | | | | |

### FIELD BORING LOG NO. 211

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 12.1 | 32 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 30.0 | lean clay | | | | | | | |
| 30.0 | 31.5 | 30.0 | 31.5 | highly plastic clay | 6 | | | | | | |
| 34.0 | 35.5 | 31.5 | | f sand | 38 | 0.84 | 32 | m sand | 0.40 | 0.18 | 2.5 |
| 38.0 | 39.5 | | | f sand | 40 | 0.81 | 32 | m sand | 0.51 | 0.21 | 2.8 |
| 42.5 | 44.0 | | ≥44.0 | f sand | 36 | 0.78 | 28 | | | | |

### FIELD BORING LOG NO. 212

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 10.1 | 22 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.5 | lean clay | | | | | | | |
| | | 8.5 | 21.0 | highly plastic clay | | | | | | | |
| 21.5 | 22.0 | 21.0 | 22.0 | m sand w/clay balls, soft | | | | | | | |
| 25.0 | 26.5 | 22.0 | | m sand | 33 | 0.95 | 30 | m sand | 0.50 | 0.26 | 2.5 |
| 28.0 | 29.5 | | | m sand | 39 | 0.92 | 36 | | | | |
| 32.0 | 33.5 | | | m sand | 39 | 0.88 | 34 | | | | |
| 36.5 | 38.0 | | ≥38.0 | m sand | 39 | 0.83 | 33 | m sand | 0.48 | 0.23 | 2.3 |

### FIELD BORING LOG NO. 213

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 7.2 | 26 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.0 | sandy and silty clay layers | | | | | | | |
| | | 9.0 | 14.0 | lean clay | | | | | | | |
| 14.0 | 15.5 | 14.0 | | silt | 4 | | | | | | |
| 17.0 | 18.5 | | 20.0 | silt | 8 | | | | | | |
| | | 20.0 | 23.0 | lean clay | 7 | | | | | | |
| 23.0 | 24.5 | 23.0 | 26.0 | silt w/sandy lenses | 14 | | | | | | |
| 26.0 | 27.5 | 26.0 | | f sand w/silt lens | 14 | 0.98 | 14 | | | | |
| 29.0 | 30.5 | | | m sand w/clay balls | 16 | 0.94 | 15 | f sand | 0.40 | 0.17 | 2.7 |
| 33.0 | 34.5 | | | m sand w/clay balls | 27 | 0.90 | 24 | m sand | 0.48 | 0.24 | 2.2 |
| 38.5 | 40.0 | | ≥40.0 | m sand | 18 | 0.85 | 15 | 0.85 | 0.60 | 0.24 | 3.3 |

FIELD BORING LOG NO. 214

Depth to water table (ft): 10.1 — Topstratum thickness (ft): 30

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 6.0 | silty clay | | | | | | | |
| | | 6.0 | 19.0 | highly plastic clay | | | | | | | |
| | | 19.0 | 25.0 | clay w/sand lens | | | | | | | |
| 25.0 | 26.5 | 25.0 | 28.0 | silty clay w/sand lens | 20 | | | | | | |
| 28.0 | 29.5 | 28.0 | 30.0 | f sand w/clay lens | 15 | | | | | | |
| 34.0 | 35.5 | 30.0 | | f sand w/clay balls | 36 | 0.86 | 31 | | | | |
| 38.0 | 39.5 | | | m sand | 50 | 0.82 | 41 | | | | |
| 43.5 | 45.0 | | ≥45.0 | m sand | 50 | 0.78 | 39 | | | | |

Laboratory Classification: Class., $D_{50}$, $D_{10}$, Cu

FIELD BORING LOG NO. 215

Depth to water table (ft): 0.0 — Topstratum thickness (ft): 28

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 24.0 | clay | | | | | | | |
| | | 24.0 | 28.0 | clay w/sand lenses | | | | | | | |
| 28.0 | 29.5 | 28.0 | | f sand | 26 | 1.07 | 28 | | | | |
| 31.0 | 32.5 | | | m sand | 30 | 1.02 | 31 | | | | |
| 34.0 | 35.5 | | | m sand | 31 | 0.97 | 30 | | | | |
| 39.5 | 41.0 | | ≥41.0 | m sand | 37 | 0.93 | 34 | | | | |

FIELD BORING LOG NO. 216

Depth to water table (ft): 5.0 — Topstratum thickness (ft): 20.0

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 11.0 | silty clay and sandy clay layers | | | | | | | |
| | | 11.0 | 14.0 | wood | | | | | | | |
| | | 14.0 | 20.0 | highly plastic clay | | | | | | | |
| 20.0 | 20.5 | 20.0 | | f sand, soft | NA | | | | | | |
| 22.0 | 22.5 | | | f sand, soft | NA | | | | | | |
| 25.0 | 26.5 | | | m sand | 39 | 1.04 | 41 | | | | |
| 28.0 | 29.5 | | | m sand | 30 | 0.97 | 29 | | | | |
| 32.0 | 34.0 | | ≥34.0 | m sand | 35 | 0.92 | 32 | | | | |

FIELD BORING LOG NO. 217

Depth to water table (ft): 5.0 — Topstratum thickness (ft): 22

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 19.0 | clay | | | | | | | |
| | | 17.5 | 22.0 | clay w/sand lenses | | | | | | | |
| 22.0 | 23.5 | 22.0 | | f sand | 13 | 1.08 | 14 | | | | |
| 25.0 | 26.5 | | | m sand | 39 | 1.03 | 40 | m sand | 0.58 | 0.30 | 2.4 |
| 30.0 | 31.5 | | | m sand | NA | | | | | | |
| 35.0 | 36.5 | | | m sand | 34 | 0.95 | 32 | m sand | 0.55 | 0.38 | 1.6 |
| 40.5 | 42.0 | | ≥42.0 | m sand | 36 | 0.90 | 32 | m sand | 0.52 | 0.35 | 1.7 |

FIELD BORING LOG NO. 218

Depth to water table (ft): NA — Topstratum thickness (ft): 26.0

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 26.0 | clay | | | | | | | |
| 27.0 | 28.5 | 26.0 | | f sand | 19 | | | f sand | 0.32 | 0.19 | 2.0 |
| 31.0 | 32.5 | | | f sand | 49 | | | | | | |
| 35.0 | 36.5 | | | f sand | 49 | | | | | | |
| 40.5 | 42.0 | | ≥42.0 | f sand | 51 | | | | | | |

FIELD BORING LOG NO. 219

Depth to water table (ft): 10.1 — Topstratum thickness (ft): 21

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 21.0 | clay | | | | | | | |
| 21.5 | 22.0 | 21.0 | | m sand, soft | NA | | | | | | |
| 24.0 | 25.5 | | | m sand | 38 | 0.97 | 37 | | | | |
| 28.0 | 29.5 | | | m sand | 18 | 0.92 | 17 | f sand | 0.42 | 0.20 | 2.5 |
| 32.0 | 33.5 | | | m sand | 22 | 0.87 | 19 | | | | |
| 37.5 | 39.0 | | ≥39.0 | m sand | 49 | 0.82 | 40 | m sand | 0.55 | 0.19 | 4.5 |

FIELD BORING LOG NO. 220

Depth to water table (ft): 13.1 — Topstratum thickness (ft): 27

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 21.0 | clay | | | | | | | |
| | | 21.0 | 23.0 | clay w/silt lens | | | | | | | |
| 24.0 | 25.5 | 23.0 | 27.0 | f sand w/clay lens | 20 | | | | | | |
| 27.0 | 28.5 | | | m sand | 44 | 0.90 | 40 | f sand | 0.31 | 0.15 | 2.3 |
| 30.0 | 31.5 | | | m sand | 44 | 0.86 | 38 | m sand | 0.50 | 0.21 | 2.7 |
| 35.5 | 37.0 | | ≥37.0 | m sand | 47 | 0.82 | 39 | | | | |

FIELD BORING LOG NO. 221

Depth to water table (ft): 11.2 — Topstratum thickness (ft): 23.0

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 20.0 | clay | | | | | | | |
| | | 20.0 | 23.0 | silty clay | | | | | | | |
| 24.0 | 25.5 | 23.0 | | m sand | 50 | 0.96 | 48 | f sand | 0.38 | 0.17 | 2.5 |
| 27.0 | 28.5 | | | m sand | 40 | 0.92 | 37 | | | | |
| 30.0 | 31.5 | | | m sand | 44 | 0.89 | 39 | | | | |
| 35.5 | 37.0 | | ≥37.0 | m sand | 36 | 0.84 | 30 | m sand | 0.43 | 0.17 | 2.9 |

FIELD BORING LOG NO. 222

Depth to water table (ft): 10.0 — Topstratum thickness (ft): 22

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.5 | clay | | | | | | | |
| | | 5.5 | 8.0 | sand w/clay lens | | | | | | | |
| | | 8.0 | 18.0 | clay | | | | | | | |
| 19.0 | 20.5 | 18.0 | 22.0 | m sand w/lenses clay | 23 | | | | | | |
| 22.0 | 23.5 | 22.0 | | sandy silt | 22 | 1.00 | 22 | | | | |
| 25.0 | 26.5 | | | f sand | 29 | 0.96 | 28 | | | | |
| 28.0 | 29.5 | | | m sand | 36 | 0.93 | 33 | | | | |
| 33.0 | 34.5 | | ≥40.0 | m sand | 40 | 0.87 | 35 | | | | |
| 38.5 | 40.0 | | ≥40.0 | m sand | 55 | 0.82 | 45 | | | | |

FIELD BORING LOG NO. 223

Depth to water table (ft): 9.0 — Topstratum thickness (ft): 24(48)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12.0 | 14.5 | 0.0 | 21.0 | silty clay and silty sand layers | | | | silty sand | 0.12 | 0.067 | 2.1 |
| 18.6 | 19.6 | 21.0 | 24.0 | sandy silt and silty sand layers | | | | f sand | 0.23 | 0.10 | 2.7 |
| | | 24.0 | | f sand | | | | | | | |
| 27.5 | 29.5 | | | silty sand and f sand | 34 | | | | | | |
| 30.0 | 32.0 | | | f sand | 38 | | | | | | |
| 32.5 | 34.5 | | 35.0 | f sand | 75 | | | | | | |
| 35.0 | 37.0 | 35.0 | 37.5 | sandy silt w/clay lens | 31 | | | | | | |
| 37.5 | 39.5 | 37.5 | 40.0 | f sand | 27 | | | f sand | 0.16 | 0.095 | 1.8 |
| 40.0 | 41.0 | 40.0 | 41.0 | highly plastic clay | | | | | | | |
| 41.0 | 42.0 | 41.0 | 42.5 | f sand | | | | | | | |
| | | 42.5 | 47.5 | silty sand w/clay lens | | | | | | | |
| 47.5 | 49.5 | 47.5 | | silty sand | 65 | | | | | | |
| 50.0 | 52.0 | | | silty sand | 50 | | | | | | |
| 52.5 | 54.5 | | | silty sand | 35 | | | | | | |
| 55.0 | 57.0 | | | silty sand | 50 | | | | | | |
| 57.5 | 59.5 | | | silty sand | 58 | | | | | | |
| 60.0 | 62.0 | | | silty sand | 43 | | | | | | |
| 62.5 | 64.5 | | | f sand | 50 | | | f sand | 0.15 | 0.068 | 2.5 |
| 65.0 | 67.0 | | | f sand | 43 | | | | | | |
| 67.5 | 69.5 | | | f sand | 47 | | | | | | |
| 70.0 | 72.0 | | | f sand | 45 | | | | | | |
| 72.5 | 74.5 | | | f sand | 55 | | | | | | |
| 75.0 | 77.0 | | ≥77.0 | f sand | 47 | | | | | | |

FIELD BORING LOG NO. 224

Depth to water table (ft): 6.3 Topstratum thickness (ft): 13

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 7.5 | silty clay and silty sand layers | | | | | | | |
| 10.8 | 12.3 | 7.5 | 13.0 | sand and clay layers | | | | | | | |
| 13.0 | 15.0 | 13.0 | | f sand, gr | 25 | | | silty sand | 0.17 | 0.034 | 5.3 |
| 15.0 | 17.0 | | | f sand, gr | 50 | | | | | | |
| 17.5 | 19.5 | | | f sand, gr | 45 | | | | | | |
| 20.0 | 22.0 | | | f sand, gr | 52 | | | | | | |
| 22.5 | 24.5 | | | f sand, gr | 55 | | | | | | |
| 25.0 | 27.0 | | | f sand, gr | 25 | | | f sand | 0.25 | 0.080 | 3.8 |
| 27.5 | 29.5 | | | f sand, gr | 50 | | | | | | |
| 30.0 | 32.0 | | | f sand, gr | 35 | | | | | | |
| 32.5 | 34.5 | | | f sand, gr | 44 | | | | | | |
| 35.0 | 37.0 | | | f sand, gr | 64 | | | | | | |
| 37.5 | 39.5 | | | f sand, gr | 66 | | | | | | |
| 40.0 | 42.0 | | | f sand, gr | 60 | | | f sand | 0.32 | 0.21 | 1.6 |
| 42.5 | 44.5 | | | f sand, gr | 70 | | | | | | |
| 45.0 | 47.0 | | | f sand, gr | 70 | | | | | | |
| 47.0 | 49.5 | | | f sand, gr | 70 | | | | | | |
| 50.0 | 52.0 | | | f sand, gr | 52 | | | | | | |
| 52.5 | 54.5 | | | f sand, gr | 52 | | | f sand | 0.31 | 0.17 | 1.9 |
| 55.0 | 57.0 | | | f sand, gr | 70 | | | | | | |
| 57.5 | 59.5 | | | f sand, gr | 98 | | | | | | |
| 60.0 | 62.0 | | | f sand, gr | 67 | | | | | | |
| 62.5 | 64.5 | | | f sand, gr | 57 | | | | | | |
| 65.0 | 67.0 | | ≥67.0 | f sand, gr | 54 | | | | | | |

FIELD BORING LOG NO. 225

Depth to water table (ft): 8.4 Topstratum thickness (ft): 30

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 24.0 | clay and silt and silty clay layers | | | | | | | |
| 27.0 | 28.3 | 24.0 | 30.0 | sandy silt | | | | | | | |
| 32.5 | 34.5 | 30.0 | 35.0 | silty sand | 12 | | | f sand | 0.15 | 0.061 | 2.8 |
| 35.0 | 37.0 | 35.0 | | f sand | 35 | | | | | | |
| 37.5 | 39.5 | | | f sand | 45 | | | | | | |
| 40.0 | 42.0 | | 42.5 | f sand | 33 | | | | | | |
| | | 42.5 | 47.5 | f sand and clay layers | | | | | | | |
| 47.5 | 49.5 | 47.5 | | f sand | 33 | | | | | | |
| 50.0 | 52.0 | | | f sand | 30 | | | silty sand | 0.13 | 0.057 | 2.5 |
| 52.5 | 54.5 | | | f sand | 31 | | | | | | |
| 55.0 | 57.0 | | | f sand | 35 | | | | | | |
| 57.5 | 59.5 | | | f sand | 20 | | | | | | |
| 60.0 | 62.0 | | | f sand | 37 | | | | | | |
| 62.5 | 64.5 | | | f sand | 60 | | | | | | |
| 65.0 | 67.0 | | | f sand | 65 | | | f sand | 0.21 | 0.13 | 1.7 |
| 67.5 | 69.5 | | | f sand | 66 | | | | | | |
| 70.0 | 72.0 | | | f sand | 64 | | | | | | |
| 72.5 | 74.5 | | | f sand | 70 | | | | | | |
| 76.0 | 78.0 | | ≥78.0 | m sand | 52 | | | | | | |

FIELD BORING LOG NO. 226

Depth to water table (ft): 5.3 Topstratum thickness (ft): 8

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 7.0 | clay | | | | | | | |
| | | 7.0 | 8.0 | clay and sand layers | | | | | | | |
| | | 8.0 | | f sand, gr | | | | | | | |
| 12.5 | 14.5 | | | f sand, gr | 20 | | | f sand | 0.37 | 0.10 | 3.9 |
| 15.0 | 17.0 | | | f sand, gr | 26 | | | | | | |
| 17.5 | 19.5 | | | f sand, gr | 21 | | | | | | |
| 20.0 | 22.0 | | | f sand, gr | 20 | | | | | | |
| 22.5 | 24.5 | | | f sand, gr | 23 | | | | | | |
| 25.0 | 27.0 | | | f sand, gr | 35 | | | | | | |
| 27.5 | 29.5 | | | f sand, gr | 37 | | | | | | |
| 30.0 | 32.0 | | | f sand, gr | 53 | | | f sand | 0.40 | 0.21 | 2.0 |
| 32.5 | 34.5 | | | f sand, gr | 65 | | | | | | |
| 35.0 | 37.0 | | | f sand, gr | 68 | | | | | | |
| 37.5 | 39.5 | | | f sand, gr | 50 | | | | | | |
| 40.0 | 42.0 | | | f sand, gr | 45 | | | | | | |
| 42.5 | 44.5 | | | f sand, gr | 46 | | | | | | |
| 45.0 | 47.0 | | | f sand, gr | 57 | | | f sand | 0.37 | 0.19 | 2.1 |
| 47.5 | 49.5 | | | f sand, gr | 60 | | | | | | |
| 50.0 | 52.0 | | | f sand, gr | 65 | | | | | | |
| 52.5 | 54.5 | | | m sand, gr | 75 | | | | | | |
| 55.0 | 57.0 | | | m sand, gr | 90 | | | | | | |
| 57.5 | 59.5 | | | m sand, gr | 93 | | | | | | |
| 60.0 | 62.0 | | | m sand, gr | 85 | | | | | | |

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FIELD BORING LOG NO. 227

Depth to water table (ft): 9.3 Topstratum thickness (ft): 12

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 12.0 | clayey sand | | | | | | | |
| 12.5 | 14.5 | 12.0 | | silty sand | 15 | | | | | | |
| 15.0 | 17.0 | | | f sand, gr | 50 | | | | | | |
| 17.5 | 19.5 | | | f sand, gr | 60 | | | | | | |
| 20.0 | 22.0 | | | f sand, gr | 45 | | | | | | |
| 22.5 | 24.5 | | | f sand, gr | 57 | | | f sand | 0.27 | 0.17 | 1.6 |
| 25.0 | 27.0 | | | f sand, gr | 60 | | | | | | |
| 27.5 | 29.5 | | | f sand, gr | 55 | | | | | | |
| 30.0 | 32.0 | | | f sand, gr | 60 | | | | | | |
| 32.5 | 34.5 | | | f sand, gr | 60 | | | | | | |
| 35.0 | 37.0 | | | f sand, gr | 55 | | | | | | |
| 37.5 | 39.5 | | | f sand, gr | 75 | | | | | | |
| 40.0 | 42.0 | | | f sand, gr | 65 | | | | | | |
| 42.5 | 44.5 | | | f sand, gr | 75 | | | | | | |
| 45.0 | 47.0 | | | f sand, gr | 100 | | | | | | |
| 47.5 | 49.5 | | | f sand, gr | 100 | | | f sand | 0.21 | 0.13 | 1.7 |
| 50.0 | 52.0 | | | f sand, gr | 50 | | | | | | |
| 52.5 | 54.5 | | | f sand, gr | 55 | | | | | | |
| 55.0 | 57.0 | | | f sand, gr | 60 | | | | | | |
| 57.5 | 59.5 | | | f sand, gr | 39 | | | | | | |
| 60.0 | 62.0 | | | f sand, gr | 49 | | | | | | |
| 62.5 | 64.5 | | | f sand, gr | 51 | | | | | | |
| 65.0 | 67.0 | | | f sand, gr | 75 | | | | | | |
| 67.5 | 69.5 | | | f sand, gr | 61 | | | f sand | 0.28 | 0.19 | 1.6 |
| 70.0 | 72.0 | | | f sand, gr | 53 | | | | | | |
| 73.0 | 75.0 | | ≥75.0 | f sand, gr | 75 | | | | | | |

FIELD BORING LOG NO. 228

Depth to water table (ft): 10.0 Topstratum thickness (ft): 15

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 2.5 | sandy clay | | | | | | | |
| | | 2.5 | 10.5 | highly plastic clay | | | | | | | |
| | | 10.5 | 15.0 | clayey sand and wood | | | | | | | |
| 15.0 | 17.0 | 15.0 | | f sand, gr | 25 | | | | | | |
| 17.5 | 19.5 | | | f sand, gr | 35 | | | f sand | 0.23 | 0.16 | 1.6 |
| 20.0 | 22.0 | | | f sand, gr | 22 | | | | | | |
| 22.5 | 24.5 | | | f sand w/clay lens | | | | | | | |
| 25.0 | 27.0 | | | f sand, gr | 58 | | | | | | |
| 27.5 | 29.5 | | | f sand, gr | 48 | | | | | | |
| 30.0 | 32.0 | | | f sand, gr | 38 | | | | | | |
| 32.5 | 34.5 | | | f sand, gr | 44 | | | | | | |
| 35.0 | 37.0 | | | f sand, gr | 54 | | | | | | |
| 37.5 | 39.5 | | | f sand, gr | 75 | | | | | | |
| 40.0 | 42.0 | | | f sand, gr | 65 | | | | | | |
| 42.5 | 44.5 | | | f sand, gr | 75 | | | | | | |
| 45.0 | 47.0 | | | f sand, gr | 80 | | | | | | |
| 47.5 | 49.5 | | | f sand, gr | 65 | | | | | | |
| 50.0 | 52.0 | | | f sand, gr | 77 | | | | | | |
| 52.5 | 54.5 | | | f sand, gr | 67 | | | f sand | 0.41 | 0.19 | 2.4 |
| 55.0 | 57.0 | | | f sand, gr | 45 | | | | | | |
| 57.5 | 59.5 | | | f sand, gr | 34 | | | | | | |
| 60.0 | 62.0 | | | m sand | 32 | | | | | | |
| 62.5 | 64.5 | | | m sand and gravel | 100 | | | | | | |
| 65.0 | 67.0 | | | p sand | 34 | | | | | | |
| 67.5 | 69.5 | | | m sand | 39 | | | | | | |
| 70.0 | 72.0 | | ≥72.0 | m sand | 31 | | | | | | |

FIELD BORING LOG NO. 229

Depth to water table (ft): 12.3 Topstratum thickness (ft): 14

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 13.5 | clayey sand and sandy clay layers | | | | | | | |
| 11.3 | 13.5 | 13.5 | 15.0 | silty sand | | | | f sand | 0.195 | 0.054 | 3.9 |
| 15.0 | 17.0 | | | f sand, gr | 23 | | | | | | |
| 17.5 | 19.5 | | | f sand, gr | 30 | | | | | | |
| 20.0 | 22.0 | | | f sand, gr | 19 | | | | | | |
| 22.5 | 24.5 | | | f sand, gr | 17 | | | | | | |
| 25.0 | 27.0 | | | f sand, gr | 27 | | | | | | |
| 27.5 | 29.5 | | | f sand, gr | 31 | | | | | | |
| 30.0 | 32.0 | | | f sand, gr | 21 | | | | | | |
| 32.5 | 34.5 | | | f sand, gr | 28 | | | | | | |
| 35.0 | 37.0 | | | f sand, gr | 43 | | | | | | |
| 37.5 | 39.5 | | | f sand, gr | 38 | | | | | | |
| 40.0 | 42.0 | | | f sand, gr | 50 | | | | | | |
| 42.5 | 44.5 | | | f sand, gr | 55 | | | | | | |
| 45.0 | 47.0 | | | f sand, gr | 66 | | | | | | |
| 47.5 | 49.5 | | | f sand, gr | 39 | | | | | | |
| 50.0 | 52.0 | | | f sand, gr | 46 | | | | | | |
| 52.5 | 54.5 | | | f sand, gr | 53 | | | | | | |
| 55.0 | 57.0 | | | f sand, gr | 68 | | | | | | |
| 57.5 | 59.5 | | | f sand, gr | 53 | | | | | | |
| 60.0 | 62.0 | | | f sand, gr | 70 | | | | | | |
| 62.5 | 64.5 | | | f sand, gr | 70 | | | | | | |
| 65.0 | 67.0 | | | f sand, gr | 75 | | | | | | |
| 67.5 | 69.5 | | | f sand, gr | 55 | | | f sand | 0.32 | 0.17 | 2.2 |
| 70.0 | 72.0 | | | f sand, gr | 50 | | | | | | |
| 72.5 | 74.5 | | | f sand, gr | 50 | | | | | | |

FIELD BORING LOG NO. 230

Depth to water table (ft) 8.7 Topstratum thickness (ft) 18

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 11.0 | silty clay | | | | | | | |
| | | 11.0 | 18.0 | clayey sand | | | | | | | |
| 18.0 | 18.5 | 18.0 | | f sand, gr | | | | f sand | 0.27 | 0.15 | 1.9 |
| 22.0 | 24.0 | | | f sand, gr | 50 | | | | | | |
| 25.0 | 27.0 | | | f sand, gr | 55 | | | | | | |
| 27.5 | 29.5 | | | f sand, gr | 56 | | | | | | |
| 30.0 | 32.0 | | | f sand, gr | 43 | | | | | | |
| 32.5 | 34.5 | | | f sand, gr | 70 | | | | | | |
| 35.0 | 37.0 | | | f sand, gr | 45 | | | | | | |
| 37.5 | 39.5 | | | f sand, gr | 37 | | | | | | |
| 40.0 | 42.0 | | | f sand, gr | 57 | | | f sand | 0.35 | 0.24 | 1.6 |
| 42.5 | 44.5 | | | f sand, gr | 43 | | | | | | |
| 45.0 | 47.0 | | | f sand, gr | 38 | | | | | | |
| 48.0 | 49.5 | | | silty clay, gr | | | | | | | |
| 50.0 | 52.0 | | | f sand, gr | 18 | | | | | | |
| 52.5 | 54.5 | | | f sand, gr | 40 | | | | | | |
| 55.0 | 57.0 | | | f sand, gr | 50 | | | | | | |
| 57.5 | 59.5 | | | f sand, gr | 55 | | | | | | |
| 60.0 | 62.0 | | | f sand, gr | 42 | | | | | | |
| 62.5 | 64.5 | | | f sand, gr | 37 | | | | | | |
| 65.0 | 67.0 | | | f sand, gr | 45 | | | | | | |
| 68.0 | 70.0 | | ≥70 | f sand, gr | 61 | | | | | | |

FIELD BORING LOG NO. 231

Depth to water table (ft) NA Topstratum thickness (ft) 11

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 10.5 | sandy clay and clayey | | | | | | | |
| 11.5 | 12.0 | 10.5 | 17.5 | silty sand, soft | NA | | | silty sand | 0.155 | 0.02 | 8.5 |
| | | 17.5 | 19.5 | silty clay | 15 | | | | | | |
| 20.0 | 22.0 | 19.5 | | f sand, gr | 35 | | | | | | |
| 22.5 | 24.5 | | | f sand, gr | 53 | | | f sand | 0.21 | 0.12 | 1.9 |
| 25.0 | 27.0 | | | f sand, gr | 52 | | | | | | |
| 27.5 | 29.5 | | | f sand w/clay balls | 26 | | | | | | |
| 30.0 | 32.0 | | | f sand, gr | 54 | | | | | | |
| 32.5 | 34.5 | | | f sand, gr | 40 | | | | | | |
| 35.0 | 37.0 | | | f sand, gr | 50 | | | | | | |
| 37.5 | 39.5 | | | f sand, gr | 47 | | | | | | |
| 40.0 | 42.0 | | | f sand, gr | 45 | | | | | | |
| 42.5 | 44.5 | | | f sand, gr | 43 | | | | | | |
| 45.0 | 47.0 | | | f sand, gr | 50 | | | | | | |
| 47.5 | 49.5 | | | f sand, gr | 55 | | | | | | |
| 50.0 | 52.0 | | | f sand, gr | 57 | | | f sand | 0.24 | 0.17 | 1.5 |
| 52.5 | 54.5 | | | f sand, gr | 60 | | | | | | |
| 55.0 | 57.0 | | | f sand, gr | 65 | | | | | | |
| 57.5 | 59.5 | | | f sand, gr | 60 | | | | | | |
| 60.0 | 62.0 | | | f sand and lignite | 47 | | | | | | |
| 62.5 | 64.5 | | | f sand, gr | 65 | | | | | | |
| 65.0 | 67.0 | | | f sand, gr | 65 | | | | | | |

FIELD BORING LOG NO. 232

Depth to water table (ft) 14.3 Topstratum thickness (ft) 19

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0. | 11.0 | clay | | | | | | | |
| 18.5 | 19.0 | 11.0 | 19.0 | clay and sand layers | | | | f sand | 0.28 | 0.14 | 2.1 |
| 20.0 | 22.0 | 19.0 | | f sand w/clay balls | 55 | | | | | | |
| 22.5 | 24.5 | | | f sand, gr | 55 | | | | | | |
| 25.0 | 27.0 | | | f sand, gr | 50 | | | | | | |
| 27.5 | 29.5 | | | f sand, gr | 46 | | | | | | |
| | | 30.0 | 34.5 | clay and sand layers | | | | | | | |
| 32.5 | 34.5 | 34.5 | | f sand, gr | 62 | | | | | | |
| 35.0 | 37.0 | | | f sand,gr | 75 | | | | | | |
| 37.5 | 39.5 | | | f sand, gr | 75 | | | f sand | 0.265 | 0.17 | 1.6 |
| 40.0 | 42.0 | | | f sand, gr | 66 | | | | | | |
| 42.5 | 44.5 | | | f sand, gr | 70 | | | | | | |
| 45.0 | 47.0 | | | f sand, gr | 46 | | | | | | |
| 47.5 | 49.5 | | | f sand, gr | 70 | | | | | | |
| 50.0 | 52.0 | | | f sand, gr | 70 | | | | | | |
| 52.5 | 54.5 | | | f sand, gr | 43 | | | | | | |
| 55.0 | 57.0 | | | f sand, gr | 48 | | | f sand | 0.265 | 0.16 | 1.9 |
| 57.5 | 59.5 | | | f sand, gr | 69 | | | | | | |
| 62.5 | 64.5 | | | m sand, gr | 73 | | | | | | |
| 65.0 | 67.0 | | | f sand, gr | 71 | | | | | | |
| 67.5 | 69.5 | | | f sand, gr | 68 | | | | | | |
| 71.0 | 73.0 | | ≥73.0 | f sand, gr | 61 | | | f sand | 0.37 | 0.18 | 2.2 |

FIELD BORING LOG NO. 233

Depth to water table (ft) 17.1 Topstratum thickness (ft) 14

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 2.5 | silty clay and sand | | | | | | | |
| | | 2.5 | 11.0 | clay | | | | | | | |
| | | 11.0 | 13.5 | clay and silty sand layers | | | | | | | |
| | | 13.5 | 20.0 | silty sand | | | | | | | |
| 20.0 | 22.0 | 20.0 | | f sand, gr | 18 | | | | | | |
| 22.5 | 24.5 | | | f sand, gr | 20 | | | | | | |
| 25.0 | 27.0 | | | f sand, gr | 21 | | | | | | |
| 27.5 | 29.5 | | | f sand, gr | 27 | | | | | | |
| 30.0 | 32.0 | | | f sand, gr | 28 | | | | | | |
| 32.5 | 34.5 | | | f sand w/clay lens | 15 | | | | | | |
| 35.0 | 37.0 | | | f sand, gr | 27 | | | | | | |
| 37.5 | 39.5 | | | f sand, gr | 30 | | | | | | |
| 40.0 | 42.0 | | | f sand, gr | 37 | | | | | | |
| 42.5 | 44.5 | | | m sand | 39 | | | | | | |
| 45.0 | 47.0 | | | m sand | 60 | | | | | | |
| 47.5 | 49.5 | | | f sand | 65 | | | | | | |
| 50.0 | 52.0 | | | f sand | 37 | | | | | | |
| 52.5 | 54.5 | | | f sand | 65 | | | | | | |
| 55.0 | 57.0 | | | f sand | 70 | | | | | | |
| 57.5 | 59.5 | | | f sand | 70 | | | | | | |
| 60.0 | 62.0 | | | f sand | 65 | | | | | | |
| 62.5 | 64.5 | | | f sand | 70 | | | | | | |
| 65.0 | 67.0 | | | f sand | 65 | | | | | | |
| 67.5 | 69.5 | | | f sand | 50 | | | | | | |
| 70.0 | 72.0 | | | f sand | 43 | | | | | | |
| 73.0 | 75.0 | | ≥75 | f sand | 67 | | | | | | |

FIELD BORING LOG NO. 234

Depth to water table (ft) 16.0 Topstratum thickness (ft) 38

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 11.0 | clay | | | | | | | |
| | | 11.0 | 20.0 | silt and sandy silt layers | | | | | | | |
| | | 20.0 | 25.0 | clay | | | | | | | |
| 25.0 | 26.5 | 25.0 | 28.0 | silty sand | 37 | 0.90 | 33 | | | | |
| | | 28.0 | 34.0 | sandy silt w/wood | | | | | | | |
| | | 34.0 | 38.0 | clay | | | | | | | |
| 40.0 | 41.5 | 38.0 | 43.0 | silty sand, gr | 63 | 0.76 | 48 | | | | |
| 45.0 | 46.5 | 43.0 | | f sand, gr | 60 | 0.73 | 44 | | | | |
| 50.0 | 51.5 | | | f sand w/lignite | 61 | 0.70 | 43 | | | | |
| 60.0 | 61.5 | | | m sand, gr | 61 | 0.64 | 39 | | | | |
| 70.0 | 71.5 | | | m sand, gr | 67 | 0.59 | 40 | | | | |
| 80.0 | 81.5 | | | m sand, gr | 71 | 0.55 | 39 | | | | |
| 90.0 | 91.5 | | 97.0 | m sand, gr | 79 | 0.52 | 41 | | | | |
| | | 97.0 | 120.0 | sandy gravel | NA | | | | | | |
| 130 | 131.5 | 120.0 | 135.0 | gravelly sand | 56 | 0.40 | 22 | | | | |
| | | 135.0 | | Tertiary clay | | | | | | | |

