Appendix E
Preliminary **Geotechnical Report**

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Report of Preliminary Geotechnical Consultation

Proposed Master Planning Study

Providence Saint John's Health Center Phase II Project
2125 Santa Monica Boulevard
Santa Monica, California

Prepared for:

Providence Health System

Project 4953-14-0991

November 14, 2014
(Revised June 15, 2018)

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November 14, 2014
Revised June 15, 2018
Wood Project 4953-14-0991

Ms. Hillary Altmann
Director Institutional Planning, Real Estate and Construction
Providence Health System
600 Broadway, Suite 304
Seattle, Washington 98122

Subject: Letter of Transmittal
Report of Preliminary Geotechnical Consultation
Proposed Master Planning Study
Providence Saint John's Health Center Phase II Project
2125 Santa Monica Boulevard
Santa Monica, California

Dear Ms. Altmann:

We are pleased to submit the results of our preliminary geotechnical consultation in support of the proposed master planning study for Providence Saint John's Health Center Phase II Project in Santa Monica, California. This consultation was conducted in general accordance with our proposal dated August 6, 2014, which you authorized on August 7, 2014. We were also authorized to perform a concurrent surface fault rupture hazard investigation in support of the proposed master planning study; the details of that investigation are submitted in a separate report.

The scope of our services was originally planned with Ms. Pooja Bhagat of Moore Ruble Yudell Architects & Planners. Ms. Bhagat has provided us with a site plan for the proposed master planning study and, along with Mr. Joseph Stewart of KPFF Consulting Engineers, has provided us with a general description of the types of structures planned. This report has been revised based on our discussions with Mr. Boon Lim of Perkins Eastman and in response to comments from Environmental Impact Report consultant and the city Environmental Planner.

The results of our preliminary consultation and preliminary geotechnical recommendations are presented in this report. Please note that a comprehensive geotechnical investigation(s) will need to be performed at a later date when more specific project details and locations are known.

It has been a pleasure to be of professional service to you. Please contact us if you have any questions or if we can be of further assistance.

Sincerely,
Wood Environment & Infrastructure Solutions, Inc.

Rosalind Munro
Principal Engineering Geologist

Mark A. Murphy
Principal Geotechnical Engineer
Project Manager

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(Electronic copies submitted)

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Proposed Master Planning Study
Providence Saint John's Health Center Phase II Project

2125 Santa Monica Boulevard
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Prepared for:

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Los Angeles, California

November 14, 2014
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Executive Summary

We have completed our preliminary geotechnical consultation in support of the master planning study of the Providence Saint John's Health Center Phase II Project in Santa Monica, California. Our relevant prior subsurface explorations, engineering analyses, and preliminary foundation design recommendations are summarized below.

A master planning study is being conducted for the Providence Saint John's Health Phase II Project which will include ambulatory and acute care, medical, education/conference and research buildings, child and family development center, and visitor and multifamily housing. The new structures may contain up to five subterranean levels to accommodate the parking requirements of the medical center campus.

Fill soils, up to 6 feet thick, were encountered in our prior borings drilled within or near the potential development sites. The fill soils consist of clayey silt, sandy silt, silty clay, silty sand, and sand with some gravel and concrete and brick fragments and are not uniformly well compacted. Deeper fill could occur between our borings and in other unexplored areas, particularly in areas where existing buildings, utilities, vaults, or underground tanks are present. The natural soils consist of silt, clay, silty sand, and sand. Varying amounts of gravel and some cobbles were also encountered throughout the depths explored. The natural soils are generally stiff and dense; however, there are some layers of medium stiff silt and clay and medium dense silty sand between depths of 10 and 35 feet. The upper silty soils in some areas are susceptible to hydroconsolidation and will become weaker and more compressible when wet. The upper clayey soils in some areas are slightly expansive. Groundwater seepage was encountered in 2 out 15 of our prior borings within or near the potential development areas at various depths as shallow as 22 feet below the existing grade. Our recent borings encountered groundwater at depths between 110 and 115 feet below the existing grade and the historic-high groundwater level is estimated to be deeper than 40 feet below the ground surface at the site. Prior corrosion studies indicate that the on-site soils are corrosive to ferrous metals, aggressive to copper, and that the potential for sulfate attack on portland cement concrete is considered negligible.

Based on the available geologic data and our recent fault surface rupture investigation, active faults with the potential for surface fault rupture are not known to be located beneath or projecting toward the site. In our opinion, the potential for surface rupture at the site due to fault plane displacement propagating to the ground surface during the design life of the project is considered low. Although the site could be subjected to strong ground shaking in the event of an earthquake, this hazard is common in Southern California and the effects of ground shaking can be mitigated by proper engineering design and construction in conformance with current building codes and engineering practices. The site is relatively level and not susceptible to slope stability hazards. The potential for other geologic hazards such as liquefaction, tsunamis, inundation, seiches, flooding, methane gas, and subsidence affecting the site is also considered low.

The existing fill soils are not considered suitable for support of new structures on conventional spread/continuous footings. If the existing fill soils are excavated and replaced as properly compacted fill, relatively light at-grade buildings may be supported on spread/continuous footings established on properly compacted fill and the floor slabs may be supported on grade. However, since the upper silty soils may be susceptible to hydroconsolidation and become weaker and more compressible when wet and the upper clayey soils may be somewhat expansive, remedial grading may be required for support of footings and floor slabs for at-grade structures. Such remedial grading measures would likely consist of the placement of approximately two

feet of properly compacted fill beneath footings and floor slabs. This fill soil will need to consist of relatively non-expansive soils, which may be derived from on-site excavations or imported to the site.

Based on the data obtained from our prior borings, excavations for buildings containing one or more basement levels are anticipated to remove the existing fill soils. Remedial grading measures will likely not be required for support of new relatively heavy (maximum dead-plus-live column loads on the order of 1,500 kips or less) structures containing one or more basement levels; it will likely be feasible to support such structures on conventional spread/continuous footings underlain by undisturbed natural soils at the basement level.

For heavier structures with subterranean levels, relatively heavy at-grade structures, or structures with large overturning loads, the use of drilled cast-in-place concrete piles may be required for foundation support. However, for pile-supported subterranean structures, the lower floor slab may still be supported on grade; for at-grade pile-supported structures, the floor slab may be supported on-grade after the remedial grading measures described above are performed. However, since a significant amount of gravel was encountered in some areas, with some cobbles and boulders, the installation of drilled piles could be difficult, particularly where groundwater seepage was encountered. Special techniques could be necessary to drill through cobble and boulder layers and to prevent caving of the sidewalls during drilling.

1.0 Scope

This report provides preliminary geotechnical recommendations in support of the master planning study of the Providence Saint John's Health Center Phase II Project in Santa Monica, California. The location of the site is shown on Figure 1, Vicinity Map. The locations of the proposed development sites, existing buildings, and our nearby prior explorations are shown on Figure 2, Plot Plan. Logs of our prior borings are included in Appendix A.

This preliminary consultation was authorized to perform a geologic-seismic hazards evaluation, determine the static physical characteristics of the soils at the site, and to provide preliminary recommendations for foundations, shoring, and grading based on prior explorations; no new explorations were performed as part of this consultation. More specifically, our services included the following:

- Evaluate our prior subsurface explorations to determine the nature and stratigraphy of the subsurface soils within the site.
- Perform a geologic-seismic hazards evaluation.
- Provide preliminary recommendations for appropriate foundation systems.
- Determine the applicable seismic design parameters based on the current California Building Code (CBC).
- Provide preliminary recommendations for subgrade preparation and floor slab support.
- Provide preliminary recommendations for design of temporary shoring.
- Provide preliminary recommendations for design of walls below grade.
- Provide recommendations relating to earthwork and grading.

The scope of this consultation did not include the assessment of general site environmental conditions for the presence of contaminants in the soils and groundwater of the site. A comprehensive geotechnical investigation(s) will need to be performed at a later date as required by the City of Santa Monica when more specific project details are known.

Our preliminary recommendations are based on the results of our previous field explorations, laboratory tests, and appropriate engineering analyses. The results of the prior field explorations, which form the basis of our recommendations, are presented in Appendix A.

Our professional services have been performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in this or similar localities. No other warranty, express or implied, is made as to the professional advice included in this report. This report has been prepared for Providence Health & Services and their design consultants to be used solely for the Phase II master planning study. This report has not been prepared for use by other parties, and may not contain sufficient information for purpose of other parties or other uses.

2.0 Project Description and Site Conditions

A master planning study is being conducted for the Providence Saint John's Health Center Phase II Project, which will include ambulatory and acute care, medical, education/conference and research buildings, child and family development center, and visitor and multifamily housing. The areas being evaluated for future developments are shown on Figure 2.

We understand that the code enforcing agency for the new structures is planned to be the City of Santa Monica rather than the Office of Statewide Health Planning and Development (OSHPD) as the structures are anticipated to be designated as OSHPD 3 structures. OSHPD 3 requirements for clinics apply to clinics that are licensed pursuant to Health and Safety Code Section 1200, which includes primary care clinics and specialty clinics, or outpatient services of a hospital licensed pursuant to Health and Safety Code Section 1250. However, we understand that the West Ambulatory and Acute Care Building (Building 2C) and the East Ambulatory and Acute Care Building (Building 2D/E) may fall under OSHPD jurisdiction. Should that be the case, the comprehensive geotechnical report and the design for that building will need to comply with the requirements of Chapters 16A and 18A of the 2016 CBC and those of OSHPD. The new structures may contain up to five subterranean levels to accommodate the parking requirements of the medical center campus. We anticipate that the subterranean levels will extend up to approximately 60 feet below the existing grade.

The ground surface within the medical center campus generally gently slopes down from north to south, with a maximum difference in elevation of approximately 10 feet across the proposed development area. The proposed development area is partially occupied by existing buildings, landscaped areas, and asphalt-paved parking areas. Various underground utilities cross the site.

3.0 Soil Conditions

Fill soils, up to 5 feet thick, were encountered in our prior borings drilled within or near the proposed development sites north of Santa Monica Boulevard; fill soils, up to 6 feet thick, were encountered in our prior borings drilled within or near the potential development sites south of Santa Monica Boulevard. The fill soils consist of clayey silt, sandy silt, silty clay, silty sand, and sand with some gravel and concrete and brick fragments and are not uniformly well compacted. Deeper fill could occur between our borings and in other unexplored areas, particularly in areas where existing buildings, utilities, vaults, or underground tanks are present.

The natural soils consist of silt, clay, silty sand, and sand. Varying amounts of gravel and some cobbles were also encountered throughout the depths explored. The natural soils are generally stiff and dense; however, there are some layers of medium stiff silt and clay and medium dense silty sand between depths of 10 and 35 feet. The upper silty soils in some areas are susceptible to hydroconsolidation and will become weaker and more compressible when wet. The upper clayey soils in some areas are slightly expansive.

North of Santa Monica Boulevard, local seepage was encountered within two borings within or near the proposed development area at various depths between 22 and 57 feet below the existing grade. Our most recent prior borings encountered groundwater at depths between 110 and 115 feet below the existing grade. The historic-high groundwater level is reported to be deeper than 40 feet below the ground surface at the site (California Division of Mines and Geology, 1998).

Prior corrosion studies indicate that the on-site soils are corrosive to ferrous metals, aggressive to copper, and that the potential for sulfate attack on portland cement concrete is considered negligible.

4.0 Geology

4.1 Geologic Setting

The site is located just south of the boundary between the Transverse Ranges and Peninsular Ranges geomorphic provinces. The Transverse Ranges geomorphic province to the north is characterized by east-west trending mountain ranges that include the Santa Monica Mountains. The Santa Monica, Hollywood, Raymond, Sierra Madre, and Cucamonga faults mark the southern boundary of the province. The Peninsular Range province is characterized by northwest/southeast trending alignments of mountains and hills and intervening basins, reflecting the influence of northwest trending major faults and folds controlling the general geologic structural fabric of the region. This province extends northwesterly from Baja California into the Los Angeles Basin and westerly into the offshore area, including Santa Catalina, Santa Barbara, San Clemente and San Nicolas islands. This province is bounded on the east by the San Jacinto fault zone. The Los Angeles Basin is the northernmost part of the Peninsular Ranges province.

The site is located on the Santa Monica plain near the northwest margin of the Los Angeles basin and about 3 miles south of the Santa Monica Mountains. The Santa Monica plain is a Pleistocene age surface that has been uplifted, dissected by erosion, and locally infilled with Holocene age alluvial deposits (Poland et al., 1959). The natural geologic materials at the site consist of Late to Middle Pleistocene age alluvial fan and marine deposits. The local geologic conditions are shown on Figure 3.

4.2 Geologic Materials

Fill soils, up to 6 feet thick, were encountered in our prior borings drilled at or near the proposed development areas. The fill soils consisted of clayey silt, sandy silt, silty clay, silty sand, and sand with some gravel and concrete and brick fragments.

The underlying Pleistocene alluvial fan deposits consist of sandy silt, clayey silt and silty sand and sand to depths between approximately 40 and 90 feet. Channel deposits within the fan deposits are coarser grained with local gravelly zones. Marine deposits consisting predominantly of fine grained sand and silty sand were encountered below the alluvial fan deposits.

4.3 Groundwater

Regionally, the site is located in the Santa Monica Subbasin of the Coastal Plain of Los Angeles groundwater basin (Department of Water Resources, 2003). Localized seepage has been documented in two of our prior borings between the depths of about 22 feet and 57 feet below ground surface (bgs) in the northern portion of the site, north of Santa Monica Boulevard. Groundwater was encountered in our most recent prior borings at depths of between 110 and 115 feet bgs both north and south of Santa Monica Boulevard. The historic-high groundwater level is reported to be more than 40 feet below the existing ground surface at the site [California Division of Mines and Geology (CDMG), 1998]. The closest well monitored by the Los Angeles County Department of Public Works with a recent measurement, is located 1.1 miles to the east. On April 27, 2009, the well reported the depth to water surface as 176 feet bgs. The shallowest record was 96 feet bgs on June 1, 1992.

4.4 Faults

Numerous faults in Southern California have been previously characterized as active or potentially active. The criteria for these major groups are based on criteria developed by the California Geological Survey (CGS), for the Alquist-Priolo Earthquake Fault Zoning Program (Bryant and Hart, 2007). According to Bryant and Hart, an active fault is one with surface displacement within Holocene time (about the last 11,00 years); and a potentially active fault is a fault that has demonstrated surface displacement of Quaternary age deposits (last 1.6 million years) (Jennings and Bryant, 2010, Bryant and Hart, 2007). More recently the CGS has revised fault activity designations for the purpose of the Alquist-Priolo (A-P) Earthquake Fault Zoning Program (CGS, 2018b). A Holocene-active fault is one that has had surface displacement within Holocene time (about the last 11,700 years). A pre-Holocene fault is a fault that has been demonstrated to not have Holocene surface displacement. An age-undetermined fault is one where the recency of fault movement has not been determined.

There are numerous faults in Southern California. Many of these fault systems are considered to be active (Field et al., 2013; USGS-CGS, 2006.) The California Geological Survey (CGS), has established Alquist-Priolo Earthquake Fault Zones (A-P Zone) for surface fault rupture hazards (CGS, 2018a and CDMG, 2002) for many active faults. An A-P Zone is an area which requires investigation to evaluate whether an active fault is present with the potential for surface fault rupture (CGS, 2018b; Bryant and Hart, 2007).

Although A-P Zones have been established for many of the state's active faults, not all active faults have been zoned. A list of nearby active faults (those faults included in CGS, 2008, and Petersen, et al., 2014) and selected Quaternary faults with the distance in miles between the site and the nearest point on the fault, the maximum magnitude, and the slip rate for the fault is given in Tables 1 and 2. The faults in the vicinity of the site are shown in Figure 6, Regional Faults and Seismicity Map (Jennings and Bryant, 2010.)

Active Faults

Santa Monica Fault

The Santa Monica and Hollywood fault zones form a portion of the Transverse Ranges Southern Boundary (TRSB) fault system. The TRSB fault system also includes the Malibu-Coast fault to the west of the Santa Monica fault and the Raymond and Cucamonga faults to the east of the Hollywood fault (Dolan et al., 2000a). The Santa Monica fault zone (SMFZ) is the western segment of the Santa Monica-Hollywood fault zone. The fault zone trends east-west from the Santa Monica coastline on the west to the Hollywood area on the east. Urbanization and development within the greater Los Angeles area has resulted in a poor understanding of the lateral extent, location, and rupture history of the SMFZ. However, the surface expression of the SMFZ includes fault-related geomorphic features, offset stratigraphy, and groundwater barriers within late Quaternary deposits (Hill et al., 1979).

An Alquist-Priolo Earthquake Fault Zone for the Santa Monica Fault has recently been established by the California Geological Survey, as shown on Figure 4 (CGS, 2018a.) The City of Santa Monica adopted the state's A-P Zone in 2018 for their Fault Zone, as shown on Figure 5. The closest trace of the Santa Monica fault is shown as over 1300 feet north of the site. The site is not within an A-P Zone or a City of Santa Monica Fault Zone.

The recent fault investigation performed by our predecessor company AMEC (AMEC, 2014) evaluated previously drilled boring data and six additional continuous core borings to determine potential for fault surface rupture at the proposed development sites. Groundwater levels were found to range between approximately between elevations 30 and 40 feet over a span of 800 feet. Therefore, a groundwater barrier was not encountered across the proposed development areas. In addition, the underlying soil stratigraphy was evaluated along three cross sections, which were oriented to intersect any potential fault traces traversing the proposed development areas. Pleistocene-age near shore marine deposits were encountered in all of the deeper borings with a gentle dip to the north of approximately 4 degrees. No faults were encountered in the surface fault rupture hazard investigation (described in detail in AMEC 2014.)

Malibu Coast Fault Zone

The active Malibu Coast fault zone is located approximately 3.1 miles west-northwest of the site and is an east-west trending, north-dipping reverse fault extending westward from Santa Monica to offshore of Point Mugu. Fault trenching conducted in 1985 and 1986 on south Winter Mesa in the Malibu area of Los Angeles County exposed several faults disrupting Tertiary and Pleistocene units, and one fault offsetting colluvial deposits estimated to be 6,000 years old (Rzonca et al., 1991). The observed faults, named the Winter Mesa faults, are believed to be splays of the Malibu Coast fault; accordingly, the Holocene faulting on the Winter Mesa faults is considered representative of active faulting along the Malibu Coast fault zone.

Hollywood Fault

The active Hollywood fault trends approximately east-west along the base of the Santa Monica Mountains from the West Hollywood-Beverly Hills area (Dolan and Sieh, 1992) to the Los Feliz area of Los Angeles. The fault is a ground-water barrier within Holocene sediments (Converse et al., 1981). Studies by several investigators (Dolan et al., 2000a; Dolan et al., 1997; Dolan and Sieh, 1992; and Crook and Proctor, 1992) have indicated that the fault is active, based on geomorphic evidence, stratigraphic correlation between exploratory borings, and fault trenching studies. The Hollywood fault zone has been included in the Earthquake Zones of Investigation by the CGS (CGS, 2014 and 2018a). The closest distance to the Hollywood fault from the site is approximately 4.8 miles.

Newport-Inglewood Fault Zone

The Newport-Inglewood fault zone is located zone is located about 5.6 miles east-southeast of the site. The Newport-Inglewood fault zone is composed of a series of discontinuous northwest-trending en echelon faults extending from Ballona Gap southeastward to the area offshore from Newport Beach. The Newport-Inglewood fault zone is reflected at the surface by a line of geomorphically young anticlinal hills and mesas formed by the folding and faulting of a thick sequence of Pleistocene age sediments and Tertiary age sedimentary rocks (Barrows, 1974). Fault-plane solutions for 39 small earthquakes (between 1977 and 1985) show mostly strike-slip faulting with some reverse faulting along the north segment (north of Dominguez Hills) and some normal faulting along the south segment (south of Dominguez Hills to Newport Beach) (Hauksson, 1987). Investigations by Law/Crandall (1993) in the Huntington Beach area indicate that the North Branch segment of the Newport-Inglewood fault zone offsets Holocene age alluvial deposits in the vicinity of the Santa Ana River.

Palos Verdes Fault Zone

Studies by Stephenson et al. (1995), which included geophysical studies, aerial photograph interpretation, and limited fault trenching, indicate that there are several active on-shore splays of the Palos Verdes fault zone. Geophysical data also indicate the off-shore splays of the fault are active, offsetting Holocene age deposits (Clarke et al., 1985), which is approximately 4.8 miles southwest of the site. Based on geophysical data, the dip of the fault is interpreted to be near vertical to 55 degrees to the southwest (Stephenson et al., 1995). Vertical separations up to about 5,900 feet occur across the fault at depth. However, strike-slip movement is indicated by the configuration of the basement surface and lithologic changes in the Tertiary age rocks across the fault. No historic large magnitude earthquakes are associated with this fault. However, the fault is considered active by the California Geological Survey (CGS) and local reviewing agencies.

San Andreas Fault Zone

The Mojave South section of the active San Andreas fault zone is located about 41 miles northeast of the site. This fault zone, California's most prominent geological feature, trends generally northwest for almost the entire length of the state. The 1857 Fort Tejon earthquake was the last major earthquake along the San Andreas fault zone in Southern California.

Blind Thrust Fault Zones

Several buried thrust faults, commonly referred to as blind thrusts, underlie the Los Angeles Basin at depth. These faults are not exposed at the ground surface and are typically identified at depths greater than 3 kilometers. These faults do not present a potential surface fault rupture hazard. However, the following described blind thrust faults are considered active and potential sources for future earthquakes.

Compton Thrust

The Compton blind thrust has been defined from seismic reflection profiles and borehole data (Leon et al., 2009) as a northeast-dipping structure. This blind thrust fault system extends approximately 45 kilometers from southwest Los Angeles County to northern Orange County in a southeastern direction. Leon et al. (2009) has correlated blind faulting at depth to near-surface folding. Several uplift events have been interpreted by investigating deformed Holocene layers along buried fold scarps. The cumulative uplift from the observed events ranged from 0.6 to 1.9 meters or approximately 1.3 to 4.2 meters of thrust displacement (Leon et al., 2009). Slip rate is estimated to be 0.9 mm/yr (Field et al., 2013). The Compton Thrust fault underlies the site at depth, however this thrust fault is not exposed at the surface and does not present a potential surface fault rupture hazard.

Northridge Blind Thrust

The Northridge Thrust is located beneath the majority of the San Fernando Valley and is the causative fault of the January 17, 1994 Northridge earthquake. This thrust fault is not exposed at the surface and does not present a potential surface fault rupture hazard. However, the Northridge Thrust is an active feature that can generate future earthquakes. The vertical surface projection of the Northridge Thrust is approximately 7.8 miles north of the site

at the closest point. The California Geological Survey (2003 and 2008) estimates an average slip rate of 1.5 mm/yr. and a maximum magnitude of 7.0 for the Northridge Thrust.

Puente Hills Blind Thrust

The Puente Hills Blind Thrust fault (PHBT) is defined based on seismic reflection profiles, petroleum well data, and precisely located seismicity (Shaw et al., 2002). This blind thrust fault system extends eastward from downtown Los Angeles to Brea (in northern Orange County). The PHBT includes three north-dipping segments, named from east to west as the Coyote Hills segment, the Santa Fe Springs segment, and the Los Angeles segment. These segments are overlain by folds expressed at the surface as the Coyote Hills, Santa Fe Springs Anticline, and the Montebello Hills. The Santa Fe Springs segment of the PHBT is believed to be the causative fault of the October 1, 1987 Whittier Narrows Earthquake (Shaw et al., 2002). The vertical surface projection of the PHBT is approximately 9 miles east of the site at its closest point. Postulated earthquake scenarios for the PHBT include single segment fault ruptures capable of producing an earthquake of magnitude 6.5 to 6.6 (Mw) and a multiple segment fault rupture capable of producing an earthquake of magnitude 7.1 (Mw). The PHBT is not exposed at the ground surface and does not present a potential for surface fault rupture. However, based on deformation of late Quaternary age sediments above this fault system and the occurrence of the Whittier Narrows earthquake, the PHBT is considered an active fault capable of generating future earthquakes beneath the Los Angeles Basin. An average slip rate of 0.7 mm/yr and a maximum magnitude of 7.1 are estimated by the California Geological Survey (2003) for the Puente Hills Blind Thrust.

Upper Elysian Park Blind Thrust

The Upper Elysian Park fault is a blind thrust fault that overlies the Los Angeles and Santa Fe Springs segments of the Puente Hills Thrust (Oskin et al., 2000 and Shaw et al., 2002). The eastern edge of the Upper Elysian Park fault is defined by the northwest-trending Whittier fault zone. The vertical surface projection of the Upper Elysian Park fault is approximately 10 miles east-northeast of the site at its closest point. Like other blind thrust faults in the Los Angeles area, the Upper Elysian Park fault is not exposed at the surface and does not present a potential surface rupture hazard; however, the Upper Elysian Park fault should be considered an active feature capable of generating future earthquakes. An average slip rate of 1.3 mm/yr and a maximum magnitude of 6.4 are estimated by the California Geological Survey (2003) for the Upper Elysian Park fault.

4.5 Geologic-Seismic Hazards

Fault Rupture

Based on the available geologic data and our recent fault surface rupture investigation, active faults with the potential for surface fault rupture are not known to be located beneath or projecting toward the site. In our opinion, the potential for surface rupture at the site due to fault plane displacement propagating to the ground surface during the design life of the project is considered low.

Seismicity

The seismicity of the region surrounding the site was determined from research of an electronic database of seismic data (Southern California Seismographic Network, 2018). This database includes earthquake data compiled by the

California Institute of Technology for 1932 through 2018 and data for 1769 to 1931 compiled by the CGS (CDMG, 2000). The search for earthquakes that occurred within 100 kilometers of the site indicates that 436 earthquakes of Richter magnitude 4.0 and greater occurred from 1932 through 2018; 33 earthquakes of magnitude 4.0 or greater occurred between 1769 and 1931.

A number of earthquakes of moderate to major magnitude have occurred in the Southern California area within about the last 100 years. A partial list of these earthquakes is included in the following table.

List of Historic Earthquakes

Earthquake (Oldest to Youngest)	Date of Earthquake	Magnitude	Distance to Epicenter (Miles)	Direction to Epicenter
Long Beach	March 10, 1933	6.4	41	SE
Tehachapi	July 21, 1952	7.5	73	NW
San Fernando	February 9, 1971	6.6	27	N
Whittier Narrows	October 1, 1987	5.9	23	ESE
Sierra Madre	June 28, 1991	5.8	32	NE
Landers	June 28, 1992	7.3	118	ENE
Big Bear	June 28, 1992	6.4	96	ENE
Northridge	January 17, 1994	6.7	13	NNW
Hector Mine	October 16, 1999	7.1	132	ENE
Sierra El Mayor	April 4, 2010	7.2	235	SE
La Habra	March 29, 2014	5.1	33	SE
				By: PER Chkd: RM

The site could be subjected to strong ground shaking in the event of an earthquake such as an event on the Santa Monica fault, which is located approximately 1300 feet north of the site. The distance from the site to major active faults is shown in Table 1. However, the hazard of strong ground shaking is common in Southern California and the effects of ground shaking can be mitigated by proper engineering design and construction in conformance with current building codes and engineering practices.

Slope Stability

The relatively flat-lying topography at site precludes both stability problems and the potential for lurching. There are no known landslides near the site, nor is the site in the path of any known or potential landslides. Additionally, the site is not located within an area identified as having a potential for seismic slope instability according to the City of Santa Monica (2018) and the CGS (CDMG, 1999).

Potential subterranean excavations would expose alluvial and marine deposits that are massive to thickly bedded and generally lack well developed planar features such as bedding or joints which would act as planes of weakness. The geologic conditions will not create an additional surcharge on the potential subterranean walls.

The alluvial and marine deposits can be prone to raveling and caving and a temporary shoring system may be necessary to support any planned vertical excavation faces.

Liquefaction and Seismically-Induced Settlement

Liquefaction potential is greatest where the ground-water level is shallow, and submerged loose, fine sands occur within a depth of about 50 feet or less. Liquefaction potential decreases as grain size and clay and gravel content increase. As ground acceleration and shaking duration increase during an earthquake, liquefaction potential increases. The site is not within a State of California Liquefaction Hazard Zone (CDMG, 1999) or City of Santa Monica Liquefaction Risk Zone (City of Santa Monica, 2018).

Localized seepage was encountered in two of our prior borings between the depths of 22 and 57 feet bgs in the northeastern portion of the medical center campus (north of Santa Monica Boulevard). Groundwater was not encountered in our prior borings elsewhere in the potential development area. Our recent borings and borings by AECOM encountered groundwater at depths between 110 and 115 feet below the existing grade. The historic-high groundwater level is estimated to be deeper than 40 feet below the ground surface at the site (CDMG, 1998.)

Based on the results of our nearby prior borings, the soils below the historic-high groundwater level are generally dense and stiff; therefore, the liquefaction potential beneath the site is anticipated to be low. Nevertheless, a site-specific liquefaction evaluation will be required in accordance with the City of Santa Monica Guidelines for Geotechnical Reports for each new project site.

Seismically-induced dry settlement is often caused by loose to medium-dense granular soils densified during ground shaking. Uniform settlement beneath a given structure would cause minimal damage; however, because of variations in distribution, density, and confining conditions of the soils, seismically-induced settlement is generally non-uniform and can cause serious structural damage. Dry and partially saturated soils as well as saturated granular soils are subject to seismically-induced settlement. The seismically-induced (dry) settlement will depend on the depth of excavation and will need to be evaluated on a site-specific basis for each new project site. However, based on the currently available data and the anticipated depths of excavation, the seismically-induced settlement is not anticipated to exceed ½ inch, which can be mitigated with compliance with current building codes and engineering practices.

Tsunamis, Inundation, Seiches, and Flooding

The site is at an elevation of about 150 feet above mean sea level. The site is not located in a Tsunami Inundation Area (CGS, 2009.) Therefore, tsunamis (seismic sea waves) are not considered a significant hazard at the site.

According to the County of Los Angeles Safety Element (1990), the site is not located downslope of any large bodies of water that could adversely affect the site in the event of earthquake-induced dam failures or seiches (wave oscillations in an enclosed or semi-enclosed body of water).

The site is located in an area of 0.2% annual chance flood (Zone X) as designated by the Federal Emergency Management Association (FEMA, 2014). Therefore, the potential for flooding to affect the site is considered low.

Subsidence

The site is not within an area of known subsidence associated with fluid withdrawal (groundwater or petroleum), peat oxidation, or hydrocompaction [California Division of Oil, Gas, and Geothermal Resources (DOGGR), 2018.]

Methane Gas

The site is not located in an oil field (DOGGR, 2018.) Plugged and abandoned oil exploration holes are not known to be located near the site; however, there is a remote possibility that undocumented wells could be encountered during construction. Any well encountered would need to be properly abandoned in accordance with the current requirements of the California Division of Oil, Gas, and Geothermal Resources.

Erosion

The majority of the site is paved and therefore not subject to erosion. Landscape areas are constructed such that runoff is directed toward area drains or paved areas where runoff is directed to storm drains. Design and construction of future facilities and improvements should collect runoff and direct it to area and storm drains. Unpaved areas should be graded and landscaped such that runoff is directed toward area drains or storm drains. Irrigation should be minimized. If design, construction and maintenance of future facilities and improvements for the Phase II Project are performed in accordance with applicable standards, the potential for erosion is anticipated to be low.

4.6 Geologic Conclusions

Based on the available geologic data, active faults with the potential for surface fault rupture are not known to be located beneath or projecting toward the site. In our opinion, the potential for surface rupture at the site due to fault plane displacement propagating to the ground surface during the design life of the project is considered low. Although the site could be subjected to strong ground shaking in the event of an earthquake, this hazard is common in Southern California and the effects of ground shaking can be mitigated by proper engineering design and construction in conformance with current building codes and engineering practices.

The site is relatively level and not susceptible to slope stability hazards. The potential for other geologic hazards such as liquefaction, tsunamis, inundation, seiches, flooding, methane gas, and subsidence affecting the site is also considered low.

5.0 Preliminary Recommendations

5.1 General

As previously stated, a master planning study is being conducted for the Providence Saint John's Health Center Phase II Project. Specific details of the Phase II Project are still being developed. Therefore, the recommendations contained in this report are considered preliminary and a comprehensive geotechnical investigation(s) will need to be performed at a later date when more specific project details are developed as required by the City of Santa Monica Building and Safety Divisions at the time of plan check Content requirements of the required comprehensive geotechnical investigation(s) and report(s) are presented in the City of Santa Monica "Guidelines for Geotechnical Reports, City of Santa Monica Building and Safety," dated March, 2010. Those Guidelines provide minimum standards and a recommended format for geotechnical reports submitted to the City and explain the City's geotechnical review process. Those Guidelines require the content of geotechnical reports to include, among other things (and depending on the project), the (a) purpose and scope of the study; (b) a description of the site studied; (c) a description of the proposed development; (d) previously collected geotechnical data relied upon; (e) a description of the field explorations conducted; (f) a description of the groundwater conditions; (g) materials test data; (h) geotechnical analysis and findings; (i) identification and mitigation of risks; (j) figures, maps, and attachments supporting the report; (k) a seismic hazard evaluation (including fault rupture hazards, ground shaking, CBC seismic design factors, liquefaction, and settlement); (l) an evaluation of possible hydrocollapse, soil expansion, and settlement/heave; (m) an evaluation of slope stability; (n) conclusions and geotechnical recommendations; (o) references and appendices.

The existing fill soils are not considered suitable for support of new structures on conventional spread/continuous footings. If the existing fill soils are excavated and replaced as properly compacted fill, relatively light at-grade buildings may be supported on spread/continuous footings established on properly compacted fill and the floor slabs may be supported on grade. However, since the upper silty soils may be susceptible to hydroconsolidation and become weaker and more compressible when wet and the upper clayey soils may be somewhat expansive, remedial grading may be required for support of footings and floor slabs for at-grade structures. Such remedial grading measures would likely consist of the placement of approximately two feet of properly compacted fill beneath footings and floor slabs. This fill soil will need to consist of relatively non-expansive soils, which may be derived from on-site excavations or imported to the site.

Based on the data obtained from our prior borings, excavations for buildings containing one or more basement levels are anticipated to remove the existing fill soils. Remedial grading measures will likely not be required for support of new relatively heavy (maximum dead-plus-live column loads on the order of 1,500 kips or less) structures containing one or more basement levels; it will likely be feasible to support such structures on conventional spread/continuous footings underlain by undisturbed natural soils at the basement level.

For heavier structures with subterranean levels, relatively heavy at-grade structures, or structures with large overturning loads, the use of drilled cast-in-place concrete piles may be required for foundation support. However, for pile-supported subterranean structures, the lower floor slab may still be supported on grade; for at-grade pile-supported structures, the floor slab may be supported on-grade after the remedial grading measures described above are performed. However, since a significant amount of gravel was encountered in some areas, with some cobbles and boulders, the installation of drilled piles could be difficult, particularly where groundwater seepage was encountered. Special techniques, such as the use of casing, drilling mud, and/or specialty augers, could be

necessary to drill through cobble and boulder layers and to prevent caving of the sidewalls during drilling. Blasting and percussive pile driving will not be required.

5.2 Foundations

Spread Footings

If the existing fill soils are excavated and replaced as properly compacted fill, relatively light at-grade buildings may be supported on conventional spread/continuous footings underlain by a layer of properly compacted fill. Spread footings carried at least 1 foot into the properly compacted fill and at least 2 feet below the lowest adjacent grade or floor level may be designed to impose a net dead-plus-live load pressure of 2,500 pounds per square foot.

Relatively heavy structures with subterranean levels may also be supported on conventional spread/continuous footings established in the undisturbed natural soils. Spread footings carried at least 1 foot into the undisturbed natural soils and at least 2 feet below the lowest adjacent grade or floor level may be designed to impose a net dead-plus-live load pressure of 6,000 pounds per square foot.

The excavations should be deepened as necessary to extend into satisfactory soils. A one-third increase may be used for wind or seismic loads. The recommended bearing values are net values, and the weight of concrete in the footings may be taken as 50 pounds per cubic foot; the weight of soil backfill may be neglected when determining the downward loads.

Building settlements will depend on the magnitude of the structural loads. However, it is anticipated that the settlement of new structures, supported on spread footings in the manner recommended above, will be less than 1 inch with differential settlements of less than ½ inch between adjacent columns. In addition, new structures should be designed to accommodate the dynamic settlement, as discussed previously, in addition to the static settlement given above.

Lateral loads may be resisted by soil friction and by the passive resistance of the soils. A coefficient of friction of 0.4 may be used between spread footings and the floor slab and the supporting soils. The passive resistance of the soils may be assumed to be equal to the pressure developed by a fluid with a density of 250 pounds per cubic foot. A one-third increase in the passive value may be used for wind or seismic loads. The frictional resistance and the passive resistance of the soils may be combined without reduction in determining the total lateral resistance.

Drilled Piles

For heavier structures with subterranean levels, relatively heavy at-grade structures, or structures with large overturning loads, the use of drilled cast-in-place concrete piles may be required for foundation support. For preliminary estimating purposes, the downward and upward capacities of 24-inch diameter drilled cast-in-place concrete piles as a function of penetration below pile cap are presented on Figure 7, Drilled Pile Capacities. The capacity of other size piles may be assumed to be proportional to their diameter. The pile capacities shown on Figure 7 are for dead-plus-live load capacities; a one-third increase may be used for wind or seismic loads. The capacities presented are based on the strength of the soils; the compressive and tensile strengths of the pile sections should be checked to verify the structural capacity of the piles.

We anticipate that the settlement of new structures, supported on drilled cast-in-place concrete pile foundations in the manner recommended, will be less than ½ inch with differential settlements of less than ¼ inch between adjacent columns.

Due to the potential for significant amounts of gravel to be encountered beneath the site in some areas, with some cobbles possible, the installation of drilled piles could be difficult, particularly where groundwater seepage was encountered. Special techniques, such as the use of casing, drilling mud, and/or specialty augers, could be necessary to drill through cobble and boulder layers and to prevent caving of the sidewalls during drilling. Caving should also be anticipated within the sandy deposits.

5.3 Seismic Design Parameters

We have determined the seismic design parameters in accordance with the 2016 CBC and ASCE 7-10 Standard (ASCE, 2010) using the United States Geological Survey (USGS) Seismic Design Maps Web Application. The CBC Site Classification is to be determined based on Table 20.3-1 in ASCE 7-10, as summarized in the table below:

Site Classification

Site Class	$V_{s\text{-}avg}$ (feet per second)	N_{avg}	$S_{u\text{-}avg}$ (pounds per square foot)
A. Hard Rock	>5,000	NA	NA
B. Rock	2,500 to 5,000	NA	NA
C. Very dense soil and soft rock	1,200 to 2,500	>50	>2,000
D. Stiff soil	600 to 1,200	15 to 50	1,000 to 2,000
E. Soft clay soil	<600	<15	<1,000
F. Soils requiring site response analysis	NA	NA	NA

where: $V_{s\text{-}avg}$ = average shear wave velocity within the upper 100 feet
N_{avg} = average Standard Penetration Test blowcount within the upper 100 feet
$S_{u\text{-}avg}$ = average undrained shear strength within the upper 100 feet

Accordingly, the CBC Site Class for the project site was determined to be Site Class "C" based on the results of our prior explorations, nearby shear wave velocity data, the anticipated basement depths, and a review of the local soil and geologic conditions. The mapped seismic parameters for the site are presented in the table below. The values in the table below are to be used by the structural engineer in designing the structures to resist the effects of earthquake motions in accordance with Section 1613 of the 2016 CBC; no other special seismic design requirements are associated with CBC Site Class "C".

Parameter	Mapped Value
S_S (0.2 second period)	2.09g
S_1 (1.0 second period)	0.77g
Site Class	C
F_a	1.0
F_v	1.3
$S_{MS} = F_a S_S$ (0.2 second period)	2.09g
$S_{M1} = F_v S_1$ (1.0 second period)	1.01g
$S_{DS} = 2/3 \times S_{MS}$ (0.2 second period)	1.39g
$S_{D1} = 2/3 \times S_{M1}$ (1.0 second period)	0.67g

By: WL 11/12/14, Checked By: MM 11/12/14

where: S_S = mapped risk-targeted maximum considered earthquake (MCE_R), 5% damped, spectral response acceleration parameter at short periods.
S_1 = mapped MCE_R, 5% damped, spectral response acceleration parameter at a spectral period of 1 second.
S_{MS} = mapped MCE_R, 5% damped, spectral acceleration response acceleration parameter at short periods adjusted for site effects.
S_{M1} = mapped MCE_R, 5% damped, spectral acceleration response acceleration parameter at a spectral period of 1 second adjusted for site effects.
S_{DS} = mapped design, 5% damped, spectral acceleration response acceleration parameter at short periods adjusted for site effects.
S_{D1} = mapped design, 5% damped, spectral acceleration response acceleration parameter at a spectral period of 1 second adjusted for site effects.

The mapped geometric mean peak ground acceleration (PGA_M) for the Maximum Considered Earthquake (MCE_G) at the site is 0.80g.

5.4 Excavation, Slopes, and Groundwater Control

As previously stated, new structures may by underlain by up to five levels of subterranean parking which may extend to a depth of approximately 60 feet below the existing grade. Since groundwater seepage was encountered in two of our prior borings within and near the proposed development areas at depths as shallow as 22 feet below the existing grade, groundwater control measures may be required during construction of the foundations and lower levels, particularly within the proposed development sites north of Santa Monica Boulevard. However, since groundwater was not encountered within the likely excavation depths (only groundwater seepage), significant dewatering using wells is not anticipated to be required and a system of trenches and sumps may be adequate during construction if seepage is encountered. Although not anticipated, the need for dewatering and a sub-floor drainage system should be assessed based on the current groundwater conditions underlying each proposed building site as determined by new borings. However, all retaining walls and walls below grade should be thoroughly waterproofed and provided with drainage or designed to resist hydrostatic pressures.

Based on the maximum depth of excavation planned and the proximity of existing buildings to the proposed development sites, shoring is anticipated to be required. One method of shoring would consist of steel soldier piles placed in drilled holes, backfilled with concrete, and tied back with earth anchors if necessary. Where the necessary space is available, temporary unsurcharged embankments may be sloped back at 1:1 without shoring. Adjacent to existing structures, the bottom of any unshored excavation should be restricted so as not to extend below a plane drawn at 1½:1 (horizontal to vertical) downward from the foundations of existing structures.

Where excavations expose wet clayey soils, which may be present in some areas depending on the planned depth of excavation, to provide a working base for men and equipment, a layer of select granular material, at least 1-foot-thick, may be necessary over the excavated surface. Preferably, this layer should consist of 1½-inch crushed rock. As an alternative, a concrete slab (or "waste" slab), at least 4 inches thick, could be placed at the bottom of the excavation. This could be done to allow for placement of waterproofing and construction of reinforcement, as required, without disturbance of the upper natural soils.

The excavations should be observed by personnel of our firm so that any necessary modifications based on variations in the soil conditions encountered can be made. All applicable safety requirements and regulations, including OSHA regulations, should be met.

5.5 Grading

The existing fill soils are not considered suitable for support of new structures on conventional spread/continuous footings. If the existing fill soils are excavated and replaced as properly compacted fill, relatively light at-grade buildings may be supported on spread/continuous footings established on properly compacted fill and the floor slabs may be supported on grade. However, since the upper silty soils may be susceptible to hydorconsolidation and become weaker and more compressible when wet and the upper clayey soils may be somewhat expansive, remedial grading may be required for support of footings and floor slabs for at-grade structures. Such remedial grading measures would likely consist of the placement of approximately two feet of properly compacted fill beneath footings and floor slabs. This fill soil will need to consist of relatively non-expansive soils, which may be derived from on-site excavations or imported to the site.

Based on the data obtained from our prior borings, excavations for buildings containing one or more basement levels are anticipated to remove the existing fill soils. Remedial grading measures will likely not be required for support of new relatively heavy structures containing one or more basement levels; it will likely be feasible to support such structures on conventional spread/continuous footings underlain by undisturbed natural soils at the basement level.

All required fill should be uniformly well compacted and observed and tested during placement.

Site Preparation

After the site is cleared and any existing fill soils are excavated as recommended, the exposed natural soils should be carefully observed for the removal of all unsuitable deposits. Next, the exposed soils should be scarified to a depth of 6 inches, brought to near-optimum moisture content, and rolled with heavy compaction equipment. At

least the upper 6 inches of the exposed soils should be compacted to at least 90% of the maximum dry density obtainable by the ASTM Designation D1557 method of compaction.

Compaction

Any required fill should be placed in loose lifts not more than 8-inches-thick and compacted. The fill should be compacted to at least 90% of the maximum density obtainable by the ASTM Designation D1557 method of compaction. The moisture content of the on-site soils at the time of compaction should vary no more than 2% below or above optimum moisture content. The moisture content of the on-site clayey soils at the time of compaction should be between 2% and 4% above optimum moisture content.

Material for Fill

The on-site soils, less any debris or organic matter, can be used in required fills. However, because of their somewhat expansive characteristics, the on-site clayey soils should not be used within approximately two feet of the subgrade for floor slabs, pavement, and other exterior concrete walks and slabs. Cobbles larger than 4 inches in diameter should not be used in the fill. Any required import material should consist of relatively non-expansive soils with an expansion index of less than 35. The imported materials should contain sufficient fines (at least 15% passing the No. 200 sieve) so as to be relatively impermeable and result in a stable subgrade when compacted. All proposed import materials should be approved by our personnel prior to being placed at the site.

Shrinkage

In computing fill quantities, a shrinkage of about 10% can be expected when excavating and compacting the soils to 90% as recommended. That is, it will require about 1.1 cubic yards of excavation to make 1 cubic yard of compacted fill.

5.6 Geotechnical Observation

The reworking of the upper soils and the compaction of all required fill should be observed and tested during placement by a representative of our firm. Our representative should observe the preparation of the site, shoring installation, fill placement operations, and foundation excavations. He should also approve materials proposed to be placed in fills and test the in-place fill materials for conformance to the project specifications and our recommendations.

The governmental agencies having jurisdiction over the project should be notified prior to commencement of grading so that the necessary grading permits can be obtained and arrangements can be made for required inspection(s). The contractor should be familiar with the inspection requirements of the reviewing agencies.

5.7 Impacts After Recommendations

With compliance with applicable regulations and implementation of the recommendations identified in this report, as may be modified by the required comprehensive geotechnical investigation, the geology and soils impacts of the Project would be less than significant.

6.0 Basis for Recommendations

The recommendations provided in this report are based upon our understanding of the described project information and on our interpretation of the data collected during our previous and recent subsurface explorations. We have made our recommendations based upon experience with similar subsurface conditions under similar loading conditions. The recommendations apply to the specific project areas and types discussed in this report; therefore, any change in the locations or structure types should be provided to us so that we can review our conclusions and recommendations and make any necessary modifications.

The preliminary recommendations provided in this report are also based upon the assumption that the necessary geotechnical observations and testing during construction will be performed by representatives of our firm. The field observation services are considered a continuation of the geotechnical investigation and essential to verify that the actual soil conditions are as expected. This also provides for the procedure whereby the client can be advised of unexpected or changed conditions that would require modifications of our original recommendations. In addition, the presence of our representative at the site provides the client with an independent professional opinion regarding the geotechnically-related construction procedures. If another firm is retained for the geotechnical observation services, our professional responsibility and liability would be limited to the extent that we would not be the geotechnical engineer of record.

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Ziony, J. I., and Jones, L. M., 1989, "Map Showing Late Quaternary Faults and 1978–1984 Seismicity of the Los Angeles Region, California," U.S. Geological Survey Miscellaneous Field Studies Map MF-1964.