FIELD BORING LOG NO. 235

Depth to water table (ft) NA Topstratum thickness (ft) 11(43)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 11.0 | clay | | | | | | | |
| | | 11.0 | 13.0 | silty sand | | | | | | | |
| | | 13.0 | 16.0 | f sand | | | | | | | |
| 17.0 | 18.5 | 16.0 | | silty sand, br | 16 | | | | | | |
| 20.0 | 21.5 | | | silty sand, br | 10 | | | | | | |
| 23.0 | 24.5 | | 26.0 | silty sand, br | 12 | | | | | | |
| | | 26.0 | 29.0 | sand silt w/lenses of clay | | | | | | | |
| | | 29.0 | 32.0 | clay | | | | | | | |
| | | 32.0 | 35.0 | silt w/lenses of clay | | | | | | | |
| | | 35.0 | 43.0 | clay | | | | | | | |
| 43.0 | 45.5 | 43.0 | | silty sand | | | | | | | |
| 46.0 | 47.5 | | | f sand | 29 | | | | | | |
| 49.0 | 50.5 | | | gravelly sand | 22 | | | | | | |
| 54.5 | 56.0 | | ≥56.0 | m sand | 65 | | | | | | |

### FIELD BORING LOG NO. 236

Depth to water table (ft): 5.0 — Topstratum thickness (ft): 11

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 11.0 | silty clay | | | | | | | |
| 11.0 | 13.5 | 11.0 | | silty sand | NA | | | | | | |
| 14.0 | 15.5 | | | silty sand | 18 | 1.26 | 23 | | | | |
| 17.0 | 18.5 | | | silty sand | 23 | 1.18 | 27 | | | | |
| 20.0 | 21.5 | | | silty sand | 24 | 1.10 | 26 | | | | |
| 23.0 | 24.5 | | | sandy silt w/wood | 11 | 1.06 | 12 | | | | |
| 26.0 | 27.5 | | | sandy silt w/wood | 23 | 1.02 | 23 | | | | |
| 29.0 | 30.5 | | | sandy silt | 22 | 0.96 | 21 | | | | |
| 32.0 | 33.5 | | | silty sand | 25 | 0.93 | 23 | | | | |
| 35.0 | 36.5 | | | f sand | 40 | 0.90 | 36 | | | | |
| 38.0 | 39.5 | | | silty sand w/lens of clay | 72 | 0.87 | 63 | | | | |
| 41.0 | 42.5 | | | f sand | 48 | 0.84 | 40 | | | | |
| 44.0 | 45.5 | | | f sand | 46 | 0.81 | 37 | | | | |
| 49.5 | 51.0 | | ≥51.0 | m sand | 49 | 0.78 | 38 | | | | |

### FIELD BORING LOG NO. 237

Depth to water table (ft): 12.5 — Topstratum thickness (ft): 17

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | | CH, clay, gr-br | | | | | | | |
| 5.0 | 6.5 | | | CH, clay, gr-br | 7 | | | | | | |
| 8.0 | 9.5 | | | CH, clay, gr-br | 9 | | | | | | |
| 11.0 | 12.5 | | 14.2 | CH, clay, gr-br | 9 | | | | | | |
| 14.0 | 15.5 | 14.2 | 15.4 | CL, silty clay, gr-br | 6 | | | | | | |
| | | 15.4 | 17.0 | SC, clayey sand, gr | | | | | | | |
| 17.0 | 18.5 | 17.0 | | SP, f sand, gr, w/f gravel | 36 | 1.05 | 38 | | | | |
| 20.0 | 21.5 | | | SP, f sand, gr | 63 | 1.00 | 63 | | | | |
| 23.0 | 24.5 | | | SP, f sand, gr, w/ f gravel | 35 | 0.96 | 34 | | | | |
| 26.0 | 27.5 | | | SP, f sand, gr, w/ organics | 42 | 0.92 | 39 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand, gr, w/c sand lenses | 45 | 0.90 | 40 | | | | |

### FIELD BORING LOG NO. 238

Depth to water table (ft): 6.2 — Topstratum thickness (ft): 11(20)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 4.5 | CH, plastic clay, gr and br | | | | | | | |
| 5.0 | 6.5 | 4.5 | 8.2 | CL, sandy clay, gr and br | 8 | | | | | | |
| 8.0 | 9.5 | 8.2 | 11.0 | SC, clayey sand, w/f sand lenses, gr | 17 | | | | | | |
| 11.0 | 12.5 | 11.0 | 14.0 | SP, f sand, tan | 7 | 1.32 | 9 | | | | |
| 14.0 | 15.5 | 14.0 | 17.5 | CL, silty clay, gr and br | 3 | | | | | | |
| 17.0 | 18.5 | 17.5 | 20.0 | SP, f sand w/clay lens and some f gravel, gr | 26 | 1.17 | 30 | | | | |
| 20.0 | 21.5 | 20.0 | | SP, f sand, gr | 53 | 1.10 | 58 | | | | |
| 23.0 | 24.5 | | | SP, f to m sand w/some f gravel, gr | 45 | 1.05 | 47 | | | | |
| 26.0 | 27.5 | | | SP, f to m sand w/some f gravel, gr | 31 | 1.01 | 31 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f to m sand w/some f gravel, gr; some organics | 41 | 0.96 | 39 | | | | |

### FIELD BORING LOG NO. 239

Depth to water table (ft): 9.4 — Topstratum thickness (ft): 17

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.5 | clay, gr and br | | | | | | | |
| 11.0 | 12.5 | 9.5 | 14.0 | CH, plastic clay, gr and br | 12 | | | | | | |
| 14.0 | 15.5 | 14.0 | 17.0 | CL, silty clay, gr and br | 7 | | | | | | |
| 17.0 | 18.5 | 17.0 | | SP, f sand, gr | 17 | 1.10 | 19 | | | | |
| 20.0 | 21.5 | | | SP, f sand w/some c sand and f gravel, gr | 30 | 1.04 | 31 | | | | |
| 23.0 | 24.5 | | | SP, f sand w/some c | 31 | 0.99 | 31 | | | | |
| 26.0 | 27.5 | | | SP, f sand w/occ. lenses m sand and f gravel, gr | 50 | 0.95 | 48 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f to m sand, w/occ. f gravel, gr | 52 | 0.92 | 48 | | | | |

### FIELD BORING LOG NO. 240

Depth to water table (ft): 13.5 — Topstratum thickness (ft): 20

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 15.1 | CH, plastic clay, gr and br | | | | | | | |
| 14.0 | 15.5 | 15.1 | 17.5 | ML, clayey silt, gr | 8 | | | | | | |
| 17.0 | 18.5 | 17.5 | 20.2 | layers of sand and clayey silt, gr | 0 | | | | | | |
| 20.0 | 21.5 | 20.2 | | SP, f sand, gr | 18 | 0.98 | 18 | | | | |
| 23.0 | 24.5 | | | SP, f sand w/some c sand and f gravel, gr | 23 | 0.93 | 21 | | | | |
| 26.0 | 27.5 | | | SP, f sand, gr | 36 | 0.90 | 32 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand w/some c sand and f gravel, gr | 51 | 0.87 | 44 | | | | |

### FIELD BORING LOG No. 241

Depth to water table (ft): 12.2 — Topstratum thickness (ft): 18

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.0 | CH, plastic clay, gr and br | | | | | | | |
| 14.0 | 15.5 | 14.0 | 17.0 | CH, plastic clay, gr and br | 13 | | | | | | |
| 17.0 | 18.5 | 17.0 | 18.4 | CL, silty f sand, w/lenses of f sand | 6 | 1.00 | 6 | | | | |
| 23.0 | 24.5 | 23.0 | | SP, f sand, gr | 36 | 0.96 | 35 | | | | |
| 26.0 | 27.5 | | | SP, f sand, gr | 31 | 0.92 | 29 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand, gr | 34 | 0.88 | 30 | | | | |

### FIELD BORING LOG NO. 242

Depth to water table (ft): 10.4 — Topstratum thickness (ft): 17

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 6.5 | CH, plastic clay, gr and br | | | | | | | |
| 8.0 | 9.5 | 6.5 | 11.0 | CH, plastic clay w/ concretions, gr and br | 8 | | | | | | |
| 11.0 | 12.5 | 11.0 | 14.6 | CL, silty clay, gr and br | 8 | | | | | | |
| 14.0 | 15.5 | 14.6 | 17.0 | CL, silty clay w/lenses of f sand, gr and br | 10 | | | | | | |
| 17.0 | 18.5 | 17.0 | | SM, silty sand w/lenses | 10 | 1.10 | 11 | | | | |
| 20.0 | 21.5 | | 23.0 | SM, silty sand w/lenses of f sand, gr | 13 | 1.02 | 13 | | | | |
| 23.0 | 24.5 | | | SP, f sand w/some f gravel, gr | 36 | 0.98 | 39 | | | | |
| 26.0 | 27.5 | | | SP, f sand w/some f | 42 | 0.93 | 39 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand, gr | 26 | 0.89 | 23 | | | | |

### FIELD BORING LOG NO. 243

Depth to water table (ft): 14.3 — Topstratum thickness (ft): 20

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.5 | CH, plastic clay, gr and br | | | | | | | |
| 11.0 | 12.5 | 9.5 | 14.6 | CH, plastic clay, gr and br | 8 | | | | | | |
| 14.0 | 15.5 | 146 | 17.1 | CL, sandy clay, gr and br | 10 | | | | | | |
| 17.0 | 18.5 | 17.1 | 20.0 | SC, clayey f sand, gr and br | 12 | | | | | | |
| 20.0 | 21.5 | 20.0 | | SP, f sand w/occ. organic lenses, gr | 19 | 0.91 | 17 | | | | |
| 23.0 | 24.5 | | | SP, f sand w/lenses of m sand, gr | 41 | 0.88 | 36 | | | | |
| 26.0 | 27.5 | | | SP, f to m sand, gr | 65 | 0.85 | 55 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, c sand w/some f gravel, gr | 38 | 0.82 | 31 | | | | |

FIELD BORING LOG NO. 244

Depth to water table (ft): 7.6 Topstratum thickness (ft): 18

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 2.5 | SP, f sand, tan | | | | | | | |
| | | 2.5 | 6.5 | CH, plastic clay, gr and br | | | | | | | |
| 8.0 | 9.5 | 6.5 | 12.1 | CH, plastic clay, gr and br | 9 | | | | | | |
| 11.0 | 12.5 | 12.1 | 14.0 | SP, f sand, br | 25 | | | | | | |
| 14.0 | 15.5 | 14.0 | 17.0 | CL, sandy clay, br and gr | 9 | | | | | | |
| 17.0 | 18.5 | 17.0 | 18.3 | SM, silty f sand w/thin clay lens, gr | 25 | 1.13 | 28 | | | | |
| 20.0 | 21.5 | 18.3 | | SP, f sand, gr | 23 | 1.06 | 24 | | | | |
| 23.0 | 24.5 | | | SP, f sand, gr | 24 | 0.97 | 23 | | | | |
| 26.0 | 27.5 | | | SP, f sand w/some lenses of c sand, gr | 24 | 0.97 | 23 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, m to c sand, gr | 57 | 0.93 | 53 | | | | |

FIELD BORING LOG NO. 245

Depth to water table (ft): <21 Topstratum thickness (ft): 26

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 17.0 | CH, clay | | | | | | | |
| | | 17.0 | 21.2 | CL, silty clay | | | | | | | |
| | | 21.2 | 23.0 | SP, f sand | | | | | | | |
| 23.0 | 24.5 | 23.0 | 26.2 | CL, silty clay | 4 | | | | | | |
| 26.0 | 27.5 | 26.2 | | SP, f to m sand | 59 | | | | | | |
| 29.0 | 30.5 | | ≤30.5 | SP, f to m sand, w/ some coarse sand | 49 | | | f sand | 0.25 | 0.11 | 2.5 |

FIELD BORING LOG NO. 246

Depth to water table (ft): 18.7 Topstratum thickness (ft): 21

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 17.0 | CH, clay | | | | | | | |
| | | 17.0 | 21.0 | CL, sandy clay | | | | | | | |
| | | 21.0 | | SP, f sand | NA | | | | | | |
| 23.0 | 24.5 | | | SP, f to m sand | 37 | 0.89 | 33 | f sand | 0.41 | 0.11 | 4.6 |
| 26.0 | 27.5 | | | SP, f to m sand, w/ some coarse sand | 49 | 0.85 | 42 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f to m sand, w/ some coarse sand | 71 | 0.82 | 58 | m sand | 0.68 | 0.18 | 4.6 |

FIELD BORING LOG NO. 247

Depth to water table (ft): 15.1 Topstratum thickness (ft): 27

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 16.7 | CL, sandy clay and silty clay layers | | | | | | | |
| | | 16.7 | 20.0 | SP, f sand w/thin clay lens | | | | | | | |
| | | 20.0 | 27.4 | CL, silty clay | | | | | | | |
| 29.0 | 30.5 | 27.4 | ≥30.5 | SP, f to m sand | 20 | 0.86 | 17 | | | | |

FIELD BORING LOG NO. 248

Depth to water table (ft): NA Topstratum thickness (ft): 23

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 23.0 | clay, sandy clay, and silty clay layers | | | | | | | |
| 23.0 | 24.5 | 23.0 | 23.5 | SM, silty f sand | 19 | | | | | | |
| 26.0 | 27.5 | 23.5 | | SP, f sand | 36 | | | f sand | 0.23 | 0.11 | 2.6 |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand | 11 | | | | | | |

FIELD BORING LOG NO. 249

Depth to water table (ft): 14 Topstratum thickness (ft): 18

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 17.0 | CH, clay | | | | | | | |
| | | 17.0 | 17.6 | CL, f to m sand | | | | | | | |
| 20.0 | 21.5 | 17.6 | | SP, f to m sand | 23 | 0.97 | 22 | m sand | 0.43 | 0.18 | 2.9 |
| 23.0 | 24.5 | | | SP, f to m sand | 32 | 0.94 | 30 | | | | |
| 26.0 | 27.5 | | | SP, f to m sand | 10 | 0.90 | 9 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f to m sand | 22 | 0.86 | 19 | | | | |

FIELD BORING LOG NO. 250

Depth to water table (ft): 8.6 Topstratum thickness (ft): 14

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.0 | clay | | | | | | | |
| 14.0 | 15.5 | 14.0 | | SP, f sand | 11 | 1.20 | 13 | f sand | 0.41 | 0.14 | 3.6 |
| 17.0 | 18.5 | | | SM, silty sand | 18 | 1.12 | 20 | | | | |
| 20.0 | 21.5 | | | SP, f sand | 14 | 1.06 | 15 | | | | |
| 23.0 | 24.5 | | | SP, f to m sand | 39 | 1.02 | 40 | m sand | 0.50 | 0.22 | 2.5 |
| 26.0 | 27.5 | | | SP, f sand | 26 | 0.97 | 25 | f sand | 0.34 | 0.13 | 3.1 |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand | 11 | 0.92 | 10 | m sand | 0.46 | 0.19 | 2.8 |

FIELD BORING LOG NO. 251

Depth to water table (ft): 15 Topstratum thickness (ft): 21

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 15.0 | CH, clay | | | | | | | |
| | | 15.0 | 20.0 | clay and silty clay layers | | | | | | | |
| | | 20.8 | 21.5 | SM, silty sand w/sand lens | NA | | | | | | |
| 23.0 | 24.5 | 21.5 | | SP, f sand | 19 | 0.93 | 18 | silty sand | 0.18 | 0.089 | 2.3 |
| 26.0 | 27.5 | | | SP, f sand | 44 | 0.90 | 40 | f sand | 0.38 | 0.16 | 2.6 |
| 29.0 | 30.5 | | 30.5 | SP, f sand | 37 | 0.86 | 32 | f sand | 0.27 | 0.13 | 2.5 |

FIELD BORING LOG NO. 252

Depth to water table (ft): 14 Topstratum thickness (ft): 20

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 20.0 | clay, sandy clay and silty clay layers | | | | | | | |
| 20.0 | 21.5 | 20.0 | | SP, f sand w/thin silt lens | 20 | 0.97 | 19 | | | | |
| 23.0 | 24.5 | | | SP, f sand | 26 | 0.93 | 24 | m sand | 0.39 | 0.20 | 2.2 |
| 26.0 | 27.5 | | | SP, f sand | 37 | 0.89 | 33 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand w/some f gravel | 50 | 0.86 | 43 | m sand | 0.50 | 0.25 | 2.3 |

FIELD BORING LOG NO. 253

Depth to water table (ft): 15 Topstratum thickness (ft): 18

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 17.0 | clay and silty clay layers | | | | | | | |
| | | 17.0 | 18.3 | CL, sandy clay | | | | | | | |
| 20.0 | 21.5 | 18.3 | | SP, f sand | 12 | 0.97 | 12 | f sand | 0.39 | 0.17 | 2.7 |
| 23.0 | 24.5 | | | SP, f sand w/some m sand | 15 | 0.93 | 14 | | | | |
| 26.0 | 27.5 | | | SP, f sand | 11 | 0.89 | 10 | | | | |
| 29.0 | 30.5 | | ≥30.5 | SP, f sand | 15 | 0.86 | 13 | | | | |

FIELD BORING LOG NO.254

Depth to water table (ft) 9.0 Topstratum thickness (ft) 9

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 1.5 | SP, f sand (dune sand) | | | | | | | |
| | | 1.5 | 9.0 | SC, clayey sand w/ lenses of silt and clay, br | | | | | | | |
| 9.0 | 10.5 | 9.0 | | SP, f sand, br, w/ some m sand lenses | 5 | 1.28 | 6 | | | | |
| 12.0 | 13.5 | | 15.0 | SP, f sand, br, w/ some m sand lenses | 15 | 1.21 | 18 | | | | |
| 15.0 | 16.5 | 15.0 | | SP, f and m sand, br, 1/2" lens of gravel | 18 | 1.14 | 20 | m sand | 0.64 | 0.26 | 2.8 |
| 18.0 | 19.5 | | | SP, f and m sand, br, occ. coal gravel | 35 | 1.07 | 37 | | | | |
| 21.0 | 22.5 | | | SP, f and m sand, br, w/some f gravel lenses | 28 | 1.02 | 29 | | | | |
| 24.0 | 25.5 | | | SP, f and m sand, br, w/some f gravel lenses | 30 | 0.97 | 29 | m sand | 0.50 | 0.24 | 2.2 |
| 27.0 | 28.5 | | 30.0 | SP, f and m sand, br, w/some f gravel lenses | 45 | 0.93 | 42 | | | | |
| 30.0 | 31.5 | 30.0 | 31.0 | SP, f sand, gr | 59 | 0.90 | 53 | | | | |
| | | 31.0 | 31.5 | SP, f and m sand, br-gr | | | | m sand | 0.49 | 0.21 | 2.8 |
| 33.0 | 34.5 | 31.5 | | SP, f and m sand, br-gr, w/trace coal | 74 | 0.87 | 64 | | | | |
| 36.0 | 37.5 | | ≥37.5 | SP, f sand, br-gr, w/ tr coal | 85 | 0.84 | 71 | | | | |

FIELD BORING LOG NO.255

Depth to water table (ft) 8.0 Topstratum thickness (ft) 8

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 6.0 | CS, sandy clay, br, dry | | | | | | | |
| | | 6.0 | 8.0 | CL, br, moist | | | | | | | |
| 8.0 | 9.5 | 8.0 | 11.0 | SM, silty f sand, br | 6 | 1.38 | 8 | | | | |
| 11.0 | 12.5 | 11.0 | | SP, f sand, br | 25 | 1.27 | 32 | | | | |
| 14.0 | 15.5 | | | SP, f sand, br, w/some m sand lenses | 21 | 1.20 | 25 | | | | |
| 17.0 | 18.5 | | | SP, f and m sand, br | 20 | 1.13 | 23 | | | | |
| 20.0 | 21.5 | | | SP, f sand, gr | 19 | 1.07 | 20 | f sand | 0.27 | 0.16 | 1.9 |
| 23.0 | 24.5 | | | SP, f and m sand w/ | 25 | 1.02 | 25 | m sand | 0.60 | 0.22 | 2.9 |
| 26.0 | 27.5 | | | SP, f sand, gr | | | | | | | |
| 29.0 | 30.5 | | | SP, f sand, gr | 24 | 0.93 | 22 | | | | |
| 32.0 | 33.5 | | ≥33.5 | SP, f sand, gr | 39 | 0.89 | 35 | | | | |

FIELD BORING LOG NO.256

Depth to water table (ft) 10.0 Topstratum thickness (ft) 0

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | | SM, silty f sand, br, moist | | | | | | | |
| 7.0 | 8.5 | | 10.0 | SM, silty f sand, br, moist | 3 | 1.40 | 4 | | | | |
| 10.0 | 11.5 | 10.0 | 11.0 | SM, silty f sand, br, sat | 11 | 1.25 | 14 | | | | |
| | | 11.0 | 13.0 | SP, f sand,gr, sat | | | | | | | |
| 13.0 | 14.5 | 13.0 | | SP, f and m sand, br-gr w/some f gravel | 24 | 1.18 | 28 | | | | |
| 16.0 | 17.5 | | 17.0 | SP, f and m sand, br-gr | 21 | 1.11 | 23 | | | | |
| 19.0 | 20.5 | 17.0 | 19.0 | SP, f sand, gr | 19 | 1.04 | 20 | m sand | 0.63 | 0.26 | 3.0 |
| 22.0 | 23.5 | 19.0 | 25.0 | SP, f and m sand, br-gr w/some f gravel | 17 | 1.01 | 17 | | | | |
| 25.0 | 26.5 | 25.0 | | CS, sandy clay, gr | 30 | | | | | | |
| 28.0 | 29.5 | | ≥29.5 | CS, sandy clay, gr | 34 | | | | | | |

FIELD BORING LOG NO.257

Depth to water table (ft) 18.0 Topstratum thickness (ft) 19.5

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 19.5 | CH, clay w/thin silt lenses | | | | | | | |
| 20.0 | 21.5 | 19.5 | | SP, f sand, br | 16 | 0.93 | 15 | | | | |
| 23.0 | 24.5 | | | SP, f and m sand, w/ gravel | 56 | 0.89 | 50 | f sand | 0.40 | 0.22 | 2.1 |
| 26.0 | 27.5 | | | SP, f sand | 30 | 0.86 | 26 | | | | |
| 29.0 | 30.5 | | | SP, f and m sand, w/ 2 in. lens of gravel | 43 | 0.83 | 36 | | | | |
| 32.0 | 33.5 | | | SP, f and m sand, w/ 2 in. lens of f sand | 56 | 0.80 | 45 | m sand | 0.50 | 0.22 | 2.5 |
| 34.0 | 35.5 | | 35.5 | SP, f and m sand | 60 | 0.78 | 47 | | | | |
| 35.5 | 35.7 | 35.5 | ≥35.7 | f gravel | | | | c sand | 2.6 | 0.91 | 3.1 |

FIELD BORING LOG NO.258

Depth to water table (ft) 8.5 Topstratum thickness (ft) 5

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | SC, sandy clay | | | | | | | |
| 6.0 | 7.5 | 5.0 | 9.0 | SP, f sand, br, moist | 9 | 1.40 | 13 | | | | |
| 9.0 | 10.5 | 9.0 | 12.5 | SP, f sand, br, sat | 9 | 1.26 | 11 | | | | |
| 12.0 | 13.5 | 12.5 | 13.5 | SP, f and m sand, blk-br | 9 | 1.11 | 10 | | | | |
| 15.0 | 16.5 | | | SP, f sand, br | 18 | 1.06 | 19 | f sand | 0.32 | 0.16 | 2.3 |
| 18.0 | 19.5 | | | SP, f and m sand, br-gr | 19 | 1.01 | 19 | | | | |
| 21.0 | 22.5 | | | SP, f and m sand, br-gr | 22 | 0.96 | 21 | | | | |
| 24.0 | 25.5 | | 27.0 | SP, f sand, gr | 40 | 0.92 | 37 | | | | |
| 27.0 | 28.5 | 27.0 | 27.5 | SP, f sand w/much coal | 33 | 0.89 | 29 | | | | |
| | | 27.5 | | SP, f sand, gr | | | | | | | |
| 30.0 | 31.5 | | 33.0 | SP, f sand, gr, w/tr of coal | 73 | 0.86 | 63 | f sand | 0.41 | 0.18 | 2.4 |
| 33.0 | 34.5 | 33.0 | 34.0 | SP, m sand w/gravel | 74 | 0.83 | 61 | | | | |
| | | 34.0 | ≥34.5 | SP, f and m sand, br-gr | | | | | | | |

FIELD BORING LOG NO.259

Depth to water table (ft) 10 Topstratum thickness (ft) 0

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.0 | f sand, br, w/pieces of wood and coal; probably sheet of sand from earthquake | | | | | | | |
| | | 3.0 | 8.0 | f sand, br, moist | NA | | | | | | |
| 8.0 | 9.5 | 8.0 | | f sand, br, wet | 6 | 1.31 | 8 | | | | |
| 10.0 | 11.5 | | | f sand, br, wet | 8 | 1.24 | 10 | | | | |
| 13.0 | 14.5 | | | f sand, br, wet | 19 | 1.18 | 22 | | | | |
| 16.0 | 17.5 | | | f sand, br, wet | 20 | 1.11 | 22 | | | | |
| 19.0 | 20.5 | | | f sand, br, w/gravel | 25 | 1.05 | 26 | | | | |
| 22.0 | 23.5 | | | f sand, br | 42 | 1.01 | 42 | | | | |
| 25.0 | 26.5 | | | f sand, br, w/many 1/2 in. coal lenses, about 1 in. apart | 12 | 0.96 | 12 | | | | |
| 28.0 | 29.5 | | ≥29.5 | f sand, br | 37 | 0.92 | 34 | | | | |

FIELD BORING LOG NO.260

Depth to water table (ft) 9 Topstratum thickness (ft) 3

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.0 | clayey silt, br, moist | | | | | | | |
| 5.0 | 6.5 | 3.0 | 8.0 | f sand, br, w/tr clay | 16 | >1.4 | >20 | | | | |
| 8.0 | 9.5 | 8.0 | 11.0 | f sand, br, w/thin clay | 3 | 1.34 | 4 | | | | |
| 11.0 | 12.5 | 11.0 | 14.0 | f sand, br | 19 | 1.24 | 24 | | | | |
| 14.0 | 15.5 | 14.0 | 17.0 | coal(lost all but 2in. of sample) | 3 | 1.16 | 3 | | | | |
| 17.0 | 18.5 | 17.0 | | f sand, gr, w/coal | 9 | 1.10 | 10 | | | | |
| 20.0 | 21.5 | | | f sand, gr | 21 | 1.05 | 22 | | | | |
| 23.0 | 24.5 | | | f sand, gr | 24 | 1.00 | 24 | | | | |
| 26.0 | 27.5 | 26.0 | 26.5 | sandy clay, gr | 23 | 0.96 | 22 | | | | |
| | | 26.5 | | f sand, gr | | | | | | | |
| 29.0 | 30.5 | | | f sand, gr, w/coal | 36 | 0.93 | 33 | | | | |
| 32.0 | 33.5 | | | f and m sand, gr, w/ coal | 26 | 0.89 | 23 | | | | |
| 35.0 | 36.5 | | | f and m sand, gr | 55 | 0.86 | 47 | | | | |
| 38.5 | 40.0 | | ≥40.0 | f and m sand, gr | 57 | 0.83 | 47 | | | | |

FIELD BORING LOG NO.261

Depth to water table (ft) 12 Topstratum thickness (ft) 15(26)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 12.0 | CH, clay, grading to sandy silt w/depth | | | | | | | |
| 12.0 | 13.5 | 12.0 | 12.5 | ML, sandy silt | 4 | | | | | | |
| | | 12.5 | 15.0 | CL, lean clay | | | | | | | |
| 15.0 | 16.5 | 15.0 | | SP, f sand, br | 15 | 1.10 | 16 | | | | |
| 18.0 | 19.5 | | | SM, silty sand, br | 15 | 1.04 | 16 | | | | |
| 21.0 | 22.5 | | | f sand and silty f sand w/in lens of clay | 12 | 0.98 | 12 | | | | |
| 24.0 | 25.5 | | | SM, silty sand, gr, w/ thin clay lens | 5 | 0.94 | 5 | | | | |
| 27.0 | 28.5 | | | SP, m sand, gr, w/ gravel and coal | 26 | 0.90 | 23 | | | | |
| 30.0 | 31.5 | | | SP, f and m sand, gr, w/gravel | 29 | 0.87 | 25 | | | | |
| 33.0 | 34.5 | | | SP, f and m sand, gr, w/gravel | 64 | 0.85 | 54 | | | | |
| 36.0 | 37.5 | | ≥37.5 | SP, f and m sand, gr | 62 | 0.82 | 51 | | | | |

FIELD BORING LOG NO. 262

Depth to water table (ft): 20 | Topstratum thickness (ft): 7(24)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 7.0 | clayey silt, moist | | | | | | | |
| 7.0 | 8.5 | 7.0 | | SP, f and m sand, gr-br, dry | 5 | 1.4 | 7 | f sand | 0.16 | 0.12 | 1.5 |
| 8.5 | 10.0 | | | SP, f and m sand, gr-br, dry | 11 | 1.32 | 15 | | | | |
| 10.5 | 12.0 | | 15.0 | SP, f and m sand, gr-br, dry | 7 | 1.22 | 9 | | | | |
| 15.0 | 16.5 | 15.0 | 16.0 | CH, clay, stiff | 14 | | | | | | |
| | | 16.0 | 16.3 | ML, dsnfy dily | | | | | | | |
| | | 16.3 | | SP, f and m sand, gr, wet | | | | | | | |
| 18.0 | 19.5 | | 19.0 | SP, f and m sand, gr, wet | 13 | 0.93 | 12 | | | | |
| | | 19.0 | 19.5 | CH, clay, stiff | | | | | | | |
| 21.0 | 22.5 | 19.5 | 24.0 | lenses of sand and clay | 12 | 0.89 | 11 | | | | |
| 24.0 | 25.5 | 24.0 | | SP, lenses of vf and m sand w/coal | 27 | 0.86 | 23 | | | | |
| 27.0 | 28.5 | | | SP, m sand, gr, w/coal | 45 | 0.83 | 37 | | | | |
| 30.0 | 31.5 | | ≥31.5 | SP, m sand, gr, w/coal | 68 | 0.80 | 54 | f sand | 0.27 | 0.15 | 2.0 |

FIELD BORING LOG NO. 263

Depth to water table (ft): 14 | Topstratum thickness (ft): 9

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.0 | silty clay, gr, moist | | | | | | | |
| 9.0 | 10.5 | 9.0 | | SP, f sand, br, moist | 16 | 1.26 | 20 | | | | |
| 12.0 | 13.5 | | | SP, f sand, br, moist | 17 | 1.14 | 19 | | | | |
| 15.0 | 16.5 | | | SP, f sand, gr, sat | 19 | 1.06 | 20 | | | | |
| 18.0 | 19.5 | | | SP, f sand, gr, sat | 44 | 1.01 | 44 | | | | |
| 21.0 | 22.5 | | | SP, f sand, gr, w/some | 44 | 0.96 | 42 | | | | |
| 24.0 | 25.5 | | | SP, f and m sand, gr | 51 | 0.93 | 47 | | | | |
| 27.0 | 28.5 | | ≥28.5 | SP, f and m sand, gr | 67 | 0.89 | 60 | | | | |

FIELD BORING LOG NO. 264

Depth to water table (ft): 8.0 | Topstratum thickness (ft): 10

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 6.0 | silty clay, br-gr, moist | | | | | | | |
| | | 6.0 | | SC, clayey sand, w/sand increasing at depth | | | | | | | |
| 7.0 | 8.5 | | 10.0 | SC, sand mixed w/some clay | 18 | | | | | | |
| 10.0 | 11.5 | 10.0 | | SP, f sand w/lenses of coal lens | 22 | 1.31 | 29 | | | | |
| 13.0 | 14.5 | | | SP, f sand w/lenses of coal | 39 | 1.23 | 48 | | | | |
| 16.0 | 17.5 | | | SP, f sand, gr | 29 | 1.15 | 33 | | | | |
| 19.0 | 20.5 | | | SP, f sand, gr | 39 | 1.10 | 43 | | | | |
| 22.0 | 23.5 | | | SP, f sand, gr, w/3/4 in. lens of coal | 34 | 1.05 | 36 | | | | |
| 25.0 | 26.5 | | | SP, f sand, gr, w/some | 36 | 1.00 | 36 | | | | |
| 28.0 | 29.5 | | ≥29.5 | SP, f samd. gr | >71 | 0.95 | >68 | | | | |

FIELD BORING LOG NO. 265

Depth to water table (ft): 10 | Topstratum thickness (ft): 10.5

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 10.5 | CL, sandy clay, br and gr, moist | | | | | | | |
| 12.0 | 13.5 | 10.5 | | SP, f sand, gr | 34 | 1.20 | 41 | | | | |
| 15.0 | 16.5 | | | SP, f sand, w/lens of coal | 46 | 1.13 | 52 | | | | |
| 18.0 | 19.5 | | | SP, f sand, w/lens of coal | 36 | 1.06 | 38 | | | | |
| 21.0 | 22.5 | | | SP, f sand, gr | 27 | 1.01 | 27 | | | | |
| 24.0 | 25.5 | | | SP, f sand, gr | 29 | 0.96 | 28 | | | | |
| 27.0 | 28.5 | | ≥28.5 | SP, f sand, gr | 60 | 0.93 | 56 | | | | |

FIELD BORING LOG NO. 266

Depth to water table (ft): 25 | Topstratum thickness (ft): 13.5

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 13.5 | silty clay, moist, br | | | | | | | |
| 15.0 | 16.5 | 13.5 | | SP, thin lenses of f and m and silty sand, br and lin. lens of clayey silt | 12 | 1.03 | 12 | | | | |
| 18.0 | 19.5 | | | SP, m sand, br, moist | 39 | 0.94 | 37 | | | | |
| 21.0 | 22.5 | | | SP, f and m sand, br, moist | 17 | 0.88 | 15 | | | | |
| 24.0 | 25.5 | | | SP, f and m sand, br, | 35 | 0.82 | 29 | | | | |
| 27.0 | 28.5 | | | SP, f and m sand, br, 6in. layer of f sand | 25 | 0.79 | 20 | | | | |
| 30.0 | 31.5 | | | SP, f and m sand, br | 40 | 0.76 | 30 | | | | |
| 33.0 | 34.5 | | ≥34.5 | SP, f and m sand, br | 39 | 0.74 | 29 | | | | |