Table 1

Major Named Faults Considered to be Active in Southern California

Table 1
Major Named Faults Considered to be Active
in Southern California

Fault (in increasing distance)	Maximum Magnitude			Slip Rate (mm/yr.)	Distance From Site (miles)	Direction From Site
Compton Thrust	7.1	(a)	BT	0.9	0*	NA
Santa Monica	6.6	(a)	RO	1.0	0.8	N
Malibu Coast	6.7	(a)	RO	0.3	3.1	WNW
Hollywood	6.4	(a)	RO	1.0	4.8	NE
Palos Verdes	7.3	(a)	SS	3.0	4.9	SW
Northridge Thrust	7.0	(a)	BT	1.5	7.8	N
Puente Hills Blind Thrust	7.1	(a)	BT	0.7	9.0	E
Upper Elysian Park Thrust	6.4	(a)	BT	1.3	10	ENE
Anacapa-Dume	7.5	(a)	RO	3.0	12	W
Verdugo	6.9	(a)	RO	0.5	14	NE
Raymond	6.5	(a)	RO	1.5	15	ENE
Sierra Madre (San Fernando)	6.7	(a)	RO	2.0	17	N
Santa Susana	6.7	(a)	RO	5.0	19	N
Sierra Madre	7.2	(a)	RO	2.0	19	NE
San Gabriel	7.2	(a)	SS	1.0	21	NNE
Simi-Santa Rosa	7.0	(a)	RO	1.0	22	NNW
Whittier	6.8	(a)	RO	2.5	26	ESE
Holser	6.5	(a)	RO	0.4	27	N
Clamshell-Sawpit	6.5	(a)	RO	0.5	28	ENE
Oak Ridge	7.0	(a)	RO	4.0	29	NNW
San Cayetano	7.0	(a)	RO	6.0	32	NNW
San Jose	6.4	(a)	RO	0.5	34	E
San Joaquin Thrust	6.6	(a)	BT	0.5	40	SE
San Andreas (Mojave S.Section)	7.4	(a)	SS	29.0	41	NE
Chino-Central Avenue	6.7	(a)	RO	1.0	43	E
Cucamonga	6.9	(a)	RO	5.0	45	E
Elsinore (Glen Ivy Section)	6.8	(a)	SS	5.0	48	ESE
San Jacinto (SB Section)	6.7	(a)	SS	6.0	55	ENE
Santa Ynez	7.1	(a)	SS	2.0	55	NW
San Andreas (SB N.Section)	7.5	(a)	SS	22.0	59	ENE
Santa Cruz Island	7.0	(a)	RO	1.0	59	W

(a) California Geological Survey, 2003, 2008
SS Strike Slip
NO Normal Oblique
RO Reverse Oblique
BT Blind Thrust
* At depth, does not come to surface

Prepared by: PER 8/15/14
Checked by: RM 11/13/14

Table 2

Selected Quaternary Faults in Southern California

Table 2
Selected Quaternary Faults in Southern California

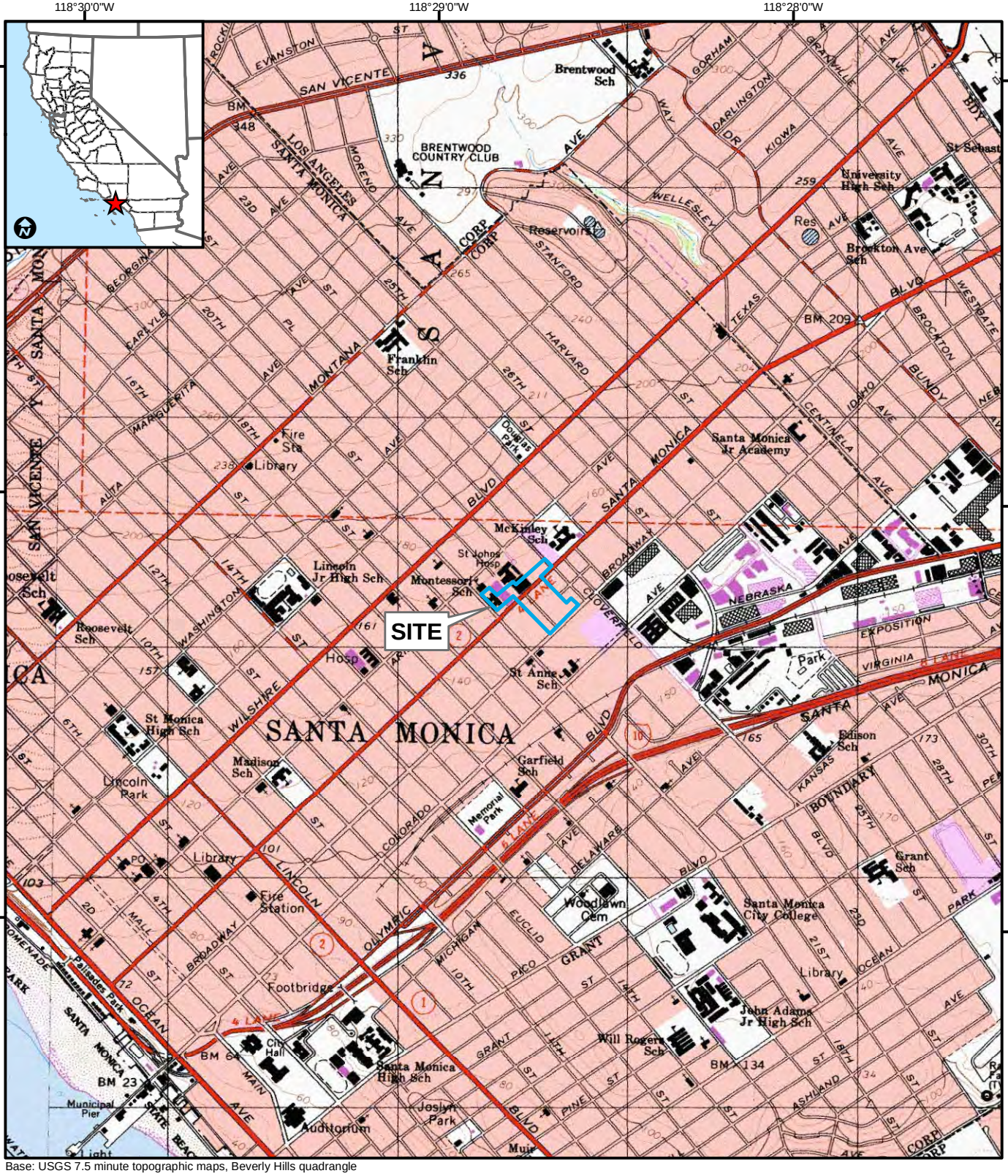
Fault (in increasing distance)	Maximum Magnitude			Slip Rate (mm/yr.)	Distance From Site (miles)	Direction From Site
Charnock	6.5	(c)	SS	0.1	3.5	ESE
Overland	6.0	(c)	SS	0.1	3.7	E
Northridge Hills	6.6	(d)	SS	1.2	14	NNE
Norwalk	6.7	(c)	RO	0.1	24	ESE
Los Alamitos	6.2	(b)	SS	0.1	25	SE
Duarte	6.7	(c)	RO	0.1	29	ENE
El Modeno	6.5	(b)	NO	0.1	34	ESE

(b) Mark, 1977
(c) Slemmons, 1979
(d) Wesnousky, 1986
SS Strike Slip
NO Normal Oblique
RO Reverse Oblique

Prepared by: PER 8/15/14
Checked by: RM 11/13/14

Figure 1

Vicinity Map



Base: USGS 7.5 minute topographic maps, Beverly Hills quadrangle

0 500 1,000 2,000 3,000 Feet

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Master Plan Study
Providence Saint John's Healh Center Phase II Project
Santa Monica, California

LAT:	34.0304
LON:	-118.4795
SCALE:	1:24,000
DRAWN:	PER
CHECK:	RM
DATE:	05-08-18

VICINITY MAP

FIGURE: 1

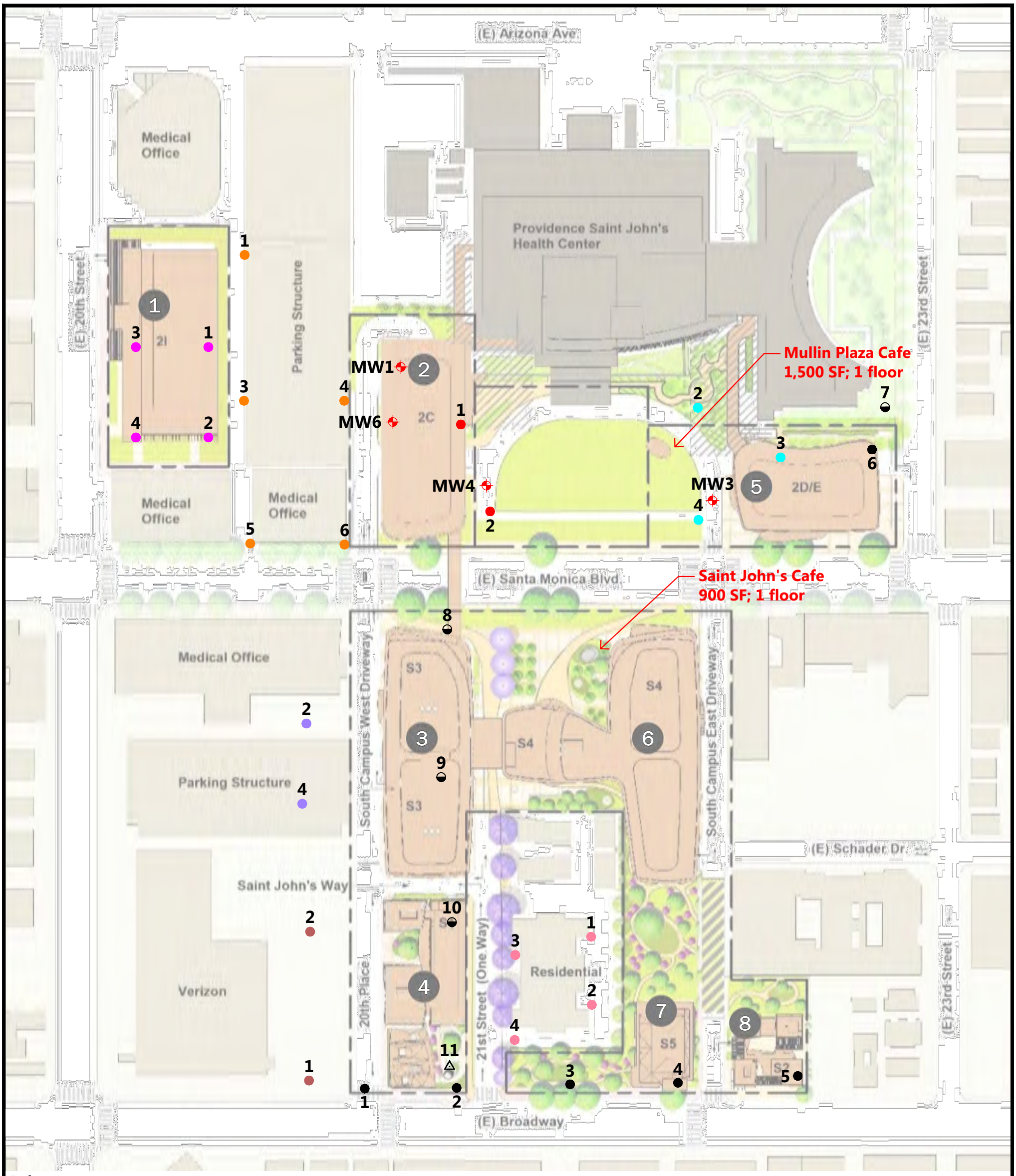
PROJECT: 4953-14-0991

G:\4953 Geotech\2014\140991 St Johns MCIGIS\2018\140991 Figure 1 Vicinity Map.mxd

Figure 2

Plot Plan

Path: G:\4953_Geotech\2014\140991_St_Johns_MC\CAD\DWG\4953-14-0991_Fig-2_Plot-Plan(18.05.18).dwg [B-17x11]
Date: May 18, 2018 - 3:57pm By: vo.nguyen



Reference: Plans provided by Perkins Eastman, Architects & Planners

LEGEND

- 6 ● AMEC 2014 Previous Fault Investigation (4953-14-0992)
- 10 ◒ Law/Crandall 1996 Previous Investigation (70131-6-0325.0001)
- 4 ● LeRoy Crandall 1960 Previous Investigation (60540)
- 4 ● Law/Crandall 1992 Previous Investigation (L92281.ADEO)
- 6 ● LeRoy Crandall 1963 Previous Investigation (63635)
- 2 ● LeRoy Crandall 1963 Previous Investigation (63125)
- 5 ● LeRoy Crandall 1988 Previous Investigation (A-87159)
- 4 ● LeRoy Crandall 1978 Previous Investigation (ADE-77210)
- 2 ● LeRoy Crandall 1981 Previous Investigation (A-81019)
- Boring Location and Number
- MW6 AECOM Monitoring Well Location
- 11 △ Law/Crandall 1996 Previous Investigation (70131-6-0325.0001) (Cone Penetration Test Location and Number)
- Proposed Development Sites

1. 2I: 20th Street Medical Building
2. 2C: West Ambulatory Care & Acute Care Building
3. S3: West Ambulatory Care & Research Building
4. S1: Child & Family Development Center
5. 2D/E: East Ambulatory & Acute Care Building
6. S4: Education/Conference and East Ambulatory/Research Building
7. S5: Visitor Housing
8. S2: Multifamily Housing

0 60' 120' 240'
SCALE: 1" = 120'

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LT,LNG:	
SCALE:	1" = 120'
DRAWN:	VMN
CHKD:	MM
DATE:	05/18/2018

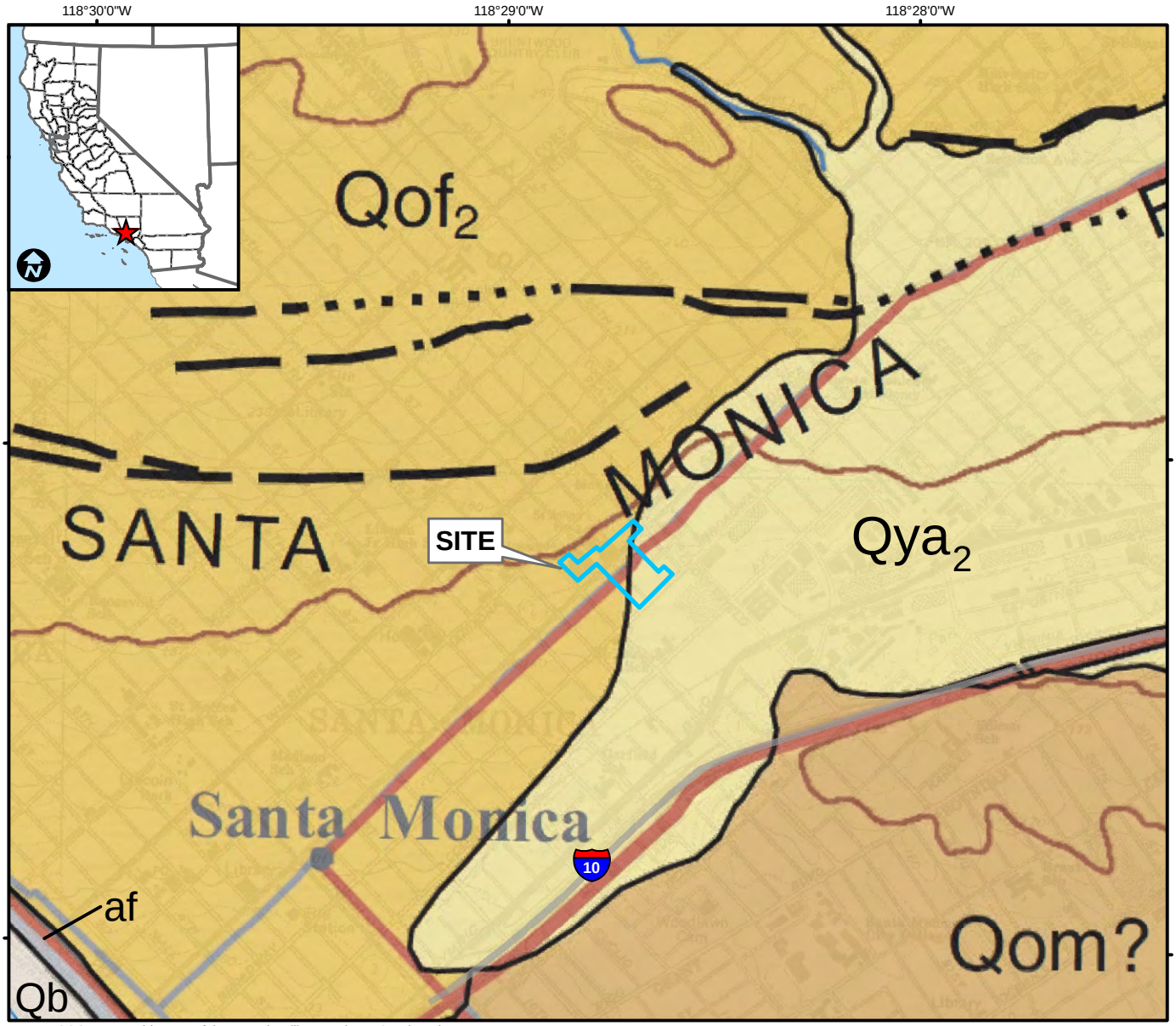
PLOT PLAN

FIGURE NO. 2

PROJECT NO. 4953-14-0991

Figure 3

Local Geologic Map



Base: USGS topographic map of the Beverly Hills 7.5-minute Quadrangle

Geologic Units

Unit - Description (Age)

- af - Artificial Fill (late Holocene)
- Qb - Beach Deposits (late Holocene)
- Qya -Young alluvium (with sub-units) (late Pleistocene)
- Qof - Old Alluvial Fan Deposits (with sub-units) (Late Pleistocene)
- Qom - Old shallow marine deposits on wave-cut surface (late Pleistocene) (undivided where queried)

0 1,000 2,000 4,000 Feet

Contacts:

- contact, location accurate
- contact, location approximate
- contact, location concealed
- contact, location inferred
- fault, location accurate
- fault, location approximate
- fault, location concealed
- fault, location inferred

References:
Campbell, R.H., Wills, C.J., Irvine, P.J., and Swanson, B.J., 2016, Preliminary geologic map of the Los Angeles 30' x 60' quadrangle, California: Version 2.1: California Geological Survey, Preliminary Geologic Maps, scale 1:100,000.

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SCALE: 1:24,000
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CHECK: RM
DATE: 05-08-18

LOCAL GEOLOGIC MAP

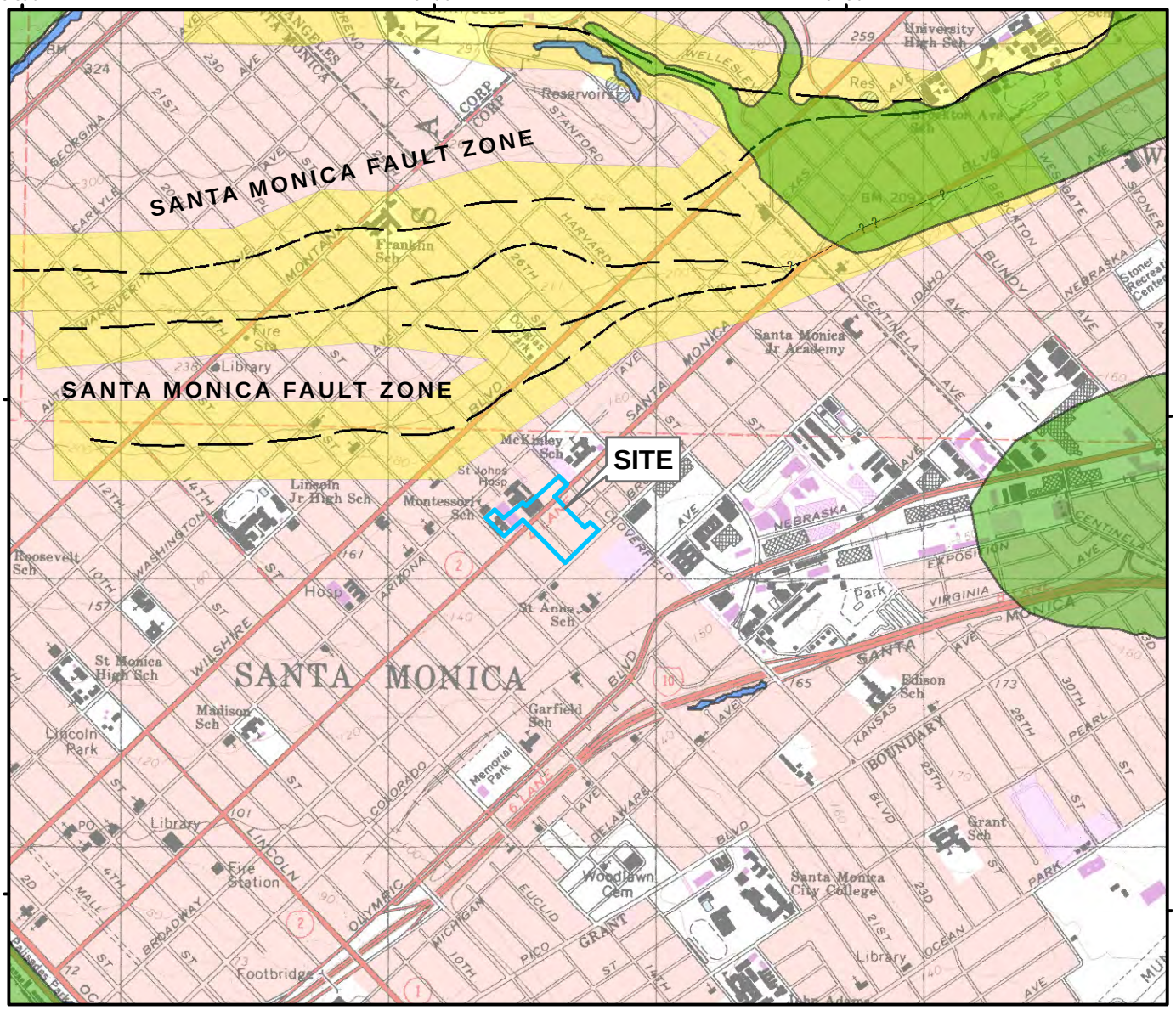
FIGURE: 3

PROJECT: 4953-14-0991

Path: G:\4953 Geotech\2014\140991 St Johns MC\GIS\2018\140991 Figure 3 Local Geologic Map2.mxd

Figure 4

Seismic Hazards Map



Base: USGS 7.5 minute topographic map of the Beverly Hills quadrangles.

Seismic Hazards

Earthquake-induced landslide - Areas where Holocene occurrence of landslide movement, or local slope of terrain, and geological, geotechnical and ground moisture conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Liquefaction hazard zones shall be delineated as areas where historic occurrence of liquefaction, or local geological, geotechnical and ground water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake Fault Zones

- Accurately Located Fault Traces
- Approximately Located Fault Traces
- Inferred Fault Traces
- Concealed Fault Traces
- Aerial Photo Lineament
- Alquist Priolo Earthquake Fault Zone Boundary

References:
California Geological Survey, 2018, Earthquake Fault Zones and Seismic Hazard Zones Beverly Hills 7.5 Minute Quadrangle, Earthquake Zones of Required Investigation, Beverly Hills Quadrangle, Revised Official Map, released January 11, 2018 and
Seismic Hazard Zones Map, released March 25, 1999.
California Geological Survey, 2018, Spatial Data of Earthquake Fault Zones and Seismic Hazard Zones Beverly Hills 7.5 Minute Quadrangle, Earthquake Zones of Required Investigation, Beverly Hills Quadrangle, Accessed May 7, 2018,
<http://maps.conservation.ca.gov/cgs/informationwarehouse/>

0 1,000 2,000 4,000 Feet

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Santa Monica, California

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SEISMIC HAZARDS MAP

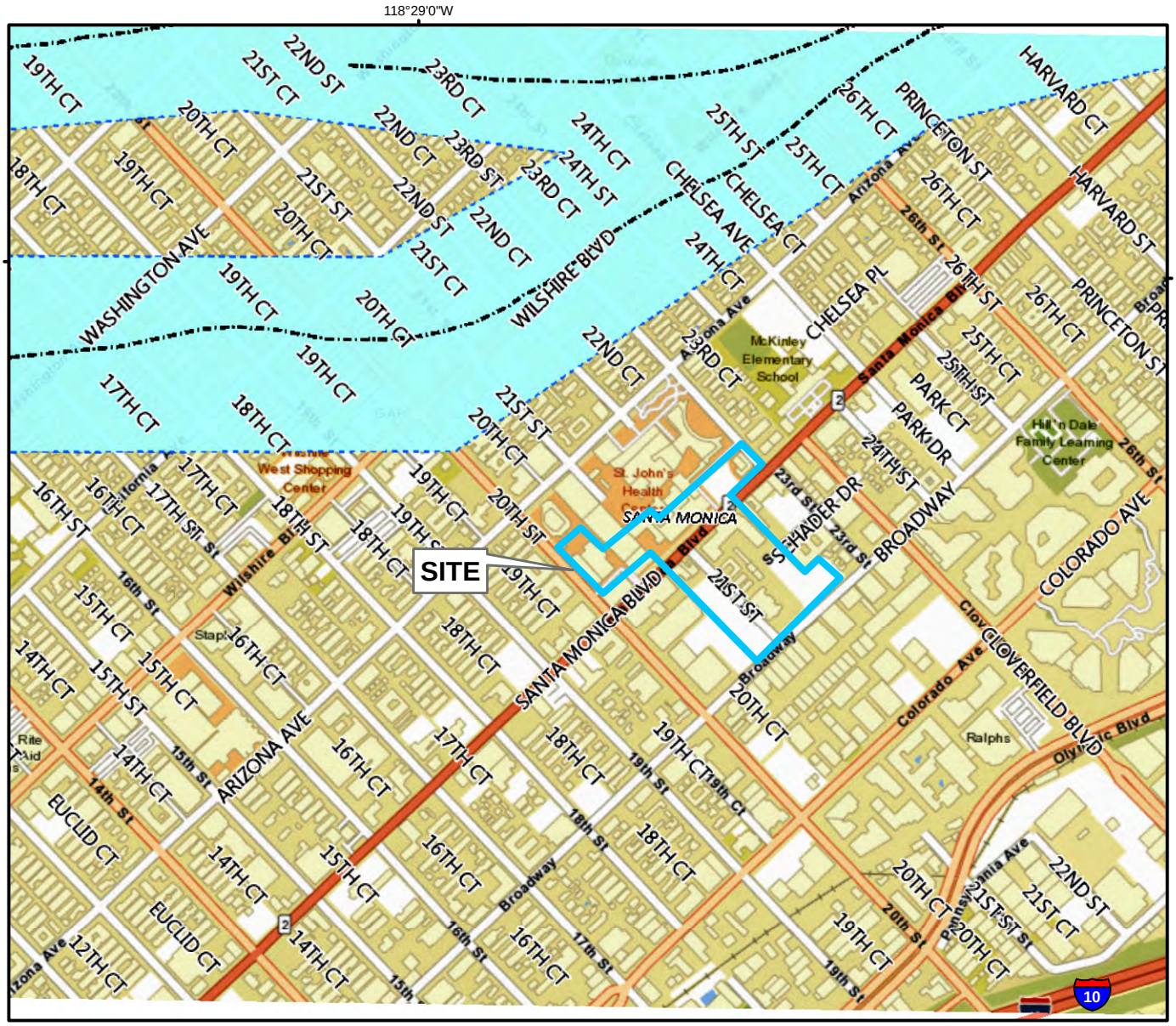
FIGURE: 4

PROJECT: 4953-14-0991

Path: G:\4953_Geotech\2014\140991_St_Johns_MC\GIS\2018\140991_Figure_4_Seismic_Hazards_AP.mxd