FIELD BORING LOG NO. 267

Depth to water table (ft): 30 | Topstratum thickness (ft): 16

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 12.0 | clayey silt, w/silt increasing at depth | | | | | | | |
| | | 12.0 | 16.0 | sandy silt, w/tr clay dry | | | | | | | |
| 16.0 | 17.5 | 16.0 | | SP, f sand, lt br, dry | 11 | 0.98 | 11 | | | | |
| 19.0 | 20.5 | | | SP, f and m sand, lt br, dry | 20 | 0.92 | 18 | | | | |
| 22.0 | 23.5 | | | SP f and m sand, lt br, dry | 23 | 0.85 | 20 | | | | |
| 25.0 | 26.5 | | | SP, f and m sand, moist | 31 | 0.79 | 24 | | | | |
| 28.0 | 29.5 | | | SP,f and m sand, w/ some 1/16 in. lenses of clayey silt | 21 | 0.75 | 16 | | | | |
| 31.0 | 33.5 | | | SP, f and m sand, moist | 16 | 0.72 | 12 | | | | |
| 35.0 | 36.5 | | ≥36.5 | SP, f and m sand, moist | 25 | 0.70 | 18 | | | | |

FIELD BORING LOG NO. 268

Depth to water table (ft): 14 | Topstratum thickness (ft): 10

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.0 | silty clay, br, grading to silt at depth, br | | | | | | | |
| | | 8.0 | 10.5 | ML, silt, br | | | | | | | |
| 11.0 | 12.5 | 10.5 | | SP, f sand, br, moist | 10 | 1.17 | 12 | | | | |
| 14.0 | 15.5 | | | SP, f sand, br, wet | 38 | 1.08 | 41 | | | | |
| 17.0 | 18.5 | | | SP, m sand in upper 6in. br, layers of f to m sand in tower 12in., br | 25 | 1.02 | 26 | | | | |
| 20.0 | 21.5 | | | SP, m sand, br, w/ layers of 1/2in. thick f sand, gr | 58 | 0.96 | 56 | | | | |
| 23.0 | 24.5 | | | SP, m sand, br, w/ lenses of f sand | 28 | 0.93 | 26 | | | | |
| 26.0 | 27.5 | | | SP, m sand, br | 33 | 0.90 | 30 | | | | |
| 29.0 | 30.5 | | | SP, m sand, br, w/ gravel | 77 | 0.87 | 67 | | | | |
| 32.0 | 33.5 | | ≥33.5 | SP, m sand, br, w/ gravel | 76 | 0.83 | 63 | | | | |

FIELD BORING LOG NO. 269

Depth to water table (ft): 17 | Topstratum thickness (ft): 18

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 18.0 | silty clay, moist (became sat at 17.0) | | | | | | | |
| 18.0 | 19.5 | 18.0 | | SP, f sand, br, w/6in. thick lens of sandy silt | 5 | 1.03 | 5 | | | | |
| 21.0 | 22.5 | | | ML, sandy silt, gr | 1 | | | | | | |
| 24.0 | 25.5 | | | lost sample | 4 | | | | | | |
| 27.0 | 28.5 | | | ML, sandy silt, gr, w/ 6 in. lens of clay | 12 | | | | | | |
| 30.0 | 31.5 | | | SM, silty sand | 27 | 0.89 | 24 | | | | |
| 33.0 | 34.5 | | | CL, clayey silt, gr, w/ 6in. lens of CH | 7 | | | | | | |
| 36.0 | 37.5 | | ≥37.5 | ML, sandy silt, gr | 7 | | | | | | |

FIELD BORING LOG NO. 270

Depth to water table (ft): 12.5 Topstratum thickness (ft): 12

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.0 | silty clay | | | | | | | |
| | | 9.0 | 11.0 | ML, silty sand, moist | | | | | | | |
| 10.0 | 11.5 | 11.0 | 11.5 | CL, lean clay, br, wet | 8 | | | | | | |
| | | 11.5 | 12.0 | ML, sandy silt, br, moist | | | | | | | |
| 12.0 | 13.5 | 12.0 | 13.5 | SM, silty sand, br, w/ occ. thin clayey lenses, sat | 4 | 1.14 | 5 | | | | |
| | | 13.0 | 15.5 | SM, silty sand, br, sat | | | | | | | |
| 15.0 | 16.5 | 15.5 | 16.0 | SP, f sand, br | 9 | 1.08 | 10 | | | | |
| | | 16.0 | 19.0 | SP, f sand, gr | | | | | | | |
| 19.0 | 21.0 | 19.0 | 21.0 | SP, f and m sand, br-gr | 9 | 1.00 | 9 | | | | |
| 21.0 | 22.5 | 21.0 | 24.5 | SP, f and m sand, w/ very thin clay lenses | 16 | 0.98 | 16 | | | | |
| 24.0 | 25.5 | 24.5 | 25.5 | SP, f sand, gr | 17 | 0.93 | 16 | | | | |

FIELD BORING LOG NO. 271

Depth to water table (ft): 14 Topstratum thickness (ft): 9

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.0 | silty clay grading to f sand, br, at depth | | | | | | | |
| 9.0 | 10.5 | 9.0 | | SP, f sand, br, dry | 18 | 1.26 | 23 | | | | |
| 12.0 | 13.5 | | | SP, f sand, gr, moist | 19 | 1.14 | 22 | | | | |
| 15.0 | 16.5 | | | SP, f sand, gr, w/coal | 38 | 1.06 | 40 | f sand | 0.25 | 0.17 | 1.6 |
| 18.0 | 19.5 | | | SP, f sand, gr | 16 | 1.02 | 16 | | | | |
| 21.0 | 22.5 | | | SP, f sand, gr | 22 | 0.97 | 21 | | | | |
| 24.0 | 25.5 | | | SP, f sand, gr | 33 | 0.93 | 31 | | | | |
| 27.0 | 28.5 | | ≥28.5 | SP, f sand, gr | 25 | 0.89 | 22 | f sand | 0.25 | 0.16 | 1.7 |

FIELD BORING LOG NO. 272

Depth to water table (ft): 10 Topstratum thickness (ft): 8

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.0 | silt and lean clay, br-gr, moist | | | | | | | |
| 9.0 | 10.5 | 8.0 | | SP, f sand, gr, moist | 22 | 1.27 | 28 | | | | |
| 12.0 | 13.5 | | | SP, f sand, gr, sat | 16 | 1.21 | 19 | | | | |
| 15.0 | 16.5 | | | SP, f sand, gr, w/ | 34 | 1.14 | 39 | f sand | 0.28 | 0.17 | 1.8 |
| 18.0 | 19.5 | | | SP, f sand, gr | 30 | 1.08 | 32 | | | | |
| 21.0 | 22.5 | | | SP, f sand, gr, w/ lenses of coal | 28 | 1.02 | 29 | | | | |
| 24.0 | 25.5 | | | SP, f sand, gr | 30 | 0.97 | 29 | | | | |
| 27.0 | 28.5 | | 30.0 | SP, f sand, gr | 20 | 0.94 | 19 | | | | |
| 30.0 | 31.5 | 30.0 | | SP, f and m sand, gr, w/gravel lenses | 21 | 1.90 | 19 | m sand | 0.55 | 0.30 | 2.1 |
| 33.0 | 34.5 | | ≥34.5 | SP, f and m sand, gr, w/ gravel lenses and tr of coal | 34 | 0.86 | 29 | | | | |

FIELD BORING LOG NO. 273

Depth to water table (ft): 16 Topstratum thickness (ft): 5.5

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.5 | CL, silty clay, br-gr, dry | | | | | | | |
| 7.0 | 8.5 | 5.5 | | SP, f sand, dry, slightly reddish stained and br banks of sand | 16 | 1.4 | 22 | | | | |
| 10.0 | 11.5 | | | SP, f sand w/tr of reddish staining of sand, dry | 13 | 1.22 | 16 | | | | |
| 13.0 | 14.5 | | | SP, f and w/1/2in. lens of clay at 14.0ft; br, dry | 13 | 1.09 | 14 | f sand | 0.23 | 0.13 | 1.9 |
| 16.0 | 17.5 | | | SP, f sand, br, sat | 21 | 1.02 | 21 | | | | |
| 19.0 | 20.5 | | | SP, f sand, br, sat | 15 | 0.96 | 14 | | | | |
| 22.0 | 23.5 | | | SP, f sand, br, sat | 15 | 0.92 | 14 | | | | |
| 25.0 | 26.5 | | | SP, f sand, gr, w/1/2 in. lens of coal | 20 | 0.89 | 18 | | | | |
| 28.0 | 29.5 | | | SP, f sand, gr | 16 | 0.85 | 14 | | | | |
| 31.0 | 32.5 | | ≥32.5 | SP, f sand, gr | 70 | 0.82 | 57 | f sand | 0.29 | 0.16 | 1.2 |

FIELD BORING LOG NO. 274

Depth to water table (ft): 12.0 Topstratum thickness (ft): 14.5

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.5 | silty clay grading to sand at 14.5ft | | | | | | | |
| 16.0 | 17.5 | 14.5 | | SP, f sand, br | 22 | 1.06 | 23 | f sand | 0.15 | 0.10 | 1.7 |
| 19.0 | 20.5 | | | SP, f sand, gr and br, w/coal and w/3in. lens of clay in top | 11 | 1.02 | 11 | | | | |
| 22.0 | 23.5 | | 25.0 | SP, f sand, gr-br | 6 | 0.97 | 6 | | | | |
| 25.0 | 26.5 | 25.0 | 28.0 | CL, silty clay, gr | 2 | | | | | | |
| 28.0 | 29.5 | 28.0 | | SP, f sand, gr | 11 | 0.89 | 10 | | | | |
| 31.0 | 32.5 | | | SP, f sand, gr | 73 | 0.86 | 63 | | | | |
| 34.0 | 32.5 | | ≥35.5 | SP, f sand, gr | 90 | 0.83 | 75 | f sand | 0.22 | 0.13 | 1.8 |

FIELD BORING LOG NO. 275

Depth to water table (ft): 12.0 Topstratum thickness (ft): 15

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 12.0 | CL, clay, br-gr, w/ lenses of silt | | | | | | | |
| | | 12.0 | 15.0 | CL, silty cla, br-gr,wet | | | | | | | |
| 16.0 | 17.5 | 15.0 | | SP, f sand, br-gr | 18 | 1.09 | 20 | f sand | 0.41 | 0.28 | 1.6 |
| 22.0 | 23.5 | | | SP, f sand, br-gr | 17 | 0.97 | 16 | f sand | 0.26 | 0.20 | 1.4 |
| 25.0 | 26.5 | | | SP, f sand, br-gr | 25 | 0.93 | 23 | | | | |
| 28.0 | 29.5 | | | SP, f sand, gr, w/coal | 14 | 0.90 | 13 | | | | |
| 31.0 | 32.5 | | | SP, f sand, gr, w/coal | 15 | 0.87 | 13 | | | | |
| 34.0 | 35.5 | | | SP, f sand w/gravel lens and w/coal | 22 | 0.84 | 18 | | | | |
| 37.0 | 38.5 | | | SP, f and m sand, gr | 22 | 0.82 | 18 | | | | |

FIELD BORING LOG NO. 276

Depth to water table (ft): 9.0 Topstratum thickness (ft): 9

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.0 | CS, sandy clay, gr | | | | | | | |
| 9.0 | 10.5 | 9.0 | 13.0 | SP, f sand, br, w/trim | 10 | 1.30 | 13 | | | | |
| 12.0 | 13.5 | 13.0 | 13.5 | SP, m sand, gr, w/ gravel lenses | 31 | 1.21 | 38 | | | | |
| 16.0 | 17.5 | 13.5 | | SP, f sand, gr, w/tr of coal | 27 | 1.12 | 30 | | | | |
| 18.0 | 19.5 | | | SP, m sand and gravel, br-gr | 29 | 1.08 | 31 | m sand | 1.2 | 0.48 | 4.2 |
| 21.0 | 22.5 | | | gravel, gr | NA | | | c sand | 3.6 | 2.1 | 2.0 |
| 24.0 | 25.5 | | | SP, f sand, gr, w/ layers f gravel | 30 | 0.98 | 29 | | | | |
| 27.0 | 28.5 | | | SP, f and m sand, br- | 43 | 0.94 | 40 | | | | |
| 30.0 | 31.5 | | | SP, m sand and gravel | 53 | 0.91 | 48 | | | | |
| 33.0 | 34.5 | | ≥34.5 | SP, m sand and gravel | 41 | 0.88 | 36 | | | | |

FIELD BORING LOG NO. 277

Depth to water table (ft): 8.5 Topstratum thickness (ft): 8.5(15)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.5 | CS, sandy clay, gr, moist | | | | | | | |
| 9.0 | 10.5 | 8.5 | 13.0 | SP, f and m sand, br-gr sat | 13 | 1.30 | 17 | | | | |
| 12.0 | 13.5 | 13.0 | | ML, sandy silt, gr, soft | 11 | 1.23 | 14 | | | | |
| 15.0 | 16.5 | 15.0 | 18.0 | SP, f and m sand, gr | 17 | 1.16 | 20 | | | | |
| 18.0 | 19.5 | 18.0 | | SP, f and m sand, br-gr, w/lenses of gravel | 17 | 1.10 | 19 | | | | |
| 21.0 | 22.5 | | | SP, f and m sand, br-gr, w/lenses of gravel | 26 | 1.04 | 27 | m sand | 0.60 | 0.26 | 2.7 |
| 24.0 | 25.5 | | 27.0 | SP, f and m sand, br-gr, w/lenses of gravel | 51 | 0.99 | 50 | | | | |
| 27.0 | 28.5 | 27.0 | ≥28.5 | SP, f and m sand, br-gr | 44 | 0.95 | 42 | m sand | 0.52 | 0.30 | 2.0 |

FIELD BORING LOG NO. 278

Depth to water table (ft): 7.0 — Topstratum thickness (ft): 7

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.0 | silt, grading to sandy silt w/depth | | | | | | | |
| | | 3.0 | 7.0 | clayey sand grading to clean sand w/depth | | | | | | | |
| 8.0 | 9.5 | 7.0 | | SP, m sand, br, sat | 10 | 1.50 | 15 | | | | |
| 10.0 | 11.5 | | 13.0 | SP, m sand, br, sat | 27 | 1.33 | 36 | | | | |
| 13.0 | 14.5 | 13.0 | 16.0 | SP, f and m sand, br-gr | 31 | 1.24 | 38 | | | | |
| 16.0 | 17.5 | 16.0 | 19.0 | SP, f and m sand, br-gr, w/f gravel | 14 | 1.16 | 16 | m sand | 0.50 | 0.28 | 2.0 |
| 19.0 | 20.5 | 19.0 | | SP, f and m sand, br-gr | 35 | 1.10 | 38 | | | | |
| 22.0 | 23.5 | | 25.0 | SP, f and m sand, br-gr | 24 | 1.04 | 25 | | | | |
| 25.0 | 26.5 | 25.0 | | SP, m sand, gr | 33 | 1.00 | 33 | | | | |
| 28.0 | 29.5 | | 32.0 | SP, m sand, gr | 28 | 0.96 | 27 | | | | |
| 31.0 | 32.5 | 32.0 | 34.0 | SP, f and m sand, br-gr | 20 | 0.92 | 18 | | | | |
| 34.0 | 35.5 | 34.0 | ≥35.5 | SP, m sand, br-gr, w/ gravel | 31 | 0.89 | 28 | m sand | 1.1 | 0.40 | 3.8 |

FIELD BORING LOG NO. 279

Depth to water table (ft): 21.0 — Topstratum thickness (ft): 21

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 19.0 | gradual change from CH at surface to SC, gr, at depth | | | | | | | |
| | | 19.0 | 21.0 | alternating thin lenses of sand and clay | | | | | | | |
| | | 21.0 | 24.0 | SP, f sand | | | | | | | |
| 24.0 | 25.5 | 24.0 | 27.0 | silty clayey sand w/ lenses of f sand | 8 | 0.86 | 7 | | | | |
| 27.0 | 28.5 | 27.0 | | SP, f sand, gr | 16 | 0.82 | 13 | | | | |
| 30.0 | 31.5 | | | SP, f sand, gr | 18 | 0.79 | 14 | | | | |
| 33.0 | 34.5 | | | SP, f sand, gr | 19 | 0.77 | 15 | | | | |
| 36.0 | 37.5 | | | SP, f sand, gr | 27 | 0.75 | 20 | f sand | 0.33 | 0.19 | |
| 39.0 | 40.5 | | ≥40.5 | SP, f sand, gr | 28 | 0.73 | 20 | | | | |

FIELD BORING LOG NO. 280

Depth to water table (ft): 24 — Topstratum thickness (ft): 24

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 19.0 | gradual change from CH at surface to silty clay to clayey sand at depth | | | | | | | |
| | | 19.0 | 22.0 | iron cemented clayey sand-hard to auger | | | | | | | |
| | | 22.0 | 24.0 | alternating thin layers of soft silt and silty clayey sand | | | | | | | |
| 26.0 | 27.5 | 26.0 | | sandy soil flowed from SPT sampler | 8 | 0.81 | 6 | | | | |
| 29.0 | 30.5 | | | SP, f sand, br | 34 | 0.78 | 27 | | | | |
| 32.0 | 33.5 | | | SP, f sand, br | 41 | 0.76 | 31 | f sand | 0.28 | 0.19 | 1.6 |
| 35.0 | 36.5 | | ≥36.5 | SP, f sand, br | 41 | 0.74 | 30 | | | | |

FIELD BORING LOG NO. 281A

Depth to water table (ft): NA — Topstratum thickness (ft): 16

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.0 | silty clay | | | | | | | |
| | | 14.0 | 16.0 | sandy clay | | | | | | | |
| 20.0 | 21.5 | 16.0 | 23.0 | m sand | 22 | | | | | | |
| 25.0 | 26.5 | 23.0 | | sand and gravel | 29 | | | | | | |
| 30.0 | 31.5 | | 34.0 | sand and gravel | 21 | | | | | | |
| | | 34.0 | 37.0 | m sand w/silty clay layers | | | | | | | |
| 40.0 | 41.5 | 37.0 | 45.0 | m sand w/some layers f grave; | 30 | | | | | | |
| 45.0 | 46.5 | 45.0 | | coarse gravel w/some sand | 62 | | | | | | |
| 50.0 | 51.5 | | | coarse gravel w/some sand | 24 | | | | | | |
| 55.0 | 56.5 | | | coarse gravel w/some sand | 25 | | | | | | |
| 60.0 | 61.5 | | | coarse gravel w/some sand | 41 | | | | | | |
| 65.0 | 66.5 | | | coarse gravel w/some sand | 61 | | | | | | |
| 70.0 | 71.5 | | ≥71.5 | coarse gravel w/some sand | 72 | | | | | | |

FIELD BORING LOG NO. 281B

Depth to water table (ft): NA — Topstratum thickness (ft): 24

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 4.5 | sand | | | | | | | |
| | | 4.5 | 23.5 | silty sand | | | | | | | |
| 25.0 | 26.5 | 23.5 | 30.0 | sand | 24 | | | | | | |
| 30.0 | 31.5 | 30.0 | | sand and c gravel | 24 | | | | | | |
| 35.0 | 36.5 | | | sand and c gravel | 26 | | | | | | |
| 40.0 | 41.5 | | 45.0 | sand and c gravel | 28 | | | | | | |
| 45.0 | 46.5 | | | sand and c gravel | 31 | | | | | | |
| 50.0 | 51.5 | | | sand and c gravel | 20 | | | | | | |
| 55.0 | 56.5 | | | sand and c gravel | 41 | | | | | | |
| 60.0 | 61.5 | | | sand and c gravel | 50 | | | | | | |
| 65.0 | 66.5 | | | sand and c gravel | 66 | | | | | | |
| 70.0 | 71.5 | | | sand and c gravel | 36 | | | | | | |
| 75.0 | 76.5 | | ≥80.01 | sand and c gravel | >100 | | | | | | |

FIELD BORING LOG NO. 281C

Depth to water table (ft): NA — Topstratum thickness (ft): 15

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 15.0 | clay and silty clay | | | | | | | |
| 15.0 | 16.5 | 15.0 | 19.0 | vf sand and silt | 7 | | | | | | |
| 20.0 | 21.5 | 19.0 | | m sand | 7 | | | | | | |
| 25.0 | 26.5 | | | m sand | 24 | | | | | | |
| 30.0 | 31.5 | | | m sand | 25 | | | | | | |
| 25.0 | 26.5 | | 38.0 | m sand | 14 | | | | | | |
| 40.0 | 41.5 | 38.0 | | sand and large gravel | 22 | | | | | | |
| 45.0 | 46.5 | | | sand and large gravel | 23 | | | | | | |
| 50.0 | 51.5 | | | sand and large gravel | 48 | | | | | | |
| 55.0 | 56.5 | | | sand and large gravel | 45 | | | | | | |
| 60.0 | 61.5 | | | sand and large gravel | 62 | | | | | | |
| 65.0 | 66.5 | | | sand and large gravel | 65 | | | | | | |
| 70.0 | 71.5 | | ≥71.5 | sand and large gravel | 39 | | | | | | |

FIELD BORING LOG NO. 281D

Depth to water table (ft): NA — Topstratum thickness (ft): 20

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 15.0 | silty clay | | | | | | | |
| | | 15.0 | 20.0 | silt very soft | | | | | | | |
| 20.0 | 21.5 | 20.0 | 25.0 | silty sand | 1 | | | | | | |
| 25.0 | 26.5 | 25.0 | | f to m sand | 7 | | | | | | |
| 30.0 | 31.5 | | 35.0 | f to m sand | 30 | | | | | | |
| 35.0 | 36.5 | 35.0 | | c sand and gravel | 28 | | | | | | |
| 40.0 | 41.5 | | | c sand and gravel | 52 | | | | | | |
| 45.0 | 46.5 | | | c sand and gravel | 53 | | | | | | |
| 50.0 | 51.5 | | | c sand and gravel | 69 | | | | | | |
| 55.0 | 56.5 | | | c sand and gravel | 43 | | | | | | |
| 60.0 | 61.5 | | | c sand and gravel | 64 | | | | | | |
| 65.0 | 66.5 | | | c sand and gravel | 70 | | | | | | |
| 70.0 | 71.5 | | ≥71.5 | c sand and gravel | 60 | | | | | | |

FIELD BORING LOG NO. 282A

Depth to water table (ft): NA(15) — Topstratum thickness (ft): 30

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.5 | silty clay | | | | | | | |
| | | 14.5 | 30.0 | sandy clay | | | | | | | |
| 30.0 | 31.5 | 30.0 | | f sand | 36 | 0.86 | 31 | | | | |
| 35.0 | 36.5 | | | f sand | 27 | 0.81 | 22 | | | | |
| 40.0 | 41.5 | | | f sand | 27 | 0.77 | 21 | | | | |
| 45.0 | 46.5 | | | f sand | 31 | 0.73 | 23 | | | | |
| 50.0 | 51.5 | | 53.0 | c sand and gravel | 40 | 0.70 | 28 | | | | |
| 55.0 | 56.5 | 53.0 | | c sand and gravel | 38 | 0.67 | 25 | | | | |
| 60.0 | 61.5 | | 61.5 | c sand and gravel | 58 | 0.65 | 38 | | | | |

FIELD BORING LOG NO.282B

Depth to water table (ft) NA(15) Topstratum thickness (ft) 35

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 18.0 | silty clay | | | | | | | |
| | | 18.0 | 35.0 | f sand w/sandy clay layers | | | | | | | |
| 35.0 | 36.5 | 35.0 | | m sand | 45 | 0.81 | 36 | | | | |
| 40.0 | 41.5 | | | m sand | 25 | 0.77 | 19 | | | | |
| 45.0 | 46.5 | | | m sand | 35 | 0.73 | 26 | | | | |
| 50.0 | 51.5 | | 53.5 | m sand w/some gravel | 43 | 0.70 | 30 | | | | |
| 55.0 | 56.5 | | | m sand w/some gravel | 34 | 0.67 | 23 | | | | |
| 60.0 | 61.5 | | ≥61.5 | m sand w/some gravel | 70 | 0.65 | 46 | | | | |

FIELD BORING LOG NO.283A

Depth to water table (ft) NA(10) Topstratum thickness (ft) 10

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.5 | silty clay | | | | | | | |
| 10.0 | 11.5 | 9.5 | | f to m sand | 7 | 1.25 | 9 | | | | |
| 15.0 | 16.5 | | | f to m sand | 13 | 0.13 | 15 | | | | |
| 20.0 | 21.5 | | | f to m sand | 13 | 1.03 | 13 | | | | |
| 25.0 | 26.5 | | | f to m sand | 14 | 0.96 | 13 | | | | |
| 30.0 | 31.5 | | | f to m sand | 20 | 0.90 | 18 | | | | |
| 35.0 | 36.5 | | | f to m sand | 23 | 0.85 | 20 | | | | |
| 40.0 | 41.5 | | | f to m sand | 32 | 0.80 | 26 | | | | |
| 45.0 | 46.5 | | | f to m sand | 31 | 0.77 | 24 | | | | |
| 50.0 | 51.5 | | | f to m sand | 65 | 0.74 | 48 | | | | |
| 55.0 | 56.5 | | | f to m sand | 30 | 0.70 | 21 | | | | |
| 60.0 | 61.5 | | | f to m sand, w/some thin lignite layers | 56 | 0.67 | 38 | | | | |
| 65.0 | 66.5 | | ≥66.5 | f to m sand, w/some thin lignite layers | 64 | 0.64 | 41 | | | | |

FIELD BORING LOG NO.283B

Depth to water table (ft) NA(10) Topstratum thickness (ft) 10

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 10.0 | silty clay | | | | | | | |
| 10.0 | 11.5 | | | vf to f sand | 17 | 1.25 | 21 | | | | |
| 15.0 | 16.5 | | | vf to f sand | 14 | 1.13 | 16 | | | | |
| 20.0 | 21.5 | | | vf to f sand | 12 | 1.03 | 12 | | | | |
| 25.0 | 26.5 | | | vf to f sand | 13 | 0.96 | 12 | | | | |
| 30.0 | 31.5 | | | vf to f sand | 22 | 0.90 | 20 | | | | |
| 35.0 | 36.5 | | 40.0 | vf to f sand | 19 | 0.85 | 16 | | | | |
| 40.0 | 41.5 | 40.0 | 45.0 | f to m sand | 14 | 0.80 | 11 | | | | |
| 45.0 | 46.5 | 45.0 | | vf to f sand | 23 | 0.77 | 18 | | | | |
| 50.0 | 51.5 | | | vf to f sand | 77 | 0.74 | 57 | | | | |
| 55.0 | 56.5 | | | vf to f sand | 28 | 0.70 | 20 | | | | |
| 60.0 | 61.5 | | | vf to f sand | 57 | 0.67 | 38 | | | | |
| 65.0 | 66.5 | | ≥66.5 | vf to f sand | 10 | 0.64 | 6 | | | | |

FIELD BORING LOG NO.284A

Depth to water table (ft) NA(15) Topstratum thickness (ft) 12

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.5 | clay | | | | | | | |
| | | 9.5 | 12.0 | vf to f sand w/clay layers | | | | | | | |
| 15.0 | 16.5 | 12.0 | 20.0 | vf to f sand | 17 | 1.04 | 18 | | | | |
| 20.0 | 21.5 | 20.0 | | vf to f sand | 47 | 0.97 | 46 | | | | |
| 25.0 | 26.5 | | | vf to f sand | 52 | 0.90 | 47 | | | | |
| 30.0 | 31.5 | | | vf to f sand | 18 | 0.85 | 15 | | | | |
| 35.0 | 36.5 | 35.0 | | vf to f sand, w/ scattered lignite layers | 32 | 0.81 | 26 | | | | |
| 40.0 | 41.5 | | | vf to f sand, w/ scattered lignite layers | 36 | 0.77 | 28 | | | | |
| 45.0 | 46.5 | | | vf to f sand, w/ scattered lignite layers | 42 | 0.74 | 31 | | | | |
| 50.0 | 51.5 | | | vf to f sand, w/ scattered lignite layers | 43 | 0.71 | 30 | | | | |
| 55.0 | 56.5 | | | vf to f sand, w/ scattered lignite layers | 42 | 0.68 | 29 | | | | |
| 60.0 | 61.5 | | | vf to f sand, w/ scattered lignite layers | 48 | 0.65 | 31 | | | | |
| 65.0 | 66.5 | | ≥66.5 | vf to f sand, w/ scattered lignite layers | 19 | 0.62 | 12 | | | | |

FIELD BORING LOG NO.284B

Depth to water table (ft) NA(15) Topstratum thickness (ft) 12

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.4 | clay | | | | | | | |
| 15.0 | 16.5 | 9.4 | | vf to f sand (clay layers at 10.0 to 11.5) | | | | | | | |
| 20.0 | 21.5 | | | vf to f sand (clay layers at 10.0 to 11.5) | 12 | 1.04 | 12 | | | | |
| 25.0 | 26.5 | | | vf to f sand (clay layers at 10.0 to 11.5) | 18 | 0.97 | 17 | | | | |
| 30.0 | 31.5 | 28.0 | 35.0 | vf to m sand | 22 | 0.90 | 20 | | | | |
| 35.0 | 36.5 | 35.0 | 40.0 | vf to f sand | 68 | 0.85 | 58 | | | | |
| 40.0 | 41.5 | 40.0 | 45.0 | vf to m sand | 21 | 0.81 | 17 | | | | |
| 45.0 | 46.5 | 45.0 | | f to m sand | 38 | 0.77 | 29 | | | | |
| 50.0 | 51.0 | | | f to m sand | 23 | 0.74 | 17 | | | | |
| 55.0 | 56.5 | | | f to m sand | 27 | 0.68 | 18 | | | | |
| 60.0 | 61.5 | | | f to m sand | 34 | 0.65 | 22 | | | | |
| 65.0 | 66.5 | | ≥66.5 | f to m sand | 32 | 0.62 | 20 | | | | |

FIELD BORING LOG NO.285A

Depth to water table (ft) 14 Topstratum thickness (ft) 15

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 15.0 | clay | | | | | | | |
| 15.0 | 16.5 | 15.0 | | f to m sand | 6 | 1.06 | 6 | | | | |
| 20.0 | 21.5 | | 25.0 | f to m sand | 13 | 0.98 | 13 | | | | |
| 25.0 | 26.5 | 25.0 | | m to f sand | 27 | 0.91 | 25 | | | | |
| 30.0 | 31.5 | | | m to f sand | 72 | 0.86 | 62 | | | | |
| 35.0 | 36.5 | | | m to f sand | 77 | 0.81 | 62 | | | | |
| 40.0 | 41.5 | | | m to f sand | 51 | 0.77 | 39 | | | | |
| 45.0 | 46.5 | | | m to f sand | 29 | 0.74 | 21 | | | | |
| 50.0 | 51.5 | | | m to f sand | 25 | 0.71 | 18 | | | | |
| 55.0 | 56.5 | | | m to f sand | 33 | 0.68 | 22 | | | | |
| 60.0 | 61.5 | | | m to f sand | 46 | 0.65 | 30 | | | | |
| 65.0 | 66.5 | | 70.0 | m to f sand | 23 | 0.62 | 30 | | | | |
| 70.0 | 71.5 | 70.0 | 71.5 | lignite | 21 | 0.60 | 14 | | | | |
| 75.0 | 76.5 | 71.5 | | f sand | 35 | 0.58 | 20 | | | | |
| 80.0 | 81.5 | | | f sand | 31 | 0.56 | 17 | | | | |
| 85.0 | 86.5 | | 85.0 | f sand | 37 | 0.54 | 20 | | | | |
| 90.0 | 91.5 | 85.0 | ≥91.5 | m sand and gravel | 49 | 0.53 | 26 | | | | |

FIELD BORING LOG NO.285B

Depth to water table (ft) 14 Topstratum thickness (ft) 15

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 10.0 | silty clay | | | | | | | |
| | | 10.0 | 15.0 | silt, soft | | | | | | | |
| 15.0 | 16.5 | 15.0 | 18.0 | silty sand | 4 | 1.06 | 4 | | | | |
| 20.0 | 21.5 | 18.0 | | vf to f sand | 9 | 0.98 | 9 | | | | |
| 25.0 | 26.5 | | | vf to f sand | 11 | 0.91 | 10 | | | | |
| 30.0 | 31.5 | | | vf to f sand | 47 | 0.86 | 40 | | | | |
| 35.0 | 36.5 | | | vf to f sand | 19 | 0.81 | 15 | | | | |
| 40.0 | 41.5 | | | vf to f sand | 56 | 0.77 | 43 | | | | |
| 45.0 | 46.5 | | 50.0 | vf to f sand | 23 | 0.74 | 17 | | | | |
| 50.0 | 51.5 | 50.0 | | f to m sand | 17 | 0.71 | 12 | | | | |
| 55.0 | 56.5 | | | f to m sand | 23 | 0.68 | 16 | | | | |
| 60.0 | 61.5 | | | f to m sand | 20 | 0.65 | 13 | | | | |
| 65.0 | 66.5 | | | f to m sand | 26 | 0.62 | 16 | | | | |
| 70.0 | 71.5 | | | f to m sand | 30 | 0.60 | 18 | | | | |
| 75.0 | 76.5 | | ≥76.5 | vf to f sand | 31 | 0.58 | 18 | | | | |

FIELD BORING LOG NO.286A

Depth to water table (ft) NA(15) Topstratum thickness (ft) 53

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 30.0 | clay | | | | | | | |
| | | 30.0 | 53.0 | silty clay and silt layers | | | | | | | |
| 55.0 | 56.5 | 53.0 | | vf to m sand | 28 | 0.67 | 19 | | | | |
| 60.0 | 61.5 | | | vf to m sand | 44 | 0.65 | 29 | | | | |
| 65.0 | 66.5 | | | vf to m sand | 27 | 0.62 | 17 | | | | |
| 70.0 | 71.5 | | | vf to m sand | 47 | 0.60 | 28 | | | | |
| 75.0 | 76.5 | | 75.0 | vf to m sand, w/some f gravel | 26 | 0.58 | 15 | | | | |
| 80.0 | 81.5 | 75.0 | ≥81.5 | vf to m sand, w/some f gravel | 31 | 0.56 | 17 | | | | |

FIELD BORING LOG NO. 286B

Depth to water table (ft): NA(15) Topstratum thickness (ft): 51

Laboratory Classification

| Sample From (ft) | To (ft) | Stratum From (ft) | To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 30.0 | silty clay | | | | | | | |
| | | 30.0 | 35.0 | silt and silty clay | | | | | | | |
| | | 35.0 | 40.0 | silt | | | | | | | |
| | | 40.0 | 51.0 | silty clay | | | | | | | |
| 55.0 | 56.5 | 51.0 | · | vf to m sand | 25 | 0.67 | 17 | | | | |
| 60.0 | 61.5 | | | vf to m sand | 59 | 0.65 | 38 | | | | |
| 65.0 | 66.5 | | | vf to m sand | 29 | 0.62 | 18 | | | | |
| 70.0 | 71.5 | | | vf to m sand | 36 | 0.60 | 22 | | | | |
| 75.0 | 76.5 | | | vf to m sand | 27 | 0.58 | 16 | | | | |
| 80.0 | 81.5 | | ≥81.5 | vf to m sand | 39 | 0.56 | 22 | | | | |

FIELD BORING LOG NO. 287A

Depth to water table (ft): NA(15) Topstratum thickness (ft): 9

Laboratory Classification

| Sample From (ft) | To (ft) | Stratum From (ft) | To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.0 | silt | | | | | | | |
| 10.0 | 11.5 | 9.0 | 15.0 | m sand | 24 | 1.22 | 29 | | | | |
| 15.0 | 16.5 | 15.0 | | vf sand | 15 | 1.03 | 15 | | | | |
| 20.0 | 21.5 | | 21.0 | vf sand | 61 | 0.95 | 58 | | | | |
| 25.0 | 26.5 | 21.0 | | vc sand | 35 | 0.89 | 31 | | | | |
| 30.0 | 31.5 | | | vc sand | 43 | 0.85 | 37 | | | | |
| 35.0 | 36.5 | | | vc sand | 80 | 0.81 | 65 | | | | |
| 40.0 | 41.5 | | | vc sand | 61 | 0.77 | 47 | | | | |
| 45.0 | 46.5 | | 50.0 | f sand | 62 | 0.73 | 45 | | | | |
| 50.0 | 51.5 | 50.0 | | f sand | 55 | 0.70 | 39 | | | | |
| 55.0 | 56.5 | | | f sand | 49 | 0.67 | 33 | | | | |
| 60.0 | 61.5 | | ≥65.0 | f sand | 52 | 0.65 | 34 | | | | |

FIELD BORING LOG NO. 287B

Depth to water table (ft): NA(15) Topstratum thickness (ft): 9

Laboratory Classification

| Sample From (ft) | To (ft) | Stratum From (ft) | To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.0 | clay | | | | | | | |
| 10.0 | 11.5 | 9.0 | 15.0 | vf sand | 11 | 1.22 | 13 | | | | |
| 15.0 | 16.5 | 15.0 | | m sand | 33 | 1.03 | 34 | | | | |
| 20.0 | 21.5 | | 25.0 | m sand | 36 | 0.95 | 34 | | | | |
| 25.0 | 26.5 | 25.0 | | c sand w/many pebbles | 16 | 0.89 | 14 | | | | |
| 30.0 | 31.5 | | 35.0 | c sand w/many pebbles | 22 | 0.85 | 19 | | | | |
| 35.0 | 36.5 | 35.0 | | vc sand | 38 | 0.81 | 31 | | | | |
| 40.0 | 41.5 | | | vc sand | 32 | 0.77 | 25 | | | | |
| 45.0 | 46.5 | | | vc sand | 33 | 0.73 | 24 | | | | |
| 50.0 | 51.5 | | 55.0 | m sand | 29 | 0.70 | 20 | | | | |
| 55.0 | 56.5 | 55.0 | | m sand | 48 | 0.67 | 32 | | | | |
| 60.0 | 61.5 | | ≥61.5 | m sand | 28 | 0.65 | 18 | | | | |

FIELD BORING LOG NO. 288A

Depth to water table (ft): NA(15) Topstratum thickness (ft): 17

Laboratory Classification

| Sample From (ft) | To (ft) | Stratum From (ft) | To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 12.0 | sandy clay | | | | | | | |
| | | 12.0 | 16.5 | clayey and silty sand | | | | | | | |
| 20.0 | 21.5 | 16.5 | | m sand | 29 | 0.96 | 28 | | | | |
| 25.0 | 26.5 | | | m sand | 30 | 0.90 | 27 | | | | |
| 30.0 | 31.5 | | 35.0 | m sand | 36 | 0.85 | 31 | | | | |
| 35.0 | 36.5 | 35.0 | | vc sand | 51 | 0.81 | 41 | | | | |
| 40.0 | 41.5 | | | vc sand | 50 | 0.77 | 39 | | | | |
| 45.0 | 46.5 | | | vc sand | 55 | 0.73 | 40 | | | | |
| 50.0 | 51.5 | | | vc sand | 81 | 0.70 | 57 | | | | |
| 55.0 | 56.5 | | 56.5 | vc sand | 80 | 0.67 | 54 | | | | |
| 60.0 | 61.5 | 56.5 | | m to vc sand | 69 | 0.64 | 44 | | | | |
| 65.0 | 66.5 | | ≥66.5 | m to vc sand | 66 | 0.62 | 41 | | | | |

FIELD BORING LOG NO. 288B

Depth to water table (ft): NA(15) Topstratum thickness (ft): 16

Laboratory Classification

| Sample From (ft) | To (ft) | Stratum From (ft) | To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 16.0 | sandy clay | | | | | | | |
| 20.0 | 21.5 | 16.0 | | m to c sand | 30 | 0.96 | 29 | | | | |
| 25.0 | 26.5 | | 30.0 | m to c sand | 29 | 0.90 | 26 | | | | |
| 30.0 | 31.5 | 30.0 | | c to vc sand | 38 | 0.85 | 32 | | | | |
| 35.0 | 36.5 | | 40.0 | c to vc sand | 32 | 0.81 | 26 | | | | |
| 40.0 | 41.5 | 40.0 | | vc sand | 16 | 0.77 | 12 | | | | |
| 45.0 | 46.5 | | | vc sand | 31 | 0.73 | 23 | | | | |
| 50.0 | 51.5 | | 55.0 | vc sand | 39 | 0.70 | 27 | | | | |
| 55.0 | 56.5 | 55.0 | 60.0 | m sand | 55 | 0.67 | 37 | | | | |
| 60.0 | 61.5 | 60.0 | | f to m sand | 51 | 0.64 | 33 | | | | |
| 65.0 | 66.5 | | ≥70.0 | f to m sand | 51 | 0.62 | 32 | | | | |

FIELD BORING LOG NO. 289A

Depth to water table (ft): NA(15) Topstratum thickness (ft): 11

Laboratory Classification

| Sample From (ft) | To (ft) | Stratum From (ft) | To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 11.0 | sandy clay | | | | | | | |
| 15.0 | 16.5 | 11.0 | | vc sand | 32 | 1.5 | 48 | | | | |
| 20.0 | 21.5 | | | vc sand | 34 | 0.97 | 33 | | | | |
| 25.0 | 26.0 | | 30.0 | vc sand | 30 | 0.91 | 27 | | | | |
| 30.0 | 31.5 | 30.0 | 35.0 | m sand and coal chips | 39 | 0.85 | 33 | | | | |
| 35.0 | 36.5 | 35.0 | 40.0 | c sand | 25 | 0.81 | 20 | | | | |
| 40.0 | 41.5 | 40.0 | | vc sand | 34 | 0.77 | 26 | | | | |
| 45.0 | 46.5 | | 50.0 | vc sand | 48 | 0.75 | 36 | | | | |
| 50.0 | 51.5 | 50.0 | 55.0 | c sand | 55 | 0.71 | 39 | | | | |
| 55.0 | 56.5 | 55.0 | 60.0 | m sand | 35 | 0.68 | 24 | | | | |
| 60.0 | 61.5 | 60.0 | 65.0 | f sand | 50 | 0.65 | 33 | | | | |
| 65.0 | 66.5 | 65.0 | ≥66.5 | c sand | 71 | 0.62 | 44 | | | | |

FIELD BORING LOG NO. 289B

Depth to water table (ft): NA(15) Topstratum thickness (ft): 16

Laboratory Classification

| Sample From (ft) | To (ft) | Stratum From (ft) | To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.0 | sandy clay | | | | | | | |
| | | 8.0 | 12.0 | m to c sand | | | | | | | |
| | | 12.0 | 16.0 | silt | | | | | | | |
| 20.0 | 21.5 | 16.0 | 20.0 | m sand | 31 | 0.97 | 30 | | | | |
| 25.0 | 26.5 | | | m sand | 40 | 0.91 | 36 | | | | |
| 30.0 | 31.5 | | | m sand | 47 | 0.85 | 40 | | | | |
| 35.0 | 36.5 | | | m sand | 31 | 0.81 | 25 | | | | |
| 40.0 | 41.5 | | | m sand | 23 | 0.77 | 18 | | | | |
| 45.0 | 46.5 | 40.0 | 45.0 | c sand | 60 | 0.75 | 45 | | | | |
| 50.0 | 51.5 | 45.0 | | m sand | 48 | 0.71 | 34 | | | | |
| 55.0 | 56.5 | | | m sand | 55 | 0.68 | 37 | | | | |
| 60.0 | 61.5 | | | m sand | 73 | 0.65 | 36 | | | | |
| 65.0 | 66.5 | | ≥66.5 | m sand | NA | | | | | | |

FIELD BORING LOG NO. 290

Depth to water table (ft): NA(6) Topstratum thickness (ft): 0

Laboratory Classification

| Sample From (ft) | To (ft) | Stratum From (ft) | To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9.0 | 10.5 | 0.0 | 9.0 | wind-blown f sand | 12 | | | | | | |
| 14.0 | 15.5 | 9.0 | | m sand | 27 | 1.24 | 33 | | | | |
| 19.0 | 20.5 | | 22.0 | m sand | 29 | 1.13 | 33 | | | | |
| 24.0 | 25.5 | 22.0 | 29.0 | c sand | 43 | 1.04 | 45 | | | | |
| 29.0 | 30.5 | 29.0 | 32.0 | m sand | 21 | 0.96 | 20 | | | | |
| 34.0 | 35.5 | 32.0 | 37.0 | f sand | 30 | 0.90 | 27 | | | | |
| 39.0 | 40.5 | 37.0 | | c sand | 43 | 0.85 | 37 | | | | |
| 44.0 | 45.5 | | ≥45.5 | c sand | 37 | 0.81 | 30 | | | | |

FIELD BORING LOG NO. 291A

Depth to water table (ft): 6 | Topstratum thickness (ft): 0 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.6 | 7.1 | 0.0 | | m sand | 48 | >1.4 | >67 | | | | |
| 10.6 | 12.1 | | | m sand | 41 | 1.34 | 55 | | | | |
| 15.6 | 17.1 | | | m sand | 25 | 1.21 | 30 | | | | |
| 20.6 | 22.1 | | | m sand | 38 | 1.1 | 42 | | | | |
| 25.6 | 27.1 | | 28.0 | m sand | 69 | 1.02 | 70 | | | | |
| 30.6 | 32.1 | 28.0 | | f sand | 32 | 0.95 | 30 | | | | |
| 35.6 | 37.1 | | ≥37.1 | f sand | 49 | 0.88 | 43 | | | | |

FIELD BORING LOG NO. 291B

Depth to water table (ft): 6 | Topstratum thickness (ft): .0 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.0 | 7.5 | | | m sand | 13 | >1.4 | >18 | | | | |
| 11.0 | 12.5 | | | m sand | 38 | 1.33 | 51 | | | | |
| 16.0 | 17.5 | | 18.0 | m sand | 31 | 1.20 | 37 | | | | |
| 21.0 | 22.5 | 18.0 | 24.0 | f sand | 25 | 1.08 | 27 | | | | |
| 26.0 | 27.5 | 24.0 | | m sand | 50 | 1.0 | 50 | | | | |
| 31.0 | 32.5 | | 28.0 | m sand w/lignite | 25 | 0.93 | 23 | | | | |
| 36.0 | 37.5 | 28.0 | ≥37.5 | m sand w/lignite | 35 | 0.88 | 31 | | | | |

FIELD BORING LOG NO. 292

Depth to water table (ft): 10 | Topstratum thickness (ft): 0 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9.0 | 10.5 | 0.0 | 12.0 | m sand | 28 | 1.28 | 36 | | | | |
| 14.0 | 15.5 | 12.0 | 17.0 | c sand | 37 | 1.14 | 42 | | | | |
| 19.0 | 20.5 | 17.0 | | m sand | 37 | 1.06 | 39 | | | | |
| 24.0 | 25.5 | | 27.0 | m sand | 30 | 0.98 | 29 | | | | |
| 29.0 | 30.5 | 27.0 | 31.0 | f sand | 35 | 0.92 | 32 | | | | |
| 34.0 | 35.5 | 31.0 | 37.0 | f sand w/lignite | 16 | 0.86 | 14 | | | | |
| 39.0 | 40.5 | 37.0 | 42.0 | m sand | 44 | 0.82 | 36 | | | | |
| 44.0 | 45.5 | 42.0 | ≥45.5 | m sand w/lignite | 36 | 0.78 | 28 | | | | |

FIELD BORING LOG NO. 293A

Depth to water table (ft): 6 | Topstratum thickness (ft): 0 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 13.0 | 14.5 | 0.0 | | m sand | 33 | 1.26 | 42 | | | | |
| 18.0 | 19.5 | | | m sand | 16 | 1.14 | 18 | | | | |
| 23.0 | 24.5 | | | m sand | 18 | 1.06 | 19 | | | | |
| 28.0 | 29.5 | | | m sand | 13 | 0.97 | 13 | | | | |
| 34.5 | 36.0 | | | m sand | 29 | 0.91 | 26 | | | | |
| 38.0 | 39.5 | | | m sand | 21 | 0.84 | 18 | | | | |
| 43.0 | 44.5 | | ≥44.5 | m sand | 22 | 0.81 | 18 | | | | |

FIELD BORING LOG NO. 293B

Depth to water table (ft): 6 | Topstratum thickness (ft): 0 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 13.0 | 14.5 | 0.0 | | f sand | 15 | 1.26 | 19 | | | | |
| 18.0 | 19.5 | | | f sand | 12 | 1.14 | 14 | | | | |
| 23.0 | 24.5 | | | f sand | 23 | 1.06 | 24 | | | | |
| 28.0 | 29.5 | | 30.0 | f sand | 14 | 0.97 | 14 | | | | |
| 33.0 | 34.5 | 30.0 | | m sand | 46 | 0.92 | 42 | | | | |
| 34.5 | 36.0 | | 37.0 | m sand | 29 | 0.91 | 26 | | | | |
| 38.0 | 39.5 | 37.0 | | f sand w/lignite | 41 | 0.84 | 34 | | | | |
| 43.0 | 44.5 | | 41.0 | vf sand | 23 | 0.81 | 19 | | | | |
| 48.0 | 49.5 | 41.0 | | vf sand | 70 | 0.77 | 54 | | | | |
| 53.0 | 54.5 | | ≥54.5 | vf sand | 28 | 0.75 | 21 | | | | |

FIELD BORING LOG NO. 294A

Depth to water table (ft): 12 | Topstratum thickness (ft): 24 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 24.0 | silty clay w/some silt layers | | | | | | | |
| 25.0 | 26.5 | 24.0 | | vf sand | 20 | 0.93 | 19 | | | | |
| 30.0 | 31.5 | | | vf sand | 25 | 0.88 | 22 | | | | |
| 35.0 | 36.5 | | | vf sand | 35 | 0.84 | 29 | | | | |
| 40.0 | 41.5 | | | vf sand | 38 | 0.80 | 30 | | | | |
| 45.0 | 46.5 | | | vf sand | 66 | 0.76 | 50 | | | | |
| 50.0 | 51.5 | | | vf sand w/some lignite layers | 32 | 0.72 | 23 | | | | |
| 55.0 | 56.5 | | | vf sand w/some lignite layers | 27 | 0.69 | 19 | | | | |
| 60.0 | 61.5 | | | vf sand w/some lignite layers | 29 | 0.66 | 19 | | | | |
| 65.0 | 66.5 | | | vf sand w/some lignite layers | 32 | 0.64 | 20 | | | | |
| 70.0 | 71.5 | | ≥71.5 | vf sand w/some lignite layers | 23 | 0.61 | 14 | | | | |

FIELD BORING LOG NO. 294B

Depth to water table (ft): 12 | Topstratum thickness (ft): 24 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 24.0 | silty clay | | | | | | | |
| 25.0 | 26.5 | 24.0 | | vf to m sand | 3 | 0.93 | 3 | | | | |
| 30.0 | 31.5 | | | vf to m sand | 23 | 0.88 | 20 | | | | |
| 35.0 | 36.5 | | | vf to m sand | 26 | 0.84 | 22 | | | | |
| 40.0 | 41.5 | | | vf to m sand | 29 | 0.80 | 23 | | | | |
| 45.0 | 46.5 | | | vf to m sand | 31 | 0.76 | 24 | | | | |
| 50.0 | 51.5 | | | vf to m sand | 30 | 0.72 | 22 | | | | |
| 55.0 | 56.5 | | | vf to m sand | 35 | 0.69 | 24 | | | | |
| 60.0 | 61.5 | | | vf to m sand | 22 | 0.66 | 15 | | | | |
| 65.0 | 66.5 | | | vf to m sand | 37 | 0.64 | 24 | | | | |
| 70.0 | 71.5 | | ≥71.5 | vf to m sand | 41 | 0.61 | 25 | | | | |

FIELD BORING LOG NO. 295A

Depth to water table (ft): 8 | Topstratum thickness (ft): 0 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9.6 | 11.1 | 0.0 | 13.0 | c sand | 28 | 1.28 | 36 | | | | |
| 14.6 | 16.1 | 13.0 | 18.0 | c sand and gravel | 38 | 1.16 | 44 | | | | |
| 19.6 | 21.1 | 18.0 | 23.0 | m sand and gravel layers | 80 | 1.06 | 85 | | | | |
| 24.6 | 26.1 | 23.0 | 28.0 | f sand | 58 | 0.98 | 57 | | | | |
| 29.6 | 31.1 | 28.0 | | f sand w/lignite | 54 | 0.92 | 50 | | | | |
| 34.6 | 36.1 | | 38.0 | f sand w/lignite | 58 | 0.86 | 50 | | | | |
| 39.6 | 41.1 | 38.0 | ≥41.1 | vf sand w/lignite | 41 | 0.82 | 34 | | | | |

FIELD BORING LOG NO. 295B

Depth to water table (ft): 8 | Topstratum thickness (ft): 0 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10.0 | 11.6 | 0.0 | 13.0 | f sand | 46 | 1.28 | 59 | | | | |
| 15.1 | 16.6 | 13.0 | 18.0 | f sand and lignite | 41 | 1.16 | 48 | | | | |
| 20.1 | 21.6 | 18.0 | | c sand | 65 | 1.06 | 69 | | | | |
| 25.1 | 26.6 | | 28.0 | c sand | 55 | 0.99 | 54 | | | | |
| 30.1 | 31.6 | 28.0 | 35.0 | f sand and lignite | 66 | 0.92 | 61 | | | | |
| 40.1 | 41.6 | 35.0 | ≥41.6 | c sand and lignite | 39 | 0.82 | 32 | | | | |

FIELD BORING LOG NO. 296

Depth to water table (ft): 3 | Topstratum thickness (ft): 3 | Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 3.0 | sandy silt | | | | | | | |
| | | 3.0 | 23.0 | coarse sand | NA | | | | | | |

### FIELD BORING LOG NO. 297

| Depth to water table (ft) | Topstratum thickness (ft) | Laboratory Classification |
|---|---|---|
| 15 | 0 | |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 13.0 | 14.5 | 0.0 | 15.0 | m sand | 27 | 1.1 | 30 | | | | |
| 18.0 | 19.5 | | | f sand | 37 | 1.0 | 37 | | | | |
| 23.0 | 24.5 | | 25.0 | f sand | 37 | 0.93 | 34 | | | | |
| 28.0 | 29.5 | 25.0 | 31.0 | m sand w/lignite | 38 | 0.88 | 33 | | | | |
| 33.0 | 34.5 | 31.0 | 36.0 | c sand | 56 | 0.83 | 46 | | | | |
| 38.0 | 39.5 | 36.0 | 41.0 | m sand w/lignite | 49 | 0.78 | 38 | | | | |
| 43.0 | 44.5 | 41.0 | | c sand | 50 | 0.75 | 38 | | | | |
| 48.0 | 49.5 | | | c sand | 38 | 0.72 | 27 | | | | |
| 53.0 | 54.5 | 50.0 | ≥54.5 | m sand w/pebbles | 45 | 0.69 | 31 | | | | |

### FIELD BORING LOG NO. 298

| Depth to water table (ft) | Topstratum thickness (ft) | Laboratory Classification |
|---|---|---|
| 7 | 0 | |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.0 | 4.5 | 0.0 | 6.0 | m sand | 10 | >1.4 | >14 | | | | |
| 8.0 | 9.5 | 6.0 | | c sand | 16 | 1.4 | 22 | | | | |
| 13.0 | 14.5 | | 16.0 | c sand | 19 | 1.22 | 23 | | | | |
| 18.0 | 19.5 | 16.0 | 21.0 | m sand w/lignite | 14 | 1.13 | 16 | | | | |
| 23.0 | 24.5 | 21.0 | 26.0 | f sand w/lignite | 3 | 1.04 | 3 | | | | |
| 28.0 | 29.5 | 26.0 | | m sand | 21 | 0.96 | 20 | | | | |
| 33.0 | 34.5 | | 36.0 | m sand | 44 | 0.90 | 40 | | | | |
| 38.0 | 39.5 | 36.0 | 41.0 | c sand | 35 | 0.85 | 30 | | | | |
| 43.0 | 44.5 | 41.0 | ≥44.5 | m sand | 37 | 0.8 | 30 | | | | |

### FIELD BORING LOG NO. 299A

| Depth to water table (ft) | Topstratum thickness (ft) | Laboratory Classification |
|---|---|---|
| NA(10) | 21 | |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 12.5 | clay | | | | | | | |
| | | 12.5 | 21.0 | silt and clay | | | | | | | |
| 25.0 | 26.5 | 21.0 | 27.5 | silty sand | 14 | 0.96 | 13 | | | | |
| 30.0 | 31.5 | 27.5 | | c sand and gravel | 31 | 0.90 | 28 | | | | |
| 35.0 | 36.5 | | | c sand and gravel | NA | | | | | | |
| 40.0 | 41.5 | | | c sand and gravel | 62 | 0.82 | 50 | | | | |
| 45.0 | 46.5 | | | c sand and gravel | 78 | 0.77 | 60 | | | | |
| 50.0 | 51.5 | | 51.5 | c sand and gravel | 42 | 0.73 | 31 | | | | |
| | | 51.5 | 79.0 | c sand and some gravel | NA | | | | | | |
| | | 79.0 | 90.0 | c sand and gravel layers | NA | | | | | | |
| | | 90.0 | 100.0 | c sand and gravel layers | NA | | | | | | |

### FIELD BORING LOG NO. 299B

| Depth to water table (ft) | Topstratum thickness (ft) | Laboratory Classification |
|---|---|---|
| NA(10) | 20 | |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 20.0 | silty and sandy clay | | | | | | | |
| 20.0 | 21.5 | 20.0 | | sand | 8 | 1.03 | 8 | | | | |
| 25.0 | 26.5 | | | sand | 49 | 0.96 | 47 | | | | |
| 30.0 | 31.5 | | | sand | 46 | 0.90 | 41 | | | | |
| 35.0 | 36.5 | | | sand | 77 | 0.83 | 64 | | | | |
| 40.0 | 41.5 | | | sand | 52 | 0.80 | 42 | | | | |
| 45.0 | 46.5 | | | sand | 74 | 0.77 | 57 | | | | |
| 50.0 | 51.5 | | ≥51.5 | sand | 93 | 0.73 | 68 | | | | |

### FIELD BORING LOG NO. 299C

| Depth to water table (ft) | Topstratum thickness (ft) | Laboratory Classification |
|---|---|---|
| NA(10) | 22 | |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 22.0 | silty clay and silty sand | | | | | | | |
| 25.0 | 26.5 | 22.0 | | sand | 22 | 0.96 | 21 | | | | |
| 30.0 | 31.5 | | | sand | 58 | 0.90 | 52 | | | | |
| 35.0 | 36.5 | | | sand | 93 | 0.83 | 77 | | | | |
| 40.0 | 41.5 | | | sand | 52 | 0.80 | 42 | | | | |
| 45.0 | 46.5 | | | sand | 51 | 0.77 | 39 | | | | |
| 50.0 | 51.5 | | 60.0 | sand | >100 | 0.73 | >73 | | | | |
| | | 60.0 | 100.0 | sand and gravel | | | | | | | |

### FIELD BORING LOG NO. 300A

| Depth to water table (ft) | Topstratum thickness (ft) | Laboratory Classification |
|---|---|---|
| NA(10) | 26 | |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 7.0 | sandy silt | | | | | | | |
| | | 7.0 | 17.0 | clay | | | | | | | |
| | | 17.0 | 25.5 | sandy silt | | | | | | | |
| 25.0 | 26.5 | 25.5 | | f sand | 16 | 0.95 | 15 | | | | |
| 30.0 | 31.5 | | 32.0 | f sand | 31 | 0.89 | 28 | | | | |
| 35.0 | 36.5 | 32.0 | | sand | 69 | 0.83 | 57 | | | | |
| 40.0 | 41.5 | | | sand | 44 | 0.80 | 35 | | | | |
| 45.0 | 46.5 | | | sand | 53 | 0.77 | 41 | | | | |
| 50.0 | 51.5 | | | sand | 80 | 0.73 | 58 | | | | |
| | | | 61.0 | sand | | | | | | | |
| | | 61.0 | 92.0 | c sand and gravel layers | | | | | | | |
| | | 92.0 | 100.0 | c sand and c gravel layers | | | | | | | |

### FIELD BORING LOG NO. 300B

| Depth to water table (ft) | Topstratum thickness (ft) | Laboratory Classification |
|---|---|---|
| NA(10) | 26 | |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 7.0 | sandy silt | | | | | | | |
| | | 7.0 | 12.5 | clay | | | | | | | |
| | | 12.5 | 26.0 | sandy silt | | | | | | | |
| 30.0 | 31.5 | 26.0 | | sand | 41 | 0.89 | 36 | | | | |
| 35.0 | 36.5 | | | sand | 61 | 0.83 | 51 | | | | |
| 40.0 | 41.5 | | | sand | 45 | 0.80 | 36 | | | | |
| 45.0 | 46.5 | | | sand | 62 | 0.77 | 48 | | | | |
| 50.0 | 51.5 | | ≥51.5 | sand | 58 | 0.73 | 42 | | | | |

### FIELD BORING LOG NO. 301A

| Depth to water table (ft) | Topstratum thickness (ft) | Laboratory Classification |
|---|---|---|
| NA(10) | 39 | |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 12.0 | clay | | | | | | | |
| | | 12.0 | 39.0 | sandy silt | | | | | | | |
| 40.0 | 41.5 | 39.0 | | f sand | 21 | 0.80 | 17 | | | | |
| 45.0 | 46.5 | | 49.0 | f sand | 34 | 0.77 | 26 | | | | |
| 50.0 | 51.5 | 49.0 | | c sand | 45 | 0.73 | 33 | | | | |
| 55.0 | 56.5 | | | c sand | 38 | 0.70 | 27 | | | | |
| 60.0 | 61.5 | | | c sand | 35 | 0.67 | 23 | | | | |
| | | | 72.0 | c sand | | | | | | | |
| | | 72.0 | 100.0 | c sand and gravel layers | | | | | | | |

0(se ml, 175, h5)

### FIELD BORING LOG NO. 301B

| Depth to water table (ft) | Topstratum thickness (ft) | Laboratory Classification |
|---|---|---|
| NA(10) | 27(57) | |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.0 | clay | | | | | | | |
| | | 9.0 | 27.0 | sandy silt | | | | | | | |
| 30.0 | 31.5 | 27.0 | | c sand | 42 | 0.89 | 37 | | | | |
| 35.0 | 36.5 | | | c sand | 28 | 0.84 | 24 | | | | |
| 40.0 | 41.5 | | 44.0 | c sand | 21 | 0.80 | 17 | | | | |
| 45.0 | 46.5 | 44.0 | 49.0 | c sand and gravel | 68 | 0.77 | 52 | | | | |
| | | 49.0 | 57.0 | sandy clay and clay | | | | | | | |
| 60.0 | 61.5 | 57.0 | 66.0 | c sand and c gravel layers | 74 | 0.67 | 50 | | | | |
| | | 66.0 | 67.5 | boulders | NA | | | | | | |
| | | 67.5 | 92.0 | c sand | NA | | | | | | |
| | | 92.0 | 100.0 | c gravel | NA | | | | | | |

### FIELD BORING LOG NO. 302

| Depth to water table (ft) | Topstratum thickness (ft) | Laboratory Classification |
|---|---|---|
| 12 | 45 | |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 45.3 | silty clay | | | | | | | |
| 45.0 | 46.5 | 45.3 | | f to c sand, w/some f gravel | 26 | 0.76 | 20 | | | | |
| 50.0 | 51.5 | | | f to c sand, w/some f gravel | 53 | 0.72 | 38 | | | | |
| 55.0 | 56.5 | | | f to c sand, w/some f gravel | 94 | 0.69 | 65 | | | | |
| 60.0 | 61.5 | | | f to c sand, w/some f gravel | 66 | 0.67 | 44 | | | | |
| 65.0 | 66.5 | | ≥66.5 | f to c sand, w/some f gravel | >100 | 0.64 | >64 | | | | |

FIELD BORING LOG NO. 303

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 13 | 13 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 6.0 | clay | | | | | | | |
| | | 6.0 | 13.0 | sandy clay | | | | | | | |
| 15.0 | 16.5 | 13.0 | | f sand | 6 | 1.08 | 6 | | | | |
| 20.0 | 21.5 | | | f sand | 13 | 0.99 | 13 | | | | |
| 25.0 | 26.5 | | 27.5 | f sand | 9 | 0.92 | 8 | | | | |
| 30.0 | 31.5 | 27.5 | 33.0 | f to m sand | 43 | 0.87 | 37 | | | | |
| 35.0 | 36.5 | 33.0 | | m to c sand | 53 | 0.86 | 43 | | | | |
| 40.0 | 41.5 | | 43.5 | m to c sand | 51 | 0.78 | 40 | | | | |
| 45.0 | 46.5 | 43.5 | | m sand | >100 | 0.75 | >75 | | | | |
| 50.0 | 51.5 | | 53.5 | m sand | 67 | 0.72 | 48 | | | | |
| 55.0 | 56.5 | 53.5 | | m sand | 91 | 0.68 | 62 | | | | |
| 60.0 | 61.5 | | 63.8 | f to m sand | 53 | 0.66 | 35 | | | | |
| 65.0 | 66.5 | 63.8 | ≥66.5 | f to m sand | 100 | 0.63 | 63 | | | | |

FIELD BORING LOG NO. 304A

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| NA(10) | 4 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 4.0 | sandy clay | | | | | | | |
| 10.0 | 11.5 | 4.0 | | m to c sand | 12 | 1.24 | 15 | | | | |
| 15.0 | 16.5 | | | m to c sand | 18 | 1.13 | 20 | | | | |
| 20.0 | 21.5 | | | m to c sand | 11 | 1.03 | 11 | | | | |
| 25.0 | 26.5 | | | m to c sand | 35 | 0.96 | 34 | | | | |
| 30.0 | 31.5 | | | m to c sand | 30 | 0.89 | 27 | | | | |
| 35.0 | 36.5 | | | m to c sand | 26 | 0.85 | 22 | | | | |
| 40.0 | 41.5 | | | m to c sand | 23 | 0.81 | 19 | | | | |
| 45.0 | 46.5 | | | m to c sand | 50 | 0.77 | 39 | | | | |
| 50.0 | 51.5 | | | m to c sand | 52 | 0.73 | 38 | | | | |
| 55.0 | 56.5 | | 59.0 | m to c sand | 24 | 0.70 | 17 | | | | |
| 60.0 | 61.5 | 59.0 | | m to c sand, w/some pebbles and lignite | 28 | 0.68 | 19 | | | | |
| 65.0 | 66.5 | | ≥66.5 | m to c sand, w/some pebbles and lignite | 23 | 0.64 | 15 | | | | |

FIELD BORING LOG NO. 304B

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| NA(10) | 15 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 15.0 | sandy clay | | | | | | | |
| 15.0 | 16.5 | 15.0 | 19.0 | m sand | 21 | 1.13 | 24 | | | | |
| 20.0 | 21.5 | 19.0 | | m sand | 7 | 1.03 | 7 | | | | |
| 25.0 | 26.5 | | | m sand | 27 | 0.96 | 26 | | | | |
| 30.0 | 31.5 | | | m sand | 16 | 0.89 | 14 | | | | |
| 35.0 | 36.5 | | | m sand | 30 | 0.85 | 26 | | | | |
| 40.0 | 41.5 | | 45.0 | m sand | 43 | 0.81 | 35 | | | | |
| 45.0 | 46.5 | 45.0 | | m to c sand | 68 | 0.77 | 52 | | | | |
| 50.0 | 51.5 | | | m to c sand | 50 | 0.73 | 37 | | | | |
| 55.0 | 56.5 | | | m to c sand | 56 | 0.70 | 39 | | | | |
| 60.0 | 61.5 | | | m to c sand | 70 | 0.68 | 48 | | | | |
| 65.0 | 66.5 | | ≥66.5 | m to c sand | >100 | 0.64 | >64 | | | | |

FIELD BORING LOG No. 305A

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| NA(10) | 11 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 10.5 | silty clay | | | | | | |
| 15.0 | 16.5 | 10.5 | | m sand | 20 | 1.13 | 23 | | | |
| 20.0 | 21.5 | | | m sand | 35 | 1.04 | 36 | | | |
| 25.0 | 26.5 | | 28.0 | m sand | 32 | 0.96 | 31 | | | |
| 30.0 | 31.5 | 28.0 | | m to c sand | 56 | 0.90 | 50 | | | |
| 35.0 | 36.5 | | | m to c sand | 52 | 0.85 | 44 | | | |
| 40.0 | 41.5 | | | m to c sand | 48 | 0.81 | 39 | | | |
| 45.0 | 46.5 | | | m to c sand | 40 | 0.77 | 31 | | | |
| 50.0 | 51.5 | | | m to c sand | 47 | 0.73 | 34 | | | |
| 55.0 | 56.5 | | | m to c sand | 43 | 0.70 | 30 | | | |
| 60.0 | 61.5 | | | m to c sand | 43 | 0.67 | 29 | | | |
| 65.0 | 66.5 | | | m to c sand | 45 | 0.65 | 29 | | | |
| 70.0 | 71.5 | | ≥71.5 | m to c sand | 37 | 0.63 | 23 | | | |