Figure 5

City of Santa Monica Geologic Hazards Map



GEOLOGIC HAZARDS

Fault Zones (2018 Update)

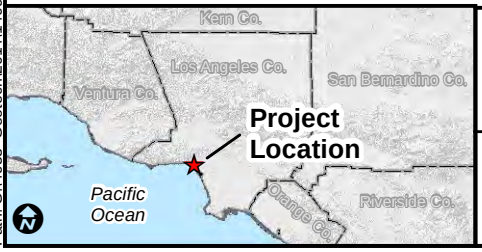
- Fault Traces
- City of Santa Monica Fault Zone

N W E S

0 400 800 1,600 Feet

0 0.075 0.15 0.3 Miles

Reference:
City of Santa Monica, 2018, Information Systems, Santa Monica Mapping Application Platform, accessed April 19, 2018, <https://www.smgov.net/Departments/ISD/content.aspx?id=15297>



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LAT:	34.0304
LON:	-118.4795
SCALE:	1 in=800 ft
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DATE:	05-08-18

CITY OF SANTA MONICA
GEOLOGIC HAZARDS MAP

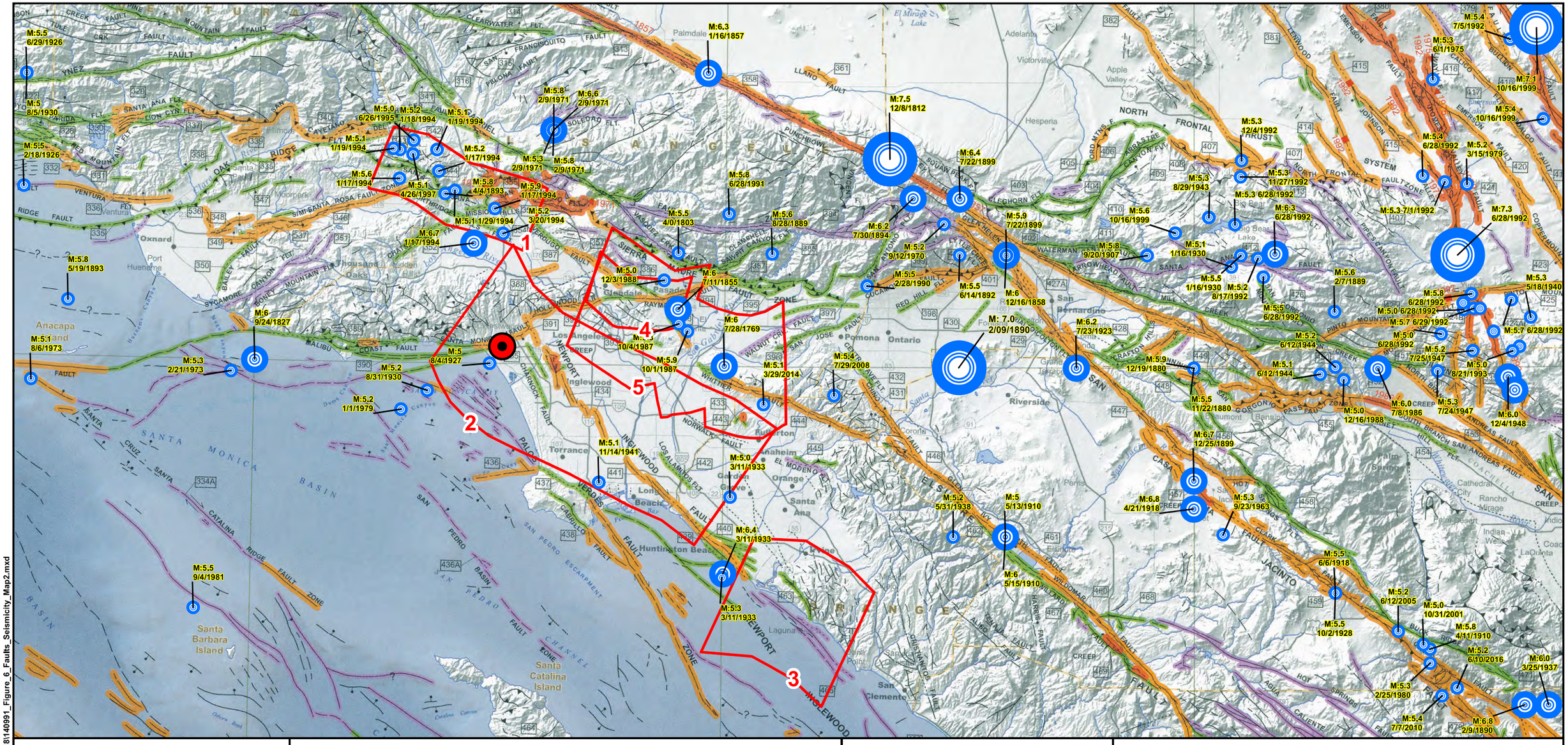
FIGURE: **5**

PROJECT: 4953-14-0991

Path: G:\4953_Geotech\2014\140991_St Johns_MC\GIS\2018\140991_Figure_5_SM_Fault_Zones_Map_rev01.mxd

Figure 6

Regional Fault and Seismicity Map



REFERENCES:

Jennings, C.W. and Bryant, W.A., 2010,"Fault Activity Map of California," California Geological Survey, GDM-006, May 2010

Earthquake Catalogs: California Geological Survey, 1769-1932; Southern California Earthquake Center, 1932-2018.

Working Group on California Earthquake Probabilities (WGCEP), 2016, Fault Database Tools, <http://www.wgcep.org/tools-fault_db>

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Master Plan Study
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DRAWN:	PER
CHECK:	RM
DATE:	05-08-18

REGIONAL FAULT AND SEISMICITY MAP

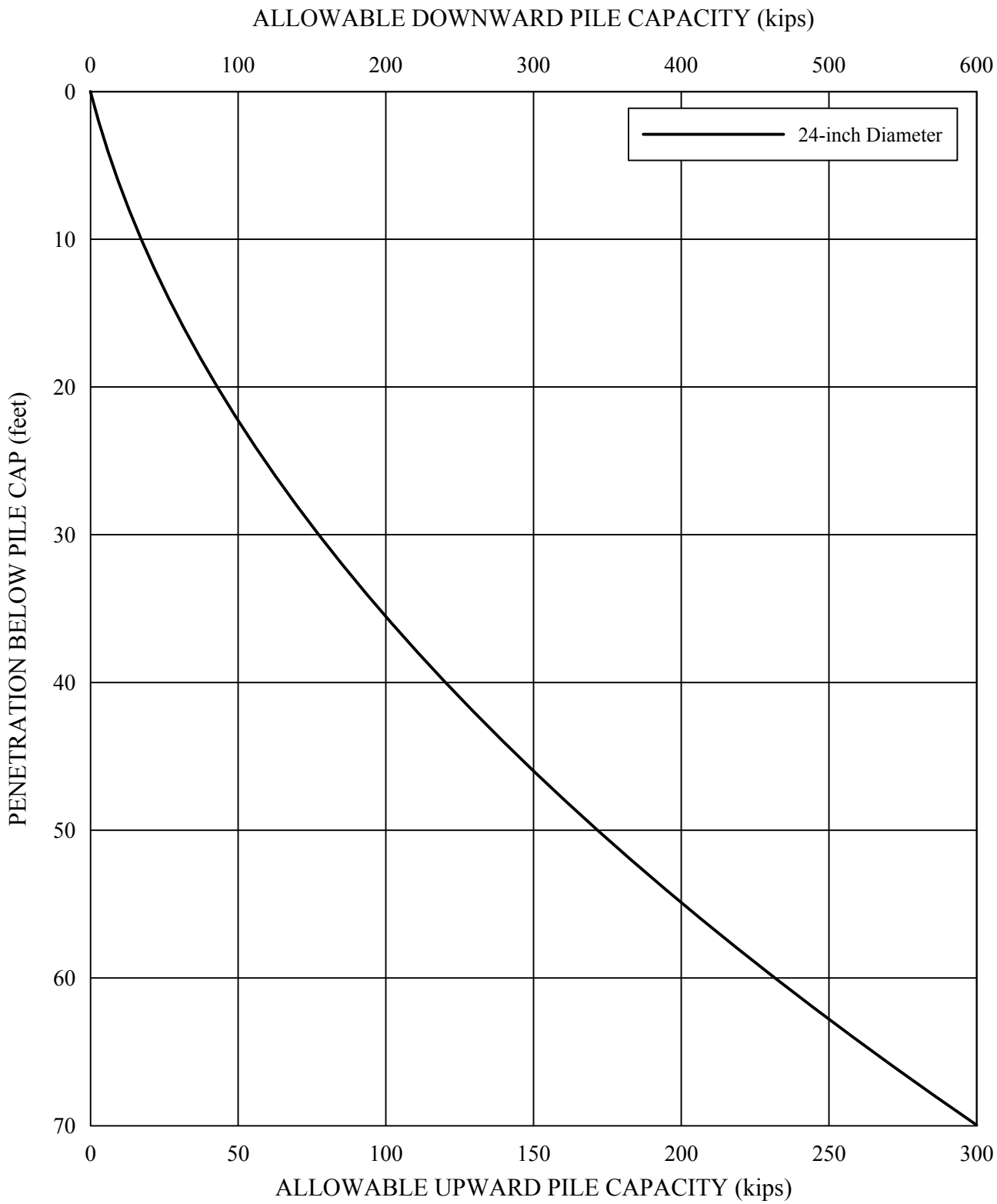
FIGURE: 6

PROJECT: 4953-14-0991

Path: G:\4953_Geotech\2014\140991_St_Johns_MC\GIS\2018\140991_Figure_6_Faults_Seismicity_Map2.mxd

Figure 7

Drilled Pile Capacities



NOTES: (1) The indicated values refer to the total of dead plus live loads; a one-third increase may be used when considering wind or seismic loads.
(2) Piles in groups should be spaced a minimum of 3 pile diameters on centers.
(3) The indicated values are based on the strength of the soils; the actual pile capacities may be limited to lesser values by the strength of the piles.

Prepared/Date: WL 11/13/14
Checked/Date: MM 11/13/14

Master Planning Study Providence Saint John's Health Center Phase II Project Santa Monica, California	wood.	DRILLED PILE CAPACITIES Project No. 4953-14-0991 Figure 7

Appendix A

Previous Field Explorations

Previous Fault Investigation (4953-14-0992)

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		B-1
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 8, 2014	6 Inches	147.1 feet

GROUND-WATER READINGS
Groundwater level was encountered at 115 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
								Asphalt Concrete (5 inches thick) over Base (4 inches thick)
							SM	**FILL** SILTY SAND - strong brown (7.5Y 4/6), slightly moist
145	5	1	1	60			SM	**QUATERNARY ALLUVIAL FAN DEPOSITS** SILTY SAND with GRAVEL - gray (10YR 5/1), slightly moist, fine to coarse sand, approx 20 to 35 percent fine to medium gravel, angular to subangular
140								No core recovery from 8.0 to 10.0 feet
	10						SM/ ML	SILTY SAND to SANDY SILT - dark yellowish brown (10YR 4/4), slightly moist
135		1	2	94			ML	CLAYEY SILT - olive brown (2.5Y 4/3), moist, few fine sand layers (up to 1/4 inch thick), crudely bedded, thinly
								At 13.9 to 14.1 feet: Paleosol brown (7.5YR 4/4), poor ped development
	15							No core recovery from 14.7 to 15 feet
							SM/ ML	SILTY SAND to SANDY SILT - brown (7.5YR 4/2), moist, fine to coarse sand, approx 5 to 10 percent fine gravel
130		2	3	100			ML	CLAYEY SILT - brown (10YR 4/3), moist
	20							At 19 feet: Dark yellowish brown (10YR 4/4), approx 10 percent fine sand, approx 2 to 5 percent fine gravel

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/18/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A1a

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-1 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 8, 2014	6 Inches	147.1 feet

GROUND-WATER READINGS
Groundwater level was encountered at 115 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
125	25	2	4	100				SM	SILTY SAND - dark yellowish brown (10YR 4/4-4/6), moist, fine to medium sand, approx 5 percent clay At 20 to 20.3 feet: Approx 10 to 15 percent fine to coarse gravel, angular to subangular At 22.9 to 23 feet: Approx 10 percent fine to medium gravel, subangular to angular At 24.6 to 25 feet: Black, carbon specks At 25.5 feet: Dark yellowish brown (10YR 4/4), fine sand, less clay
120	30	3	5	100				SC	CLAYEY SAND - dark yellowish brown (10YR 4/4), moist, some Lean Clay At 27.6 feet: Becomes crudely bedded, thinly
								SP-SM	POORLY GRADED SAND with SILT - dark yellowish brown (10YR 4/4-4/6), moist, fine sand
								SC	CLAYEY SAND - dark yellowish brown (10YR 4/4), moist
115	35	3	6	100				SP-SC	POORLY GRADED SAND with CLAY - dark yellowish brown (10YR 4/4), moist, fine sand, approx 10 to 15 percent clay At 32.7 feet: Manganese rich layers
								CL	LEAN CLAY - dark yellowish brown (10YR 3/4), moist
								SP-SC	POORLY GRADED SAND with CLAY - dark yellowish brown (10YR 4/4), moist, fine to medium sand, approx 5 to 10 percent clay
110	40	4	7	94				SP-SM	POORLY GRADED SAND with SILT - dark yellowish brown (10YR 4/4), moist, fine to medium sand At 36.2 feet: Yellowish brown (10YR 5/6), few silty layers (up to 1/2 inch thick) No core recovery from 39.7 to 40 feet

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/18/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A1b

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-1 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 8, 2014	6 Inches	147.1 feet

GROUND-WATER READINGS
Groundwater level was encountered at 115 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
105	45	4	8	92			SP	At 42.3 to 42.6 feet: Coarsens to medium sand with some fine At 43.9 to 44 feet: Very dark brown (7.5YR 2.5/3), some coarse sand At 44.4 feet: Becomes pale yellow (2.5Y 7/4), fine sand, some silt No core recovery from 44.6 to 45 feet
100	50	5	9	92			SP-SC	POORLY GRADED SAND with CLAY - strong brown (7.5YR 5/6), moist, crude, sorted layers At 45.8 to 46.1 feet: Light yellowish brown (2.5Y 6.4), moist, fine sand At 47.2 feet: Very dark brown (7.5YR 2.5/2), coarser layer (1/2 to 1 inch thick) At 47.3 feet: Pale yellow (2.5Y 7/4), fine sand, some medium No core recovery from 49.6 to 50 feet
95	55	5	10	94			SP	At 51.1 to 52.2 feet: Few coarse sand layers (up to 1/4 inch thick), coarse sand coated with very dark brown (7.5YR 2.5/2) No core recovery from 54.7 to 55 feet
90	60	6	11	96			SP-SM	**NEAR SHORE DEPOSITS** POORLY GRADED SAND with SILT - pale yellow (2.5Y 7/3), moist, fine sand, few crude laminae of fine to medium sand layers (1/4 to 1/2 inch in size) At 57.6 feet: Fine to coarse sand layer (1/4 to 1 inch thick) No core recovery from 59.8 to 60 feet

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/18/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A1c

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-1 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 8, 2014	6 Inches	147.1 feet

GROUND-WATER READINGS
Groundwater level was encountered at 115 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
85	65	6	12	88				SP-SM	Pockets of fine sand
									No core recovery from 64.4 to 65 feet
80	70	7	13	92				SP-SM	Pockets of fine sand
									No core recovery from 69.6 to 70 feet
75	75	7	14	92				SP-SM	At 71.5 to 72.3 feet: Laminated with Silty Sand and Poorly Graded Sand with Silt
									No core recovery from 74.6 to 75 feet
70	80	8	15	76				SP-SM	POORLY GRADED SAND with SILT - light yellowish brown (2.5Y 6/3), slightly moist, fine sand, approx 10 to 15 percent medium, approx 1 percent fine gravel, subangular
									No core recovery from 78.8 to 80 feet

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/18/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING
Project No.: 4953-14-0992 Figure: A1d

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-1 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 8, 2014	6 Inches	147.1 feet

GROUND-WATER READINGS
Groundwater level was encountered at 115 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
65	85	8	16	74			SM/ SP-SM	SILTY SAND and POORLY GRADED SAND with SILT - light yellowish brown (2.5Y 6/4), moist, fine sand, laminated, few laminae oxidized
								No core recovery from 83.7 to 85 feet
60	90	9	17	96			SM	SILTY SAND - olive yellow (2.5Y 6/6), moist, fine sand
							SP-SM	POORLY GRADED SAND with SILT - light olive brown (2.5Y 5/4), moist, approx 10 to 15 percent fine to medium gravel, angular to subangular
								At 86.8 feet: Poorly Graded Sand with Silt and Gravel, approx 30 to 35 percent fine to coarse gravel, subrounded to angular
							SP	POORLY GRADED SAND - yellowish brown (10YR 5/8), moist, fine to medium sand, approx 5 to 10 percent coarse, oxidized
55	95	9	18	92			SP	No core recovery from 89.8 to 90 feet POORLY GRADED SAND - brownish yellow (10YR 6/8), moist, fine to medium sand
								At 91.7 feet: Few very dark brown (10YR 2/2), laminated, oxidized
								At 92.9 feet: Approx 10 to 20 percent coarse sand
50	100	10	19	76			SP	No core recovery from 94.6 to 95 feet POORLY GRADED SAND - light yellowish brown (2.5Y 6/4), moist, fine to coarse sand, approx 40 percent coarse, approx 5 to 10 percent fine to coarse gravel, rounded to subrounded
								At 96.6 to 96.9 feet: Fine sand layers
							SP-SM	At 97.2 feet: Cobble (3 inches in diameter) POORLY GRADED SAND with SILT - light yellowish brown (2.5Y 6/4), moist, fine sand, oxidized stains At 98.1 feet: Approx 30 percent fine to coarse gravel, subrounded to subangular At 98.2 feet: Silty Sand with Gravel to Poorly Graded Sand with Silt layer (1/2 inch thick), brown (7.5YR 3/3) No core recovery from 98.8 to 100 feet

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/18/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A1e

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-1 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 8, 2014	6 Inches	147.1 feet

GROUND-WATER READINGS
Groundwater level was encountered at 115 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
45	105	10	20	88				SP-SM	POORLY GRADED SAND with SILT to SILTY SAND - light yellowish brown (2.5Y 6/3), slightly moist, fine sand At 101.9 to 102.1 feet: Cobbles, coarse sand layers At 102.1 feet: Poorly Graded Sand with Silt At 102.3 feet: Micaceous layer At 102.6 feet: Fine to medium sand, increase oxidation with depth At 103.2 feet: Moist, approx 15 to 30 percent fine to medium gravel, subrounded to angular, oxidized layers At 103.6 feet: Poorly Graded Sand with Silt, fine sand, oxidation staining No core recovery from 104.4 to 105 feet
40	110	11	21	100				SP-SM	POORLY GRADED SAND with SILT - light olive brown (2.5Y 5/3), moist, fine sand
35	115	11	22	86				SP	POORLY GRADED SAND - light brownish gray (2.5Y 6.2), moist to wet, fine sand, few oxidized laminae No core recovery from 114.3 to 115 feet
30	120	12	23	96				SP	At 115 feet: Wet, approx 10 to 15 percent slate gravel, subangular
								CL	**MARINE DEPOSITS** LEAN CLAY - black (2.5Y 2.5/1), moist, medium to high plasticity At 117.4 feet: Abundant fine shell fragments

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/18/2014
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LOG OF BORING

Project No.: 4953-14-0992 Figure: A1f

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-1 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 8, 2014	6 Inches	147.1 feet

GROUND-WATER READINGS
Groundwater level was encountered at 115 feet below the ground surface.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
								SC	No core recovery from 119.8 to 120 feet
								CL	CLAYEY SAND - black (2.5Y 2.5/1), moist, fine sand, approx 1 to 5 percent fine gravel, shell fragments SANDY LEAN CLAY - black (2.5Y 2.5/1), moist, shell fragments, hard, plastic
25		12	24	100				SC	CLAYEY SAND - moist, fine sand At 122.6 feet: black (2.5Y 2.5/1)
	125							SP-SM	POORLY GRADED SAND with SILT - black (2.5Y 2.5/1), wet, fine sand
								CL	LEAN CLAY - black (2.5Y 2.5/1), slightly moist, hard, plastic
								SP-SM	POORLY GRADED SAND with SILT - fine sand, some medium At 126.5 feet: Fine to medium sand, some coarse
20		13	25	100				CL	LEAN CLAY
								SP-SM	POORLY GRADED SAND with SILT - fine sand, some Silty Sand
	130							CL	LEAN CLAY
									END OF BORING AT 130 FEET
15									NOTES: Hand augered upper 5 feet to avoid damage to utilities. Groundwater level was encountered at 115 feet below the ground surface. Borehole grouted with cement-bentonite slurry and patched with rapid cement.
	135								
10									
	140								

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Field Geologist: MAS
Prepared/Date: JF 9/18/2014
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LOG OF BORING
Project No.: 4953-14-0992 Figure: A1g

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		B-2
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 11, 2014	6 Inches	148.2 feet

GROUND-WATER READINGS
Groundwater level was encountered at 113.5 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
								Asphalt Concrete (6 inches thick), no Base
							SM	**FILL** SILTY SAND with GRAVEL - brown, slightly moist, fine to medium grained
145	5							
							SM	**QUATERNARY ALLUVIAL FAN DEPOSITS** SILTY SAND with GRAVEL - light olive brown (2.5Y 5/3) and black (2.5Y 2.5/1), slightly moist, approx 30 to 40 percent slate gravel, angular to subangular
		1	1	70				
140								No core recovery from 8.5 to 10 feet
	10						GP-GM	POORLY GRADED GRAVEL with SILT and SAND - light olive brown (2.5Y 5/3) and black (2.5Y 2.5/1), dry to slightly moist, approx 60 percent fine to coarse gravel, subangular to angular, approx 30 percent sand to silt
		1	2	78				SILTY SAND with GRAVEL - light olive brown (2.5Y 5/3), slightly moist, approx 30 percent fine to medium gravel, subangular to angular
135							CL	LEAN CLAY - light olive brown (2.5Y 5/3), slightly moist
								SILTY SAND with GRAVEL - light olive broan (2.5Y 5/3), slightly moist, 30% gravel, fine to medium gravel, subangular to angular No core recovery from 13.9 to 15 feet
	15						SM	SILTY SAND with GRAVEL - light olive brown (2.5Y 5/3) and black (2.5Y 2.5/1), slightly moist, approx 30 to 40 percent slate gravel, angular to subangular
		2	3	80				
130								No core recovery from 19 to 20 feet
	20							

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/19/2014
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LOG OF BORING

Project No.: 4953-14-0992 Figure: A2a

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-2 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 11, 2014	6 Inches	148.2 feet

GROUND-WATER READINGS
Groundwater level was encountered at 113.5 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
		2	4	82				SM	SILTY SAND with GRAVEL - light olive brown (2.5Y 5/3) and black (2.5Y 2.5/1), slightly moist, approx 30 to 40 percent slate gravel, angular to subangular
									At 21.3 feet: 2-inch thick Silt bed, light olive brown (2.5Y 5/3)
									At 22 feet: 2-inch thick Clay bed, light olive brown (2.5Y 5/3)
125									
									No core recovery from 24.1 to 25 feet
	25								
		3	5	86				SM	SILTY SAND with GRAVEL - light olive brown (2.5Y 5/3) and black (2.5Y 2.5/1), slightly moist, approx 30 to 40 percent slate gravel, angular to subangular
120								CL-ML	SILTY CLAY - dark yellowish brown (10YR 4/4), moist, plastic
									No core recovery from 29.3 to 30 feet
	30							CL	SANDY LEAN CLAY - dark yellowish brown (10YR 4/4), moist, approx 15 to 30 percent fine sand, plastic
		3	6	100				SC	CLAYEY SAND - dark yellowish brown (10YR 4/4), moist, fine sand, approx 15 to 30 percent fines, plastic
115								CL	SANDY LEAN CLAY - dark yellowish brown (10YR 4/4), moist, approx 15 to 30 percent fine sand, plastic
	35								
		4	7	100				CL	LEAN CLAY - dark grayish brown (10YR 4/2), moist, hard, very plastic
110									
	40								

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/19/2014
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LOG OF BORING

Project No.: 4953-14-0992 Figure: A2b

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-2 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 11, 2014	6 Inches	148.2 feet

GROUND-WATER READINGS
Groundwater level was encountered at 113.5 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
105	45	4	8	100				CL-ML	SILTY CLAY - approx 30 to 40 percent silt
								CL	LEAN CLAY
100	50	5	9	100				SC	CLAYEY SAND - dark yellowish brown (10YR 4/6), moist, fine sand, oxidized
									At 48 feet: Poorly Graded Sand with Clay, becomes laminated
								SP-SM	POORLY GRADED SAND with SILT - light yellowish brown (2.5Y 6/4), moist, fine sand, few coarse (up to 1/4 inch thick), coated with dark iron oxide
									At 50 feet: Fine to coarse sand
									At 50.4 feet: Poorly Graded Sand with Silt to Silty Sand, yellowish brown (10YR 5/6), moist, fine sand, oxidized
95	55	5	10	88					At 51 feet: Fine to coarse sand
									At 52.1 feet: Pale brown (10YR 6/3) to brownish yellow (10YR 6/6), moist, few coarse gravel, rounded, thinly layered with sorted coarser beds`
									At 54.2 feet: Fine to coarse sand
									No core recovery from 54.4 to 55 feet
								SP-SM	
90	60	6	11	60				SP-SM	**NEAR SHORE DEPOSITS**
									SILTY SAND to POORLY GRADED SAND with SILT - pale yellowish brown (10YR 6/3), moist, fine sand
									At 57.5 feet: Fine to medium sand
									No core recovery from 58 to 60 feet