FIELD BORING LOG NO. 305B

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| NA(10) | 10 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 10.3 | clay | | | | | | | |
| 10.0 | 11.5 | 10.3 | | sand | 21 | 1.24 | 26 | | | | |
| 15.0 | 16.5 | | | sand | 46 | 1.13 | 52 | | | | |
| 20.0 | 21.5 | | | sand | 40 | 1.04 | 42 | | | | |
| 25.0 | 26.5 | | | sand | 36 | 0.96 | 35 | | | | |
| 30.0 | 31.5 | | | sand | 34 | 0.90 | 31 | | | | |
| 35.0 | 36.5 | | | sand | 35 | 0.85 | 30 | | | | |
| 40.0 | 41.5 | | | sand | 48 | 0.81 | 39 | | | | |
| 45.0 | 46.5 | | | sand | 68 | 0.77 | 52 | | | | |
| 50.0 | 51.5 | | | sand | 41 | 0.73 | 32 | | | | |
| 55.0 | 56.5 | | | sand | 41 | 0.70 | 29 | | | | |
| 60.0 | 61.5 | | | sand | 48 | 0.67 | 32 | | | | |
| 70.0 | 71.5 | | ≥71.5 | sand | 61 | 0.63 | 38 | | | | |

FIELD BORING LOG NO. 306A

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| NA(10) | 8 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 6.0 | sand and clayey sand | | | | | | | |
| | | 6.0 | 8.0 | sandy clay | | | | | | | |
| 10.0 | 11.5 | 8.0 | | f to m sand | 11 | 1.26 | 14 | | | | |
| 15.0 | 16.5 | | 20.0 | f to m sand | 30 | 1.14 | 34 | | | | |
| 20.0 | 21.5 | 20.0 | | c to vc sand | 17 | 1.05 | 18 | | | | |
| 25.0 | 26.5 | | | c to vc sand | 16 | 0.97 | 16 | | | | |
| 30.0 | 31.5 | | | c to vc sand | 20 | 0.93 | 19 | | | | |
| 35.0 | 36.5 | | | c to vc sand | 16 | 0.85 | 14 | | | | |
| 40.0 | 41.5 | | | c to vc sand | 27 | 0.81 | 22 | | | | |
| 45.0 | 46.5 | | | c to vc sand | 29 | 0.77 | 22 | | | | |
| 50.0 | 51.5 | | | c to vc sand | 31 | 0.73 | 23 | | | | |
| 55.0 | 56.5 | | | c to vc sand | 21 | 0.70 | 15 | | | | |
| 60.0 | 61.5 | | | c to vc sand | 50 | 0.67 | 34 | | | | |
| 65.0 | 66.5 | | | c to vc sand | 15 | 0.65 | 10 | | | | |
| 70.0 | 71.5 | | | c to vc sand | 24 | 0.62 | 15 | | | | |
| 75.0 | 76.5 | | ≥76.5 | c to vc sand | 24 | 0.60 | 14 | | | | |

FIELD BORING LOG NO. 306B

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| NA(10) | 11 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 7.0 | sand w/thin clay layers | | | | | | | |
| | | 7.0 | 11.0 | clayey sand | | | | | | | |
| 15.0 | 16.5 | 11.0 | | f to m sand | 14 | 1.14 | 16 | | | | |
| 20.0 | 21.5 | | 25.0 | f to m sand | 24 | 1.05 | 25 | | | | |
| 25.0 | 26.5 | 25.0 | | m to c sand | 28 | 0.97 | 27 | | | | |
| 30.0 | 31.5 | | | m to c sand | 23 | 0.93 | 21 | | | | |
| 35.0 | 36.5 | | | m to c sand | 29 | 0.85 | 25 | | | | |
| 40.0 | 41.5 | | | m to c sand | 18 | 0.81 | 15 | | | | |
| 45.0 | 46.5 | | 50.0 | m to c sand | 33 | 0.77 | 25 | | | | |
| 50.0 | 51.5 | 50.0 | 53.0 | f to m sand, w/scattered thin clay layers | 45 | 0.73 | 33 | | | | |
| 55.0 | 56.5 | 53.0 | | c sand | 30 | 0.70 | 21 | | | | |
| 60.0 | 61.5 | | | c sand | 19 | 0.67 | 13 | | | | |
| 65.0 | 66.5 | | | c sand | 23 | 0.65 | 15 | | | | |
| 70.0 | 71.5 | | | c sand | 19 | 0.62 | 12 | | | | |
| 75.0 | 76.5 | | | c sand | 35 | 0.60 | 21 | | | | |

FIELD BORING LOG NO. 307

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 4 | 0 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Laboratory Classification: Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.0 | 6.5 | 0.0 | | f sand | 22 | >1.4 | >31 | | | | |
| 10.0 | 11.5 | | 15.0 | f sand | 26 | >1.4 | >36 | | | | |
| 15.0 | 16.5 | 15.0 | 20.0 | m sand | 31 | 1.26 | 39 | | | | |
| 20.0 | 21.5 | 20.0 | 25.0 | c sand | 32 | 1.14 | 36 | | | | |
| 25.0 | 26.5 | 25.0 | | m sand | 59 | 1.05 | 62 | | | | |
| 30.0 | 31.5 | | 35.0 | m sand | 30 | 0.98 | 29 | | | | |
| 35.0 | 36.5 | 35.0 | | f sand | 50 | 0.92 | 46 | | | | |
| 40.0 | 41.5 | | 45.0 | f sand | 64 | 0.86 | 55 | | | | |
| 45.0 | 46.5 | 45.0 | | c sand | 57 | 0.81 | 46 | | | | |
| 50.0 | 51.5 | | ≥51.5 | c sand | 72 | 0.77 | 55 | | | | |

FIELD BORING LOG NO. 308A

Depth to water table (ft): 8 — Topstratum thickness (ft): 4 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 4.0 | sandy clay | | | | | | | |
| 8.0 | 9.5 | 4.0 | 8.0 | f sand | 23 | 1.4 | 32 | | | | |
| 13.0 | 14.5 | 8.0 | | f sand | 23 | 1.21 | 28 | | | | |
| 18.0 | 19.5 | | 21.0 | f sand | 32 | 1.12 | 36 | | | | |
| 23.0 | 24.5 | 21 | 26.0 | f to m sand | 41 | 1.03 | 42 | | | | |
| 28.0 | 29.5 | 26.0 | 31.0 | f sand | 43 | 0.95 | 41 | | | | |
| 33.0 | 34.5 | 31.0 | 36.0 | m sand | 45 | 0.89 | 40 | | | | |
| 38.0 | 39.5 | 36.0 | 41.0 | f sand | 55 | 0.84 | 46 | | | | |
| 43.0 | 44.5 | 41.0 | 45.0 | f sand w/much lignite | 47 | 0.79 | 37 | | | | |
| 48.0 | 49.5 | 45.0 | | f sand | 39 | 0.76 | 30 | | | | |
| 53.0 | 54.5 | | ≥54.5 | f sand | 32 | 0.72 | 23 | | | | |

FIELD BORING LOG NO. 308B

Depth to water table (ft): 8 — Topstratum thickness (ft): 4 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 4.0 | sandy clay | | | | | | | |
| 8.0 | 9.5 | 4.0 | | f sand | 17 | 1.4 | 24 | | | | |
| 13.0 | 14.5 | | 16.0 | f sand | 28 | 1.21 | 34 | | | | |
| 18.0 | 19.5 | 16.0 | | f to m sand | 44 | 1.12 | 49 | | | | |
| 23.0 | 24.5 | | 26.0 | f to m sand | 51 | 1.03 | 53 | | | | |
| 28.0 | 29.5 | 26.0 | 31.0 | f sand | 51 | 0.95 | 48 | | | | |
| 33.0 | 34.5 | 31.0 | 36.0 | f to m sand w/lignite | 40 | 0.89 | 36 | | | | |
| 38.0 | 39.5 | 36.0 | | f sand | 87 | 0.84 | 73 | | | | |
| 43.0 | 44.5 | | 46.0 | f sand | 49 | 0.79 | 39 | | | | |
| 48.0 | 49.5 | 46.0 | 51.0 | vf sand | 31 | 0.76 | 24 | | | | |
| 53.0 | 54.5 | 51.0 | ≥54.5 | f to c sand | 29 | 0.72 | 21 | | | | |

FIELD BORING LOG NO. 309A

Depth to water table (ft): 17 — Topstratum thickness (ft): 5 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | sandy clay | | | | | | | |
| 9.0 | 10.5 | 5.0 | 12.0 | f sand | 29 | 1.28 | 37 | | | | |
| 14.0 | 15.5 | 12.0 | 17.0 | m sand | 29 | 1.07 | 31 | | | | |
| 19.0 | 20.5 | 17.0 | 22.0 | f to m sand | 39 | 0.96 | 37 | | | | |
| 24.0 | 25.0 | 22.0 | 27.0 | f sand | 63 | 0.89 | 56 | | | | |
| 29.0 | 30.5 | 27.0 | 32.0 | f to m sand | 58 | 0.84 | 49 | | | | |
| 34.0 | 35.5 | 32.0 | | f sand | 54 | 0.79 | 43 | | | | |
| 39.0 | 40.5 | | | f sand | 19 | 0.76 | 14 | | | | |
| 44.0 | 45.5 | | 47.0 | f sand | 20 | 0.72 | 14 | | | | |
| 49.0 | 50.5 | 47.0 | | c sand | 39 | 0.70 | 27 | | | | |
| 54.0 | 55.5 | | ≥55.5 | c sand | 34 | 0.68 | 23 | | | | |

FIELD BORING LOG NO. 309B

Depth to water table (ft): 17 — Topstratum thickness (ft): 4 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 4.0 | top soil | | | | | | | |
| 9.0 | 10.5 | 4.0 | | f sand | 21 | 1.28 | 27 | | | | |
| 14.0 | 15.5 | | 17.0 | f sand | 28 | 1.07 | 30 | | | | |
| 19.0 | 20.5 | 17.0 | 22.0 | f to m sand | 31 | 0.96 | 30 | | | | |
| 24.0 | 25.5 | 22.0 | 27.0. | f sand | 49 | 0.89 | 44 | | | | |
| 29.0 | 30.5 | 27.0 | 32.0 | f to m sand | 52 | 0.84 | 44 | | | | |
| 34.0 | 35.5 | 32.0 | | c sand | 41 | 0.79 | 32 | | | | |
| 39.0 | 40.5 | | 42.0 | c sand | 36 | 0.76 | 27 | | | | |
| 44.0 | 45.5 | 42.0 | | f sand | 26 | 0.72 | 19 | | | | |
| 49.0 | 50.5 | | 52.0 | c sand | 30 | 0.70 | 21 | | | | |
| 54.0 | 55.5 | 52.0 | ≥55.5 | c sand | 34 | 0.68 | 23 | | | | |

FIELD BORING LOG NO. 310

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 6 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0. | 6.0 | clayey and silty sand | | | | | | | |
| 19.0 | 20.5 | 6.0 | | layers of c and f sand | 23 | 1.05 | 24 | | | | |
| 24.0 | 25.5 | | | layers of c and f sand | 23 | 0.97 | 22 | | | | |
| 29.0 | 30.5 | | | layers of c and f sand | 29 | 0.91 | 26 | | | | |
| 39.0 | 40.5 | | | layers of c and f sand | 18 | 0.81 | 15 | | | | |
| 49.0 | 50.5 | | | layers of c and f sand | 43 | 0.73 | 31 | | | | |
| 59.0 | 60.5 | | ≥60.5 | layers of c and f sand | 24 | 0.68 | 16 | | | | |

FIELD BORING LOG NO. 311

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 6 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 6.0 | clayey and silty sand | | | | | | | |
| 22.6 | 24.1 | 6.0 | | layers of c and f sand | 60 | 1.08 | 65 | | | | |
| 27.6 | 29.1 | | | layers of c and f sand | 37 | 0.98 | 36 | | | | |
| 32.6 | 34.1 | | | layers of c and f sand | 68 | 0.92 | 63 | | | | |
| 42.6 | 44.1 | | | layers of c and f sand | 90 | 0.82 | 74 | | | | |
| 52.6 | 54.1 | | | layers of c and f sand | 38 | 0.74 | 28 | | | | |
| 62.6 | 64.1 | | ≥64.1 | layers of c and f sand | 26 | 0.68 | 18 | | | | |

FIELD BORING LOG NO. 312A

Depth to water table (ft): 15 — Topstratum thickness (ft): 10 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 7.5 | clay | | | | | | | |
| | | 7.5 | 10.0 | sandy clay | | | | | | | |
| 10.0 | 11.5 | 10.0 | 15.0 | f sand | 42 | 1.23 | 52 | | | | |
| 15.0 | 16.5 | 15.0 | 20.0 | f to m sand | 42 | 1.05 | 44 | | | | |
| 20.0 | 21.5 | 20.0 | 25.0 | f sand w/some gravel | 42 | 0.97 | 41 | | | | |
| 25.0 | 26.5 | 25.0 | 30.0 | f sand w/some lignite layers | 43 | 0.92 | 40 | | | | |
| 30.0 | 31.5 | 30.0 | 35.0 | m to c sand w/some gravel | 69 | 0.86 | 59 | | | | |
| 35.0 | 36.5 | 35.0 | | f to m sand w/some gravel | 65 | 0.81 | 53 | | | | |
| 40.0 | 41.5 | | 45.0 | f to m sand w/some gravel | 46 | 0.77 | 35 | | | | |
| 45.0 | 46.5 | 45.0 | | m sand | >100 | 0.73 | >73 | | | | |
| 50.0 | 51.5 | | | m sand | 79 | 0.70 | 55 | | | | |
| 55.0 | 56.5 | | 60.0 | m sand | >100 | 0.68 | >68 | | | | |
| 60.0 | 61.5 | 60.0 | | m to c sand w/some lignite and gravel layers | 91 | 0.64 | 58 | | | | |
| 70.0 | 71.5 | | ≥71.5 | m to c sand w/some lignite and gravel layers | 98 | 0.60 | 59 | | | | |

FIELD BORING LOG NO. 312B

Depth to water table (ft): 15 — Topstratum thickness (ft): 10 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 10.3 | clay | | | | | | | |
| 10.0 | 11.5 | 10.3 | 15.0 | f sand | 16 | 1.23 | 20 | | | | |
| 15.0 | 16.5 | 15.0 | | f to m sand w/some gravel | 48 | 1.05 | 50 | | | | |
| 20.0 | 21.5 | | 25.0 | f to m sand w/some gravel | 36 | 0.97 | 35 | | | | |
| 25.0 | 26.5 | 25.0 | | f sand and lignite | 37 | 0.92 | 34 | | | | |
| 30.0 | 31.5 | | 35.0 | f sand and lignite | 42 | 0.86 | 36 | | | | |
| 35.0 | 36.5 | 35.0 | 40.0 | m to c sand | 39 | 0.81 | 32 | | | | |
| 40.0 | 41.5 | 40.0 | | f sand w/some lignite layers | 63 | 0.77 | 49 | | | | |
| 45.0 | 46.5 | | | f sand w/some lignite layers | 39 | 0.73 | 28 | | | | |
| 50.0 | 51.5 | | | f sand w/some lignite | 30 | 0.70 | 21 | | | | |
| 55.0 | 56.5 | | 60.0 | f sand w/some lignite | 62 | 0.68 | 42 | | | | |
| 60.0 | 61.5 | 60.0 | 65.0 | m to c sand w/some f | >100 | 0.64 | >64 | | | | |
| 65.0 | 66.5 | 65.0 | | f to m sand | 64 | 0.62 | 40 | | | | |
| 70.0 | 71.5 | | 80.0 | f to m sand | 72 | 0.60 | 43 | | | | |
| 80.0 | 81.5 | 80.0 | ≥81.5 | m to c sand | 55 | 0.56 | 31 | | | | |

FIELD BORING LOG NO. 313

Depth to water table (ft): 9 — Topstratum thickness (ft): 32 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.0 | clay | | | | | | | |
| | | 14.0 | 31.5 | silt | | | | | | | |
| 35.0 | 36.5 | 31.5 | | sand | 48 | 0.85 | 41 | | | | |
| 40.0 | 41.5 | | | sand | 60 | 0.81 | 49 | | | | |
| 45.0 | 46.0 | | | sand | 63 | 0.77 | 49 | | | | |
| 50.0 | 51.5 | | ≥51.5 | sand | 92 | 0.73 | 67 | | | | |

FIELD BORING LOG NO. 314A

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 16 | 46 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 19.0 | silty clay | | | | | | | |
| | | 19.0 | 29.0 | silt | | | | | | | |
| | | 29.0 | 46.0 | silty clay | | | | | | | |
| 50.0 | 51.5 | 46.0 | | sand | 47 | 0.70 | 33 | | | | |
| 55.0 | 56.5 | | | sand | 64 | 0.67 | 43 | | | | |
| 60.0 | 61.5 | | | sand | >100 | 0.64 | >64 | | | | |
| 65.0 | 66.5 | | 78.0 | sand | >100 | 0.62 | >62 | | | | |
| | | 78.0 | ≥100.0 | sand and gravel | NA | | | | | | |

FIELD BORING LOG NO. 314B

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 16 | 47 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 22.0 | silty clay | | | | | | | |
| | | 22.0 | 40.0 | silt | | | | | | | |
| | | 40.0 | 47.0 | silty clay | | | | | | | |
| 50.0 | 51.5 | 47.0 | | sand | 12 | 0.70 | 8 | | | | |
| 55.0 | 56.5 | | | sand | 13 | 0.67 | 9 | | | | |
| 60.0 | 61.5 | | | sand | 21 | 0.64 | 13 | | | | |
| 65.0 | 66.5 | | | sand | 48 | 0.62 | 30 | | | | |
| 70.0 | 71.5 | | | sand | 63 | 0.60 | 38 | | | | |
| 75.0 | 76.5 | | ≥76.5 | sand | 73 | 0.57 | 42 | | | | |

FIELD BORING LOG NO. 315A

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| NA(10) | 5 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | sandy clay | | | | | | | |
| 8.0 | 9.5 | 5.0 | 13.0 | f sand | 33 | 1.32 | 44 | | | | |
| 13.0 | 14.5 | 13.0 | 18.0 | m sand | 31 | 1.19 | 37 | | | | |
| 18.0 | 19.5 | 18.0 | | f sand | 45 | 1.08 | 49 | | | | |
| 23.0 | 24.5 | | 28.0 | f sand | 49 | 1.00 | 49 | | | | |
| 28.0 | 29.5 | 28.0 | 33.0 | m sand | 37 | 0.93 | 34 | | | | |
| 33.0 | 34.5 | 33.0 | | f sand | 44 | 0.88 | 39 | | | | |
| 38.0 | 39.5 | | 43.0 | m sand | 58 | 0.82 | 48 | | | | |
| 43.0 | 44.5 | 43.0 | | m sand | 71 | 0.78 | 55 | | | | |
| 48.0 | 49.5 | | 53.0 | m sand | 39 | 0.75 | 29 | | | | |
| 53.0 | 54.5 | 53.0 | | f sand | 53 | 0.72 | 38 | | | | |
| 58.0 | 59.5 | | ≥59.5 | f sand | 64 | 0.69 | 44 | | | | |

FIELD BORING LOG NO. 315B

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| NA(10) | 13 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 7.0 | clayey and silty sand | | | | | | | |
| | | 7.0 | 13.0 | sandy clay | | | | | | | |
| 15.0 | 16.5 | 13.0 | 16.0 | f sand | 15 | 1.13 | 17 | | | | |
| 20.0 | 21.5 | 16.0 | 25.0 | vf to f sand | 31 | 1.03 | 32 | | | | |
| 25.0 | 26.5 | 25.0 | 30.0 | m sand | 28 | 0.96 | 27 | | | | |
| 30.0 | 31.5 | 30.0 | | f sand | 25 | 0.90 | 23 | | | | |
| 35.0 | 36.5 | | | f sand | 22 | 0.85 | 19 | | | | |
| 40.0 | 41.5 | | | f sand | 18 | 0.81 | 15 | | | | |
| 45.0 | 46.5 | | 50.0 | f sand | 29 | 0.77 | 22 | | | | |
| 50.0 | 51.5 | 50.0 | | m sand | 44 | 0.73 | 32 | | | | |
| 55.0 | 56.5 | | | m sand | 43 | 0.70 | 30 | | | | |
| 60.0 | 61.5 | | 65.0 | m sand | 29 | 0.67 | 19 | | | | |
| 65.0 | 66.5 | 65.0 | ≥66.5 | f sand | 61 | 0.64 | 39 | | | | |

FIELD BORING LOG NO. 316A

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| NA(10) | 15 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 15.0 | silt | | | | | | | |
| 15.0 | 16.5 | 15.0 | 20.0 | m sand | 45 | 1.13 | 51 | | | | |
| 20.0 | 21.5 | 20.0 | 25.0 | f sand | 16 | 1.04 | 17 | | | | |
| 25.0 | 26.5 | 25.0 | | c sand | 36 | 0.96 | 35 | | | | |
| 30.0 | 31.5 | | | c sand | 45 | 0.90 | 41 | | | | |
| 35.0 | 36.5 | | 40.0 | c sand | 32 | 0.85 | 27 | | | | |
| 40.0 | 41.5 | 40.0 | 45.0 | f sand | 34 | 0.80 | 27 | | | | |
| 45.0 | 46.5 | 45.0 | | m to c sand | 51 | 0.77 | 39 | | | | |
| 50.0 | 51.5 | | 55.0 | m to c sand | 48 | 0.73 | 35 | | | | |
| 55.0 | 56.5 | 55.0 | 60.0 | m to vc sand | 42 | 0.70 | 29 | | | | |
| 60.0 | 61.5 | 60.0 | ≥61.5 | f sand | 62 | 0.67 | 42 | | | | |

FIELD BORING LOG NO. 316B

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| NA(10) | 17 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 16.5 | silt | | | | | | | |
| 20.0 | 21.5 | 16.5 | 22.0 | vc sand | 7 | 1.04 | 7 | | | | |
| 25.0 | 26.5 | 22.0 | 30.0 | m sand | 26 | 0.96 | 25 | | | | |
| 30.0 | 31.5 | 30.0 | 35.0 | f sand | 12 | 0.90 | 11 | | | | |
| 35.0 | 36.5 | 35.0 | 40.0 | c sand | 10 | 0.85 | 9 | | | | |
| 40.0 | 41.5 | 40.0 | | m to c sand | 43 | 0.80 | 34 | | | | |
| 45.0 | 46.5 | | 50.0 | m to c sand | 41 | 0.77 | 32 | | | | |
| 50.0 | 51.5 | 50.0 | | vc sand | 29 | 0.73 | 21 | | | | |
| 55.0 | 56.5 | | 60.0 | vc sand | 25 | 0.70 | 18 | | | | |
| 60.0 | 61.5 | 60.0 | ≥61.5 | f sand | 48 | 0.67 | 32 | | | | |

FIELD BORING LOG NO. 317A

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 20 | 14 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.0 | sandy clay | | | | | | | |
| 15.0 | 16.5 | 14.0 | | m sand | 27 | 1.02 | 28 | | | | |
| 20.0 | 21.5 | | | m sand | 40 | 0.91 | 36 | | | | |
| 25.0 | 26.5 | | 30.0 | m sand | 41 | 0.86 | 35 | | | | |
| 30.0 | 31.5 | 30.0 | 35.0 | vf sand | 36 | 0.81 | 29 | | | | |
| 35.0 | 36.5 | 35.0 | 40.0 | c sand | 57 | 0.77 | 44 | | | | |
| 40.0 | 41.5 | 40.0 | | m to vc sand | 35 | 0.73 | 26 | | | | |
| 45.0 | 46.5 | | | m to vc sand | 45 | 0.70 | 32 | | | | |
| 50.0 | 51.5 | | | m to vc sand | 49 | 0.68 | 33 | | | | |
| 55.0 | 56.5 | | | m to vc sand | 32 | 0.64 | 20 | | | | |
| 60.0 | 61.5 | | | m to vc sand | 43 | 0.62 | 27 | | | | |
| 65.0 | 66.5 | | ≥66.5 | m to vc sand | 31 | 0.60 | 19 | | | | |

FIELD BORING LOG NO. 317B

| Depth to water table (ft) | Topstratum thickness (ft) |
|---|---|
| 20 | 14 |

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 13.5 | sandy clay | | | | | | | |
| 15.0 | 16.5 | 13.5 | 20.0 | m sand w/some gravel | 15 | 1.02 | 15 | | | | |
| 20.0 | 21.5 | 20.0 | 25.0 | f sand | 21 | 0.91 | 19 | | | | |
| 25.0 | 26.5 | 25.0 | 30.0 | m to vc sand | 29 | 0.86 | 25 | | | | |
| 30.0 | 31.5 | 30.0 | | c sand | 31 | 0.81 | 25 | | | | |
| 35.0 | 36.5 | | 40.0 | c sand | 33 | 0.77 | 25 | | | | |
| 40.0 | 41.5 | 40.0 | 45.0 | f sand | 42 | 0.73 | 31 | | | | |
| 45.0 | 46.5 | 45.0 | | m to c sand | 29 | 0.70 | 20 | | | | |
| 50.0 | 51.5 | | | m to c sand | 26 | 0.68 | 18 | | | | |
| 55.0 | 56.5 | | | m to c sand | 23 | 0.64 | 15 | | | | |
| 60.0 | 61.5 | | | m to c sand | 14 | 0.62 | 9 | | | | |
| 65.0 | 66.5 | | ≥66.5 | m to c sand | 23 | 0.60 | 14 | | | | |

FIELD BORING LOG NO. 318A

Depth to water table (ft) Topstratum thickness (ft) — Laboratory Classification

NA(10) 14

| Sample From (ft) | To (ft) | Stratum From (ft) | To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.0 | clay and sandy clay | | | | | | | |
| 15.0 | 16.5 | 14.0 | | f sand | 41 | 1.13 | 46 | | | | |
| 20.0 | 21.5 | | | f sand | 39 | 1.04 | 41 | | | | |
| 25.0 | 26.5 | | 30.0 | f sand | 52 | 0.96 | 50 | | | | |
| 30.0 | 31.5 | 30.0 | | m sand | 46 | 0.90 | 41 | | | | |
| 35.0 | 36.5 | | 40.0 | m sand | 36 | 0.86 | 31 | | | | |
| 40.0 | 41.5 | 40.0 | 45.0 | c sand | 51 | 0.81 | 41 | | | | |
| 45.0 | 46.5 | 45.0 | | m sand | 38 | 0.77 | 29 | | | | |
| 50.0 | 51.5 | | | m sand | 49 | 0.73 | 36 | | | | |
| 55.0 | 56.5 | | | m sand | 35 | 0.70 | 25 | | | | |
| 60.0 | 61.5 | | | m sand | 40 | 0.67 | 27 | | | | |
| 65.0 | 66.5 | | | m sand | 39 | 0.65 | 25 | | | | |
| 70.0 | 71.5 | | ≥71.5 | m sand | 34 | 0.62 | 21 | | | | |

FIELD BORING LOG NO. 318B

Depth to water table (ft) Topstratum thickness (ft) — Laboratory Classification

NA(10) 0

| Sample From (ft) | To (ft) | Stratum From (ft) | To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.0 | 6.5 | 0.0 | 10.0 | f sand | 16 | >1.4 | >22 | | | | |
| 10.0 | 11.5 | 10.0 | | c sand | 20 | 1.24 | 25 | | | | |
| 15.0 | 16.5 | | 20.0 | c sand | 27 | 1.13 | 31 | | | | |
| 20.0 | 21.5 | 20.0 | | vc sand | 36 | 1.04 | 37 | | | | |
| 25.0 | 26.5 | | 30.0 | vc sand | 36 | 0.96 | 35 | | | | |
| 30.0 | 31.5 | 30.0 | 35.0 | m sand w/pebbles | 26 | 0.90 | 23 | | | | |
| 35.0 | 36.5 | 35.0 | | c sand | 31 | 0.86 | 27 | | | | |
| 40.0 | 41.5 | | | c sand | 36 | 0.81 | 29 | | | | |
| 45.0 | 46.5 | | 50.0 | c sand | 44 | 0.77 | 34 | | | | |
| 50.0 | 51.5 | 50.0 | ≥51.5 | f sand | 23 | 0.73 | 17 | | | | |

FIELD BORING LOG NO. 319A

Depth to water table (ft) Topstratum thickness (ft) — Laboratory Classification

11 11

| Sample From (ft) | To (ft) | Stratum From (ft) | To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 11.0 | sandy clay | | | | | | | |
| 20.0 | 21.5 | 11.0 | 25.0 | f to m sand | 32 | 1.02 | 33 | | | | |
| 25.0 | 26.5 | 25.0 | 30.0 | m to c sand | 45 | 0.94 | 42 | | | | |
| 30.0 | 31.5 | 30.0 | | m sand | 61 | 0.89 | 54 | | | | |
| 35.0 | 36.5 | | 40.0 | m sand | 49 | 0.84 | 41 | | | | |
| 40.0 | 41.5 | 40.0 | | c sand | 53 | 0.80 | 42 | | | | |
| 45.0 | 46.5 | | | c sand | 38 | 0.76 | 29 | | | | |
| 50.0 | 51.5 | | | c sand | 74 | 0.73 | 54 | | | | |
| 55.0 | 56.5 | | 60.0 | c sand | 59 | 0.70 | 41 | | | | |
| 60.0 | 61.5 | 60.0 | | m to c sand | 20 | 0.67 | 13 | | | | |
| 65.0 | 66.5 | | | m to c sand | 39 | 0.64 | 25 | | | | |
| 70.0 | 71.5 | | 72.0 | m to c sand w/some f gravel | 75 | 0.62 | 47 | | | | |
| 75.0 | 76.5 | 72.0 | ≥76.5 | m to c sand w/layers of gravel | 39 | 0.60 | 23 | | | | |

FIELD BORING LOG NO. 319B

Depth to water table (ft) Topstratum thickness (ft) — Laboratory Classification

11 13

| Sample From (ft) | To (ft) | Stratum From (ft) | To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 13.0 | clay | | | | | | | |
| 20.0 | 21.5 | 13.0 | | m sand | 40 | 4.02 | 41 | | | | |
| 25.0 | 26.5 | | | m sand | 37 | 0.94 | 35 | | | | |
| 30.0 | 31.5 | | | m sand | 45 | 0.89 | 40 | | | | |
| 35.0 | 36.5 | | | m sand | 98 | 0.84 | 82 | | | | |
| 40.0 | 41.5 | | 45.0 | m sand | 41 | 0.80 | 33 | | | | |
| 45.0 | 46.5 | 45.0 | 50.0 | m to c sand | 43 | 0.76 | 33 | | | | |
| 50.0 | 51.5 | 50.0 | 55.0 | m sand | 56 | 0.73 | 41 | | | | |
| 55.0 | 56.5 | 55.0 | | m to c sand | 39 | 0.70 | 27 | | | | |
| 60.0 | 61.5 | | 65.0 | m to c sand | 42 | 0.67 | 28 | | | | |
| 65.0 | 66.5 | 65.0 | 67.0 | m sand | 54 | 0.64 | 35 | | | | |
| 70.0 | 71.5 | 67.0 | ≥71.5 | m sand and gravel layers | 52 | 0.62 | 32 | | | | |

FIELD BORING LOG NO. 320A

Depth to water table (ft) Topstratum thickness (ft) — Laboratory Classification

NA(10) 8

| Sample From (ft) | To (ft) | Stratum From (ft) | To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 7.0 | silty clay | | | | | | | |
| | | 7.0 | 8.2 | sandy clay | | | | | | | |
| 9.0 | 10.5 | 8.2 | | f to m sand | NA | 1.29 | NA | | | | |
| 14.0 | 15.5 | | 20.0 | f to m sand | 20 | 1.18 | 24 | | | | |
| 19.0 | 20.5 | 20.0 | | c sand w/some pebbles and gravel | 15 | 1.05 | 16 | | | | |
| 24.0 | 25.5 | | | c sand w/some pebbles and gravel | 24 | 0.97 | 23 | | | | |
| 29.0 | 30.5 | | | c sand w/some pebbles and gravel | 11 | 0.91 | 10 | | | | |
| 34.0 | 35.5 | | | c sand w/some pebbles and gravel | 25 | 0.86 | 22 | | | | |
| 39.0 | 40.5 | | | c sand w/some pebbles and gravel | 29 | 0.81 | 23 | | | | |
| 44.0 | 45.5 | | | c sand w/some pebbles and gravel | 18 | 0.76 | 14 | | | | |
| 49.0 | 50.5 | | | c sand w/some pebbles and gravel | 22 | 0.75 | 17 | | | | |
| 54.0 | 55.5 | | | c sand w/some pebbles and gravel | 38 | 0.71 | 27 | | | | |
| 59.0 | 60.5 | | | c sand w/some pebbles and gravel | 33 | 0.68 | 22 | | | | |
| 64.0 | 65.5 | | | c sand w/some pebbles and gravel | 23 | 0.65 | 15 | | | | |
| 69.0 | 70.0 | | ≥70.5 | c sand w/some pebbles and gravel | 46 | 0.63 | 29 | | | | |

FIELD BORING LOG NO. 320B

Depth to water table (ft) Topstratum thickness (ft) — Laboratory Classification

NA(10) 9

| Sample From (ft) | To (ft) | Stratum From (ft) | To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 7.0 | silty caly | | | | | | | |
| | | 7.0 | 8.5 | sandy clay | | | | | | | |
| 9.0 | 10.5 | 8.5 | | f to c sand | 11 | 1.29 | 14 | | | | |
| 14.0 | 15.5 | | | f to c sand | 31 | 1.18 | 37 | | | | |
| 19.0 | 20.5 | | | f to c sand | 24 | 1.05 | 25 | | | | |
| 24.0 | 25.5 | | | f to c sand | 24 | 0.97 | 23 | | | | |
| 29.0 | 30.5 | | | f to c sand | 25 | 0.91 | 23 | | | | |
| 34.0 | 35.5 | | | f to c sand | 28 | 0.86 | 24 | | | | |
| 39.0 | 40.5 | | | f to c sand | 25 | 0.81 | 20 | | | | |
| 44.0 | 45.5 | | | f to c sand | 17 | 0.76 | 13 | | | | |
| 49.0 | 50.5 | | | f to c sand | 25 | 0.75 | 19 | | | | |
| 54.0 | 55.5 | | | f to c sand | 22 | 0.71 | 16 | | | | |
| 59.0 | 60.5 | | | f to c sand | 30 | 0.68 | 20 | | | | |
| 64.0 | 65.5 | | | f to c sand | 37 | 0.65 | 24 | | | | |
| 69.0 | 70.5 | | ≥70.5 | f to c sand | 44 | 0.63 | 28 | | | | |