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/19/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A2c

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-2 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 11, 2014	6 Inches	148.2 feet

GROUND-WATER READINGS
Groundwater level was encountered at 113.5 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
85	65	6	12	100				SP-SM	At 60.3 feet: Fine sand At 61.8 feet: Coarse sand bed (up to 1/2 inch thick) At 63 feet: Pockets of fine sand
		7	13	58					At 65 feet: Thickly bedded
80	70								No core recovery from 67.9 to 70 feet
		7	14	100				SP-SM	At 70 feet: Pockets of fine sand
75	75								At 75 feet: Few pockets of fine sand, thickly bedded
70	80	8	15	100					

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/19/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A2d

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-2 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 11, 2014	6 Inches	148.2 feet

GROUND-WATER READINGS
Groundwater level was encountered at 113.5 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
65	85	8	16	100				At 83 feet: Crude, laminated At 85 feet: Few pockets of sand
60	90	9	17	100				At 87.5 feet: Wet At 90 feet: Approx 5 percent medium gravel (SM slate), subangular to subrounded
55	95	9	18	90				At 92 feet: Pale yellow (2.5Y 7/4), moist, approx 15 percent gravel bed, no gravel below, few gradational layers (1/2 to 2 inches thick) No core recovery from 94.5 to 95 feet
50	100	10	19	74			SP-SM	At 95 feet: Few coarse sand layers, gradational No core recovery from 98.7 to 100 feet

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/19/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A2e

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-2 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 11, 2014	6 Inches	148.2 feet

GROUND-WATER READINGS
Groundwater level was encountered at 113.5 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
45		10	20	78				SP-SM: At 100 to 100.9 feet: Poorly Graded Sand, light yellowish brown (2.5Y 6/4), moist, fine to coarse sand, approx 5 to 10 percent fine to coarse gravel, subrounded to subangular At 101.5 feet: Gravel and clay bed, orange, wet, oxidized At 101.9 feet: Moist, fine to medium sand, approx 5 to 10 percent gravel, angular to subangular At 103.6 feet: Fine to medium sand, some coarse, cobble (5 inches in size) No core recovery from 103.9 to 105 feet
	105	11	21	6				SP-SM: POORLY GRADED SAND with SILT and GRAVEL - light yellowish brown (2.5Y 6/6), fine sand, fine to coarse gravel, subangular to angular, approx 15 percent silt, poor sample recovery No core recovery from 105.3 to 110 feet
40								
	110	11	22	100				SP-SM: POORLY GRADED SAND with SILT - light yellowish brown (2.5Y 6/4), moist, fine sand, few layers with approx 10 percent coarse sand At 113.5 feet: Wet
35								
	115	12	23	84				At 118.5 feet: Few crude beds of Silty Sand No core recovery from 119.2 to 120 feet
30								
	120							

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/19/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING
Project No.: 4953-14-0992 Figure: A2f

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-2 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 11, 2014	6 Inches	148.2 feet

GROUND-WATER READINGS
Groundwater level was encountered at 113.5 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
		12	24	60				SP-SM	Thickly bedded, saturated
25									No core recovery from 123 to 125 feet
	125							SP-SM	POORLY GRADED SAND with SILT - black (2.5Y 2.5/1), wet, fine sand
		13	25	86					
20								SC	**MARINE DEPOSITS** CLAYEY SAND - black (2.5Y 2.5/1), wet, fine sand
								CL	SANDY LEAN CLAY - black (2.5Y 2.5/1), wet, fine sand
									No core recovery from 129.3 to 130 feet
	130								END OF BORING AT 130 FEET
15									NOTES:
									Hand augered upper 5 feet to avoid damage to utilities. Groundwater level was encountered at 113.5 feet below the ground surface. Borehole grouted with cement-bentonite slurry and patched with rapid cement.
	135								
10									
	140								

Field Geologist: MAS
Prepared/Date: JF 9/19/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING
Project No.: 4953-14-0992 Figure: A2g

METRO SOIL CORE MC 200 \\LAX-FS1\LIBRARY\70131 GEOTECH\GINTW\OLD GINT LIBRARY\FAULT_INVESTIGATION_WSE_LIBRARY AMEC OCTOBER2011.GLB
P:\4953 GEOTECH\2014-PROJ\140992 ST JOHNS\3.2 ALL FIELD NOTES\GINT LOGS.GPJ 4/26/18

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		B-3
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 10, 2014	6 Inches	149 feet

GROUND-WATER READINGS
Groundwater level was encountered at 115 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
145	0						ML	Asphalt Concrete (6 inches thick), no Base **FILL** SANDY SILT - brown, slightly moist, approx 5 to 10 percent gravel
	5	1	1	100			ML	**QUATERNARY ALLUVIAL FAN DEPOSITS** CLAYEY SILT - dark yellowish brown (10YR 4/4), slightly moist, approx 5 percent fine to medium gravel, angular
140							CL-ML	SILTY CLAY - dark yellowish brown (10YR 4/4), slightly moist, low plasticity
	10	1	2	70			ML	CLAYEY SILT with SAND - dark yellowish brown (10YR 4/4), slightly moist, approx 20 percent fine sand, approx 1 percent fine to medium gravel, subrounded to subangular, less clay and sand with depth At 11.8 feet: Sandy Silt At 12.5 feet: Silty Clay At 12.7 feet: Clayey Silt with Sand, approx 10 percent fine to medium gravel No core recovery from 13.5 to 15 feet
135								
	15	2	3	100			SP-SM	POORLY GRADED SAND with SILT - brown (10YR 4/3), slightly moist, fine to medium sand, approx 15 percent fine to coarse gravel, angular to subangular
130							ML	SILT - dark yellowish brown (10YR 4/4), slightly moist, few clay layers
	20							

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/19/2014
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LOG OF BORING

Project No.: 4953-14-0992 Figure: A3a

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-3 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 10, 2014	6 Inches	149 feet

GROUND-WATER READINGS
Groundwater level was encountered at 115 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
								ML	CLAYEY SILT - dark yellowish brown (10YR 4/4), slightly moist to moist
		2	4	100				SM	SILTY SAND - dark brown (7.5YR 3/4), slightly moist, approx 60 percent fine sand, approx 5 percent clay, approx 30 percent silt, fine to medium gravel, angular to subangular
125	25								
		3	5	100				SM	SILTY SAND with GRAVEL - approx 30 to 40 percent gravel, subangular to angular
									At 28.5 feet: Clayey
120								CL	LEAN CLAY - dark yellowish brown (10YR 4/4)
	30							ML	CLAYEY SILT with SAND - dark yellowish brown (10YR 4/4), slightly moist, approx 5 percent fine to medium gravel, angular to subangular, few clay layers
		3	6	100					
115								CL	LEAN CLAY - dark yellowish brown (10YR 4/4), laminated, hard, plastic
	35							ML	CLAYEY SILT - dark yellowish brown (10YR 4/4), slightly moist
		4	7	100				CL	LEAN CLAY - dark yellowish brown (10YR 4/4), moist, thickly bedded, scattered manganese staining, medium plasticity
110	40								

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/19/2014
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LOG OF BORING

Project No.: 4953-14-0992 Figure: A3b

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-3 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 10, 2014	6 Inches	149 feet

GROUND-WATER READINGS
Groundwater level was encountered at 115 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
105	45	4	8	100				CL	SANDY LEAN CLAY - dark yellowish brown (10YR 4/4), moist, approx 30 to 40 percent fine sand, thickly bedded
								ML	CLAYEY SILT
		5	9	100				CL	SANDY LEAN CLAY - increasing sand with depth
100	50							SC	CLAYEY SAND - dark yellowish brown (10YR 4/4), moist, fine sand
		5	10	50				SP-SC SP-SM	POORLY GRADED SAND with CLAY to POORLY GRADED SAND with SILT - dark yellowish brown (10YR 4/4), moist, fine to medium sand, crude laminae
95	55								At 52.2 to 52.5 feet: Clay bed, brown (10YR 4/3), moist At 52.5 feet: Poorly Graded Sand with Clay, brown (10YR 5/3), moist, fine to medium sand No core recovery from 52.5 to 55 feet
		6	11	96				SP-SC	POORLY GRADED SAND with CLAY - brown (10YR 5/3), moist, fine to medium sand
90	60							SP-SM	POORLY GRADED SAND with SILT - brown (10YR 5/3), moist, fine to medium sand

(CONTINUED ON FOLLOWING FIGURE)

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A3c

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-3 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 10, 2014	6 Inches	149 feet

GROUND-WATER READINGS
Groundwater level was encountered at 115 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
								No core recovery from 59.8 to 60 feet
							SP-SM	**NEAR SHORE DEPOSITS** POORLY GRADED SAND with SILT - yellow (10YR 7/6), moist, very fine sand layers (up to 1/4 inch thick), few coarse
		6	12	70				At 62.2 feet: Poorly Graded Sand with Silt to Silty Sand, brownish yellow (10YR 6/6), moist, fine sand, laminated
								No core recovery from 63.5 to 65 feet
85	65						SP-SM	POORLY GRADED SAND with SILT - very pale brown (10YR 7/4), slightly moist, fine sand, few laminae
		7	13	84				At 68.7 feet: Pockets of fine sand
80								No core recovery from 69.2 to 70 feet
	70						SP-SM	
		7	14	100				At 73.7 feet: Coarse sand layers (up to 1 inch thick)
75	75							At 75 feet: Laminated, thickly bedded with depth
		8	15	90				
70	80							No core recovery from 79.5 to 80 feet

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/19/2014
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LOG OF BORING
Project No.: 4953-14-0992 Figure: A3d

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-3 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 10, 2014	6 Inches	149 feet

GROUND-WATER READINGS
Groundwater level was encountered at 115 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
65	85	8	16	90				SP-SM	POORLY GRADED SAND with SILT - thinly interbedded with Silty Sand, laminae
									No core recovery from 84.5 to 85 feet
		9	17	86				SP-SM	
60	90								At 88.6 feet: Cobble
									No core recovery from 89.3 to 90 feet
		10	18	94				SP-SM	
55								CL	LEAN CLAY - brown (10YR 4/3), moist, medium plasticity
									At 93.7 feet: Sandy Lean Clay, brown (10YR 4/3), approx 30 percent fine sand, gradational contact below
	95							SC	CLAYEY SAND - dark yellowish brown (10YR 3/6), moist, fine sand
									No core recovery from 94.7 to 95 feet
		11	19	84				SC	
50								SP-SM	POORLY GRADED SAND with SILT - brownish yellow (10YR 6/6), moist, fine sand
	100								No core recovery from 99.2 to 100 feet

(CONTINUED ON FOLLOWING FIGURE)

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LOG OF BORING
Project No.: 4953-14-0992 Figure: A3e

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-3 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 10, 2014	6 Inches	149 feet

GROUND-WATER READINGS
Groundwater level was encountered at 115 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
45	105	11	20	82			SP-SM	POORLY GRADED SAND with SILT - fine sand, few coarse layers (1 to 2 inches thick), gradational
								No core recovery from 104.1 to 105 feet
		12	21	56			SP-SM	Very pale brown (10YR 7/3), moist, fine sand At 105 to 105.8 feet: Poorly Graded Sand with Gravel, fine to coarse sand, fine to coarse gravel, subangular to subrounded At 106.3 to 106.7 feet: Poorly Graded Sand with Gravel, fine to coarse sand, fine to coarse gravel, subangular to subrounded At 107.4 to 107.8 feet: Poorly Graded Sand with Gravel, fine to coarse sand, fine to coarse gravel, subangular to subrounded No core recovery from 107.8 to 110 feet
40	110	12	22	60			SP-SM	POORLY GRADED SAND with SILT - pale yellow (2.5Y 7/4), moist, fine sand At 110 to 111.3 feet: Approx 20 percent fine to coarse slate gravel, subrounded to angular
								No core recovery from 113 to 115 feet At 113.2 feet: 1/2-inch thick Poorly Graded Sand with Silt and Gravel, Silty Sand layers below, few black manganese stains, oxidized
35	115	13	23	100			SM	SILTY SAND - light yellowish brown (2.5Y 6/3), wet
30	120							At 118.1 feet: Few oxidized layers (1 to 2 inches thick)

(CONTINUED ON FOLLOWING FIGURE)

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A3f

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-3 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 10, 2014	6 Inches	149 feet

GROUND-WATER READINGS

Groundwater level was encountered at 115 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
		12	24	58				SP-SM	POORLY GRADED SAND with SILT - light yellowish brown (2.5Y 6/3), wet, fine to medium sand, few gravels, crudely and coated layers
25	125								At 122 feet: Silty Sand, light yellowish brown (2.5Y 6/3), wet, some orange oxidized layers
									No core recovery from 122.9 to 125 feet
		13	25	80				SP-SM	Fine to medium sand
20	130								No core recovery from 129 to 130 feet
									END OF BORING AT 130 FEET
15	135								NOTES:
									Hand augered upper 5 feet to avoid damage to utilities. Groundwater level was encountered at 115 feet below the ground surface. Borehole grouted with cement-bentonite slurry and patched with rapid cement.
10	140								

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LOG OF BORING
Project No.: 4953-14-0992 Figure: A3g

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		B-4
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 12, 2014	6 Inches	148.8 feet

GROUND-WATER READINGS
Groundwater level was encountered at 116.4 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
145	0							Asphalt Concrete (5 inches thick) over Base (3 inches thick)
								FILL (af) SANDY SILT - dark yellowish brown (10YR 4/4), slightly moist, approx 5 to 10 percent fine to coarse gravel, subangular to subrounded
	5	1	1	100			ML	**QUATERNARY ALLUVIAL FAN DEPOSITS** CLAYEY SILT - dark yellowish brown (10YR 4/4), slightly moist, approx 5 to 10 percent fine to coarse gravel, subangular to subrounded
140							CL-ML	SILTY CLAY - dark yellowish brown (10YR 4/4), slightly moist
	10	1	2	82			CL	At 10 feet: Approx 10 percent fine to coarse gravel, angular to subrounded At 10.9 feet: Approx 15 to 20 percent fine to coarse slate gravel, angular to subrounded At 11.7 feet: Silt bed (2-inch thick), dark grayish brown (10YR 4/2), slightly moist LEAN CLAY with GRAVEL - dark yellowish brown (10YR 4/4), slightly moist, approx 30 to 40 percent fine to coarse slate gravel, angular to subangular
135								No core recovery from 14.1 to 15 feet
	15	2	3	44			CL	
							CL	LEAN CLAY - brown (10YR 4/3), slightly moist, medium plasticity
130								No core recovery from 17.2 to 20 feet
	20							

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/23/2014
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LOG OF BORING

Project No.: 4953-14-0992 Figure: A4a

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-4 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 12, 2014	6 Inches	148.8 feet

GROUND-WATER READINGS
Groundwater level was encountered at 116.4 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
125	25	2	4	100				CL	At 20 feet: Some silt
								CL/ SC	SANDY LEAN CLAY to CLAYEY SAND - dark brown (7.5YR 3/3), moist, fine sand, approx 10 to 15 percent gravel, subangular to subrounded
120	30	3	5	90				SP-SC	POORLY GRADED SAND with CLAY - dark yellowish brown (10YR 3/4), slightly moist, fine to medium sand, few coarse, approx 5 to 10 percent gravel, subrounded to angular
									At 27 feet: Approx 15 to 20 percent fine to coarse gravel, subangular, increasing clay content
								CL	SANDY LEAN CLAY - brown (10YR 4/3), moist, approx 20 to 30 percent fine sand and silt, approx 2 percent fine to medium gravel, hard, medium plasticity
									No core recovery from 29.5 to 30 feet
115	35	3	6	100				CL	
		4	7	100					At 37.6 feet: Less sand
110	40								At 38.4 feet: Approx 20 percent fine sand
									At 39.6 feet: Approx 40 percent fine sand

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/23/2014
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LOG OF BORING

Project No.: 4953-14-0992 Figure: A4b

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-4 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 12, 2014	6 Inches	148.8 feet

GROUND-WATER READINGS
Groundwater level was encountered at 116.4 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
105	45	4	8	100			SC	CLAYEY SAND - dark brown (7.4YR 3/3), slightly moist, fine sand, plastic
100	50	5	9	96			SP-SC	POORLY GRADED SAND with CLAY - dark yellowish brown (10YR 3/4), moist, fine sand At 47.5 feet: Laminated to thinly bedded with Poorly Graded Sand with Silt, yellowish brown (10YR 5/4), moist, fine sand
								No core recovery from 49.8 to 50 feet
95	55	5	10	78			SP-SC	
								No core recovery from 53.9 to 55 feet
		6	11	80			SP-SM	POORLY GRADED SAND with SILT - brownish yellow (10YR 6/4), moist, fine sand, few laminae
90	60						SP-SM	**NEAR SHORE DEPOSITS** POORLY GRADED SAND with SILT - very pale brown (10YR 7/3), moist, fine sand
								No core recovery from 59 to 60 feet

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/23/2014
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LOG OF BORING
Project No.: 4953-14-0992 Figure: A4c

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-4 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 12, 2014	6 Inches	148.8 feet

GROUND-WATER READINGS
Groundwater level was encountered at 116.4 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
85	65	6	12	86				SP-SM	Few coarse beds at 61.3, 62, 62.3, and 62.9 feet, coarse beds coated with dark oxidation
									No core recovery from 64.3 to 65 feet
		7	13	60				SP-SM	
80	70								No core recovery from 68 to 70 feet
		7	14	94				SP-SM	At 70 feet: Few medium to coarse sand layers (1/2 to 1 inch thick), thickly bedded
75	75								At 72.1 feet: Few pockets of fine sand
									No core recovery from 74.7 to 75 feet
		8	15	84				SP-SM	Pockets of fine sand
70	80								No core recovery from 79.2 to 80 feet

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/23/2014
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LOG OF BORING

Project No.: 4953-14-0992 Figure: A4d

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-4 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 12, 2014	6 Inches	148.8 feet

GROUND-WATER READINGS
Groundwater level was encountered at 116.4 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
65	85	8	16	100				SP-SM	Thickly bedded
									At 85 feet: Few fine to medium grained sand beds, moist
60	90	9	17	94					No core recovery from 89.7 to 90 feet
								SP-SM	
55	95	9	18	100				SM	SILTY SAND - pale yellow (2.5Y 7/3), moist, fine sand
								SP-SM	POORLY GRADED SAND with SILT - light yellowish brown (2.5Y 6/3), moist to wet, fine to medium sand
50	100	10	19	100				CL	LEAN CLAY - olive brown (2.5Y 4/3), slightly moist to moist, hard, plastic
									At 98.6 feet: Approx 15 to 30 percent fine sand
								SC	CLAYEY SAND - brown (10YR 4/3), moist, approx 30 to 40 percent fine sand
								SP-	POORLY GRADED SAND with CLAY - brown (10YR 4/3), moist, fine sand

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/23/2014
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LOG OF BORING

Project No.: 4953-14-0992 Figure: A4e

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-4 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 12, 2014	6 Inches	148.8 feet

GROUND-WATER READINGS
Groundwater level was encountered at 116.4 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
45	105	10	20	92				SC	At 100 feet: Brownish yellow (10YR 6/8), fine sand, some medium, thickly bedded
									No core recovery from 104.6 to 105 feet
		11	21	76				SP-SM	POORLY GRADED SAND with SILT - brownish yellow (10YR 6/4), moist, fine to medium sand, thickly bedded
40	110								At 107.8 feet: Some coarse sand At 107.9 feet: Fine sand
									No core recovery from 108.8 to 110 feet
		11	22	90				SP-SM	Few fine to medium sand
35	115								At 112 feet: Fine to medium sand, some coarse, approx 2 percent gravel
									At 112.8 feet: Fine to coarse sand, approx 5 percent fine to medium gravel, subangular
									No core recovery from 114.5 to 115 feet
		12	23	46				SP-SM	At 115.9 feet: Approx 15 to 20 percent fine to medium gravel (mostly slate), subangular to angular At 116.4 feet: Wet
30	120							SM	SILTY SAND - light yellowish brown (2.5Y 6/3), very moist No core recovery from 117.3 to 120 feet

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/23/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A4f

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-4 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 12, 2014	6 Inches	148.8 feet

GROUND-WATER READINGS
Groundwater level was encountered at 116.4 feet below the ground surface.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
25	125	12	24	76				SM	Wet At 121.6 and 122.1 feet: Coarse sand beds At 122.8 feet: Charcoal speck No core recovery from 123.8 to 125 feet
20	130	13	25	60				SM	No core recovery from 128 to 130 feet
15	135								END OF BORING AT 130 FEET
10	140								

NOTES:

Hand augered upper 5 feet to avoid damage to utilities. Groundwater level was encountered at 116.4 feet below the ground surface. Borehole grouted with cement-bentonite slurry and patched with rapid cement.

Field Geologist: MAS
Prepared/Date: JF 9/23/2014
Checked/Date: MAS 10/2/2014

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

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LOG OF BORING
Project No.: 4953-14-0992 Figure: A4g

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		B-5
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 9, 2014	6 Inches	149.4 feet

GROUND-WATER READINGS
Groundwater level was encountered at 120 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
								Asphalt Concrete (5 inches thick), no Base
							SM	FILL - SILTY SAND - brown (10YR 4/3), slightly moist, approx 10 to 15 percent fine to medium gravel, angular to subangular
							SM	**QUATERNARY ALLUVIAL FAN DEPOSITS** SILTY SAND with GRAVEL - dark yellowish brown (10YR 4/4), slightly moist, approx 30 to 40 percent fine to coarse slate gravel, angular to subangular
145	5	1	1	80				
140	10	1	2	0				No core recovery from 9 to 15 feet, drill cuttings similar to above
135	15	2	3	7			SM	No core recovery from 15.3 to 20 feet, drill cuttings similar to above
130	20							

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/24/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A5a

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-5 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 9, 2014	6 Inches	149.4 feet

GROUND-WATER READINGS
Groundwater level was encountered at 120 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
125	25	2	4	100				CL	LEAN CLAY - dark grayish brown (10YR 4/2), moist, approx 10 percent fine sand, approx 15 to 25 percent silt, medium plasticity At 23.4 to 23.8 feet: Sandy Silt, dark grayish brown (10YR 4/2), moist, approx 30 percent fine sand At 23.8 feet: Lean Clay, dark brown (10YR 3/3), moist, approx 15 to 20 percent fine sand, approx 2 percent fine to medium gravel, subangular to angular
		3	5	100				SC	CLAYEY SAND with GRAVEL - dark brown (10YR 3/3), moist, approx 50 to 60 percent sand, approx 10 to 15 percent clay, approx 25 to 40 percent fine to coarse slate gravel, angular to subangular
120	30							SC	CLAYEY SAND - dark brown (10YR 3/3), moist, fine to medium sand, approx 20 percent gravel, subangular to angular
		3	6	94				ML	CLAYEY SILT with SAND - dark yellowish brown (10YR 4/4), moist, approx 30 percent fine sand, some medium to coarse, approx 20 percent clay, approx 1 to 5 percent fine to medium gravel, subrounded to subangular
115	35							CL	LEAN CLAY with SAND - dark yellowish brown (10YR 4/4), moist, approx 30 percent fine sand, some medium to coarse, approx 20 percent silt, approx 1 to 5 percent fine to medium gravel
		4	7	94				SC	No core recovery from 34.7 to 35 feet CLAYEY SAND - dark yellowish brown (10YR 4/4), very moist, approx 15 percent fine to medium sand At 35.9 feet: Clayey Sand with Gravel, approx 30 percent fine to medium gravel, subrounded to subangular At 37.2 feet: No gravel
110	40							CL	LEAN CLAY - dark yellowish brown (10YR 4/4), moist At 38.3 to 38.5 feet: Poorly Graded Sand with Clay, fine sand At 38.8 to 38.9 feet: Clayey Sand
									No core recovery from 39.7 to 40 feet

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/24/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A5b

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-5 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 9, 2014	6 Inches	149.4 feet

GROUND-WATER READINGS
Groundwater level was encountered at 120 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
		4	8	100				CL	LEAN CLAY - brown (10YR 4/3), moist, black manganese specks, scattered
105	45							SC	At 43 feet: Approx 10 to 15 percent fine sand At 43.2 to 43.5 feet: Clayey Sand, fine sand
								CL	SANDY LEAN CLAY - brown (10YR 4/3), moist
		5	9	100					At 46.5 to 48 feet: Approx 5 to 10 percent fine to medium gravel
100	50								At 48 feet: Very moist, approx 30 to 40 percent fine sand, high plasticity
								SC/ CL	CLAYEY SAND to SANDY LEAN CLAY - very dark grayish brown (10YR 3/3), moist, fine sand
		5	10	100				CL	SANDY LEAN CLAY - very dark grayish brown (10YR 3/3), moist, approx 30 percent fine sand
								CL	LEAN CLAY - very dark grayish brown (10YR 3/3), moist, approx 10 percent fine sand, hard, high plasticity
95	55							SC	CLAYEY SAND - dark brown (10YR 3/3), moist, fine sand, approx 20 to 30 percent clay, slight to medium plasticity
		6	11	96					
90	60								

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/24/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A5c

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-5 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 9, 2014	6 Inches	149.4 feet

GROUND-WATER READINGS
Groundwater level was encountered at 120 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
85	65	5	12	92			SP-SC	No core recovery from 59.8 to 60 feet POORLY GRADED SAND with CLAY - dark yellowish brown (10YR 3/6), moist, fine sand At 62.9 feet: Poorly Graded Sand with Silt, dark yellowish brown (10YR 4/6), moist, fine sand, some medium
								No core recovery from 64.5 to 65 feet
80	70	6	13	86			SP-SM	POORLY GRADED SAND with SILT - dark yellowish brown (10YR 4/4) and light yellowish brown (2.5Y 6/4), moist, fine sand, some medium, laminated At 67.9 feet: Thickly bedded
								No core recovery from 69.3 to 70 feet
75	75	6	14	86			SP-SM	**NEAR SHORE DEPOSITS** POORLY GRADED SAND with SILT - light yellowish brown (2.5Y 6/3), moist, few thin coarse sand layers (1/2 to 1 inch), some medium, gradational layering, thinly bedded
								No core recovery from 74.3 to 75 feet
70	80	7	15	100			SP-SM	POORLY GRADED SAND with SILT - light yellowish brown (2.5Y 6/3), fine sand, some gradational layering, crude At 76.6 to 77.5 feet: Few isolated pockets of fine sand At 78.4 feet: Fine to medium sand with silt

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/24/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A5d

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-5 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 9, 2014	6 Inches	149.4 feet

GROUND-WATER READINGS
Groundwater level was encountered at 120 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
65	85	7	16	94					At 80 feet: Light yellowish brown (2.5Y 6/4), few pockets of fine sand
									No core recovery from 84.7 to 85 feet
								SP-SM	Thickly bedded
60	90	8	17	98					At 86.7 to 87 feet: Fine to medium sand, few coarse
								SP-SM	No core recovery from 89.9 to 90 feet Thickly bedded
55	95	8	18	76					No core recovery from 93.8 to 95 feet
								SP-SM	Few black, specks
50	100	9	19	100					At 98.3 to 98.6 feet: Oxidation At 98.9 feet: Layer appears horizontal

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/24/2014
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LOG OF BORING

Project No.: 4953-14-0992 Figure: A5e

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-5 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 9, 2014	6 Inches	149.4 feet

GROUND-WATER READINGS
Groundwater level was encountered at 120 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
									At 100 feet: Light yellowish brown (2.5Y 6/3), very moist, fine sand
		10	20	100					At 101.6 feet: Yellowish brown (10YR 5/6), very moist, few medium to coarse sand, soreted layers, crudely laminated
									At 102.9 feet: Lean Clay bed, olive gray (5Y 5/2), very moist to wet At 103 feet: Grades to fine to medium Poorly Graded Sand, wet At 103.6 feet: Wet
45	105							CL	LEAN CLAY - olive brown (2.5Y 4/3)
		11	21	84				ML	At 105.8 feet: Silt, olive brown (2.5Y 4/3), moist, mottled oxidation SANDY SILT - wet, fine sand, few clay layers
								CL	LEAN CLAY - olive brown (2.5Y 4/3), moist, hard, medium plasticity
40	110								No core recovery from 109.2 to 110 feet
		11	22	80				CL	
								SM/ ML	SILTY SAND to SANDY SILT - brown (10YR 4/3), very moist, thinly bedded, laminated
								SP-SM	POORLY GRADED SAND with SILT - dark yellowish brown (10YR 4/6), moist, fine sand
35	115								No core recovery from 114 to 115 feet
		12	23	40				SP-SM	POORLY GRADED SAND with SILT - light yellowish brown (10YR 6/4), moist, crude laminae, thin layering
30	120								No core recovery from 117 to 120 feet

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/24/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A5f

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-5 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 9, 2014	6 Inches	149.4 feet

GROUND-WATER READINGS
Groundwater level was encountered at 120 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
25	125	12	24	30				SP	POORLY GRADED SAND - light yellowish brown (10YR 6/4), wet, fine to medium sand, some coarse, poor sample recovery No core recovery from 121.5 to 125 feet
20	130	13	25	46				SP-SM	POORLY GRADED SAND with SILT - fine sand At 125.4 feet: Poorly Graded Sand, fine to medium sand No core recovery from 127.3 to 130 feet
15	135	13	26	76				SP-SM	POORLY GRADED SAND with SILT - wet, fine sand At 131.5 feet: Fine to medium sand At 133.6 feet: Silty Sand, light yellowish brown (2.5Y 5/4), wet No core recovery from 133.8 to 135 feet
10	140	14	27	58				SM	SILTY SAND - light yellowish brown (2.5Y 5/4), wet
								SP-SM	POORLY GRADED SAND with SILT - light yellowish brown (2.5Y 5/4), wet, fine to medium sand No core recovery from 137.9 to 140 feet

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/24/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A5g

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-5 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 9, 2014	6 Inches	149.4 feet

GROUND-WATER READINGS
Groundwater level was encountered at 120 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
		14	28	86				SP-SM POORLY GRADED SAND with SILT - fine to medium sand
5	145							No core recovery from 144.3 to 145 feet
		15	29	60				SP-SM
0	150							No core recovery from 148 to 150 feet
								END OF BORING AT 150 FEET
-5	155							NOTES:
								Hand augered upper 5 feet to avoid damage to utilities. Groundwater level was encountered at 120 feet below the ground surface. Borehole grouted with cement-bentonite slurry and patched with rapid cement.
-10	160							

Field Geologist: MAS
Prepared/Date: JF 9/24/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING
Project No.: 4953-14-0992 Figure: A5h

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		B-6
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 15, 2014	6 Inches	153 feet

GROUND-WATER READINGS
Groundwater level was encountered at 114.75 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
150	0						SM	Asphalt Concrete (4 inches thick) over Base (3 inches thick) FILL - SILTY SAND - brown (10YR 4/3), slightly moist, fine sand, approx 5 to 10 percent gravel
	5	1	1	78			SC	**QUATERNARY ALLUVIAL FAN DEPOSITS** CLAYEY SAND with GRAVEL - brown (10YR 4/3), slightly moist, fine to medium sand, approx 10 to 15 percent fine to medium slate gravel, angular to subangular
145							CL-ML	SILTY CLAY - brown (10YR 4/3), slightly moist, approx 10 percent fine sand, approx 30 percent silt
								No core recovery from 8.9 to 10 feet
	10	1	2	96			CL-ML	At 11.1 feet: Approx 5 to 10 percent fine to medium gravel, subangular to angular
140								At 13 feet: Approx 5 percent gravel
	15						CL-ML	No core recovery from 14.8 to 15 feet
		2	3	70			SM	SILTY SAND with GRAVEL - dark grayish brown (10YR 4/2), slightly moist to dry, fine to medium sand, some coarse, approx 30 to 40 percent fine to medium gravel (mostly slate), subangular to angular
135								No core recovery from 18.5 to 20 feet
	20							

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/30/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A6a

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-6 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 15, 2014	6 Inches	153 feet

GROUND-WATER READINGS
Groundwater level was encountered at 114.75 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
		2	4	66			SM	
							CL-ML	SILTY CLAY - dark brown (7.5YR 3/3), moist, fine sand, medium plasticity
130								No core recovery from 23.3 to 25 feet
	25						CL-ML	At 25 feet: Reddish brown (5YR 4/3), moist, approx 10 to 15 percent fine sand
		3	5	100				
125								At 28.1 feet: Dark yellowish brown (10YR 4/4), moist, approx 5 percent fine to medium gravel, subangular
	30							
		3	6	96				At 32.3 to 32.7 feet: Approx 30 percent fine to medium sand, approx 10 percent fine gravel, subangular to angular
120								At 34.2 feet: Approx 30 percent sand, approx 5 to 10 percent gravel, subangular to angular
	35						CL-ML	No core recovery from 34.8 to 35 feet At 35 feet: Increasing sand
		4	7	100			SC	CLAYEY SAND with GRAVEL - brown (10YR 4/3), moist, approx 30 percent fine to medium gravel, subangular to angular
115							CL	LEAN CLAY - brown (7.5YR 4/2), moist, sandier with depth to approx 10 percent at 39.5 feet, approx 5 percent fine to medium slate gravel, angular to subangular
	40							

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/30/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A6b

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-6 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 15, 2014	6 Inches	153 feet

GROUND-WATER READINGS
Groundwater level was encountered at 114.75 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
									At 40 feet: Approx 30 percent fine to medium sand, approx 30 percent fine to medium gravel, subangular to angular
								CL	SANDY LEAN CLAY - brown (10YR 4/3), moist, approx 30 to 40 percent fine sand
110		4	8	98					
	45							CL	No core recovery from 44.9 to 45 feet At 45 feet: Approx 2 percent fine gravel
		5	9	100					
105								SC/ CL	CLAYEY SAND to SANDY LEAN CLAY - brown (10YR 4/3), moist, fine sand
								SP-SM	POORLY GRADED SAND with SILT and GRAVEL - dark grayish brown (10YR 4/2), moist, fine to medium sand, approx 15 to 30 percent fine slate gravel, some medium, angular to subangular
	50							CL-ML	SILTY CLAY - brown (10YR 4/3), moist, approx 5 percent fine sand, medium plasticity
		5	10	100					
100									At 52.7 feet: Possible paleosol, clay, dark brown (7.5YR 3/4), moist (1½ thick)
	55							SM	SILTY SAND - dark grayish brown (2.5Y 4/2), moist, fine sand
								ML	SILT - dark grayish brown (2.5Y 4/2), moist
								CL-ML	SILTY CLAY - dark yellowish brown (10YR 4/4), moist, approx 30 to 40 percent silt, low plasticity
		6	11	100				CL	LEAN CLAY - dark yellowish brown (10YR 4/4), moist, approx 5 to 10 percent fine sand, approx 20 to 30 percent silt, medium plasticity
95									
	60								

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/30/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A6c

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-6 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 15, 2014	6 Inches	153 feet

GROUND-WATER READINGS
Groundwater level was encountered at 114.75 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
90	65	6	12	100				At 60 feet: Massive
85	70	7	13	100				
80	75	7	14	100				At 73.7 feet: Approx 30 to 40 percent fine sand, gradational
75	80	8	15	100			CL-ML	SILTY CLAY - brown (10YR 4/3), moist, with fine sand, some medium, approx 2 to 5 percent fine gravel (up to 1/2 inch in size)
								At 79.3 feet: Brown (10YR 4/3)

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/30/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING
Project No.: 4953-14-0992 Figure: A6d

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-6 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 15, 2014	6 Inches	153 feet

GROUND-WATER READINGS
Groundwater level was encountered at 114.75 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
								At 80 feet: Grades sandier
70		8	16	100			SC	CLAYEY SAND - brown (10YR 4/3), moist, fine to medium sand, approx 2 to 5 percent fine gravel (up to 3/4 inch in size), few clay layers (1/4 inch thick)
	85						SP-SC	POORLY GRADED SAND with CLAY - dark yellowish brown (10YR 4/4), moist, fine to medium sand, interbedded thin layers of clay
65		9	17	100			SP	**NEAR SHORE DEPOSITS** POORLY GRADED SAND - dark yellowish brown (10YR 4/4), moist, fine to medium clean sand
	90						SP-SM	POORLY GRADED SAND with SILT - dark yellowish brown (10YR 4/4), moist, fine sand, some medium
60		9	18	100				
	95							At 96.5 feet: Becomes pale brown (10YR 6/3) to very pale brown (10YR 7/3), slightly more silt, few pockets of fine sand
55		10	19	98				
	100							No core recovery from 99.9 to 100 feet

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/30/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING

Project No.: 4953-14-0992 Figure: A6e

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-6 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 15, 2014	6 Inches	153 feet

GROUND-WATER READINGS
Groundwater level was encountered at 114.75 feet below the ground surface.

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.	
50	105	10	20	100				SP-SM: At 100.5 feet: Grades to finer sand
45	110	11	21	100				At 107.5 feet: More silt
40	115	11	22	100				At 110 feet: More moist
35	120	12	23	100				At 113.3 feet: Becomes yellowish brown (10YR 5/6), moist to wet

At 114.75 feet: Wet, more medium sand, some coarse, approx 5 to 12 percent fine gravel (up to 1/2 inch in size)

SP: POORLY GRADED SAND with GRAVEL - black (10YR 2/1) to very dark brown (10YR 2/2), wet, fine to medium sand, some clay, layer of gravel from 115 to 116.5 feet, some iron stains in gravel zone, less gravel toward bottom of the run

(CONTINUED ON FOLLOWING FIGURE)

Field Geologist: MAS
Prepared/Date: JF 9/30/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING
Project No.: 4953-14-0992 Figure: A6f

DRILLING COMPANY/DRILLING EQUIPMENT		BORING NO.
Martini Drilling / CME 75		**B-6 (Continued)**
DRILLING METHOD	**BOREHOLE LOCATION**	
Soil Core	See Plan	
DATES DRILLED	**HOLE DIAMETER**	**GROUND EL.**
September 15, 2014	6 Inches	153 feet

GROUND-WATER READINGS
Groundwater level was encountered at 114.75 feet below the ground surface.

ELEVATION (ft)	DEPTH (ft)	BOX #	RUN #	% RECOVERY	MOISTURE CONTENT (% of dry wt.)	PERCENT PASSING No. 200 SIEVE	SAMPLE LOC.		
		12	23	96				SM	SILTY SAND - black (10YR 2/1), fine sand, approx 2 to 5 percent medium At 120 feet: Wet, gravel (up to 2 inches in size)
30								CL-ML	SILTY CLAY - dark brown (7.5YR 3/3), moist to wet, approx 2 to 5 percent fine sand
	125								No core recovery from 124.8 to 125 feet
		13	24	52				SP	POORLY GRADED SAND - dark yellowish brown (10YR 4/6 to 10YR 3/6), wet, fine to medium sand, less medium toward the end of the run
25									No core recovery from 127.6 to 130 feet
	130								END OF BORING AT 130 FEET
20									NOTES: Hand augered upper 5 feet to avoid damage to utilities. Groundwater level was encountered at 114.75 feet below the ground surface. Borehole grouted with cement-bentonite slurry and patched with rapid cement.
15	135								
	140								

THIS RECORD IS AN INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. LATITUDE AND LONGITUDE OF BORING LOCATION SHOWN ON LOGS ARE APPROXIMATE. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Field Geologist: MAS
Prepared/Date: JF 9/30/2014
Checked/Date: MAS 10/2/2014

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LOG OF BORING
Project No.: 4953-14-0992 Figure: A6g

AECOM Monitoring Wells

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Borehole/Well Construction Log

Project Name: St. John's Soil and Groundwater Investigation		Project Number: 60236290	**Borehole Number: MW-1**
Borehole Location: St. John's	*Northing:* 1833638.5	*Easting:* 6416327.3	Sheet *1* of *4*
Drilling Agency: BC2		Driller: Clint Jefferson	
Drilling Equipment: CME 95		Date Started: 12/14/2011	Total Depth (feet): 121.0
Drilling Method: Hollow Stem Auger	Number of Samples: 6	Date Finished: 12/14/2011	Depth to Bedrock (feet): NE
Drilling Fluid: None	Borehole Diameter (in): 8	Depth to Water: *Drilling (FT BGS):* 111.0	*Static (FT TOC):* 110.21
Completion Information: Completed as a flush-mounted monitoring well		Elevation (feet MSL) : *Ground:* 152.90	*Top of Casing:* 152.42
		Logged By: H. Jones	Checked By: M. Duffy 02/06/2012

Depth (feet)	Samples: Number	Type	Blow Count	Percent Recovery	Time	Field Analyses: PID (ppm) Sample/Background	Log: Graphic	USCS or Rock Type	Lithologic Description	Well Construction Diagram	Remarks
0								ML	SILT: dark reddish brown (2.5YR 3/3); very fine grained sandy silt (tr, 30, 70); moist, soft, no plasticity.		Hand auger to 4 feet.
5						0/0					At 4 feet: Begin drilling.
10						0/0					
15						0/0			at 15 feet: wood fragments present.		
20						0/0		ML	SILT: dark brown (7.5YR 3/2); sandy silt with gravel (10, 30, 60); moist, stiff, medium plasticity.		
25						0/0					At 25 feet: MW-1 relocated 3 feet to North and 3 feet to West to avoid drilling through concrete and rebar. Drilling continued from 25 feet and deeper at new location.
30											

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Borehole/Well Construction Log (Continuation Sheet)

Project Name: St. John's Soil and Groundwater Investigation	Project Number: 60236290	**Borehole Number:** **MW-1**
Borehole Location: St. John's		Sheet *2* of *4*

Depth (feet)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Percent Recovery	Samples: Time	Field Analyses: PID (ppm) Sample/Background	Log: Graphic	Log: USCS or	Lithologic Description	Well Construction Diagram	Remarks
35						0/0		OH	SILT: dark brown (7.5YR 3/2); clayey silt with fine grained sand and gravel (10, 10, 80); moist, stiff, high plasticity.		
40						0/0			at 40 feet: color changes to very dark gray (7.5YR 3/1).		
45	MW1-45		15 17 18	100	0908	0/0		CH	CLAY: dark reddish brown with black streaking (2.5YR 3/2); clay (0, tr, 100); moist, very stiff, high plasticity.		
50						0/0			at 50 feet: increased gravel content (15, tr, 85).		
55	MW1-55		16 21 27	100	0917	209/0			GRAVEL: dark gray (GLEY1 4/N); gravel with clay (90, tr, 10); moist; loose.		
								SP	SAND: black (GLEY1 2.5/N); fine grained sand (tr, 95, 5); well sorted; moist; dense.		
60						0/0					
65											

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Borehole/Well Construction Log
(Continuation Sheet)

Project Name: St. John's Soil and Groundwater Investigation	Project Number: 60236290	**Borehole Number:** **MW-1**
Borehole Location: St. John's		Sheet *3* of *4*

Depth (feet)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Percent Recovery	Samples: Time	Field Analyses: PID (ppm) Sample/Background	Log: Graphic	Log: USCS or	Lithologic Description	Well Construction Diagram	Remarks
	MW1-65		32 50/5"	60	0926	47.1/0			SAND: brown (10YR 5/3); medium to coarse grained sand (tr, 95, 5); subrounded; poorly sorted; moist; loose.		
70						0/0			at 70 feet: color changes to very pale brown (10YR 7/3).		
75	MW1-75		38 50/4"	55	0933	34.6/0					
80						220/0					At 80 feet: Has strong hydrocarbon odor.
85	MW1-85		39 50/3"	50	0944	7.9/0			SAND: light gray (10YR 7/2); fine to medium grained sand (tr, 95, 5); well sorted; moist; dense.		
90						0/0					
95	MW1-95		41 50/3"	50	0948	53.1/0					
100											

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Borehole/Well Construction Log (Continuation Sheet)

Project Name: St. John's Soil and Groundwater Investigation	Project Number: 60236290	**Borehole Number:** **MW-1**
Borehole Location: St. John's		Sheet *4* of *4*

Depth (feet)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Percent Recovery	Samples: Time	Field Analyses: PID (ppm) Sample/Background	Log: Graphic	Log: USCS or	Lithologic Description	Well Construction Diagram	Remarks
						8.4/0			at 100 feet: color changes to dark grayish brown (10YR 4/2).		
105						31.2/0					
110						79.5/0			SAND: dark grayish brown (10YR 4/2); fine to medium grained sand (tr, 95, 5); well sorted; moist; dense.		Static water level. Groundwater during drilling.
115						86.2/0					
120						53.4/0					
									Total Depth = 121.0 feet		

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Borehole/Well Construction Log

Project Name: St. John's Soil and Groundwater Investigation		Project Number: 60236290	**Borehole Number: MW-3**
Borehole Location: St. John's	*Northing:* 1833774.4	*Easting:* 6416732.8	Sheet *1* of *4*
Drilling Agency: BC2		Driller: Clint Jefferson	
Drilling Equipment: CME 95		Date Started: 12/13/2011	Total Depth (feet): 121.5
Drilling Method: Hollow Stem Auger	Number of Samples: 24	Date Finished: 12/13/2011	Depth to Bedrock (feet): NE
Drilling Fluid: None	Borehole Diameter (in): 8	Depth to Water: *Drilling (FT BGS):* 111.0	*Static (FT TOC):* 111.91
Completion Information: Completed as a flush-mounted monitoring well		Elevation (feet MSL) : *Ground:* 152.91	*Top of Casing:* 152.45
		Logged By: H. Jones	Checked By: M. Duffy 02/06/2012

Depth (feet)	Samples: Number	Type	Blow Count	Percent Recovery	Time	Field Analyses: PID (ppm) Sample/Background	Log: Graphic	Log: USCS or Rock Type	Lithologic Description	Well Construction Diagram	Remarks
								CL	CLAY: dark brown (7.5YR 3/2); silty clay with gravel (10, tr, 90); moist; stiff; medium plasticity.		Hand auger to 5 feet.
5	MW3-5		7 15 23	100	0753	0/0					At 5 feet: Begin drilling.
10	MW3-10		9 12 16	100	0755	0.6/0					
15	MW3-15		10 11 14	100	0800	0/0					
20	MW3-20		13 15 17	100	0802	0/0		CH	CLAY: dark brown (7.5YR 3/2); silty clay (tr, tr, 100); moist; stiff; high plasticity; wood fragments present (<5%).		
25	MW3-25		8 13 19	100	0806	0/0					
30											

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Borehole/Well Construction Log (Continuation Sheet)

Project Name: St. John's Soil and Groundwater Investigation	Project Number: 60236290	**Borehole Number:** **MW-3**
Borehole Location: St. John's		Sheet *2* of *4*

Depth (feet)	Samples: Number	Type	Blow Count	Percent Recovery	Time	Field Analyses: PID (ppm) Sample/Background	Log: Graphic	Log: USCS or	Lithologic Description	Well Construction Diagram	Remarks
	MW3-30		16 19 24	100	0810	0/0		CL	CLAY: dark brown (7.5YR 3/3); silty clay with gravel (25, tr, 75); moist; stiff; medium plasticity.		
35	MW3-35		15 19 24	100	0814	0/0			At 35.5 feet: Gravel content increases through 40 feet.		
40	MW3-40		10 12 16	100	0817	0/0		CH	CLAY: dark brown (7.5YR 3/2); silty clay (tr, tr, 95); moist; stiff; high plasticity.		
45	MW3-45		13 17 20	100	0821	0/0			At 45 feet: Gravel content decreases to trace amounts.		
50	MW3-50		11 14 22	100	0825	0/0					
55	MW3-55		15 19 24	100	0830	0/0					
60	MW3-60		18 19 24	100	0836	0/0					
65											

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Borehole/Well Construction Log (Continuation Sheet)

Project Name: St. John's Soil and Groundwater Investigation	Project Number: 60236290	**Borehole Number:** **MW-3**
Borehole Location: St. John's		Sheet *3* of *4*

Depth (feet)	Samples: Number	Type	Blow Count	Percent Recovery	Time	Field Analyses: PID (ppm) Sample/Background	Log: Graphic	Log: USCS or	Lithologic Description	Well Construction Diagram	Remarks
	MW3-65		16 20 27	100	0842	7.4/0			At 65 feet: Sand content increases (tr, 15, 85).		
70	MW3-70		20 23 27	100	0850	0/0		SC	SAND: brown (7.5YR 4/3); clayey sand (tr, 65, 35); fine to medium grained sand; moist; medium dense; high plasticity.		
75	MW3-75		29 50/5"	55	0859	0/0			At 75 feet: Increased amount of sand, decreased amount of fines (tr, 80, 20).		
80	MW3-80		34 50/4"	55	0904	0/0		SP	SAND: brown (7.5YR 5/4); fine to medium grained sand (tr, 90, 10); moist; dense.		
85	MW3-85		31 50/4"	55	0910	0/0					
90	MW3-90		29 50/5"	55	0917	0/0			SAND: pale brown (10YR 6/3); fine grained sand (tr, 95,5); moist; dense.		
95	MW3-95		37 50/5"	55	0923	0/0					
100											

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Borehole/Well Construction Log (Continuation Sheet)

Project Name: St. John's Soil and Groundwater Investigation	Project Number: 60236290	**Borehole Number:** **MW-3**
Borehole Location: St. John's		Sheet *4* of *4*

Depth (feet)	Samples: Number	Type	Blow Count	Percent Recovery	Time	Field Analyses: PID (ppm) Sample/Background	Log: Graphic	Log: USCS or	Lithologic Description	Well Construction Diagram	Remarks
	MW3-100		21 50/3"	50	0927	0/0					
105	MW3-105		50 50/3"	50	0932	0/0					
110	MW3-110		37 50/4"	55	0937	0/0					Groundwater during drilling. Static water level.
115	MW3-115		30 50/3"	50	1017	0/0		GC	GRAVEL: dark olive brown (2.5YR 3/3); clayey gravel (70, 5, 25); wet; dense.		
120	MW3-120		29 50/3"	50	1025	0/0					
									Total Depth = 121.5 feet		