FIELD BORING LOG NO. 321

Depth to water table (ft) Topstratum thickness (ft) — Laboratory Classification

NA(10) 10

| Sample From (ft) | To (ft) | Stratum From (ft) | To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 6.0 | clay | | | | | | | |
| | | 6.0 | 10.0 | sandy clay | | | | | | | |
| 10.0 | 11.5 | 10.0 | | m sand | 11 | 1.25 | 14 | | | | |
| 15.0 | 16.5 | | | m sand | 19 | 1.13 | 21 | | | | |
| 20.0 | 21.5 | | 25.0 | m sand | 36 | 1.04 | 37 | | | | |
| 25.0 | 26.5 | 25.0 | | m and c sand layers | 59 | 0.96 | 57 | | | | |
| 30.0 | 31.5 | | | m and c sand layers | 44 | 0.90 | 40 | | | | |
| 35.0 | 36.5 | | | m and c sand layers | 26 | 0.85 | 22 | | | | |
| 40.0 | 41.5 | | | m and c sand layers | 23 | 0.81 | 19 | | | | |
| 45.0 | 46.5 | | | m and c sand layers | 36 | 0.77 | 28 | | | | |
| 50.0 | 51.5 | | | m and c sand layers | 48 | 0.73 | 35 | | | | |
| 60.0 | 61.5 | | | m and c sand layers | 75 | 0.68 | 51 | | | | |
| 70.0 | 71.5 | | ≥71.5 | m and c sand layers | 45 | 0.63 | 28 | | | | |

FIELD BORING LOG NO. 322A

Depth to water table (ft) Topstratum thickness (ft) — Laboratory Classification

NA(10) 8

| Sample From (ft) | To (ft) | Stratum From (ft) | To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.0 | sandy clay | | | | | | | |
| 10.0 | 11.5 | 8.0 | | f sand | 16 | 1.25 | 20 | | | | |
| 15.0 | 16.5 | | | f sand | 12 | 1.13 | 14 | | | | |
| 20.0 | 21.5 | | 25.0 | f sand | 13 | 1.04 | 14 | | | | |
| 25.0 | 26.5 | 25.0 | | m to c sand | 26 | 0.96 | 25 | | | | |
| 30.0 | 31.5 | | | m to c sand | 17 | 0.90 | 15 | | | | |
| 35.0 | 36.5 | | | m to c sand | 27 | 0.85 | 23 | | | | |
| 40.0 | 41.5 | | | m to c sand | 34 | 0.81 | 28 | | | | |
| 45.0 | 46.5 | | | m to c sand | 27 | 0.77 | 21 | | | | |
| 50.0 | 51.5 | | | m to c sand | 38 | 0.73 | 28 | | | | |
| 60.0 | 61.5 | | | m to c sand | 50 | 0.68 | 34 | | | | |
| 70.0 | 71.5 | | ≥71.5 | m to c sand | 77 | 0.63 | 49 | | | | |

FIELD BORING LOG NO. 322B

Depth to water table (ft): NA(10) Topstratum thickness (ft): 8

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.0 | sandy clay | | | | | | | |
| 10.0 | 11.5 | 8.0 | | m sand | 17 | 1.25 | 21 | | | | |
| 15.0 | 16.5 | | | m sand | 22 | 1.13 | 25 | | | | |
| 20.0 | 21.5 | | | m sand | 27 | 1.04 | 28 | | | | |
| 25.0 | 26.5 | | 27.0 | m sand | 23 | 0.96 | 22 | | | | |
| 30.0 | 31.5 | 27.0 | | m to c sand | 40 | 0.90 | 36 | | | | |
| 35.0 | 36.5 | | | m to c sand | 39 | 0.85 | 33 | | | | |
| 40.0 | 41.5 | | | m to c sand | 23 | 0.81 | 19 | | | | |
| 45.0 | 46.5 | | | m to c sand | 29 | 0.77 | 22 | | | | |
| 50.0 | 51.5 | | | m to c sand | 55 | 0.73 | 40 | | | | |
| 60.0 | 61.5 | | | m to c sand | 56 | 0.68 | 38 | | | | |
| 70.0 | 71.5 | | ≥71.5 | m to c sand | 57 | 0.63 | 36 | | | | |

FIELD BORING LOG NO. 323

Depth to water table (ft): NA(10) Topstratum thickness (ft): 11

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 10.5 | sandy clay | | | | | | | |
| 10.0 | 11.5 | 10.5 | | f sand | 10 | 1.25 | 13 | | | | |
| 15.0 | 16.5 | | | f sand | 37 | 1.13 | 42 | | | | |
| 20.0 | 21.5 | | | f sand | 32 | 1.04 | 33 | | | | |
| 25.0 | 26.5 | | 30.0 | f sand | 35 | 0.96 | 34 | | | | |
| 30.0 | 31.5 | 30.0 | | m sand | 27 | 0.90 | 24 | | | | |
| 35.0 | 36.5 | | 40.0 | m sand | 21 | 0.85 | 18 | | | | |
| 40.0 | 41.5 | 40.0 | 45.0 | m to c sand | 83 | 0.81 | 67 | | | | |
| 45.0 | 46.5 | 45.0 | | m sand | 25 | 0.77 | 19 | | | | |
| 50.0 | 51.5 | | | m sand | 48 | 0.73 | 35 | | | | |
| 60.0 | 61.5 | | | m sand | 38 | 0.68 | 26 | | | | |
| 70.0 | 71.5 | | ≥71.5 | m sand | 98 | 0.63 | 62 | | | | |

FIELD BORING LOG NO. 324A

Depth to water table (ft): NA(10) Topstratum thickness (ft): 8

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.0 | sandy clay | | | | | | | |
| 10.0 | 11.5 | 8.0 | 15.0 | f sand | 15 | 1.25 | 19 | | | | |
| 15.0 | 16.5 | 15.0 | | sand | 26 | 1.13 | 29 | | | | |
| 20.0 | 21.5 | | | sand | 21 | 1.04 | 22 | | | | |
| 25.0 | 26.5 | | | sand | 25 | 0.96 | 24 | | | | |
| 30.0 | 31.5 | | | sand | 25 | 0.90 | 23 | | | | |
| 35.0 | 36.5 | | | sand | 26 | 0.85 | 22 | | | | |
| 40.0 | 41.5 | | | sand | 26 | 0.81 | 21 | | | | |
| 45.0 | 46.5 | | 46.0 | sand | 44 | 0.77 | 34 | | | | |
| 50.0 | 51.5 | 46.0 | 47.0 | f gravel | 30 | 0.73 | 22 | | | | |
| | | 47.0 | 60.0 | f to m sand | | | | | | | |
| 60.0 | 61.5 | 60.0 | | f to m sand | 24 | 0.68 | 16 | | | | |
| 70.0 | 71.5 | | 71.0 | f to m sand | 20 | 0.63 | 13 | | | | |
| 80.0 | 81.5 | 71.0 | ≥81.5 | f to m sand | 62 | 0.58 | 36 | | | | |

FIELD BORING LOG NO. 324B

Depth to water table (ft): NA(10) Topstratum thickness (ft): 11

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 11.0 | sandy clay | | | | | | | |
| 15.0 | 16.5 | 11.0 | | sand | 30 | 1.13 | 34 | | | | |
| 20.0 | 21.5 | | 25.0 | sand | 27 | 1.04 | 28 | | | | |
| 25.0 | 26.5 | 25.0 | | f sand | 37 | 0.96 | 36 | | | | |
| 30.0 | 31.5 | | | f sand | 41 | 0.90 | 37 | | | | |
| 35.0 | 36.5 | | | f sand | 28 | 0.85 | 24 | | | | |
| 40.0 | 41.5 | | | f sand | 39 | 0.81 | 32 | | | | |
| 45.0 | 46.5 | | 47.0 | f sand | 41 | 0.77 | 32 | | | | |
| | | 47.0 | 48.0 | gravel | NA | NA | NA | | | | |
| 50.0 | 51.5 | 48.0 | 55.0 | m sand | 42 | 0.73 | 31 | | | | |
| | | 55.0 | 56.0 | gravel | NA | NA | NA | | | | |
| 60.0 | 61.5 | 56.0 | | f sand | 24 | 0.68 | 16 | | | | |
| 70.0 | 71.5 | | | f sand | 65 | 0.63 | 41 | | | | |
| 80.0 | 81.5 | | ≥81.5 | f sand | 71 | 0.58 | 41 | | | | |

FIELD BORING LOG NO. 325A

Depth to water table (ft): 4 Topstratum thickness (ft): 65

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 19.0 | clay | | | | | | | |
| | | 19.0 | 41.0 | silty to sandy clay | | | | | | | |
| | | 41.0 | 48.5 | clay and silty clay layers | | | | | | | |
| | | 48.5 | 57.0 | f to m sand w/clay layers | | | | | | | |
| | | 57.0 | 65.0 | clay | | | | | | | |
| 70.0 | 71.5 | 65.0 | | f to c sand | 33 | 0.65 | 21 | | | | |
| 80.0 | 81.5 | | | f to c sand | 64 | 0.60 | 38 | | | | |
| 90.0 | 91.5 | | ≥91.5 | f to c sand | 58 | 0.56 | 32 | | | | |

FIELD BORING LOG NO. 325B

Depth to water table (ft): 6 Topstratum thickness (ft): >72

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 72.0 | clay and silty clay layers | | | | | | | |

FIELD BORING LOG NO. 326A

Depth to water table (ft): 5 Topstratum thickness (ft): 21

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 21.0 | sandy clay | | | | | | | |
| 26.0 | 27.5 | 21.0 | | f to m sand | 22 | 1.02 | 22 | | | | |
| 31.0 | 32.5 | | | f to m sand | 13 | 0.94 | 12 | | | | |
| 36.0 | 37.5 | | | f to m sand | 27 | 0.88 | 24 | | | | |
| 41.0 | 42.5 | | | f to m sand | 44 | 0.84 | 37 | | | | |
| 46.0 | 47.5 | | 48.0 | f to m sand | 53 | 0.80 | 42 | | | | |
| 51.0 | 52.5 | 48.0 | | f to c sand, some gravel | 31 | 0.76 | 24 | | | | |
| 56.0 | 57.5 | | | f to c sand, some gravel | 41 | 0.73 | 30 | | | | |
| 61.0 | 62.5 | | 63.0 | f to c sand, some gravel | 43 | 0.70 | 30 | | | | |
| 66.0 | 67.5 | 63.0 | | f to m sand | 57 | 0.67 | 38 | | | | |
| 70.0 | 71.5 | | | f to m sand | 59 | 0.65 | 38 | | | | |
| 80.0 | 81.5 | | | f to m sand | 52 | 0.60 | 31 | | | | |
| 90.0 | 91.5 | | | f to m sand | 59 | 0.56 | 33 | | | | |
| 100.0 | 101.5 | | ≥101.5 | f to m sand | 61 | 0.53 | 32 | | | | |

FIELD BORING LOG NO. 326B

Depth to water table (ft): 2 Topstratum thickness (ft): 21

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 16.0 | clay | | | | | | | |
| | | 16.0 | 21.0 | sandy and silty clay | | | | | | | |
| 25.0 | 26.5 | 21.0 | 28.0 | f sand | 17 | 1.13 | 19 | | | | |
| 30.0 | 31.5 | 28.0 | 33.0 | f to c sand | 30 | 1.0 | 30 | | | | |
| 35.0 | 36.5 | 33.0 | | f to m sand | 48 | 0.93 | 45 | | | | |
| 40.0 | 41.5 | | | f to m sand | 35 | 0.88 | 31 | | | | |
| 45.0 | 46.5 | | 48.0 | f to m sand | 45 | 0.84 | 38 | | | | |
| 50.0 | 51.5 | 48.0 | | c sand w/some gravel | 57 | 0.80 | 46 | | | | |
| 55.0 | 56.5 | | | c sand w/some gravel | 40 | 0.76 | 30 | | | | |
| 60.0 | 61.5 | | 63.0 | c sand w/some gravel | 58 | 0.72 | 42 | | | | |
| 65.0 | 66.5 | 63.0 | | f to m sand | 63 | 0.68 | 43 | | | | |
| 70.0 | 71.5 | | | f to m sand | 45 | 0.66 | 30 | | | | |
| 80.0 | 81.5 | | | f to m sand | 31 | 0.61 | 19 | | | | |
| 90.0 | 91.5 | | ≥91.5 | f to m sand | 43 | 0.58 | 25 | | | | |

FIELD BORING LOG NO.327A

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 0 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.0 | 6.5 | 0.0 | | m to f sand | 10 | >1.4 | >14 | | | | |
| 10.0 | 11.5 | | | m to f sand | 13 | 1.25 | 16 | | | | |
| 15.0 | 16.5 | | 17.0 | m to f sand | 19 | 1.13 | 21 | | | | |
| 20.0 | 21.5 | 17.0 | | m to c sand w/gravel | 33 | 1.04 | 34 | | | | |
| 25.0 | 26.5 | | 27.0 | m to c sand w/gravel | 22 | 0.96 | 21 | | | | |
| 30.0 | 31.5 | 27.0 | | m sand w/occ pebble | 19 | 0.90 | 17 | | | | |
| 35.0 | 36.5 | | 39.0 | m sand w/occ pebble | 22 | 0.85 | 19 | | | | |
| 40.0 | 41.5 | 39.0 | | m to c sand w/lignite | >100 | 0.81 | >81 | | | | |
| 45.0 | 46.5 | | | m to c sand w/lignite | 71 | 0.77 | 55 | | | | |
| 50.0 | 51.5 | | 55.0 | m to c sand w/lignite | 39 | 0.73 | 28 | | | | |
| 55.0 | 56.5 | 55.0 | | c sand w/some pebbles and c gravel | 39 | 0.70 | 27 | | | | |
| 60.0 | 61.5 | | | c sand w/some pebbles and c gravel | 79 | 0.68 | 54 | | | | |
| 65.0 | 66.5 | | ≥66.5 | c sand w/some pebbles and c gravel | 57 | 0.65 | 37 | | | | |

FIELD BORING LOG NO.327B

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 0 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.0 | 6.5 | 0.0 | | m and f sand | 8 | >1.4 | >11 | | | | |
| 10.0 | 11.5 | | | m and f sand | 16 | 1.25 | 20 | | | | |
| 15.0 | 16.5 | | | m and f sand | 7 | 1.13 | 8 | | | | |
| 20.0 | 21.5 | | | m and f sand | 48 | 1.04 | 50 | | | | |
| 25.0 | 26.5 | | | m and f sand | 28 | 0.96 | 27 | | | | |
| 30.0 | 31.5 | | | m and f sand | 69 | 0.90 | 62 | | | | |
| 35.0 | 36.5 | | | m and f sand | >100 | 0.85 | >85 | | | | |
| 40.0 | 41.5 | | 42.0 | m and f sand | 24 | 0.81 | 19 | | | | |
| 44.0 | 45.5 | 42.0 | 48.0 | f sand | 14 | 0.77 | 11 | | | | |
| 49.0 | 50.5 | 48.0 | | vc to c sand w/some pebbles and lignite | 32 | 0.75 | 24 | | | | |
| 54.0 | 55.5 | | | vc to c sand w/some pebbles and lignite | 70 | 0.72 | 50 | | | | |
| 59.0 | 60.5 | | | vc to c sand w/some pebbles and lignite | 34 | 0.68 | 23 | | | | |
| 64.0 | 65.5 | | ≥65.5 | vc to c sand w/some pebbles and lignite | 18 | 0.66 | 12 | | | | |

FIELD BORING LOG NO.328A

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 6 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.5 | silty sand | NA | | | | | | |
| 10.0 | 11.5 | 5.5 | | f to m sand | 16 | 1.25 | 20 | | | | |
| 15.0 | 16.5 | | | f to m sand | 29 | 1.13 | 33 | | | | |
| 20.0 | 21.5 | | | f to m sand | 19 | 1.04 | 20 | | | | |
| 25.0 | 26.5 | | 29.0 | f to m sand | 27 | 0.96 | 26 | | | | |
| 30.0 | 31.5 | 29.0 | | f sand | 33 | 0.90 | 30 | | | | |
| 35.0 | 36.5 | | 37.0 | f sand | 42 | 0.85 | 36 | | | | |
| 40.0 | 41.5 | 37.0 | | m to c sand | 50 | 0.81 | 41 | | | | |
| 45.0 | 46.5 | | | m to c sand | 50 | 0.77 | 39 | | | | |
| 50.0 | 51.5 | | | m to c sand | 52 | 0.73 | 38 | | | | |
| 55.0 | 56.5 | | | m to c sand | 27 | 0.70 | 19 | | | | |
| 60.0 | 61.5 | | ≥61.5 | m to c sand | 58 | 0.68 | 39 | | | | |

FIELD BORING LOG NO.328B

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 5 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | sandy clay | | | | | | | |
| 10.0 | 11.5 | 5.0 | 14.0 | f sand | 24 | 1.25 | 30 | | | | |
| 15.0 | 16.5 | 14.0 | | m sand | 29 | 1.13 | 33 | | | | |
| 20.0 | 21.5 | | | m sand | 32 | 1.04 | 33 | | | | |
| 25.0 | 26.5 | | 29.0 | m sand | 18 | 0.96 | 17 | | | | |
| 30.0 | 31.5 | 29.0 | 34.0 | m to c sand w/some pebbles | 34 | 0.90 | 31 | | | | |
| 35.0 | 36.5 | 34.0 | | f to m sand | 49 | 0.85 | 42 | | | | |
| 40.0 | 41.5 | | | f to m sand | 55 | 0.81 | 45 | | | | |
| 45.0 | 46.5 | | | f to m sand | 31 | 0.77 | 24 | | | | |
| 50.0 | 51.5 | | | f to m sand | 38 | 0.73 | 28 | | | | |
| 55.0 | 56.5 | | ≥56.5 | f to m sand | 68 | 0.70 | 48 | | | | |

FIELD BORING LOG NO.329A

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 0 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 12.0 | fill | | | | | | | |
| 15.0 | 16.5 | 12.0 | | m sand | 39 | 1.13 | 44 | | | | |
| 20.0 | 21.5 | | | m sand | 13 | 1.04 | 14 | | | | |
| 25.0 | 26.5 | | | m sand | 33 | 0.96 | 32 | | | | |
| 30.0 | 31.5 | | | m sand | 23 | 0.90 | 21 | | | | |
| 35.0 | 36.5 | | 39.0 | m sand | 35 | 0.85 | 30 | | | | |
| 40.0 | 41.5 | 39.0 | | m to c sand | 30 | 0.81 | 24 | | | | |
| 45.0 | 46.5 | | | m to c sand | 37 | 0.77 | 28 | | | | |
| 50.0 | 51.5 | | | m to c sand | 31 | 0.73 | 23 | | | | |
| 55.0 | 56.5 | | | m to c sand | 32 | 0.70 | 22 | | | | |
| 60.0 | 61.5 | | | m to c sand | 43 | 0.68 | 29 | | | | |
| 65.0 | 66.5 | | ≥66.5 | m to c sand | 42 | 0.65 | 27 | | | | |

FIELD BORING LOG NO.329B

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 0 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 11.0 | fill | | | | | | | |
| 15.0 | 16.5 | 11.0 | | m sand | 29 | 1.13 | 33 | | | | |
| 20.0 | 21.5 | | | m sand | 54 | 1.04 | 56 | | | | |
| 25.0 | 26.5 | | | m sand | 35 | 0.96 | 34 | | | | |
| 30.0 | 31.5 | | | m sand | 39 | 0.90 | 35 | | | | |
| 35.0 | 36.5 | | 39.0 | m sand | 25 | 0.85 | 21 | | | | |
| 40.0 | 41.5 | 39.0 | | m to c sand | 29 | 0.81 | 23 | | | | |
| 45.0 | 46.5 | | | m to c sand | 38 | 0.77 | 29 | | | | |
| 50.0 | 51.5 | | 55.0 | m to c sand | 51 | 0.73 | 37 | | | | |
| 55.0 | 56.5 | 55.0 | | sand w/lignite | 51 | 0.70 | 36 | | | | |
| 60.0 | 61.5 | | | sand w/lignite | 37 | 0.68 | 25 | | | | |
| 65.0 | 66.5 | | ≥66.5 | sand w/lignite | 45 | 0.65 | 29 | | | | |

FIELD BORING LOG NO.330

Depth to water table (ft): 8 — Topstratum thickness (ft): 8 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.0 | sandy clay | | | | | | | |
| 10.0 | 11.5 | 8.0 | | m to f sand w/occ gravel | 13 | 1.29 | 17 | | | | |
| 15.0 | 16.5 | | | m to f sand w/occ gravel | 28 | 1.17 | 33 | | | | |
| 20.0 | 21.5 | | | m to f sand w/occ gravel | 30 | 1.07 | 32 | | | | |
| 25.0 | 26.5 | | | m to f sand w/occ gravel | 30 | 0.99 | 30 | | | | |
| 30.0 | 31.5 | | | m to f sand w/occ gravel | 30 | 0.93 | 28 | | | | |
| 35.0 | 36.5 | | | m to f sand w/occ gravel | 38 | 0.87 | 33 | | | | |
| 40.0 | 41.5 | | | m to f sand w/occ gravel | 32 | 0.81 | 26 | | | | |
| 45.0 | 46.5 | | | m to f sand w/occ gravel | 52 | 0.78 | 41 | | | | |
| 50.0 | 51.5 | | | m to f sand w/occ gravel | 41 | 0.74 | 30 | | | | |
| 55.0 | 56.5 | | | m to f sand w/occ gravel | 48 | 0.71 | 34 | | | | |
| 60.0 | 61.5 | | ≥61.5 | m to f sand w/occ gravel | 42 | 0.68 | 29 | | | | |

FIELD BORING LOG NO.331

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 16 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 15.5 | sand and clay | | | | | | | |
| 15.0 | 16.5 | 15.5 | | f sand | 25 | 1.13 | 28 | | | | |
| 20.0 | 21.5 | | 25.0 | f sand | 13 | 1.04 | 14 | | | | |
| 25.0 | 26.5 | 25.0 | | m sand | 43 | 0.96 | 41 | | | | |
| 30.0 | 31.5 | | | m sand | 42 | 0.90 | 38 | | | | |
| 35.0 | 36.5 | | | m sand | 57 | 0.85 | 48 | | | | |
| 40.0 | 41.5 | | 45.0 | m sand | 53 | 0.81 | 43 | | | | |
| 45.0 | 46.5 | 45.0 | | m to c sand | >100 | 0.77 | >77 | | | | |
| 50.0 | 51.5 | | | m to c sand | >100 | 0.73 | >73 | | | | |
| 55.0 | 56.5 | | | m to c sand | >100 | 0.70 | >70 | | | | |
| 60.0 | 61.5 | | | m to c sand | 91 | 0.68 | 62 | | | | |
| 70.0 | 71.5 | | ≥71.5 | m to c sand | 94 | 0.63 | 59 | | | | |

FIELD BORING LOG NO.332

Depth to water table (ft) NA(10) Topstratum thickness (ft) 18

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 18.0 | sandy clay and sand layers | | | | | | | |
| 20.0 | 21.5 | 18.0 | | sand | 96 | 1.04 | 100 | | | | |
| 25.0 | 26.5 | | | sand | 80 | 0.96 | 77 | | | | |
| 30.0 | 31.5 | | | sand | >100 | 0.90 | >90 | | | | |
| 35.0 | 36.5 | | | sand | >100 | 0.85 | >100 | | | | |
| 40.0 | 41.5 | | | sand | >100 | 0.81 | >81 | | | | |
| 45.0 | 46.5 | | 50.0 | sand | 98 | 0.77 | 75 | | | | |
| 50.0 | 51.5 | 50.0 | | m to c sand w/scattered gravel layers | 93 | 0.73 | 68 | | | | |
| 55.0 | 56.5 | | | m to c sand w/ scattered gravel layers | >100 | 0.70 | >70 | | | | |
| 60.0 | 61.5 | | | m to c sand w/ scattered gravel layers | >100 | 0.68 | >100 | | | | |
| 65.0 | 66.5 | | ≥66.5 | m to c sand w/ scattered gravel layers | >100 | 0.65 | >100 | | | | |

FIELD BORING LOG NO.333A

Depth to water table (ft) NA(10) Topstratum thickness (ft) 9

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.0 | sandy clay | | | | | | | |
| | | 9.0 | 12.0 | f sand | | | | | | | |
| 20.0 | 21.5 | 12.0 | | m sand w/some lignite | 22 | 1.04 | 23 | | | | |
| 25.0 | 26.5 | | | m sand w/some lignite | 36 | 0.96 | 35 | | | | |
| 30.0 | 31.5 | | | m sand w/some lignite | 35 | 0.90 | 32 | | | | |
| 35.0 | 36.5 | | 36.5 | m sand w/some lignite | 36 | 0.85 | 31 | | | | |
| 40.0 | 41.5 | 36.5 | 45.0 | m to c sand | 53 | 0.81 | 43 | | | | |
| 45.0 | 46.5 | 45.0 | | m to c sand | 57 | 0.77 | 44 | | | | |
| 50.0 | 51.5 | | | m to c sand | 72 | 0.73 | 53 | | | | |
| 55.0 | 56.5 | | | m to c sand | 51 | 0.70 | 36 | | | | |
| 60.0 | 61.5 | | 70.0 | f sand w/thick layers of lignite | 47 | 0.68 | 32 | | | | |
| 70.0 | 71.5 | 70.0 | | f sand w/thick layers of lignite | 47 | 0.63 | 30 | | | | |
| 75.0 | 76.5 | | 76.5 | f sand w/thick layers of lignite | 53 | 0.60 | 32 | | | | |
| | | 76.5 | ≥100.0 | f sand w/thick layers of lignite | NA | | | | | | |

FIELD BORING LOG NO.333B

Depth to water table (ft) NA(10) Topstratum thickness (ft) 7

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 7.0 | sandy clay | | | | | | | |
| 20.0 | 21.5 | 7.0 | | f to m sand | 58 | 1.04 | 60 | | | | |
| 25.0 | 26.5 | | 30.0 | m sand | 37 | 0.96 | 36 | | | | |
| 30.0 | 31.5 | 30.0 | | m sand | 86 | 0.90 | 77 | | | | |
| 35.0 | 36.5 | | | m sand | 64 | 0.85 | 54 | | | | |
| 40.0 | 41.5 | | 45.0 | m sand | 43 | 0.81 | 35 | | | | |
| 45.0 | 46.5 | 45.0 | | c sand | 26 | 0.77 | 20 | | | | |
| 50.0 | 51.5 | | 55.0 | c sand | 69 | 0.73 | 50 | | | | |
| 55.0 | 56.5 | 55.0 | | f sand | >100 | 0.70 | >70 | | | | |
| 60.0 | 61.5 | | | f sand | 70 | 0.68 | 48 | | | | |
| 65.0 | 66.5 | | 70.0 | f sand w/bands of lignite. | 41 | 0.65 | 27 | | | | |
| 70.0 | 71.5 | 70.0 | | f sand w/bands of lignite | 72 | 0.63 | 45 | | | | |
| 75.0 | 76.5 | | | f sand w/bands of lignite | 52 | 0.60 | 31 | | | | |
| | | | >100 | f sand w/bands of lignite | | | | | | | |

FIELD BORING LOG NO.334

Depth to water table (ft) NA(10) Topstratum thickness (ft) 9

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 9.0 | sandy olay | | | | | | | |
| 15.0 | 16.5 | 9.0 | | f sand | 57 | 1.13 | 64 | | | | |
| 20.0 | 21.5 | | 25.0 | f sand | 52 | 1.04 | 54 | | | | |
| 25.0 | 26.5 | 25.0 | 30.0 | m to c sand | 17 | 0.96 | 16 | | | | |
| 30.0 | 31.5 | 30.0 | | m sand w/layers of gravel and lignite | 73 | 0.90 | 66 | | | | |
| 35.0 | 36.5 | | | m sand w/layers of gravel and lignite | 52 | 0.85 | 44 | | | | |
| 40.0 | 41.5 | | 45.0 | m sand w/layers of gravel and lignite | 59 | 0.81 | 48 | | | | |

FIELD BORING LOG NO.334 --Continued

Depth to water table (ft) NA(10) Topstratum thickness (ft) 9

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 45.0 | 46.5 | 45.0 | | m to c sand w/layers of gravel and lignite | 49 | 0.77 | 38 | | | | |
| 50.0 | 51.5 | | | m to c sand w/layers of gravel and lignite | 57 | 0.73 | 42 | | | | |
| 55.0 | 56.5 | | | m to c sand w/layers of gravel and lignite | 39 | 0.70 | 27 | | | | |
| 60.0 | 61.5 | | 65.0 | m to c sand w/lignite of gravel and lignite | 56 | 0.68 | 38 | | | | |
| 65.0 | 66.5 | 65.0 | | f sand w/bands of of gravel and lignite | 80 | 0.65 | 52 | | | | |
| 70.0 | 71.5 | | 90.0 | f sand w/bands of | >100 | 0.63 | >63 | | | | |
| | | 90.0 | >100.0 | f sand w/f gravel | | | | | | | |

FIELD BORING LOG NO.335A

Depth to water table (ft) NA(10) Topstratum thickness (ft) 11

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 6.0 | sandy clay | | | | | | | |
| | | 6.0 | 11.0 | clay | | | | | | | |
| 15.0 | 16.5 | 11.0 | 20.0 | sand | 43 | 1.13 | 49 | | | | |
| 20.0 | 21.5 | 20.0 | | m sand | 81 | 1.04 | 84 | | | | |
| 25.0 | 26.5 | | | m sand | 53 | 0.96 | 51 | | | | |
| 30.0 | 31.5 | | | m sand | 19 | 0.90 | 17 | | | | |
| 35.0 | 36.5 | | | m sand | >100 | 0.85 | >85 | | | | |
| 40.0 | 41.5 | | | m sand | >100 | 0.81 | >81 | | | | |
| 45.0 | 46.5 | | | m sand | 67 | 0.77 | 52 | | | | |
| 50.0 | 51.5 | | 55.0 | c sand and f gravel | 66 | 0.73 | 48 | | | | |
| 55.0 | 56.5 | 55.0 | | c sand and f gravel | 46 | 0.70 | 32 | | | | |
| 60.0 | 61.5 | | ≥61.5 | c sand and f gravel | >100 | 0.68 | >68 | | | | |

FIELD BORING LOG NO.335B

Depth to water table (ft) NA(10) Topstratum thickness (ft) 6

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 6.0 | clay | | | | | | | |
| 10.0 | 11.5 | 6.0 | | f sand | 30 | 1.25 | 38 | | | | |
| 15.0 | 16.5 | | | f sand | 24 | 1.13 | 27 | | | | |
| 20.0 | 21.5 | | 21.0 | f sand | 51 | 1.04 | 53 | | | | |
| 25.0 | 26.5 | 21.0 | | m sand | 44 | 0.96 | 42 | | | | |
| 30.0 | 31.5 | | | m sand | 79 | 0.90 | 71 | | | | |
| 35.0 | 36.5 | | | m sand | 99 | 0.85 | 84 | | | | |
| 40.0 | 41.5 | | | m sand | 92 | 0.81 | 75 | | | | |
| 45.0 | 46.5 | | | m sand | 96 | 0.77 | 74 | | | | |
| 50.0 | 51.5 | | 52.0 | m sand | 92 | 0.73 | 67 | | | | |
| 55.0 | 56.5 | 52.0 | | c sand w/some gravel | 99 | 0.70 | 69 | | | | |
| 60.0 | 61.5 | | ≥61.5 | c sand w/some gravel | 100 | 0.68 | 68 | | | | |

FIELD BORING LOG NO.335C

Depth to water table (ft) NA(10) Topstratum thickness (ft) 21

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 21.0 | clay | | | | | | | |
| 25.0 | 26.5 | 21.0 | | f sand | 35 | 0.96 | 34 | | | | |
| 30.0 | 31.5 | | | f sand | >100 | 0.90 | >90 | | | | |
| 35.0 | 36.5 | | | f sand | 40 | 0.85 | 34 | | | | |
| 40.0 | 41.5 | | | f sand | 25 | 0.81 | 20 | | | | |
| 45.0 | 46.5 | | 47.0 | f sand | 58 | 0.77 | 45 | | | | |
| 50.0 | 51.5 | 47.0 | | f to m sand | >100 | 0.73 | >73 | | | | |
| 55.0 | 56.5 | | 57.0 | f to m sand | 92 | 0.70 | 64 | | | | |
| 60.0 | 61.5 | 57.0 | | c to m sand | 66 | 0.68 | 45 | | | | |
| 65.0 | 66.5 | | | c to m sand | >100 | 0.65 | >65 | | | | |
| 71.0 | 72.5 | | ≥72.5 | c to m sand | >100 | 0.62 | >62 | | | | |

FIELD BORING LOG NO.335D

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 8 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.0 | sandy clay | | | | | | | |
| 10.0 | 11.5 | 8.0 | | f sand | 43 | 1.25 | 54 | | | | |
| 15.0 | 16.5 | | | f sand | 38 | 1.13 | 43 | | | | |
| 20.0 | 21.5 | | | f sand | 33 | 1.04 | 34 | | | | |
| 25.0 | 26.5 | | | f sand | 60 | 0.96 | 58 | | | | |
| 30.0 | 31.5 | | 33.0 | f sand | 52 | 0.90 | 47 | | | | |
| 35.0 | 36.5 | 33.0 | 38.0 | sand w/some f gravel | 79 | 0.85 | 67 | | | | |
| 40.0 | 41.5 | 38.0 | | m sand | 50 | 0.81 | 41 | | | | |
| 45.0 | 46.5 | | | m sand | 69 | 0.77 | 53 | | | | |
| 50.0 | 51.5 | | 52.5 | m sand | 72 | 0.73 | 53 | | | | |
| 55.0 | 56.5 | 52.5 | | m sand w/some f gravel | 45 | 0.70 | 32 | | | | |
| 60.0 | 61.5 | | | m sand w/some f gravel | 84 | 0.68 | 57 | | | | |
| 65.0 | 66.5 | | ≥66.5 | m sand w/some f gravel | >100 | 0.65 | >65 | | | | |

FIELD BORING LOG NO.336A

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 13 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 8.0 | clay | | | | | | | |
| | | 8.0 | 13.0 | sandy silt | | | | | | | |
| 15.0 | 16.5 | 13.0 | 17.0 | f sand | 21 | 1.13 | 24 | | | | |
| 20.0 | 21.5 | 17.0 | | m sand | 33 | 1.04 | 34 | | | | |
| 25.0 | 26.5 | | | m sand | 23 | 0.96 | 22 | | | | |
| 30.0 | 31.5 | | 33.0 | m sand | 27 | 0.90 | 24 | | | | |
| 35.0 | 36.5 | 33.0 | | c sand | 87 | 0.85 | 74 | | | | |
| 40.0 | 41.5 | | 44.0 | c sand | 49 | 0.81 | 40 | | | | |
| 45.0 | 46.5 | 44.0 | | c sand and gravel layers | 55 | 0.77 | 42 | | | | |
| | | | ≥90.0 | c sand and gravel layers | | | | | | | |

FIELD BORING LOG NO.336B

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 4 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 4.0 | sandy clay | | | | | | | |
| 5.0 | 6.5 | 4.0 | 7.0 | sand, br | 8 | 1.4 | 11 | | | | |
| 10.0 | 11.5 | 7.0 | | c sand, gr | 24 | 1.25 | 30 | | | | |
| 15.0 | 16.5 | | | c sand, gr | 17 | 1.13 | 19 | | | | |
| 20.0 | 21.5 | | | c sand, gr | 13 | 1.04 | 14 | | | | |
| 25.0 | 26.5 | | | c sand, gr | 77 | 0.96 | 74 | | | | |
| 30.0 | 31.5 | | | c sand, gr | 88 | 0.90 | 79 | | | | |
| 35.0 | 36.5 | | | c sand, gr | 72 | 0.85 | 61 | | | | |
| 40.0 | 41.5 | 40.5 | | c sand, gr | 27 | 0.85 | 22 | | | | |
| | | | 51.0 | c sand and f gravel layers | NA | | | | | | |
| | | 51.0 | 58.0 | c sand | NA | | | | | | |
| | | 58.0 | 76.0 | c sand and gravel layers | NA | | | | | | |
| | | 76.0 | 88.0 | sand | NA | | | | | | |
| | | 88.0 | 97.5 | sand and gravel layers | NA | | | | | | |
| | | 97.5 | ≥100.5 | sand | NA | | | | | | |

FIELD BORING LOG NO.337A

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 19 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 5.0 | silty clay | | | | | | | |
| | | 5.0 | 12.0 | clay | | | | | | | |
| | | 12.0 | 19.0 | clay and sand layers | | | | | | | |
| 20.0 | 21.5 | 19.0 | | sand | 19 | 1.04 | 20 | | | | |
| 25.0 | 26.5 | | | sand | 47 | 0.96 | 45 | | | | |
| 30.0 | 31.5 | | | sand | 42 | 0.90 | 38 | | | | |
| 35.0 | 36.5 | | | sand | 24 | 0.85 | 20 | | | | |
| 40.0 | 41.5 | | | sand | 43 | 0.81 | 35 | | | | |
| 45.0 | 46.5 | | | sand | 35 | 0.77 | 27 | | | | |
| 50.0 | 51.5 | | | sand | 53 | 0.73 | 39 | | | | |
| | | | 79.0 | sand | NA | | | | | | |
| | | 79.0 | >100.0 | sand and a few gravel layers | NA | | | | | | |

FIELD BORING LOG NO.337B

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 18 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 18.0 | silty clay | | | | | | | |
| 20.0 | 21.5 | 18.0 | | sand | 31 | 1.04 | 32 | | | | |
| 25.0 | 26.5 | | | sand | 43 | 0.96 | 41 | | | | |
| 30.0 | 31.5 | | | sand | 47 | 0.90 | 42 | | | | |
| 35.0 | 36.5 | | | sand | 45 | 0.85 | 38 | | | | |
| 40.0 | 41.5 | | | sand | 40 | 0.81 | 32 | | | | |
| 45.0 | 46.5 | | | sand | 49 | 0.77 | 38 | | | | |
| 50.0 | 51.5 | | | sand | 51 | 0.73 | 37 | | | | |
| | | | 78.0 | sand | NA | | | | | | |
| | | 78.0 | 81.0 | sand and a few f gravel layers | NA | | | | | | |
| | | 81.0 | 89.0 | sand | NA | | | | | | |
| | | 89.0 | ≥100.0 | sand and a few gravel layers | NA | | | | | | |

FIELD BORING LOG NO.338A

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 15 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 15.2 | clay | | | | | | | |
| 15.0 | 16.5 | 15.2 | | c to f sand | 22 | 1.13 | 25 | | | | |
| 20.0 | 21.5 | | | c to f sand | 14 | 1.04 | 15 | | | | |
| 25.0 | 26.5 | | 30.0 | c to f sand | 22 | 0.96 | 21 | | | | |
| 30.0 | 31.5 | 30.0 | | c to vc sand w/some f gravel | 21 | 0.90 | 19 | | | | |
| 35.0 | 36.5 | | | c to vc sand w/some f gravel | 52 | 0.85 | 44 | | | | |
| 40.0 | 41.5 | | | c to vc sand w/some f gravel | 47 | 0.81 | 38 | | | | |
| 45.0 | 46.5 | | | c to vc sand w/some f gravel | 32 | 0.77 | 25 | | | | |
| 50.0 | 51.5 | | | c to vc sand w/some f gravel | 57 | 0.73 | 42 | | | | |
| 55.0 | 56.5 | | | c to vc sand w/some f gravel | 65 | 0.70 | 46 | | | | |
| 60.0 | 61.5 | | | c to vc sand w/some f gravel | 61 | 0.68 | 41 | | | | |
| 70.0 | 71.5 | | ≥71.5 | c to vc sand w/some f gravel | 65 | 0.63 | 41 | | | | |

FIELD BORING LOG NO.338B

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 19 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 19.0 | clay | | | | | | | |
| 20.0 | 21.5 | 19.0 | | m to c sand | 16 | 1.04 | 17 | | | | |
| 25.0 | 26.5 | | | m to c sand | 10 | 0.96 | 10 | | | | |
| 30.0 | 31.5 | | | m to c sand | 31 | 0.90 | 28 | | | | |
| 35.0 | 36.5 | | | m to c sand | 25 | 0.85 | 21 | | | | |
| 40.0 | 41.5 | | | m to c sand | 34 | 0.81 | 28 | | | | |
| 45.0 | 46.5 | | | m to c sand | 63 | 0.77 | 49 | | | | |
| 50.0 | 51.5 | | | m to c sand | 35 | 0.73 | 26 | | | | |
| 55.0 | 56.5 | | 60.0 | m to c sand | 47 | 0.70 | 33 | | | | |
| 60.0 | 61.5 | 60.0 | | sand and gravel layers | 59 | 0.68 | 40 | | | | |
| 65.0 | 66.5 | | | sand and gravel layers | 28 | 0.65 | 18 | | | | |
| 70.0 | 71.5 | | | sand and gravel layers | 47 | 0.63 | 30 | | | | |
| | | | ≥90.0 | sand and gravel layers | NA | | | | | | |

FIELD BORING LOG NO.338C

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 19 — Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 19.0 | clay, stiff | | | | | | | |
| 20.0 | 21.5 | 19.0 | 25.0 | c sand | 6 | 1.04 | 6 | | | | |
| 25.0 | 26.5 | 25.0 | | c to vc sand w/some f gravel | 15 | 0.96 | 14 | | | | |
| 30.0 | 31.5 | | | c to vc sand w/some f gravel | 38 | 0.90 | 34 | | | | |
| 35.0 | 36.5 | | | c to vc sand w/some f gravel | 57 | 0.85 | 48 | | | | |
| 40.0 | 41.5 | | | c to vc sand w/some f gravel | 32 | 0.81 | 26 | | | | |
| 45.0 | 46.5 | | | c to vc sand w/some f gravel | 47 | 0.77 | 36 | | | | |
| 50.0 | 51.5 | | | c to vc sand w/some f gravel | 25 | 0.73 | 18 | | | | |
| 55.0 | 56.5 | | | c to vc sand w/some f gravel | 39 | 0.70 | 27 | | | | |
| 60.0 | 61.5 | | | c to vc sand w/some f gravel | 40 | 0.68 | 27 | | | | |
| 65.0 | 66.5 | | | c to vc sand w/some f gravel | 52 | 0.65 | 34 | | | | |
| 70.0 | 71.5 | | ≥71.5 | c to vc sand w/some f gravel | 96 | 0.63 | 60 | | | | |

FIELD BORING LOG NO.338D

Depth to water table (ft): NA(10) Topstratum thickness (ft): 22

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 22.0 | clay, stiff | | | | | | | |
| 25.0 | 26.5 | 22.0 | | c to vc sand w/some f gravel | 40 | 0.96 | 38 | | | | |
| 30.0 | 31.5 | | | c to vc sand w/some f gravel | 48 | 0.90 | 43 | | | | |
| 35.0 | 36.5 | | | c to vc sand w/some f gravel | 59 | 0.85 | 50 | | | | |
| 40.0 | 41.5 | | | c to vc sand w/some f gravel | 37 | 0.81 | 30 | | | | |
| 45.0 | 46.5 | | | c to vc sand w/some f gravel | 35 | 0.77 | 27 | | | | |
| 50.0 | 51.5 | | | c to vc sand w/some f gravel | 39 | 0.73 | 28 | | | | |
| 55.0 | 56.5 | | | c to vc sand w/some f gravel | 28 | 0.70 | 20 | | | | |
| 65.0 | 66.5 | | ≥66.5 | c to vc sand w/some f gravel | >100 | 0.65 | >65 | | | | |

FIELD BORING LOG NO.339A

Depth to water table (ft): NA(10) Topstratum thickness (ft): 17

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 17.0 | clayey and silty sand, stiff | | | | | | | |
| 20.0 | 21.5 | 17.0 | | sand and gravel layers | 13 | 1.04 | 14 | | | | |
| 25.0 | 26.5 | | | sand and gravel layers | 30 | 0.96 | 29 | | | | |
| 30.0 | 31.5 | | | sand and gravel layers | 31 | 0.90 | 28 | | | | |
| 35.0 | 36.5 | | | sand and gravel layers | 35 | 0.85 | 30 | | | | |
| 40.0 | 41.5 | | | sand and gravel layers | 23 | 0.81 | 19 | | | | |
| 45.0 | 46.5 | | | sand and gravel layers | 25 | 0.77 | 19 | | | | |
| 50.0 | 51.5 | | | sand and gravel layers | 41 | 0.73 | 30 | | | | |
| 55.0 | 56.5 | | | sand and gravel layers | 49 | 0.70 | 34 | | | | |
| 60.0 | 61.5 | | | sand and gravel layers | 53 | 0.68 | 36 | | | | |
| 65.0 | 66.5 | | | sand and gravel layers | 14 | 0.65 | 9 | | | | |
| 70.0 | 71.5 | | ≥71.5 | sand and gravel layers | 50 | 0.63 | 32 | | | | |

FIELD BORING LOG NO.339B

Depth to water table (ft): NA(10) Topstratum thickness (ft): 16

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 16.0 | clayey silt | | | | | | | |
| 20.0 | 21.5 | 16.0 | | sand | 65 | 1.04 | 68 | | | | |
| 25.0 | 26.5 | | | sand | 56 | 0.96 | 54 | | | | |
| 30.0 | 31.5 | | | sand | 31 | 0.90 | 28 | | | | |
| 35.0 | 36.5 | | | sand | 48 | 0.85 | 41 | | | | |
| 40.0 | 41.5 | | | sand | 55 | 0.81 | 45 | | | | |
| 45.0 | 46.5 | | 49.0 | sand | 37 | 0.77 | 28 | | | | |
| 50.0 | 51.5 | 49.0 | | sand and gravel layers | 57 | 0.73 | 42 | | | | |
| 55.0 | 56.5 | | | sand and gravel layers | 65 | 0.70 | 46 | | | | |
| 60.0 | 61.5 | | | sand and gravel layers | 62 | 0.68 | 42 | | | | |
| 65.0 | 66.5 | | | sand and gravel layers | >100 | 0.65 | >65 | | | | |
| 70.0 | 71.5 | | | sand and gravel layers | 56 | 0.63 | 35 | | | | |
| | | | 88.3 | sand and gravel layers | NA | | | | | | |
| | | 88.3 | >100.0 | c gravel and sand | NA | | | | | | |

FIELD BORING LOG NO.340A

Depth to water table (ft): NA(10) Topstratum thickness (ft): 19

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 19.0 | clayey silt | | | | | | | |
| 20.0 | 21.5 | 19.0 | | sand w/occ f gravel | 12 | 1.04 | 12 | | | | |
| 25.0 | 26.5 | | | sand w/occ f gravel | 68 | 0.96 | 65 | | | | |
| 30.0 | 31.5 | | | sand w/occ f gravel | 50 | 0.90 | 45 | | | | |
| 35.0 | 36.5 | | | sand w/occ f gravel | >100 | 0.85 | >85 | | | | |
| 40.0 | 41.5 | | | sand w/occ f gravel | 72 | 0.81 | 58 | | | | |
| 45.0 | 46.5 | | | sand w/occ f gravel | 73 | 0.77 | 56 | | | | |
| 50.0 | 51.5 | | | sand w/occ f gravel | 42 | 0.73 | 31 | | | | |
| 55.0 | 56.5 | | | sand w/occ f gravel | 36 | 0.70 | 25 | | | | |
| 60.0 | 61.5 | | | sand w/occ f gravel | 27 | 0.68 | 18 | | | | |
| 65.0 | 66.5 | | ≥66.5 | sand w/occ f gravel | 57 | 0.65 | 37 | | | | |

FIELD BORING LOG NO.340B

Depth to water table (ft): NA(10) Topstratum thickness (ft): 18

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 17.5 | clay, stiff | | | | | | | |
| 20.0 | 21.5 | 17.5 | | c to vc sand w/some m sand, gravel and lignite | 33 | 1.04 | 34 | | | | |
| 25.0 | 26.5 | | | c to vc sand w/some m sand, gravel and lignite | 45 | 0.96 | 43 | | | | |
| 30.0 | 31.5 | | | c to vc sand w/some m sand, gravel and lignite | 47 | 0.90 | 42 | | | | |
| 35.0 | 36.5 | | | c to vc sand w/some m sand, gravel and lignite | 56 | 0.85 | 48 | | | | |
| 40.0 | 41.5 | | | c to vc sand w/some m sand, gravel and lignite | 47 | 0.81 | 38 | | | | |
| 45.0 | 46.5 | | | c to vc sand w/some m sand, gravel and lignite | 36 | 0.77 | 28 | | | | |
| 50.0 | 51.5 | | | c to vc sand w/some m sand, gravel and lignite | 39 | 0.73 | 28 | | | | |
| 55.0 | 56.5 | | | c to vc sand w/some m sand, gravel and lignite | 42 | 0.70 | 29 | | | | |
| 60.0 | 61.5 | | | c to vc sand w/some m sand, gravel and lignite | 57 | 0.68 | 39 | | | | |
| 65.0 | 66.5 | | ≥66.5 | c to vc sand w/some m sand, gravel and lignite | 57 | 0.65 | 37 | | | | |

FIELD BORING LOG NO.340C

Depth to water table (ft): NA(10) Topstratum thickness (ft): 22

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 21.5 | silty clay | | | | | | | |
| 25.0 | 26.5 | 21.5 | | sand w/gravel layers | 69 | 0.96 | 66 | | | | |
| 30.0 | 31.5 | | | sand w/gravel layers | 32 | 0.90 | 29 | | | | |
| 35.0 | 36.5 | | | sand w/gravel layers | 54 | 0.85 | 46 | | | | |
| 40.0 | 41.5 | | | sand w/gravel layers | 36 | 0.81 | 29 | | | | |
| 45.0 | 46.5 | | | sand w/gravel layers | 69 | 0.77 | 53 | | | | |
| 50.0 | 51.5 | | | sand w/gravel layers | 54 | 0.73 | 39 | | | | |
| 55.0 | 56.5 | | | sand w/gravel layers | 35 | 0.70 | 25 | | | | |
| 60.0 | 61.5 | | | sand w/gravel layers | 65 | 0.68 | 44 | | | | |
| 65.0 | 66.5 | | ≥66.5 | sand w/gravel layers | 77 | 0.65 | 50 | | | | |

FIELD BORING LOG NO.340D

Depth to water table (ft): NA(10) Topstratum thickness (ft): 16

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 16.0 | silty | | | | | | | |
| 20.0 | 21.5 | 16.0 | | m to c sand | 17 | 1.04 | 18 | | | | |
| 25.0 | 26.5 | | | m to c sand | 17 | 0.96 | 16 | | | | |
| 30.0 | 31.5 | | | m to c sand | 28 | 0.90 | 25 | | | | |
| 35.0 | 36.5 | | | m to c sand | 58 | 0.85 | 49 | | | | |
| 40.0 | 41.5 | | 43.0 | m to c sand | 44 | 0.81 | 36 | | | | |
| 45.0 | 46.5 | 43.0 | | sand w/f to m gravel | 45 | 0.77 | 35 | | | | |
| 50.0 | 51.5 | | | sand w/f to m gravel | 51 | 0.73 | 37 | | | | |
| 55.0 | 56.5 | | | sand w/f to m gravel | 47 | 0.70 | 33 | | | | |
| 60.0 | 61.5 | | ≥61.5 | sand w/f to m gravel | 40 | 0.68 | 27 | | | | |

FIELD BORING LOG NO.341A

Depth to water table (ft): NA(10) Topstratum thickness (ft): 21

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 21.0 | clayey silt | | | | | | | |
| 25.0 | 26.5 | 21.0 | | sand and gravel | 34 | 0.96 | 33 | | | | |
| 30.0 | 31.5 | | | sand and gravel | 72 | 0.90 | 65 | | | | |
| 35.0 | 36.5 | | | sand and gravel | 30 | 0.85 | 26 | | | | |
| 40.0 | 41.5 | | | sand and gravel | 60 | 0.81 | 49 | | | | |
| 45.0 | 46.5 | | | sand and gravel | 71 | 0.77 | 55 | | | | |
| 50.0 | 51.5 | | | sand and gravel | 36 | 0.73 | 26 | | | | |
| 55.0 | 56.5 | | | sand and gravel | 63 | 0.70 | 44 | | | | |
| 60.0 | 61.5 | | | sand and gravel | 71 | 0.68 | 48 | | | | |
| 65.0 | 66.5 | | | sand and gravel | 88 | 0.65 | 57 | | | | |
| 70.0 | 71.5 | | ≥71.5 | sand and gravel | 76 | 0.63 | 48 | | | | |

FIELD BORING LOG NO. 341B

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 23

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. (Laboratory Classification) | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 22.5 | silty clay | | | | | | | |
| 25.0 | 26.5 | 22.5 | | sand and gravel | 50 | 0.96 | 48 | | | | |
| 30.0 | 31.5 | | | sand and gravel | 41 | 0.90 | 37 | | | | |
| 35.0 | 36.5 | | | sand and gravel | 63 | 0.85 | 54 | | | | |
| 40.0 | 41.5 | | | sand and gravel | 53 | 0.81 | 43 | | | | |
| 45.0 | 46.5 | | | sand and gravel | 44 | 0.77 | 34 | | | | |
| 50.0 | 51.5 | | | sand and gravel | 25 | 0.73 | 18 | | | | |
| 55.0 | 56.5 | | | sand and gravel | 20 | 0.70 | 14 | | | | |
| 60.0 | 61.5 | | | sand and gravel | 59 | 0.68 | 40 | | | | |
| 65.0 | 66.5 | | | sand and gravel | 74 | 0.65 | 48 | | | | |
| 70.0 | 71.5 | | | sand and gravel | 79 | 0.63 | 50 | | | | |
| | | | ≥100.0 | sand and gravel | NA | | | | | | |

FIELD BORING LOG NO. 342

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 20

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. (Laboratory Classification) | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 6.0 | silty clay | | | | | | | |
| | | 6.0 | 20.0 | silt and silty sand | | | | | | | |
| 20.0 | 28.0 | 20.0 | 28.0 | m sand w/silt | 0 | | | | | | |

FIELD BORING LOG NO. 343A

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 15

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. (Laboratory Classification) | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 2.0 | sandy clay | | | | | | | |
| | | 2.0 | 14.5 | clay | | | | | | | |
| 15.0 | 16.5 | 14.5 | | f sand | 37 | 1.13 | 42 | | | | |
| 20.0 | 21.5 | | | f sand | 46 | 1.04 | 48 | | | | |
| 25.0 | 26.5 | | 27.0 | f sand | 30 | 0.96 | 29 | | | | |
| 30.0 | 31.5 | 27.0 | | f to m sand, w/some f gravel | >100 | 0.90 | >90 | | | | |
| 35.0 | 36.5 | | | f to m sand, w/some f | >100 | 0.85 | >85 | | | | |
| 40.0 | 41.5 | | | f to m sand, w/some f gravel | 92 | 0.81 | 75 | | | | |
| 45.0 | 46.5 | | | f to m sand, w/some f gravel | 91 | 0.77 | 70 | | | | |
| 50.0 | 51.5 | | | f to m sand, w/some f gravel | 77 | 0.73 | 56 | | | | |
| | | | 60.0 | f to m sand, w/some f gravel | NA | | | | | | |

FIELD BORING LOG NO. 343B

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 11

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. (Laboratory Classification) | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 10.5 | clay, stiff | | | | | | | |
| 10.0 | 11.5 | 10.5 | | m to f sand | 26 | 1.25 | 33 | | | | |
| 15.0 | 16.5 | | | m to f sand | 28 | 1.13 | 32 | | | | |
| 20.0 | 21.5 | | | m to f sand | 35 | 1.04 | 36 | | | | |
| 25.0 | 26.5 | | | m to f sand | 11 | 0.96 | 11 | | | | |
| 30.0 | 31.5 | | | m to f sand | >100 | 0.90 | >90 | | | | |
| 35.0 | 36.5 | | | m to f sand | >100 | 0.85 | >85 | | | | |
| 40.0 | 41.5 | | | m to f sand | 59 | 0.81 | 48 | | | | |
| 45.0 | 46.5 | | | m to f sand | 77 | 0.77 | 59 | | | | |
| 50.0 | 51.5 | | | m to f sand | 52 | 0.73 | 38 | | | | |
| | | | 60.0 | m to f sand | | | | | | | |

FIELD BORING LOG NO. 344

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 34

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. (Laboratory Classification) | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 24.0 | silty clay | | | | | | | |
| | | 24.0 | 34.2 | sandy clay, soft | | | | | | | |
| 35.0 | 36.5 | 34.2 | | m to f sand | 26 | 0.85 | 22 | | | | |
| 40.0 | 41.5 | | | m to f sand | 50 | 0.81 | 41 | | | | |
| 45.0 | 46.5 | | | m to f sand | 67 | 0.77 | 52 | | | | |
| 50.0 | 51.5 | | 55.0 | m to f snd | 20 | 0.73 | 15 | | | | |
| 55.0 | 56.5 | 55.0 | | m sand | 67 | 0.70 | 47 | | | | |
| 60.0 | 61.5 | | | m sand | 41 | 0.68 | 28 | | | | |
| 65.0 | 66.5 | | ≥66.5 | m sand | 95 | 0.65 | 62 | | | | |

FIELD BORING LOG NO. 345A

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 32

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. (Laboratory Classification) | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 10.0 | clayey and silty sand | | | | | | | |
| | | 10.0 | 25.0 | silty clay | | | | | | | |
| | | 25.0 | 30.0 | clay | | | | | | | |
| | | 30.0 | 31.5 | clayey and silty sand | | | | | | | |
| 35.0 | 36.5 | 31.5 | | m sand | 13 | 0.85 | 11 | | | | |
| 40.0 | 41.5 | | | m sand | 31 | 0.81 | 25 | | | | |
| 45.0 | 46.5 | | 50.0 | m sand | 41 | 0.77 | 32 | | | | |
| 50.0 | 51.5 | 50.0 | | c sand w/some gravel | 39 | 0.73 | 28 | | | | |
| 60.0 | 61.5 | | | c sand w/some gravel | 38 | 0.68 | 26 | | | | |
| 70.0 | 71.5 | | ≥71.5 | c sand w/some gravel | 54 | 0.63 | 34 | | | | |

FIELD BORING LOG NO. 345B

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 31

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. (Laboratory Classification) | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 20.0 | clayey and silty sand | | | | | | | |
| | | 20.0 | 25.0 | silty clay | | | | | | | |
| | | 25.0 | 30.0 | clay | | | | | | | |
| | | 30.0 | 30.5 | silty clay, stiff | | | | | | | |
| 35.0 | 36.5 | 30.5 | | m sand | 20 | 0.85 | 17 | | | | |
| 40.0 | 41.5 | | 45.0 | m sand | 53 | 0.81 | 43 | | | | |
| 45.0 | 46.5 | 45.0 | | c sand | 40 | 0.77 | 31 | | | | |
| 50.0 | 51.5 | | | c sand | 46 | 0.73 | 34 | | | | |
| 60.0 | 61.5 | | ≥61.5 | c sand | 52 | 0.68 | 35 | | | | |

FIELD BORING LOG NO. 346A

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 21

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. (Laboratory Classification) | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 20.5 | silty clay | | | | | | | |
| 20.0 | 21.5 | 20.5 | | vf sand | 11 | 1.04 | 11 | | | | |
| 25.0 | 26.5 | | | vf sand | 26 | 0.96 | 25 | | | | |
| 30.0 | 31.5 | | 35.0 | vf sand | 33 | 0.90 | 30 | | | | |
| 35.0 | 36.5 | 35.0 | | f sand | 31 | 0.85 | 26 | | | | |
| 40.0 | 41.5 | | | f sand | 32 | 0.81 | 26 | | | | |
| 45.0 | 46.5 | | | f sand | 33 | 0.77 | 25 | | | | |
| 50.0 | 51.5 | | | f sand | 47 | 0.73 | 34 | | | | |
| 60.0 | 61.5 | | | f sand | 50 | 0.68 | 34 | | | | |
| 70.0 | 71.5 | | ≥71.5 | f sand | 76 | 0.63 | 48 | | | | |

FIELD BORING LOG NO. 346B

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 20(30)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. (Laboratory Classification) | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 19.5 | silty clay | | | | | | | |
| 20.0 | 21.5 | 19.5 | 25.0 | f sand | 13 | 1.04 | 14 | | | | |
| | | 25.0 | 30.0 | silty clay | | | | | | | |
| 30.0 | 31.5 | 30.0 | 35.0 | vf sand | 17 | 0.90 | 15 | | | | |
| 35.0 | 36.5 | 35.0 | | f sand | 24 | 0.85 | 20 | | | | |
| 40.0 | 41.5 | | | f sand | 17 | 0.81 | 14 | | | | |
| 45.0 | 46.5 | | | f sand | 55 | 0.77 | 42 | | | | |
| 50.0 | 51.5 | | | f sand | 45 | 0.73 | 33 | | | | |
| 60.0 | 61.5 | | | f sand | 32 | 0.68 | 22 | | | | |
| 70.0 | 71.5 | | ≥71.5 | f sand | 61 | 0.63 | 38 | | | | |

FIELD BORING LOG NO. 347A

Depth to water table (ft): NA(10) — Topstratum thickness (ft): 16

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. (Laboratory Classification) | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 16.0 | clayey silt | | | | | | | |
| 20.0 | 21.5 | 16.0 | 25.0 | vf sand | 10 | 1.04 | 10 | | | | |
| 25.0 | 26.5 | 25.0 | | m sand | 19 | 0.96 | 18 | | | | |
| 30.0 | 31.5 | | | m sand | 21 | 0.90 | 19 | | | | |
| 35.0 | 36.5 | | | m sand | 17 | 0.85 | 14 | | | | |
| 40.0 | 41.5 | | | m sand | 24 | 0.81 | 19 | | | | |
| 45.0 | 46.5 | | | m sand | 48 | 0.77 | 37 | | | | |
| 50.0 | 51.5 | | 55.0 | m sand | 34 | 0.73 | 25 | | | | |
| 55.0 | 56.5 | 55.0 | | c sand | 53 | 0.70 | 37 | | | | |
| 60.0 | 61.5 | | | c sand | 47 | 0.68 | 32 | | | | |
| 70.0 | 71.5 | | ≥71.5 | c sand | >100 | 0.63 | >63 | | | | |

FIELD BORING LOG NO. 347B

Depth to water table (ft) Topstratum thickness (ft) — Laboratory Classification

NA(10) 20

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | C N | N 1 | Class. | D 50 (mm) | D 10 (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 19.5 | clayey silt | | | | | | | |
| 20.0 | 21.5 | 19.5 | | vf sand | 9 | 1.04 | 9 | | | | |
| 25.0 | 26.5 | | 30.0 | vf sand | 34 | 0.96 | 33 | | | | |
| 30.0 | 31.5 | 30.0 | | f sand | 34 | 0.90 | 31 | | | | |
| 35.0 | 36.5 | | | f sand | 39 | 0.85 | 33 | | | | |
| 40.0 | 41.5 | | | f sand | 51 | 0.81 | 41 | | | | |
| 45.0 | 46.5 | | 50.0 | f sand | 56 | 0.77 | 43 | | | | |
| 50.0 | 51.5 | 50.0 | | f sand | 49 | 0.73 | 36 | | | | |
| 60.0 | 61.5 | | | m sand | 53 | 0.68 | 36 | | | | |
| 70.0 | 71.5 | | ≥71.5 | m sand | 40 | 0.63 | 25 | | | | |

FIELD BORING LOG NO. 348A

Depth to water table (ft) Topstratum thickness (ft) — Laboratory Classification

NA(10) 15

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | C N | N 1 | Class. | D 50 (mm) | D 10 (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 14.5 | clayey and silty sand | | | | | | | |
| 20.0 | 21.5 | 14.5 | | f sand | 26 | 1.04 | 27 | | | | |
| 25.0 | 26.5 | | 30.0 | vf sand | 25 | 0.96 | 24 | | | | |
| | | 30.0 | 33.0 | f sand w/clay | | | | | | | |
| 35.0 | 36.5 | 33.0 | | c sand | 74 | 0.85 | 63 | | | | |
| 40.0 | 41.5 | | | c sand | 24 | 0.81 | 19 | | | | |
| 45.0 | 46.5 | | | c sand | 35 | 0.77 | 27 | | | | |
| 50.0 | 51.5 | | | c sand | 75 | 0.73. | 55 | | | | |
| 60.0 | 61.5 | | ≥61.5 | c sand | >100 | 0.68 | >68 | | | | |

FIELD BORING LOG NO. 348B

Depth to water table (ft) Topstratum thickness (ft) — Laboratory Classification

NA(10) 12(45)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | C N | N 1 | Class. | D 50 (mm) | D 10 (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 12.0 | clayey and silty sand | | | | | | | |
| 20.0 | 21.5 | 12.0 | | vf sand | 15 | 1.04 | 16 | | | | |
| 25.0 | 26.5 | | 30.0 | .vf sand | 16 | 0.96 | 15 | | | | |
| | | 30.0 | 45.0 | clay | | | | | | | |
| 45.0 | 46.5 | 45.0 | | c sand | 27 | 0.77 | 21 | | | | |
| 50.0 | 51.5 | | | c sand | 54 | 0.73 | 39 | | | | |
| 55.0 | 56.5 | | | c sand | 51 | 0.70 | 36 | | | | |
| 60.0 | 61.5 | | | c sand | 62 | 0.68 | 42 | | | | |
| 70.0 | 71.5 | | ≥71.5 | c sand | 82 | 0.63 | 52 | | | | |

FIELD BORING LOG NO. 349

Depth to water table (ft) Topstratum thickness (ft) — Laboratory Classification

NA(10) 23

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | C N | N 1 | Class. | D 50 (mm) | D 10 (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 23.0 | silt, sand and clay layers | | | | | | | |
| 26.2 | 27.7 | 23.0 | | m to vc sand | 14 | 0.95 | 13 | | | | |
| 30.0 | 31.5 | | | m to vc sand | 13 | 0.90 | 12 | | | | |
| 40.0 | 41.5 | | 45.0 | m to vc sand | 16 | 0.81 | 13 | | | | |
| 50.0 | 51.5 | 45.0 | | vc to m sand | 33 | 0.73 | 24 | | | | |
| 60.0 | 61.5 | | | vc to m sand | 78 | 0.68 | 53 | | | | |
| 70.0 | 71.5 | | 76.0 | vc to m sand | 33 | 0.63 | 21 | | | | |
| 80.0 | 81.5 | 76.0 | | sand w/some gravel | 41 | 0.58 | 24 | | | | |
| 90.0 | 91.5 | | | sand w/some gravel | 58 | 0.54 | 31 | | | | |
| 100.0 | 101.5 | | | sand w/some gravel | >100 | 0.51 | >51 | | | | |
| 110.0 | 111.5 | | | sand w/some gravel | >100 | 0.49 | >49 | | | | |
| 120.0 | 121.5 | | | sand w/some gravel | 17 | 0.47 | 8 | | | | |
| 130.0 | 131.5 | | | sand w/some gravel | >100 | 0.45 | >45 | | | | |
| 140.0 | 141.5 | | | sand w/some gravel | 55 | 0.43 | 24 | | | | |
| 150.0 | 151.5 | | | sand w/some gravel | >100 | 0.41 | >41 | | | | |
| 160.0 | 161.5 | | | sand w/some gravel | >100 | 0.4 | 40 | | | | |
| 170.0 | 171.5 | | | sand w/some gravel | >100 | 0.4 | 40 | | | | |
| 180.0 | 181.5 | | | sand w/some gravel | >100 | 0.4 | 40 | | | | |
| 190.0 | 191.5 | | | sand w/some gravel | >100 | 0.4 | 40 | | | | |
| 200.0 | 201.5 | | ≥20.15 | sand w/some gravel | >100 | 0.4 | 40 | | | | |

FIELD BORING LOG NO. 350

Depth to water table (ft) Topstratum thickness (ft) — Laboratory Classification

NA(10) 0(26)

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | C N | N 1 | Class. | D 50 (mm) | D 10 (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10.0 | 11.5 | 0.0 | | m to c sand | 18 | 1.25 | 23 | | | | |
| 20.0 | 21.5 | | 26.0 | m to c sand | 15 | 1.04 | 16 | | | | |
| | | 26.0 | 40.0 | sand w/silt and clay layer | | | | | | | |
| 40.0 | 41.5 | 40.0 | 50.0 | m to c sand | 19 | 0.81 | 15 | | | | |
| | | 50.0 | 55.0 | sand w/clay layers | | | | | | | |
| 60.0 | 61.5 | 55.0 | | m to vc sand w/some f gravel | 65 | 0.68 | 44 | | | | |
| 70.0 | 71.5 | | | m to vc sand w/some f gravel | 77 | 0.63 | 49 | | | | |
| 80.0 | 81.5 | | | m to vc sand w/some f gravel | >100 | 0.58 | 58 | | | | |
| 90.0 | 91.5 | | | m to vc sand w/some f gravel | 54 | 0.54 | 29 | | | | |
| 100.0 | 101.5 | | | m to vc sand w/some f gravel | 90 | 0.51 | 46 | | | | |
| 110.0 | 111.5 | | | m to vc sand w/some f gravel | 62 | 0.49 | 30 | | | | |
| 120.0 | 121.5 | | | m to vc sand w/some f gravel | >100 | 0.47 | >47 | | | | |
| 130.0 | 131.5 | | | m to vc sand w/some f gravel | >100 | 0.45 | >45 | | | | |
| 140.0 | 141.5 | | | m to vc sand w/some f gravel | 97 | 0.43 | 42 | | | | |
| 150.0 | 151.5 | | 156.8 | m to vc sand w/some f gravel | >100 | 0.41 | >41 | | | | |
| | | 156.8 | 210.0 | hard clay w/silt and sand layers | | | | | | | |