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Borehole/Well Construction Log

Project Name: St. John's Soil and Groundwater Investigation		Project Number: 60236290	**Borehole Number:** **SB-4**
Borehole Location: St. John's	*Northing:* 1833621.8	*Easting:* 6416279.9	Sheet *1* of *4*
Drilling Agency: BC2		Driller: Clint Jefferson	
Drilling Equipment: CME 95		Date Started: 12/19/2011	Total Depth (feet): 110.0
Drilling Method: Hollow Stem Auger	Number of Samples: 22	Date Finished: 12/19/2011	Depth to Bedrock (feet): NE
Drilling Fluid: None	Borehole Diameter (in): 8	Depth to Water: *Drilling (FT BGS):* NE	*Static (FT TOC):* NA
Completion Information: Grouted to surface		Elevation (feet MSL) : *Ground:* 148.90	*Top of Casing:* NA
		Logged By: H. Jones	Checked By: M. Duffy 02/06/2012

Depth (feet)	Samples: Number	Type	Blow Count	Percent Recovery	Time	Field Analyses: PID (ppm) Sample/Background	Log: Graphic	Log: USCS or Rock Type	Lithologic Description	Remarks
								MH	SILT: dark grayish brown (2.5YR 4/2); silt with very fine sand (tr, 15, 85); moist; soft; no plasticity.	Hand augered to 5 feet.
5	SB4-5	◇	15 18 23	100	0832	0/0				At 5 feet: Drilling began.
10	SB4-10	◇	7 13 15	100	0835	0/0				
15	SB4-15	◇	9 15 18	100	0837	3.0/0		SC	SAND: dark grayish brown (2.5YR 4/2); clayey, fine to medium grained sand (0, 85, 15); moist, dense.	
20	SB4-20	◇	11 14 21	100	0842	4.2/0		CH	CLAY: brown (7.5YR 4/2); clay (tr, tr, 100); moist; stiff; high plasticity.	
25	SB4-25	◇	6 9 13	100	0846	2.1/0		GP	GRAVEL: black (7.5 2.5/1); pea gravel:10-30mm diameter gravel with medium to coarse grained sand (90, 10, tr); poorly sorted; angular to subangular; moist; loose.	
30										

EAFB_Well[SB]\St. John's\St. John's Soil and Groundwater Investigation\60236290

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Borehole/Well Construction Log (Continuation Sheet)

Project Name: St. John's Soil and Groundwater Investigation	Project Number: 60236290	**Borehole Number:** **SB-4**
Borehole Location: St. John's		Sheet *2* of *4*

Depth (feet)	Samples: Number	Type	Blow Count	Percent Recovery	Time	Field Analyses: PID (ppm) Sample/Background	Log: Graphic	Log: USCS or	Lithologic Description	Remarks
	SB4-30	◇	14 20 21	100	0849	6.1/0				
35	SB4-35	◇	37 50/5"	60	0853	0.2/0				
40	SB4-40	◇	10 17 21	100	0858	162/0		MH	SILT: black (7.5YR 2.5/1); silt (tr, tr, 100); moist; stiff; high plasticity.	
45	SB4-45	◇	13 17 19	100	0901	39.2/0			at 45 feet: color changes to dark brown (7.5YR 3/4).	
50	SB4-50	◇	24 50 5"	60	0905	26.3/0			SILT: dark gray (10YR 4/1); sandy silt (5, 10, 85); moist; stiff; medium plasticity.	
55	SB4-55	◇	17 18 25	100	0913	306/0				At 55 feet: has hydrocarbon odor.
60	SB4-60	◇	31 50/5"	60	0917	133/0		SP	SAND: dark brown (7.5YR 3/3); medium grained sand (tr, 95, 5); subrounded; well sorted; moist; dense.	At 60 feet: has hydrocarbon odor.
65										

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Borehole/Well Construction Log
(Continuation Sheet)

Project Name: St. John's Soil and Groundwater Investigation	Project Number: 60236290	**Borehole Number:** **SB-4**
Borehole Location: St. John's		Sheet *3* of *4*

Depth (feet)	Samples: Number	Type	Blow Count	Percent Recovery	Time	Field Analyses: PID (ppm) Sample/Background	Log: Graphic	Log: USCS or	Lithologic Description	Remarks
	SB4-65	◇	39 50/4"	55	0922	249/0			at 65 feet: color changes to grayish brown (10YR 5/2).	At 65 feet: has hydrocarbon odor.
70	SB4-70	◇	44 50/5"	60	0925	222/0		SP	SAND: pale brown (10YR 6/3); fine grained sand (tr, 100, tr); well sorted; moist; dense.	At 70 feet: has hydrocarbon odor.
75	SB4-75	◇	44 50/3"	50	0930	44.7/0				At 75 feet: has hydrocarbon odor.
80	SB4-80	◇	34 50/4"	55	0935	7.3/0			at 80 feet: grain size decreases to very fine grained.	
85	SB4-85	◇	41 50/4"	55	0942	23.3/0				
90	SB4-90	◇	35 50/5"	60	0947	3.4/0				
95	SB4-95	◇	39 50/3"	50	0951	20.2/0				
100										

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Borehole/Well Construction Log
(Continuation Sheet)

Project Name: St. John's Soil and Groundwater Investigation	Project Number: 60236290	**Borehole Number:** **SB-4**
Borehole Location: St. John's		Sheet *4* of *4*

Depth (feet)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Percent Recovery	Samples: Time	Field Analyses: PID (ppm) Sample/Background	Log: Graphic	Log: USCS or	Lithologic Description	Remarks
	SB4-100	◇	41 50/5"	60	0955	123/0				
105	SB4-105	◇	45 50/5"	60	1002	100/0		MH	SILT: dark yellowish brown (10YR 4/4); silt (tr, tr, 100); moist; stiff; low to medium plasticity; moist; dense.	
	SB4-110	◇	18 21 27	100	1007	100/0			at 110 feet: color changes to dark brown (10YR 4/3).	
110									Total Depth = 110.0 feet	

AECOM

Borehole/Well Construction Log

Project Name: St. John's Soil and Groundwater Investigation		Project Number: 60236290	**Borehole Number: SB-6**
Borehole Location: St. John's	*Northing:* 1833619.4	*Easting:* 6416362.9	Sheet *1* of *4*
Drilling Agency: BC2		Driller: Clint Jefferson	
Drilling Equipment: CME 95		Date Started: 12/20/2011	Total Depth (feet): 110.0
Drilling Method: Hollow Stem Auger	Number of Samples: 22	Date Finished: 12/20/2011	Depth to Bedrock (feet): NE
Drilling Fluid: None	Borehole Diameter (in): 8	Depth to Water: *Drilling (FT BGS):* NE	*Static (FT TOC):* NA
Completion Information: Grouted to surface		Elevation (feet MSL) : *Ground:* 153.00	*Top of Casing:* NA
		Logged By: H. Jones	Checked By: M. Duffy 02/06/2012

Depth (feet)	Samples: Number	Type	Blow Count	Percent Recovery	Time	Field Analyses: PID (ppm) Sample/Background	Log: Graphic	USCS or Rock Type	Lithologic Description	Remarks
								ML	SILT: brown (7.5YR 4/2); silt with gravel (10, 5, 85); moist; soft; low plasticity.	Hand auger to 5 feet.
5	SB6-5	◇	7 12 16	100	0808	16.5/0				At 5 feet: Begin drilling.
10	SB6-10	◇	14 21 31	100	0812	9.8/0				
15	SB6-15	◇	15 19 27	100	0816	6.3/0				
20	SB6-20	◇	28 31 34	100	0821	3.3/0				
25	SB6-25	◇	14 16 20	100	0824	2.7/0		CH	CLAY: Brown (7.5YR 4/2); clay (tr, tr, 100); moist; stiff; high plasticity.	
30										

AECOM

Borehole/Well Construction Log (Continuation Sheet)

Project Name: St. John's Soil and Groundwater Investigation	Project Number: 60236290	**Borehole Number:** **SB-6**
Borehole Location: St. John's		Sheet *2* of *4*

Depth (feet)	Samples: Number	Type	Blow Count	Percent Recovery	Time	Field Analyses: PID (ppm) Sample/Background	Log: Graphic	Log: USCS or	Lithologic Description	Remarks
	SB6-30	◇	12 15 16	100	0826	12.2/0				
35	SB6-35	◇	27 32 35	100	0832	14.6/0		ML	SILT: dark brown (7.5YR 3/2); fine sandy silt (0, 20, 80); moist; stiff; low plasticity.	
40	SB6-40	◇	18 26 29	100	0836	7.9/0		CH	CLAY: brown (7.5YR 4/2); clay (tr, tr, 100); moist; stiff; high plasticity.	
45	SB6-45	◇	14 17 21	100	0840	19.0/0				
50	SB6-50	◇	33 27 30	100	0850	117/0				
55	SB6-55	◇	19 27 29	100	0856	203/0		SP	SAND: black (7.5YR 2.5/1); very coarse grained sand (5, 90, 5); poorly sorted; subangular-angular; moist, dense.	At 55 feet: Has hydrocarbon odor.
60	SB6-60	◇	38 50/5"	60	0902	186/0				
65										

AECOM

Borehole/Well Construction Log
(Continuation Sheet)

Project Name: St. John's Soil and Groundwater Investigation	Project Number: 60236290	**Borehole Number:** **SB-6**
Borehole Location: St. John's		Sheet *3* of *4*

Depth (feet)	Samples: Number	Type	Blow Count	Percent Recovery	Time	Field Analyses: PID (ppm) Sample/Background	Log: Graphic	Log: USCS or	Lithologic Description	Remarks
	SB6-65	◇	40 50/5"	60	0903	163/0				At 65 feet: Has hydrocarbon odor.
70	SB6-70	◇	37 50/5"	60	0914	184/0			SAND: dark gray (7.5YR 4/1); fine to medium grained sand; well sorted; moist, dense.	At 70 feet: Has hydrocarbon odor.
75	SB6-75	◇	44 50/5"	60	0918	33.2/0			SAND: brown (7.5YR 5/2); medium grained sand (tr, 100, tr); well sorted; moist, dense.	
80	SB6-80	◇	48 50/3"	50	0925	15.1/0			At 80 feet: color changes to brown (7.5YR 5/3).	
85	SB6-85	◇	36 50/4"	55	0934	163/0				
90	SB6-90	◇	41 50/4"	55	0939	19.7/0				
95	SB6-95	◇	37 50/5"	60	0945	19.2/0				
100										

AECOM

Borehole/Well Construction Log
(Continuation Sheet)

Project Name: St. John's Soil and Groundwater Investigation	Project Number: 60236290	**Borehole Number:** **SB-6**
Borehole Location: St. John's		Sheet *4* of *4*

Depth (feet)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Percent Recovery	Samples: Time	Field Analyses: PID (ppm) Sample/Background	Log: Graphic	Log: USCS or	Lithologic Description	Remarks
	SB6-100	◇	35 50/3"	50	1020	774/0				
105	SB6-105	◇	37 50/4"	55	1024	90.7/0				
	SB6-110	◇	39 50/3"	50	1028	8.4/0				
110									Total Depth = 110.0 feet	

Previous Investigation (70131-6-0325.0001)

JOB 70131.60325.0001 DATE 7/10/1996 F.T. AR DR. JB D.E. MWH CHKD

Note: The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated.
It is not warranted to be representative of subsurface conditions at other locations and times.

BORING 7

DATE DRILLED: June 10, 1996
EQUIPMENT USED: 20" - Diameter Bucket
ELEVATION: 154

ELEVATION (ft.)	DEPTH (ft.)	O.V.A.*** (ppm)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	BLOW COUNT* (blows/ft.)	SAMPLE LOC.		
							ML	3" Asphalt Paving - 4" Base Course FILL - CLAYEY SILT - brown
		<5	13.6	117	2		ML	SURFACE OF NATURAL SOIL SANDY SILT - some Clay, about 15% Gravel, brown
150		<5	9.0	123	3			About 30% Gravel
	5	<5	9.1	119	2			
		<5	16.4	113	2			Grayish brown
145	10	<5	11.9	116	2			
140		<5	4.5	118	10		GM SP	SILTY GRAVEL and SAND - fine to coarse, some Cobbles, greyish brown
	15							Cobble (7" in size)
135	20	<5	25.9	96	1		ML	SANDY SILT - some Clay, greyish brown
130	25	<5	25.8	97	<1		CL	SILTY CLAY - some Gravel, brown
125	30	<5	12.7	118	7			About 10% Gravel
120	35	<5	15.6	115	4			
115	40	<5	15.0	114	2			

(CONTINUED ON FOLLOWING FIGURE)

LOG OF BORING

LAW/CRANDALL, INC.

FIGURE A-1.6a

BORING 7 (Continued)

DATE DRILLED: June 10, 1996
EQUIPMENT USED: 20" - Diameter Bucket
ELEVATION: 154

ELEVATION (ft.)	DEPTH (ft.)	O.V.A.*** (ppm)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	BLOW COUNT* (blows/ft.)	SAMPLE LOC.
110	45	<5	18.4	113	4	■
105	50	<5	18.2	111	7	■
100	55	<5	19.9	109	5	■
95	60	<5	18.7	109	6	■
90	65	<5	16.8	112	8	■
85	70	<5	18.1	105	7	■
80	75	<5	22.2	105	9	■

ML — CLAYEY SILT - about 10% Gravel and Cobbles, brown

Layer of Sand and Gravel

CL — SILTY CLAY - few Gravel, brown

Some Sand, greyish brown
END OF BORING AT 75'.

NOTE: Water seepage encountered at depths of 22', 51', and 57'. Water at the bottom of boring 10 minutes after completion of drilling. No caving.

JOB 70131.60325.0001 DATE 7/10/1996 F.T. AR DR. JB O.E. MWH CHKD

Note: The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

LOG OF BORING

LAW/CRANDALL, INC.

FIGURE A-1.6b

BORING 8

DATE DRILLED: June 13, 1996
EQUIPMENT USED: 20" - Diameter Bucket
ELEVATION:

DEPTH (ft.)	O.V.A.*** (ppm)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	BLOW COUNT* (blows/ft.)	SAMPLE LOC.		
							3" Asphalt Paving - 6½" Base Course
	50	11.8	109	1		ML	FILL - SANDY SILT - some Clay, few Gravel, brown
	50	13.9	107	1			
5	<5	16.0	114	1		ML	▼ SURFACE OF NATURAL SOIL CLAYEY SILT - greyish brown
	<5	14.4	115	4			
10	<5	17.0	109	2			
	<5	16.5	113	<1			
15						CL	SILTY CLAY - brown
	--	--	--	2			No sample recovered
20							
	<5	17.8	113	2			
25						SM	SILTY SAND - fine to medium, some Gravel, brown
	<5	14.7	112	5		ML	CLAYEY SILT - some Sand, light brown
30							
	<5	13.4	115	4			
35							
	<5	16.9	110	4			
40							

JOB 70131.60325.0001 DATE 7/31/1996 F.T. AR DR. JB O.E. MWH CHKD

Note: The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

(CONTINUED ON FOLLOWING FIGURE)

LOG OF BORING

LAW/CRANDALL, INC.

FIGURE A-1.1a

JOB 70131.60325.0001 DATE 7/3/1996 F.T. AR DR. JB C.E. MWH CHKD

Note: The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated.
It is not warranted to be representative of subsurface conditions at other locations and times.

BORING 8 (Continued)

DATE DRILLED: June 13, 1996
EQUIPMENT USED: 20" - Diameter Bucket
ELEVATION:

ELEVATION (ft.)	DEPTH (ft.)	O.V.A.*** (ppm)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	BLOW COUNT* (blows/ft.)	SAMPLE LOC.		
	45	<5	12.2	120	7	■	CL	SANDY CLAY - brown
	50	<5	6.6	114	14	■	SM	SILTY SAND - fine, brown
							SP	SAND - fine, light brown
	55	<5	2.8	103	15	■		Some Clay
	60	<5	1.9	102	18	■		
	65		2.2	101	20	■		
	70		1.6	101	17	■		

(BORING TERMINATED AT A DEPTH OF 72' DUE TO LACK OF DRILLING PROGRESS)

NOTE: Water not encountered. Caving from 68' to 72'. Slight raveling in Sand.

LOG OF BORING

LAW/CRANDALL, INC.

FIGURE A-1.1b

BORING 9

DATE DRILLED: June 13, 1996
EQUIPMENT USED: 20" - Diameter Bucket
ELEVATION:

ELEVATION (ft.)	DEPTH (ft.)	O.V.A.*** (ppm)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	BLOW COUNT* (blows/ft.)	SAMPLE LOC.		
								2-3/4" Asphalt Paving - 8" Base Course
		<5	13.9	110	<1		ML	FILL - CLAYEY SILT - some Sand, some bedrock fragments, pieces of brick and concrete (to 8" in size), dark brown
								▼ SURFACE OF NATURAL SOIL
		<5	14.6	117	2		ML	CLAYEY SILT - some Sand, some bedrock fragments, dark brown
	5							
		<5	10.2	120	3			Greyish brown
		<5	17.7	110	2			
	10							
		<5	16.1	114	3			
	15	<5	29.1	94	<1			
	20	<5	20.3	108	2		CL	SILTY CLAY - brown
	25	<5	14.0	119	2		ML	SANDY SILT - some Clay, some Gravel, brown
	30	<5	10.9	120	5		ML	CLAYEY SILT - some Sand, some bedrock fragments, brown
	35	<5	15.6	115	4			
	40	<5	18.8	110	4			

(CONTINUED ON FOLLOWING FIGURE)

JOB 70131.60325.0001 DATE 7/3/1996 F.T. AR DR. JB O.E. MWH CHKD

Note: The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

LOG OF BORING

LAW/CRANDALL, INC.

FIGURE A-1.2a

JOB 40131.63326.0001 DATE 7/3/1996 F.I. AH DR. JB O.E. MWH CHKD

Note: The log of subsurface conditions shown hereon applies only at the specific boring location and at the data indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

BORING 9 (Continued)

DATE DRILLED: June 13, 1996
EQUIPMENT USED: 20" - Diameter Bucket
ELEVATION:

ELEVATION (ft.)	DEPTH (ft.)	O.V.A.*** (ppm)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	BLOW COUNT* (blows/ft.)	SAMPLE LOC.		
	45	<5	15.2	116	7	■	CL	SILTY CLAY - some Sand, brown
	50	<5	12.1	123	15	■	ML	CLAYEY SILT - some Sand, brown
								END OF BORING AT 50'.
								NOTE: Water not encountered. No caving.

LOG OF BORING

LAW/CRANDALL, INC.

FIGURE A-1.2b

JOB 60131.60325:0001 DATE 7/31/1996 F.I. AR DR. JB O.E. MWH CHKD

BORING 10

DATE DRILLED: June 14, 1996
EQUIPMENT USED: 24" - Diameter Bucket
ELEVATION:

ELEVATION (ft.)	DEPTH (ft.)	O.V.A.*** (ppm)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	BLOW COUNT+ (blows/ft.)	SAMPLE LOC.		
							ML	4½" Asphalt Paving - 3" Base Course SANDY SILT - dark brown
		<5	12.5	106	2			
		<5	9.8	119	4		CL	SILTY CLAY - some Sand, brown
	5	<5	12.2	119	3			Greyish brown
		<5	14.8	114	4			
	10	<5	14.5	117	4		ML	SANDY SILT - some Clay, greyish brown
	15	<5	17.6	104	1			
							CL	SILTY CLAY - brown
	20	<5	19.9	105	1			
	25	<5	16.5	111	3			Some Sand, light brown
							SM	SILTY SAND - fine, some Clay, few bedrock fragments, brown
	30	<5	12.8	108	5			
							ML	CLAYEY SILT - some Sand, brown
	35	<5	17.0	106	2			
							CL	SILTY CLAY - brown
	40	<5	16.0	111	5			

(CONTINUED ON FOLLOWING FIGURE)

Note: The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated.
It is not warranted to be representative of subsurface conditions at other locations and times.

LOG OF BORING

LAW/CRANDALL, INC.

FIGURE A-1.3a

JOB 70131.60325.0001 DATE 7/3/1996 F.T. AR DR. JB O.E. MWH CHKD

Note: The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated.
It is not warranted to be representative of subsurface conditions at other locations and times.

BORING 10 (Continued)

DATE DRILLED: June 14, 1996
EQUIPMENT USED: 24" - Diameter Bucket
ELEVATION:

ELEVATION (ft.)	DEPTH (ft.)	O.V.A.*** (ppm)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	BLOW COUNT* (blows/ft.)	SAMPLE LOC.		
	45	<5	10.7	122	6			Some Sand
	50	<5	18.1	109	12			
	55	<5	15.7	112	16		SM	Greyish brown SILTY SAND - fine, light brown
	60	<5	4.3	106	20		SP	SAND - fine, some Silt, some Clay, light brown
	65	<5	4.6	100	20			Fine to medium
		<5	5.6	96	19			Fine (BORING TERMINATED AT A DEPTH OF 69' DUE TO CAVING AND LACK OF PROGRESS)

NOTE: Water not encountered. Slight caving from 66' to 69'. Slight raveling below 64'.

LOG OF BORING

LAW/CRANDALL, INC.

FIGURE A-1.3b

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of material is LARGER than the No.200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No.4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than 50% of coarse fraction is SMALLER than the No.4 sieve size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands or gravelly sands, little or no fines
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS (More than 50% of material is SMALLER than the No.200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS (Liquid limit GREATER than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

PARTICLE SIZE LIMITS

SILT OR CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Coarse		
	No. 200 No. 40		No. 10	No. 4	3/4 in.	3 in.	(12 in.)

U. S. STANDARD SIEVE SIZE

UNIFIED SOIL CLASSIFICATION SYSTEM

REFERENCE:
The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical Memorandum No. 3-357, Vol. 1, March, 1953, (Revised April, 1960).

LAW/CRANDALL

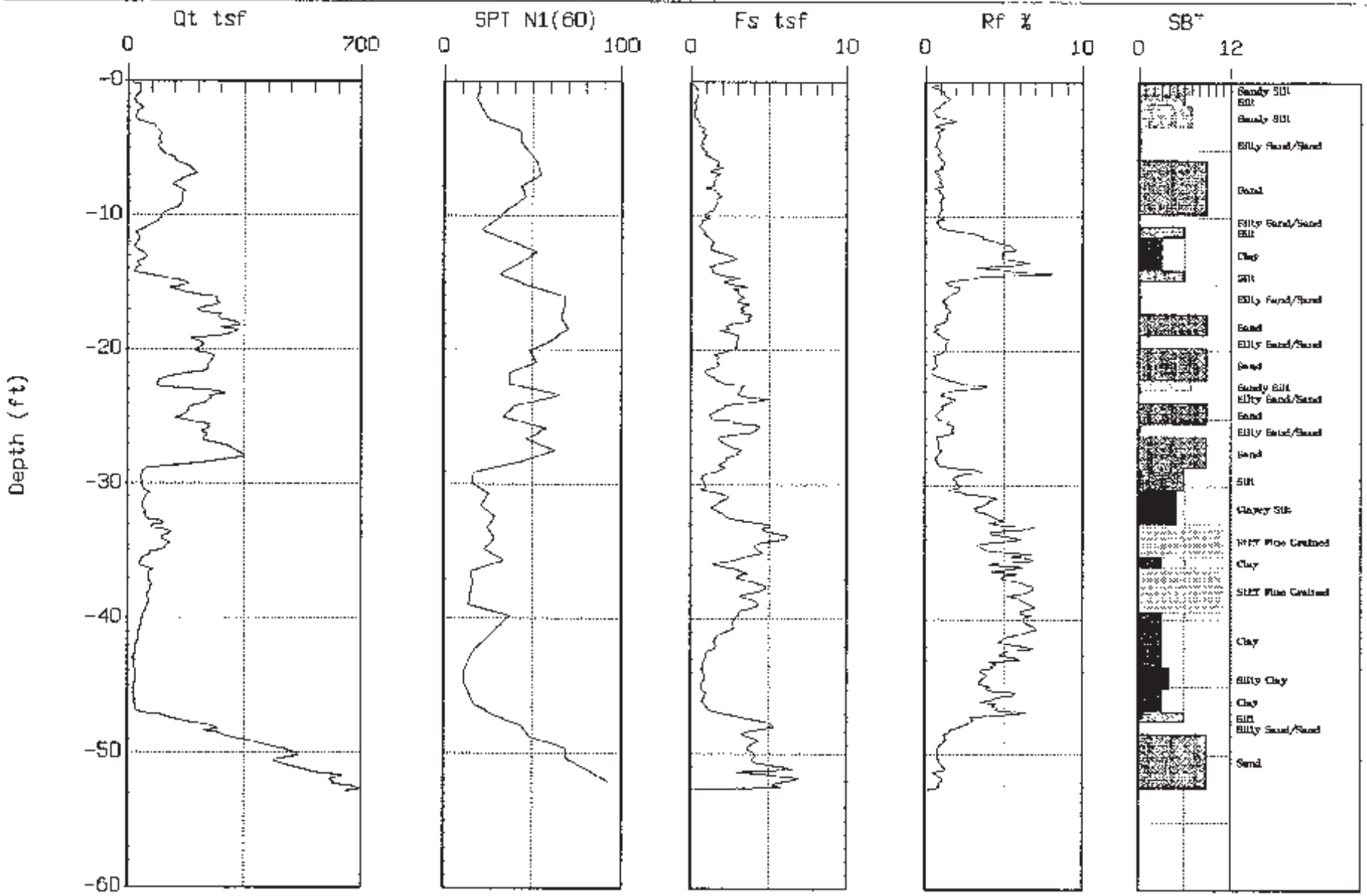
FIGURE A-2

GREGG

LAW/CRANDALL

Project : ST. JOHNS HOSPITAL
Location : CPT-11

Engineer : WIL STELIS
Date : 06:07:96 09:08



Max. Depth: 52.82 (ft)

Depth Inc: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

Previous Investigation (L92281.ADEO)

BORING 2

DATE DRILLED: October 2, 1992
EQUIPMENT USED: 18" - Diameter Bucket

ELEVATION 92.6

JOB L92281.ADEQ DATE 10/7/92 F.T. LS DR. jk O.F. JLR CHKD

Note: The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD.PEN.TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	BLOWS/FT.*	SAMPLE LOC.		
90	0		11.7	120	3		ML	5-1/2" Asphaltic Paving - 5" Base Course FILL - CLAYEY SILT - some Gravel, dark brown
								SURFACE OF NATURAL SOIL
			10.8	125	5		ML	SANDY SILT - about 15% Gravel, brown
85	5							Some layers of Silty Sand
			10.3	118	2			Greyish brown
	10		19.0	109	3		ML	CLAYEY SILT - greyish brown
80			19.9	110	2			
	15		6.8	125	12		SP	SAND - fine to coarse, about 20% Gravel, greyish brown
			4.0	112	4			
75							ML	SANDY SILT - greyish brown
	20		24.7	98	4			LL = 28, PI = 4
70								
	25		28.5	90	1			Layer of Clayey Silt
65								
	30		13.6	119	10			About 5% Gravel, brown
							SM	SILTY SAND - fine to coarse, about 20% Gravel, brown
60								
	35		9.5	116	10			
55							ML	CLAYEY SILT - some Sand, about 10% Gravel, brown
	40		16.8	114	5			

* Penetration resistance:
0' to 25' - 1600 pound hammer falling 12 inches.
25' to 50' - 800 pound hammer falling 12 inches.