FIELD BORING LOG NO. 351A

Depth to water table (ft) Topstratum thickness (ft) — Laboratory Classification

Below table (0) In Mississippi River

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | C N | N 1 | Class. | D 50 (mm) | D 10 (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 10.0 | silty clay | | | | | | | |
| | | 10.0 | 15.9 | f sand w/silty clay seams | | | | | | | |
| | | 15.9 | 20.0 | f sand | | | | | | | |
| | | 20.0 | 21.3 | silty clay | | | | | | | |
| 25.0 | 26.5 | 21.3 | | f sand | 16 | 1.13 | 18 | | | | |
| 30.0 | 31.5 | | | f sand | 28 | 1.04 | 29 | | | | |
| 35.0 | 36.5 | | | f sand | 15 | 0.96 | 14 | | | | |
| 40.0 | 41.5 | | 45.0 | f sand | 22 | 0.91 | 20 | | | | |
| 45.0 | 46.5 | 45.0 | 50.0 | f to m sand w/occ lignite layers | 28 | 0.85 | 24 | | | | |
| 50.0 | 51.5 | 50.0 | | f to m sand w/occ lignite layers | 40 | 0.81 | 32 | | | | |
| 55.0 | 56.5 | | | f to m sand w/occ lignite layers | >100 | 0.77 | >77 | | | | |
| 60.0 | 61.5 | | | f to m sand w/occ lignite layers | 94 | 0.73 | 69 | | | | |
| 65.0 | 66.5 | | | f to m sand w/occ lignite layers | >100 | 0.70 | >70 | | | | |
| 70.0 | 71.5 | | | f to m sand w/occ lignite layers | >100 | 0.67 | >67 | | | | |
| 75.0 | 76.5 | | 80.0 | f to m sand w/occ lignite layers | 74 | 0.65 | 48 | | | | |
| 80.0 | 81.5 | 80.0 | | m to c sand w/some f gravel | 88 | 0.62 | 55 | | | | |
| 85.0 | 86.5 | | ≥86.5 | m to c sand w/some f gravel | | 0.60 | | | | | |

FIELD BORING LOG NO. 351B

Depth to water table (ft) Topstratum thickness (ft) — Laboratory Classification

Below table (0) In Mississippi River

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | C N | N 1 | Class. | D 50 (mm) | D 10 (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 18.5 | silty clay w/some f sand layers | | | | | | | |
| 20.0 | 21.5 | 18.5 | | f sand | 25 | 1.25 | 31 | | | | |
| 25.0 | 26.5 | | 30.8 | f sand | 20 | 1.13 | 23 | | | | |
| | | 30.8 | 31.1 | lignite | | | | | | | |
| 35.0 | 36.5 | 31.1 | 40.0 | f sand | 29 | 0.96 | 28 | | | | |
| 40.0 | 41.5 | 40.0 | | f to m sand, w/some f gravel | 31 | 0.91 | 28 | | | | |
| 45.0 | 46.5 | | | f to m sand, w/some f gravel | 43 | 0.85 | 37 | | | | |
| 50.0 | 51.5 | | | f to m sand, w/some f gravel | 41 | 0.81 | 33 | | | | |
| 55.0 | 56.5 | | | f to m sand, w/some f gravel | 77 | 0.77 | 59 | | | | |
| 60.0 | 61.5 | | | f to m sand, w/some f gravel | 91 | 0.73 | 66 | | | | |
| 65.0 | 66.5 | | | f to m sand, w/some f gravel | >100 | 0.70 | >70 | | | | |
| 70.0 | 71.5 | | ≥71.5 | f to m sand, w/some f gravel | >100 | 0.67 | >67 | | | | |

FIELD BORING LOG NO. 352

Depth to water table (ft): NA(10)
Topstratum thickness (ft): 8

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0. | 8.2 | sandy clay | | | | | | | |
| 10.0 | 11.5 | 8.2 | 15.0 | f sand | 19 | 1.25 | 24 | | | | |
| 15.0 | 16.5 | 15.0 | 19.0 | f to m sand | 9 | 1.13 | 10 | | | | |
| 20.0 | 21.5 | 19.0 | | m sand | 29 | 1.04 | 30 | | | | |
| 25.0 | 26.5 | | | m sand | 30 | 0.96 | 29 | | | | |
| 30.0 | 31.5 | | | m sand | 29 | 0.90 | 26 | | | | |
| 35.0 | 36.5 | | | m sand | 34 | 0.85 | 29 | | | | |
| 40.0 | 41.5 | | | m sand | 51 | 0.81 | 41 | | | | |
| 45.0 | 46.5 | | | m sand | 65 | 0.77 | 50 | | | | |
| 50.0 | 51.5 | | | m sand | 51 | 0.73 | 37 | | | | |
| 55.0 | 56.5 | | | m sand | 50 | 0.70 | 35 | | | | |
| 60.0 | 61.5 | | | m sand | 74 | 0.68 | 50 | | | | |
| 65.0 | 66.5 | | ≥66.5 | m sand | 71 | 0.65 | 46 | | | | |

FIELD BORING LOG NO. 353

Depth to water table (ft): NA(10)
Topstratum thickness (ft): 34(49)

Laboratory Classification

| Sample From (ft) | Sample To (ft) | Stratum From (ft) | Stratum To (ft) | Classification and remarks | N | $C_N$ | $N_1$ | Class. | $D_{50}$ (mm) | $D_{10}$ (mm) | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 33.5 | silty clay | | | | | | | |
| 35.0 | 36.5 | 33.0 | 38.0 | f sand | 19 | 0.85 | 16 | | | | |
| 40.0 | 41.5 | 38.0 | 44.0 | m to f sand | 32 | 0.81 | 26 | | | | |
| | | 44.0 | 48.7 | sand and clay | | | | | | | |
| 50.0 | 51.5 | 48.7 | 54.0 | f sand | 35 | 0.73 | 26 | | | | |
| 55.0 | 56.5 | 54.0 | | m sand w/some gravel | 29 | 0.70 | 20 | | | | |
| 60.0 | 61.5 | | 64.0 | m sand w/some gravel | 40 | 0.68 | 27 | | | | |
| 65.0 | 66.5 | 64.0 | | m to c sand w/lignite | 31 | 0.65 | 20 | | | | |
| 70.0 | 71.5 | | 74.0 | m to c sand w/lignite | 55 | 0.63 | 35 | | | | |
| 75.0 | 76.5 | 74.0 | | m to f sand | 30 | 0.60 | 18 | | | | |
| 80.0 | 81.5 | | 84.0 | m to f sand | 21 | 0.58 | 12 | | | | |
| 85.0 | 86.5 | 84.0 | 86.5 | c sand and gravel | 13 | 0.56 | 7 | | | | |

FIELD BORING LOG NO. 1G

Number of borings at site: 1
Topstratum thickness (ft): 17.0

| Stratum From (ft) | Stratum To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 17.0 | sandy loam, loose, gray |
| 17.0 | 25.0 | coarse sand, compact, gray |
| 25.0 | ≥35.0 | med. sand, compact, gray |

FIELD BORING LOG NO. 2G

Number of borings at site: 2
Topstratum thickness (ft): 10.0

| Stratum From (ft) | Stratum To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 10.0 | fine sand/clay, brown |
| 10.0 | ≥35.0 | fine sand, gray |

FIELD BORING LOG NO. 3G(A)

Number of borings at site: 1
Topstratum thickness (ft): 6.0

| Stratum From (ft) | Stratum To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 6.0 | fine sand/clay, brown |
| 6.0 | 10.0 | fine sand, brown |
| 10.0 | 11.0 | silty sand, gray |
| 11.0 | 31.0 | fine sand, gray |
| 31.0 | 40.0 | med.coarse sand, gray |
| 40.0 | ≥46.0 | coarse sand, gray, w/gravel |

FIELD BORING LOG NO. 3G(B)

Number of borings at site: 1
Topstratum thickness (ft): 1.0

| Stratum From (ft) | Stratum To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 1.0 | sandy clay,brown |
| 1.0 | 34.0 | fine sand, brown/gray |
| 34.0 | 39.0 | med. coarse sand, gray |
| 39.0 | ≥46.0 | coarse sand, gray, w/gravel |

FIELD BORING LOG NO. 4G

Number of borings at site: 1
Topstratum thickness (ft): 10.0

| Stratum From (ft) | Stratum To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 10.0 | sandy clay, brown |
| 10.0 | 15.0 | fine silty sand, gray |
| 15.0 | 38.0 | fine sand, gray |
| 38.0 | ≥45.0 | med. coarse sand, gray |

FIELD BORING LOG NO. 5G

Number of borings at site: 1
Topstratum thickness (ft): 9.0

| Stratum From (ft) | Stratum To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 9.0 | gumbo |
| 9.0 | 11.0 | med. sand, blue |
| 11.0 | ≥32.0 | fine sand, packed, blue |

FIELD BORING LOG NO. 6G

Number of borings at site: 1
Topstratum thickness (ft): 12.0

| Stratum From (ft) | Stratum To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 12.0 | gumbo |
| 12.0 | 20.0 | med. sand, blue |
| 20.0 | ≥32.0 | fine sand, packed, blue |

FIELD BORING LOG NO. 7G

Number of borings at site: 1
Topstratum thickness (ft): 10.0

| Stratum From (ft) | Stratum To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 10.0 | gumbo |
| 10.0 | 14.0 | med. sand, gray/blue |
| 14.0 | ≥32.0 | fine sand, packed, blue |

FIELD BORING LOG NO. 8G

Number of borings at site: 1
Topstratum thickness (ft): 9.0

| Stratum From (ft) | Stratum To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 9.0 | gumbo |
| 9.0 | 11.0 | sand, blue |
| 11.0 | ≥19.0 | fine sand, packed, blue |

FIELD BORING LOG NO. 9G

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 2 | 6.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 6.0 | gumbo |
| 6.0 | 7.0 | sand, blue |
| 7.0 | ≥20.0 | fine sand, packed, blue |

FIELD BORING LOG NO. 10G

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 2 | 5.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 5.0 | sand/clay |
| 5.0 | 22.0 | fine sand, locse, gray |
| 22.0 | ≥32.0 | coarse sand, compact, gray |

FIELD BORING LOG NO. 11G

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 2 | 11.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 11.0 | sandy clay, med. firm, brown/gray |
| 11.0 | 36.0 | fine sand, compact, gray |
| 36.0 | ≥42.0 | med. fine sand, compact, gray |

FIELD BORING LOG NO. 12G

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 6 | 13.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 13.0 | fine sandy clay, med.firm to soft |
| 13.0 | ≥47.0 | fine sand, med. compact to compact, w/lignite |

FIELD BORING LOG NO. 13G

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 2 | 13.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 13.0 | sandy clay, med. firm to firm, brown |
| 13.0 | ≥44.0 | fine sand, med. comp. to comp., gray, w/lignite |

FIELD BORING LOG NO. 14G

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 2 | 12.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 12.0 | sandy clay, med. soft, brown |
| 12.0 | 27.0 | fine silty sand, med. comp., gray |
| 27.0 | ≥46.0 | fine sand, comp., gray, w/lignite |

FIELD BORING LOG NO. 15G

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 1 | 10.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 10.0 | fine sandy loam |
| 10.0 | ≥39.0 | fine sand, w/lignite |

FIELD BORING LOG NO. 16G

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 4 | 15.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 15.0 | sandy clay to silty sand/clay, med. firm to firm |
| 15.0 | ≥49.0 | fine sand, med. comp. to comp., w/lignite |

FIELD BORING LOG NO. 17G

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 2 | 3.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 3.0 | ? |
| 3.0 | 18.0 | sand, gray |
| 18.0 | ≥32.0 | coarse sand, red |

FIELD BORING LOG NO. 18G

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 2 | 9.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 9.0 | sandy clay to clay, firm to med. firm, brown |
| 9.0 | 25.0 | med. coarse sand, med. comp. to comp, brown |
| 25.0 | ≥45.0 | med. coarse sand, gray |

FIELD BORING LOG NO. 19G(A)

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 1 | 6.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 6.0 | sandy clay, firm |
| 6.0 | 28.0 | med. coarse sand, med. comp. to comp., brown |
| 28.0 | ≥39.0 | med. coarse sand, comp., gray |

FIELD BORING LOG NO. 19G(B)

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 1 | 8.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 8.0 | sandy clay, firm, brown |
| 8.0 | 26.0 | fine sand, firm to med. comp., brown |
| 26.0 | ≥40.0 | med. coarse sand, brown |

FIELD BORING LOG NO.20G(A)

Number of borings at site: 1 — Topstratum thickness (ft): 9.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 9.0 | muck |
| 9.0 | 21.0 | fine sand/silt, loose, gray |
| 21.0 | 26.0 | fine sand, med. hard, gray |
| 26.0 | ≥36.0 | coarse sand, gray |

FIELD BORING LOG NO.20G(B)

Number of borings at site: 1 — Topstratum thickness (ft): 2.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 2.0 | sandy clay |
| 2.0 | 17.0 | sand, brown to gray |
| 17.0 | 28.0 | med. coarse sand, firm, gray |
| 28.0 | ≥34.0 | coarse sand, comp., gray |

FIELD BORING LOG NO.21G

Number of borings at site: 1 — Topstratum thickness (ft): 8.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 8.0 | sandy clay |
| 8.0 | 12.0 | sand, firm, brown |
| 12.0 | 16.0 | fine sand, gray |
| 16.0 | ≥39.0 | med. coarse sand, comp., gray |

FIELD BORING LOG NO.22G

Number of borings at site: 1 — Topstratum thickness (ft): 10.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 10.0 | sandy clay, brown |
| 10.0 | 34.0 | fine sand, gray |
| 34.0 | ≥44.0 | med. coarse sand, gray, w/gravel |

FIELD BORING LOG NO.23G

Number of borings at site: 1 — Topstratum thickness (ft): 4.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 4.0 | sandy clay, brown |
| 4.0 | 22.0 | fine sand, brown to gray |
| 22.0 | ≥39.0 | med. coarse sand, gray |

FIELD BORING LOG NO.24G

Number of borings at site: 2 — Topstratum thickness (ft): 12.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 12.0 | sandy clay, firm to soft |
| 12.0 | ≥49.0 | med. coarse sand, compact, gray |

FIELD BORING LOG NO.25G

Number of borings at site: 1 — Topstratum thickness (ft): 8.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 8.0 | sandy clay, firm |
| 8.0 | ≥43.0 | med. coarse sand, comp., brown to gray |

FIELD BORING LOG NO.26G

Number of borings at site: 2 — Topstratum thickness (ft): 39.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 14.0 | clay, med. firm, brown |
| 14.0 | 24.0 | sandy clay, med. soft, brown |
| 24.0 | 34.0 | clay, soft, blue |
| 34.0 | 39.0 | fine sand/clay, med. firm |
| 39.0 | ≥50.0 | med. coarse sand, comp., gray |

FIELD BORING LOG NO.27G(A)

Number of borings at site: 1 — Topstratum thickness (ft): 13.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 13.0 | sandy clay, firm |
| 13.0 | 18.0 | med. coarse silty sand, comp., brown |
| 18.0 | 21.0 | coarse silty sand, med. comp., brown |
| 21.0 | 26.0 | med. fine sand, some silt, comp., gray |
| 26.0 | ≥36.0 | med. coarse sand, comp., gray |

FIELD BORING LOG NO.27G(B)

Number of borings at site: 1 — Topstratum thickness (ft): 11.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 11.0 | sandy clay, firm |
| 11.0 | 23.0 | fine silty sand, med. comp., brown |
| 23.0 | 30.0 | med. fine sand, comp., brown |
| 30.0 | ≥38.0 | med. coarse sand, comp., gray |

FIELD BORING LOG NO.28G

Number of borings at site: 1 — Topstratum thickness (ft): 8.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 8.0 | clay, hard |
| 8.0 | 19.0 | med. coarse sand |
| 19.0 | ≥36.0 | coarse sand, comp. |

FIELD BORING LOG NO.29G

Number of borings at site: 1 — Topstratum thickness (ft): 2.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 2.0 | ? |
| 2.0 | 15.0 | fine sand |
| 15.0 | ≥42.0 | med. coarse sand, comp. |

FIELD BORING LOG NO.30G(A)

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 1 | 2.0(15.0) |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 2.0 | ? |
| 2.0 | 6.0 | sand |
| 6.0 | 15.0 | clay, blue |
| 15.0 | ≥42.0 | fine sand, comp. |

FIELD BORING LOG NO.30G(B)

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 1 | 5.0(14.0) |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 5.0 | ? |
| 5.0 | 9.0 | sand |
| 9.0 | 14.0 | clay, soft |
| 14.0 | ≥43.0 | med. coarse sand, comp., gray |

FIELD BORING LOG NO.31G

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 2 | 29.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 23.0 | clay, firm, brown |
| 23.0 | 29.0 | clay, med. firm, gray |
| 29.0 | ≥50.0 | coarse sand, comp., gray |

FIELD BORING LOG NO.32G

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 2 | 31.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 31.0 | clay, firm to med. firm, brown to gray |
| 31.0 | ≥49.0 | coarse sand, comp., brown/gray |

FIELD BORING LOG NO.33G

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 2 | 21.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 2.0 | sandy clay, med. firm, brown |
| 2.0 | 12.0 | sandy clay, soft, gray |
| 12.0 | 21.0 | clay, some sand, med. firm, gray |
| 21.0 | 31.0 | fine sand, med. comp., brown to gray |
| 31.0 | ≥48.0 | med. coarse sand, comp., gray |

FIELD BORING LOG NO.34G

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 2 | 31.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 1.0 | sandy clay, med. firm, brown |
| 1.0 | 14.0 | sandy clay, soft, gray |
| 14.0 | 31.0 | clay, firm, gray, w/trace sand |
| 31.0 | 36.0 | fine sand, gray |
| 36.0 | ≥48.0 | med. coarse sand, gray |

FIELD BORING LOG NO.35G(A)

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 1 | 38.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 38.0 | clay, firm to med. firm, brown to gray |
| 38.0 | 41.0 | fine sand, med. firm, gray |
| 41.0 | ≥46.0 | coarse sand, med. firm, gray |

FIELD BORING LOG NO.35G(B)

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 1 | 36.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 36.0 | clay, firm to med. firm, brown to gray |
| 36.0 | 45.0 | med. coarse sand, comp., gray |
| 45.0 | ≥50.0 | coarse sand, comp., gray |

FIELD BORING LOG NO.36G(A)

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 1 | 35.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 35.0 | clay, firm to med. soft to med. firm, brown to gray |
| 35.0 | 42.0 | fine sand, firm, gray |
| 42.0 | ≥47.0 | med. coarse sand, comp., gray |

FIELD BORING LOG NO.36G(B)

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 1 | 36.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 36.0 | clay, firm to med. soft, brown to gray |
| 36.0 | 43.0 | med. fine sand, gray |
| 43.0 | ≥53.0 | med. coarse sand, comp., gray |

FIELD BORING LOG NO.37G

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 2 | 9.0(31.0) |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 9.0 | ? |
| 9.0 | 13.0 | coarse sand |
| 13.0 | 27.0 | clay, compact, blue/gray |
| 27.0 | 31.0 | silt, soft |
| 31.0 | ≥46.0 | med. sand, compact |

FIELD BORING LOG NO.38G

| Number of borings at site | Topstratum thickness (ft) |
|---|---|
| 1 | 30.0 |

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 30.0 | clay, compact, blue/gray |
| 30.0 | ≥38.0 | fine sand, compact |

FIELD BORING LOG NO. 39G

Number of borings at site: 1
Topstratum thickness (ft): 32.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 6.0 | sandy clay, firm, brown |
| 6.0 | 32.0 | clay, med. firm, gray |
| 32.0 | 46.0 | fine sand, med. comp., gray |
| 46.0 | >56.0 | coarse sand, comp., gray |

FIELD BORING LOG NO. 40G

Number of borings at site: 3
Topstratum thickness (ft): 30.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 30.0 | sandy clay, med. firm to med. soft, brown to gray |
| 30.0 | 43.0 | fine sand, med. comp., gray |
| 43.0 | >61.0 | med. coarse sand, comp., gray |

FIELD BORING LOG NO. 41G(A)

Number of borings at site: 1
Topstratum thickness (ft): 40.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 40.0 | clay, med. firm to med. soft to soft |
| 40.0 | >64.0 | coarse sand, med. comp. to comp. |

FIELD BORING LOG NO. 41G(B)

Number of borings at site: 1
Topstratum thickness (ft): 38.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 38.0 | clay, med. soft to soft |
| 38.0 | >49.0 | coarse sand, comp. |

FIELD BORING LOG NO. 41G(C)

Number of borings at site: 1
Topstratum thickness (ft): 28.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 28.0 | silty sand/clay, soft |
| 28.0 | >44.0 | coarse sand, med. comp. to comp. |

FIELD BORING LOG NO. 41G(D)

Number of borings at site: 1
Topstratum thickness (ft): 37.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 5.0 | sandy clay, med. firm |
| 5.0 | 11.0 | clay, med. soft |
| 11.0 | 37.0 | sandy clay, med. soft |
| 37.0 | >59.0 | coarse sand, med. comp. to comp. |

FIELD BORING LOG NO. 42G

Number of borings at site: 2
Topstratum thickness (ft): 42.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 20.0 | clay, med. soft/firm, brown |
| 20.0 | 26.0 | clay, med. soft/firm, gray, w/trace sand |
| 26.0 | 35.0 | sandy clay, med. soft/firm, gray |
| 35.0 | 42.0 | sand, med. comp., gray, w/trace clay |
| 42.0 | 57.0 | med. coarse sand, comp., gray |
| 57.0 | >67.0 | coarse sand, comp., gray |

FIELD BORING LOG NO. 43G(A)

Number of borings at site: 1
Topstratum thickness (ft): 30.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 29.0 | sandy clay, brown to gray |
| 29.0 | 30.0 | silty sand/clay, gray |
| 30.0 | 39.0 | silty sand, gray |
| 39.0 | 40.0 | fine sand, gray, w/trace clay |
| 40.0 | >55.0 | fine sand, gray |

FIELD BORING LOG NO. 43G(B)

Number of borings at site: 1
Topstratum thickness (ft): 40.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 20.0 | sandy clay, brown |
| 20.0 | 30.0 | clay, brown |
| 30.0 | 35.0 | sandy clay, gray |
| 35.0 | 40.0 | ? |
| 40.0 | 50.0 | silty sand, gray |
| 50.0 | 52.0 | fine sand, gray,w/trace clay |
| 52.0 | 60.0 | fine sand, gray |
| 60.0 | 62.0 | fine sand, gray, w/trace clay |
| 62.0 | >67.0 | fine sand, gray |

FIELD BORING LOG NO. 44G

Number of borings at site: 1
Topstratum thickness (ft): 37.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 10.0 | clay, firm, brown |
| 10.0 | 18.0 | sandy clay, med. soft, brown |
| 18.0 | 32.0 | clay, med. soft, blue |
| 32.0 | 37.0 | fine sand/clay, med. comp., brown |
| 37.0 | >48.0 | med. coarse sand, comp., brown |

FIELD BORING LOG NO. 45G(A)

Number of borings at site: 1
Topstratum thickness (ft): 0.0(13.0)

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 7.0 | sand |
| 7.0 | 13.0 | sandy loam |
| 13.0 | 20.0 | sand, brown |
| 20.0 | 24.0 | sand, firm, gray |
| 24.0 | >46.0 | med. coarse sand, firm, gray |

FIELD BORING LOG NO.45G(B)

Number of borings at site: 1 — Topstratum thickness (ft): 12.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 12.0 | sandy loam |
| 12.0 | 34.0 | sand, brown |
| 34.0 | 44.0 | sand, firm, gray |
| 44.0 | >49.0 | med. coarse sand, firm, gray |

FIELD BORING LOG NO.46G(A)

Number of borings at site: 1 — Topstratum thickness (ft): 12.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 12.0 | sandy loam |
| 12.0 | 20.0 | sand, loose, gray |
| 20.0 | 21.0 | med. fine sand |
| 21.0 | >39.0 | fine sand |

FIELD BORING LOG NO.46G(B)

Number of borings at site: 1 — Topstratum thickness (ft): 7.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 7.0 | ? |
| 7.0 | 25.0 | med. fine sand |
| 25.0 | >42.0 | fine sand |

FIELD BORING LOG NO.46G(C)

Number of borings at site: 1 — Topstratum thickness (ft): 7.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 7.0 | sandy loam, firm |
| 7.0 | 14.0 | coarse sand, firm, gray |
| 14.0 | 27.0 | med. fine sand, firm, gray |
| 27.0 | >57.0 | med. coarse sand, comp. to very comp., gray |

FIELD BORING LOG NO.46G(D)

Number of borings at site: 1 — Topstratum thickness (ft): 16.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 6.0 | sandy loam |
| 6.0 | 16.0 | sandy clay, soft, gray |
| 16.0 | 32.0 | fine sand, firm, gray |
| 32.0 | 43.0 | med. fine sand, comp., gray |
| 43.0 | 51.0 | med. coarse sand, very comp., gray |
| 51.0 | >58.0 | coarse sand, very comp. |

FIELD BORING LOG NO.47G

Number of borings at site: 1 — Topstratum thickness (ft): 13.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 13.0 | sandy clay |
| 13.0 | 25.0 | fine sand, firm, gray |
| 25.0 | 45.0 | coarse sand, firm, gray |

FIELD BORING LOG NO.48G(A)

Number of borings at site: 1 — Topstratum thickness (ft): 6.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 6.0 | ? |
| 6.0 | 30.0 | coarse sand, white |
| 30.0 | >34.0 | coarse sand, white, w/small gravel |

FIELD BORING LOG NO.48G(B)

Number of borings at site: 1 — Topstratum thickness (ft): 6.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 6.0 | ? |
| 6.0 | 32.0 | coarse sand, white |
| 32.0 | 39.0 | coarse sand, white, w/small gravel |
| 39.0 | >42.0 | coarse sand, white |

FIELD BORING LOG NO.48G(C)

Number of borings at site: 1 — Topstratum thickness (ft): 24.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 24.0 | sandy clay, firm to soft, blue |
| 24.0 | 30.0 | fine silty sand, med. comp., gray |
| 30.0 | 35.0 | fine sand, very comp., gray |
| 35.0 | >48.0 | coarse sand, very comp., brown/gray |

FIELD BORING LOG NO.48G(D)

Number of borings at site: 1 — Topstratum thickness (ft): 14.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 14.0 | sandy clay, firm, brown |
| 14.0 | 24.0 | fine sand, firm, brown |
| 24.0 | 31.0 | med. coarse sand, comp., brown |
| 31.0 | >51.0 | coarse sand, very comp., brown/gray |

FIELD BORING LOG NO.49G

Number of borings at site: 2 — Topstratum thickness (ft): 4.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 4.0 | ? |
| 4.0 | 19.0 | med. sand, loose |
| 19.0 | >40.0 | fine sand, comp. |

FIELD BORING LOG NO.50G(A)

Number of borings at site: 1 — Topstratum thickness (ft): 11.0(31.0)

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 11.0 | clay |
| 11.0 | 22.0 | fine sand, firm |
| 22.0 | 31.0 | clay, soft |
| 31.0 | >43.0 | fine sand, comp. |

FIELD BORING LOG NO. 50G(B)

Number of borings at site: 1 | Topstratum thickness (ft): 25.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 25.0 | clay |
| 25.0 | >45.0 | fine sand, comp. |

FIELD BORING LOG NO. 51G(A)

Number of borings at site: 1 | Topstratum thickness (ft): 33.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 12.0 | clay |
| 12.0 | 25.0 | sandy clay, firm |
| 25.0 | 33.0 | sand/clay |
| 33.0 | >48.0 | med. coarse sand, firm |

FIELD BORING LOG NO. 51G(B)

Number of borings at site: 1 | Topstratum thickness (ft): 24.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 24.0 | sandy clay |
| 24.0 | >48.0 | med. coarse sand, firm |

FIELD BORING LOG NO. 52G

Number of borings at site: 4 | Topstratum thickness (ft): 22.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 3.0 | sandy clay (fill), med. firm, brown |
| 3.0 | 12.0 | clay, med. firm, gray, w/trace sand |
| 12.0 | 22.0 | fine sand, firm, gray, w/trace clay |
| 22.0 | 32.0 | fine sand, med. comp., gray |
| 32.0 | >46.0 | fine sand, comp., gray, w/trace lignite |

FIELD BORING LOG NO. 53G(A)

Number of borings at site: 1 | Topstratum thickness (ft): 10.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 10.0 | sandy gumbo |
| 10.0 | 17.0 | fine sand/silt |
| 17.0 | >29.0 | coarse sand |

FIELD BORING LOG NO. 53G(B)

Number of borings at site: 1 | Topstratum thickness (ft): 10.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 10.0 | clay gumbo |
| 10.0 | 23.0 | sand, blue |
| 23.0 | >28.0 | coarse sand |

FIELD BORING LOG NO. 53G(C)

Number of borings at site: 1 | Topstratum thickness (ft): 10.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 10.0 | clay gumbo |
| 10.0 | >42.0 | med. fine sand, blue |

FIELD BORING LOG NO. 53G(D)

Number of borings at site: 1 | Topstratum thickness (ft): 12.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 12.0 | clay gumbo |
| 12.0 | >44.0 | fine sand, blue |

FIELD BORING LOG NO. 54G

Number of borings at site: 2 | Topstratum thickness (ft): 6.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 6.0 | gumbo clay |
| 6.0 | >12.0 | fine sand |

FIELD BORING LOG NO. 55G(A)

Number of borings at site: 1 | Topstratum thickness (ft): 10.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 10.0 | clay gumbo |
| 10.0 | >32.0 | fine sand, blue |

FIELD BORING LOG NO. 55G(B)

Number of borings at site: 1 | Topstratum thickness (ft): 9.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 6.0 | clay gumbo |
| 6.0 | 9.0 | clay/sand |
| 9.0 | >32.0 | fine sand, blue |

FIELD BORING LOG NO. 55G(C)

Number of borings at site: 1 | Topstratum thickness (ft): 12.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 12.0 | ? |
| 12.0 | >43.0 | fine sand, blue |

FIELD BORING LOG NO. 56G(A)

Number of borings at site: 1 — Topstratum thickness (ft): 1.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 1.0 | ? |
| 1.0 | 16.0 | fine sand/silt |
| 16.0 | >33.0 | fine sand |

FIELD BORING LOG NO. 56G(B)

Number of borings at site: 1 — Topstratum thickness (ft): 16.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 6.0 | gumbo |
| 6.0 | 16.0 | clay/sand |
| 16.0 | >31.0 | coarse sand, blue |

FIELD BORING LOG NO. 57G(A)

Number of borings at site: 1 — Topstratum thickness (ft): 8.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 3.0 | gumbo, black |
| 3.0 | 8.0 | sandy clay gumbo |
| 8.0 | >27.0 | coarse sand, blue, w/light gravel |

FIELD BORING LOG NO. 57G(B)

Number of borings at site: 1 — Topstratum thickness (ft): 8.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 3.0 | gumbo, black |
| 3.0 | 8.0 | sandy clay gumbo |
| 8.0 | >31.0 | coarse sand |

FIELD BORING LOG NO. 57G(C)

Number of borings at site: 1 — Topstratum thickness (ft): 7.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 3.0 | gumbo, black |
| 3.0 | 7.0 | sandy clay gumbo |
| 7.0 | >27.0 | med. coarse sand |

FIELD BORING LOG NO. 58G

Number of borings at site: 2 — Topstratum thickness (ft): 12.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 4.0 | gumbo,black |
| 4.0 | 12.0 | sandy clay gumbo |
| 12.0 | >29.0 | med. coarse sand |

FIELD BORING LOG NO. 59G(A)

Number of borings at site: 1 — Topstratum thickness (ft): 28.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 20.0 | ? |
| 20.0 | 28.0 | clay, hard |
| 28.0 | >56.0 | sand, compact |

FIELD BORING LOG NO. 59G(B)

Number of borings at site: 1 — Topstratum thickness (ft): 30.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 16.0 | ? |
| 16.0 | 23.0 | sandy loam, soft |
| 23.0 | 25.0 | fine sand, compact, gray |
| 25.0 | 30.0 | clay, soft, gray |
| 30.0 | >52.0 | coarse sand, comp. |

FIELD BORING LOG NO. 60G

Number of borings at site: 2 — Topstratum thickness (ft): 22.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 22.0 | sandy clay, med. firm to soft, brown to gray |
| 22.0 | 34.0 | silty sand, med. comp., gray |
| 34.0 | 40.0 | fine sand, comp., gray |
| 40.0 | >52.0 | med. coarse sand, comp., gray |

FIELD BORING LOG NO. 61G(A)

Number of borings at site: 1 — Topstratum thickness (ft): 28.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 28.0 | sandy clay, med. firm to med. soft, brown to gray |
| 28.0 | 37.0 | sand, med. comp., gray |
| 37.0 | >53.0 | coarse sand, gray |

FIELD BORING LOG NO. 61G(B)

Number of borings at site: 1 — Topstratum thickness (ft): 27.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 27.0 | sandy clay, med. soft to soft, brown to blue/gray |
| 27.0 | 37.0 | med. fine sand, med. comp., gray |
| 37.0 | 45.0 | med.coarse sand, comp., gray |
| 45.0 | >69.0 | coarse sand, comp., gray, w/lignite |

FIELD BORING LOG No. 61G(C)

Number of borings at site: 1 — Topstratum thickness(ft): 27.0

| Stratum From (ft) | To (ft) | Classification and remarks |
|---|---|---|
| 0.0 | 27.0 | sandy clay, med. firm to med. soft to soft, br to gr |
| 27.0 | 35.0 | med. fine sand, med. comp., gray |
| 35.0 | 42.0 | med. coarse sand, gray |
| 42.0 | ≥47.0 | coarse sand, comp., gray, w/lignite |

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