(CONTINUED ON FOLLOWING PLATE)

LOG OF BORING

LAW/CRANDALL, INC.

PLATE A - 1.2a

JOB L92281.ADEQ DATE 10/7/92 F.T. LS DR. K O.E. JLR CHKD

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

BORING 2 (Continued)

DATE DRILLED: October 2, 1992
EQUIPMENT USED: 18" - Diameter Bucket

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD.PEN.TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	BLOWS/FT.	SAMPLE LOC.
50	45		23.3	101	5	
45	50		20.6	106	5	
40	55					

Greyish brown

Brown

NOTE. Boring stopped after drilling to 25 feet for water level determination; water not encountered after waiting 10 minutes. Water not encountered after completion of drilling. No caving.

LOG OF BORING

LAW/CRANDALL, INC.

PLATE A-1.2b

BORING 3

DATE DRILLED: October 2, 1992
EQUIPMENT USED: 18" - Diameter Bucket

ELEVATION 91.8

JOB L92281.ACEO DATE 10/7/92 F.T. LS DR. lk C.E. JLR CHK'D

Note: The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD.PEN.TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	BLOWS/FT.*	SAMPLE LOC.		
90	0		7.8	105	3		ML	5" Asphaltic Paving FILL - SANDY SILT - about 10% Gravel, brown SURFACE OF NATURAL SOIL
							SP SM	SAND - fine to coarse, some Silt, about 10% Gravel, light greyish brown
	5		3.2	107	4			
85			4.4	125	9			
	10		4.2	110	4			
80			7.3	108	9			Layer of Sandy Silt Light grey
	15		3.6	118	4			
75			11.0	96	3		ML	SANDY SILT - light brown
	20		7.6	103	3			Greyish brown LL = 32, PI = 8
70								
	25		13.7	103	3			Some Clay
65								
	30		6.8	124	12			Brown
60								
							SM	SILTY SAND - fine to coarse, brown
	35		5.3	107	10			
55							ML	SANDY SILT - some Clay, brown
	40		12.9	116	10			

* Penetration resistance:
0' to 25' - 1600 pound hammer falling 12 inches.
25' to 50' - 800 pound hammer falling 12 inches.

(CONTINUED ON FOLLOWING PLATE)

LOG OF BORING

LAW/CRANDALL, INC.

BORING 3 (Continued)

DATE DRILLED: October 2, 1992
EQUIPMENT USED: 18" - Diameter Bucket

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	BLOWS/FT.	SAMPLE LOC.		DESCRIPTION
50								About 10% Gravel
	45		18.4	110	10	■	ML	CLAYEY SILT - brown
45								
	50		18.1	113	9	■		
40								
	55							

NOTE: Water not encountered. No caving.

JOB L92281.ADEO DATE 10/7/92 F.T. LS DR. lk O.E. JLR CHKD [signature]

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

LOG OF BORING

LAW/CRANDALL, INC.

PLATE A - 1.3b

BORING 4

DATE DRILLED: October 1, 1992
EQUIPMENT USED: 5" - Diameter Rotary Wash

ELEVATION 89.7

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD.PEN.TEST	MOISTURE ** (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	BLOWS/FT.*	SAMPLE LOC.		
			12.8	123	16		ML	4" Asphaltic Paving FILL - CLAYEY SILT - about 5% Gravel, some pieces of brick, dark brown
								SURFACE OF NATURAL SOIL
							ML	CLAYEY SILT - some Gravel, brown
85	5		15.7	117	19			Greyish brown
			16.1	109	16			Some Sand
80	10		16.1	110	10		ML	SANDY SILT - about 10% Gravel, greyish brown
		13						
75	15		20.9	107	6			Some layers of Silty Sand
70	20	17						
			25.0	98	7			
65	25						ML	CLAYEY SILT - about 15% Gravel, brown
		25						
			15.7	116	12			
60	30							
		26						
55	35		10.6	128	40		SM	SILTY SAND - fine to coarse, some Gravel, brown
							ML	CLAYEY SILT - some Sand, brown
		24						
50	40							

* Penetration resistance for 340 pound hammer falling 18 inches.

** Moisture content may be disturbed by the use of drilling mud.

JOB L92281.ADEO DATE 10/7/92 F.T. LS DR. lk O.E. JLR CHKD

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

(CONTINUED ON FOLLOWING PLATE)

LOG OF BORING

LAW/CRANDALL, INC.

PLATE A - 1.4a

JOB L92231.ADEQ DATE 10/7/92 F.T. LS DR. lk O.E. JLR CHKD

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

BORING 4 (Continued)

DATE DRILLED: October 1, 1992
EQUIPMENT USED: 5" - Diameter Rotary Wash

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD.PEN.TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	BLOWS/FT.	SAMPLE LOC.
			16.0	112	9	
		25				
45	45					
			22.8	106	10	
40	50		18.9	114	15	
35	55					

Some layers of Sandy Silt

LL = 25, PI = 4

NOTE: Drilling mud used in drilling process. Mud removed after completion of drilling. Water level measured at 39' 15 minutes after completion of drilling. Boring grouted with a cement and bentonite mixture.

LOG OF BORING

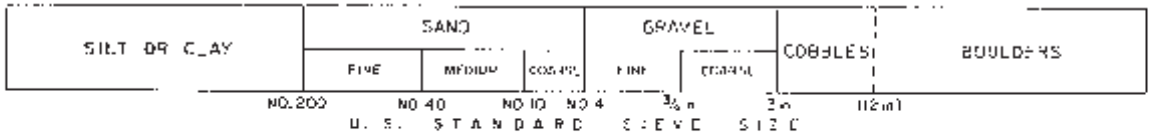
LAW/CRANDALL, INC.

PLATE A-1.4b

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of material is LARGER than No 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amt. of fines)	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amt. of fines)	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS (More than 50% of material is SMALLER than No. 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

PARTICLE SIZE LIMITS



UNIFIED SOIL CLASSIFICATION SYSTEM

Reference:
The Unified Soil Classification System, Corps of Engineers, U. S. Army Technical Memorandum No 3-357, Vol. 1, March, 953. (Revised April, 1960)

LAW/CRANDALL, INC.

PLATE A-2

Previous Investigation (A-87159)

JOB A-87159 DATE 5/8/87 F.T. ___ DR. ___ CH. ___ O.E. DM W.P. dmh CHKD BLJ

BORING 2

DATE DRILLED: April 27, 1987
EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION 150.6

ELEVATION	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.		
150		12.6	117	6			7" Asphaltic Paving - 13" Sand and Gravel Base
						SM	FILL - SILTY SAND - fine, about 10% Gravel, brown
							Layer of Gravel
						ML	(ENCOUNTERED CONCRETE SLAB, MOVED 15' SOUTH)
							SANDY SILT - few Gravel, brown
	5	12.0	123	13			
145		14.5	121	13			
	10						
140		15.2	116	10			Layers of Clay
		17.9	114	8			
	15	15.3	106	6			
135		15.1	105	5			
	20	22.4	100	5		CL	SILTY CLAY - brown
130						ML	CLAYEY SILT - few Gravel, brown
	25	16.6	115	10			
125							
	30	10.6	122	6		SM	SILTY SAND - fine, about 20% Gravel, brown
120							
	35	13.6	111	5		ML	CLAYEY SILT - brown
115							
	40	7.7	115	6		SC	CLAYEY SAND - fine, reddish brown

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

(CONTINUED ON FOLLOWING PLATE)

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A - 12a

BORING 2 (Continued)

DATE DRILLED: April 27, 1987
EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION	DEPTH (ft.)		MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.
110						
	45		7.0	109	7	■
105						
	50		4.6	101	9	■
100						
	55					

NOTE: Water not encountered. No caving.

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated.
It is not warranted to be representative of subsurface conditions at other locations and times.

JOB A-87159 DATE 5/8/87 F.T. ___ DR. dmh O.E. ___ DM ___ W.P. dmh CHKD ___

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A - 1.2b

JOB A-87159 DATE 5/8/87 F.T. ____ DR. ____ O.E. ____ DM ____ W.P. dmh CHKD ____

BORING 4

DATE DRILLED: April 28, 1987
EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION 148.7

ELEVATION	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.		
							3" Asphaltic Paving - 7" Sand and Gravel Base
		12.4	123	3		CL SP	FILL - SILTY CLAY and SAND - mottled brown
145						CL	SILTY CLAY - few Gravel, brown
	5	16.0	116	5			
		18.1	113	8			
140							Some Gravel
	10	21.4	104	6			
		13.2	116	6			Few thin layers of Sandy Silt
135						ML	CLAYEY SILT - some Sand, brown
	15	17.3	113	5			
		22.2	105	3			
130		19.0	112	6		CL	SILTY CLAY - reddish brown
	20						
		18.7	113	6			
125							
	25	19.8	112	14			
120							About 10% Gravel
		11.8	110	4		ML	CLAYEY SILT - brown
	30						
							Few Gravel
						CL	SILTY CLAY - brown
115							
	35	23.1	102	3			
110						SC	CLAYEY SAND - fine, very Clayey, reddish brown
	40	12.2	121	5			

NOTE: Water not encountered. No caving.

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

LOG OF BORING

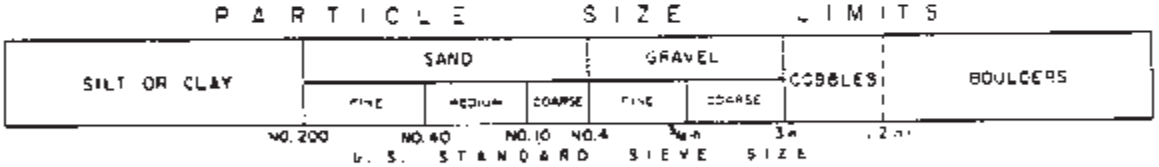
LeROY CRANDALL AND ASSOCIATES

PLATE A - 1.4

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES (Appreciable amt. of fines)	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amt. of fines)	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS (More than 50% of materials is SMALLER than No. 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS (Liquid limit GREATER than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

PARTICLE SIZE LIMITS



UNIFIED SOIL CLASSIFICATION SYSTEM

Reference:
The Unified Soil Classification System, Corps of Engineers, U. S. Army Technical Memorandum No 3-357, Vol. 1, March, 1953. (Revised April, 1960)

LeRoy Crandall and Associates

FORM 133

PLATE A-2

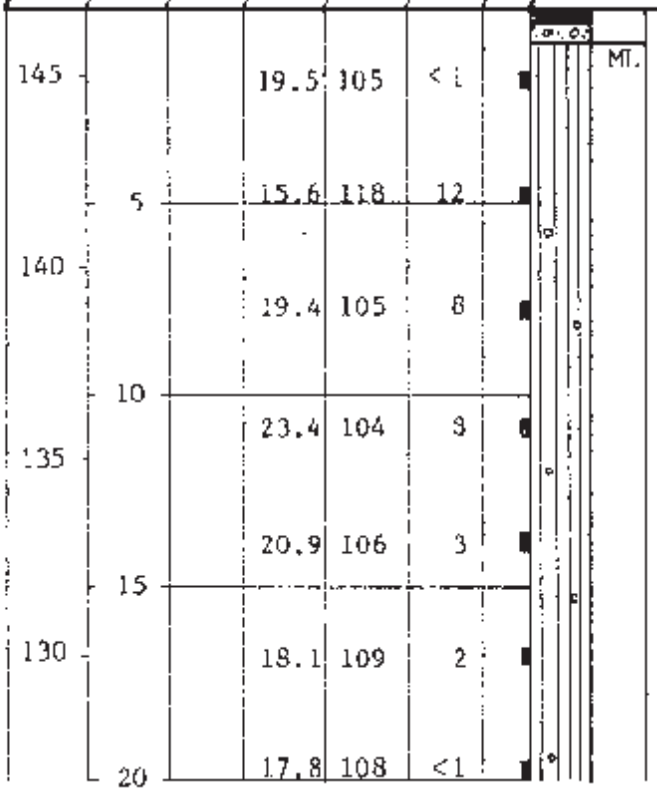
Previous Investigation (A-81019)

BORING 1

DATE DRILLED: January 19, 1981

EQUIPMENT USED 20"-Diameter Bucket

ELEVATION 146.7*



3" Asphaltic Paving - 6" Sand and Gravel Base Course

CLAYEY SILT - thin layers of Sandy Silt, brown

Few gravel
Light brown

Some Fine Sand

Greyish-brown

(CONTINUED ON FOLLOWING PLATE)

*Elevations refer to datum of reference location, utility and grading plan; see Plate 1.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

JOB A 81019 DATE 1/22/81 DR JOHN O.E. W.P. CHKD

Form 123

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.1a

BORING 1 (CONTINUED)

DATE DRILLED. January 19, 1981

EQUIPMENT USED. 20"-Diameter Bucket

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
125							SC	CLAYEY SAND - fine, brown
	25		7.0	116	10		SP	SAND - fine, light brown
120								
	30		7.2	118	12			
115							SC	CLAYEY SAND - fine, reddish-brown
	35		6.2	109	19		SP	SAND - fine, light brown
110								
	40		3.1	103	21			
105								
	45		3.5	105	23			

NOTE: Water not encountered. Caving from 40' to 44' (to 2½' in diameter).

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

JOB A-8109 DATE 1/22/81 DR JOHN Q.E. MS W.P. ER CHKD

Form 124

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.15

BORING 2

DATE DRILLED: January 19, 1981

EQUIPMENT USED: 20"-Diameter Bucket

ELEVATION 147.9

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.		
145	0		18.0	108	< 1		ML	3" Asphaltic Paving FILL - CLAYEY SILT - some Sand, brown 6" abandoned sewer line
	5		16.2	117	13		ML	CLAYEY SILT - brown
140			15.9	114	8			
	10		5.0	115	13			Layer of Silty Sand with gravel
135			15.8	113	5			
	15		4.5	133	10		SM	SILTY SAND - well graded, about 30% gravel, brown
130							ML	CLAYEY SILT - brown
	20		14.1	104	3		ML	SANDY SILT - brown
125								Lenses of Sand and gravel
	25		10.7	118	5		ML	CLAYEY SILT - few gravel, brown
120								
	30							

(CONTINUED ON FOLLOWING PLATE)

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

JOB A-81019 DATE 1/22/81 DR JOHN O.E. W.P. CHKD

Form 123

LOG OF BORING

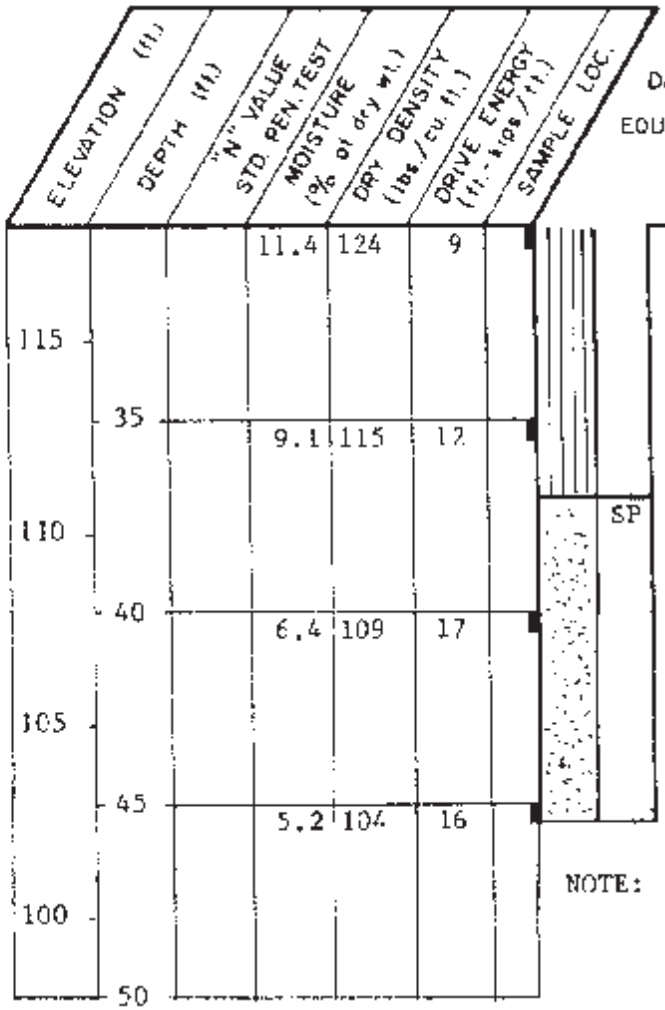
LeROY CRANDALL AND ASSOCIATES

PLATE A-1.2a

BORING 2 (CONTINUED)

DATE DRILLED: January 19, 1981

EQUIPMENT USED: 20"-Diameter Bucket



NOTE: Water not encountered.
No caving.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

JOB A-81019 DATE 1/22/81 DR JOHN O.E. S 22 W.P. 22 CHKD

Form 124

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.2b

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Apreciable amt. of fines)	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amt. of fines)	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS (More than 50% of material is SMALLER than No. 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

PARTICLE SIZE LIMITS

SILT OR CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

NO. 200 NO. 40 NO. 10 NO. 4 ¾in. 3in. (12in)

U. S. STANDARD SIEVE SIZE

UNIFIED SOIL CLASSIFICATION SYSTEM

Reference:
The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical Memorandum No. 3-357, Vol. 1, March, 1953. (Revised April, 1960)

LeRoy Crandall and Associates

FORM 133

PLATE A-2

Previous Investigation (ADE-77210)

BORING 1

DATE DRILLED: September 8, 1977

EQUIPMENT USED: 20"-Diameter Bucket

LOCATION:

ELEVATION 149.9*

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
			7.6	89	2		ML	SANDY SILT - some Clay, some roots, brown
			9.0	116	8		ML	CLAYEY SILT - some Sand and gravel, brown
145	5		9.9	116	19			
			12.2	115	8			
140	10		15.4	117	8			Patches of gravel
			6.1	104	3			Thin layers of well graded Sand with some gravel
135	15							
			22.2	103	2			
130	20							
			18.7	111	8			
125	25						SW	SAND - well graded, some Silt, about 20 to 25% gravel, brown
			9.6	126	6		ML	SANDY SILT - some Clay and gravel, brown
120	30							

NOTE: Water not encountered. No caving.

*See Plate 1 for location of bench mark.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.1

BORING 2

DATE DRILLED: September 8, 1977

EQUIPMENT USED: 20"-Diameter Bucket

LOCATION:

ELEVATION 149.7

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
145	5		6.9	93	<1		ML	SANDY SILT - some Clay, few gravel, some roots, brown About 20 to 30% gravel
			5.2	122	19			
			5.1	113	13		SM	SILTY SAND - well graded, about 20 to 25% gravel, some roots, brown
			5.4	122	18		SW	SAND - well graded, about 25 to 30% gravel, few roots, brown
140	10		4.9	113	13			
135	15		5.0	110	11			
130	20		6.4	115	11			
125	25		4.3	109	8			Layer of Sandy Silt, some gravel, dark brown
120	30		7.7	111	8			

(CONTINUED ON FOLLOWING PLATE)

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

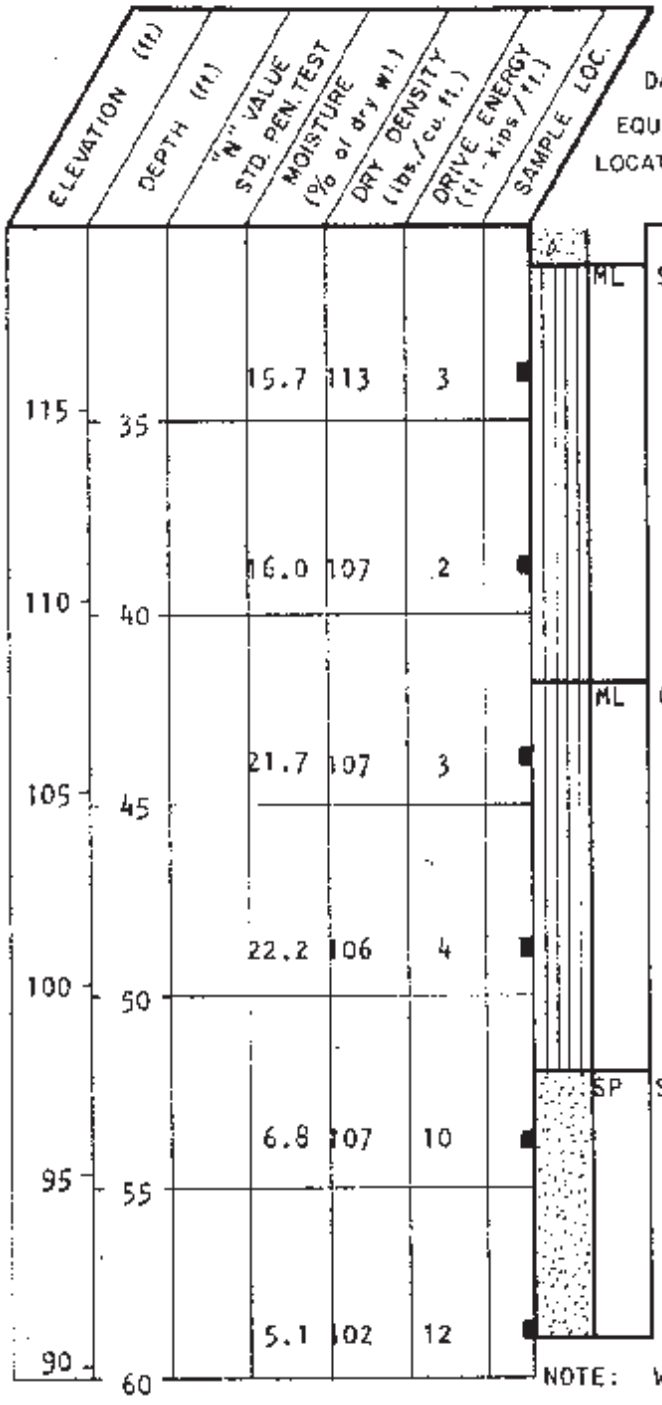
LeROY CRANDALL AND ASSOCIATES

BORING 2 (CONTINUED)

DATE DRILLED: September 8, 1977

EQUIPMENT USED: 20"-Diameter Bucket

LOCATION:



ML SANDY SILT - some Clay, brown

ML CLAYEY SILT - some Sand, brown

Layers of Sandy Silt

SP SAND - Fine, light brown to brown

NOTE: Water not encountered. No caving.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.2b

BORING 3

DATE DRILLED: September 12, 1977

EQUIPMENT USED: 5"-Diameter Rotary Wash

LOCATION:

ELEVATION 149.5

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
145	5		13.6	114	18		ML	CLAYEY SILT - few gravel and roots, brown to dark brown
			11.0	124	29			Few layers of gravel
			16.6	113	11			
140	10		15.8	110	11			Layers of well graded Sand with gravel
			10.6	120	9			
135	15		17.3	112	21		SW	SAND - well graded, about 20 to 25% gravel, brown
130	20	92						
125	25		9.4	128	29			Layers of Clayey Silt, light brown
120	30	30					ML	CLAYEY SILT - few gravel, brown
115	35		15.3	116	5			
110	40		19.1	108	14			

(CONTINUED ON FOLLOWING PLATE)

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

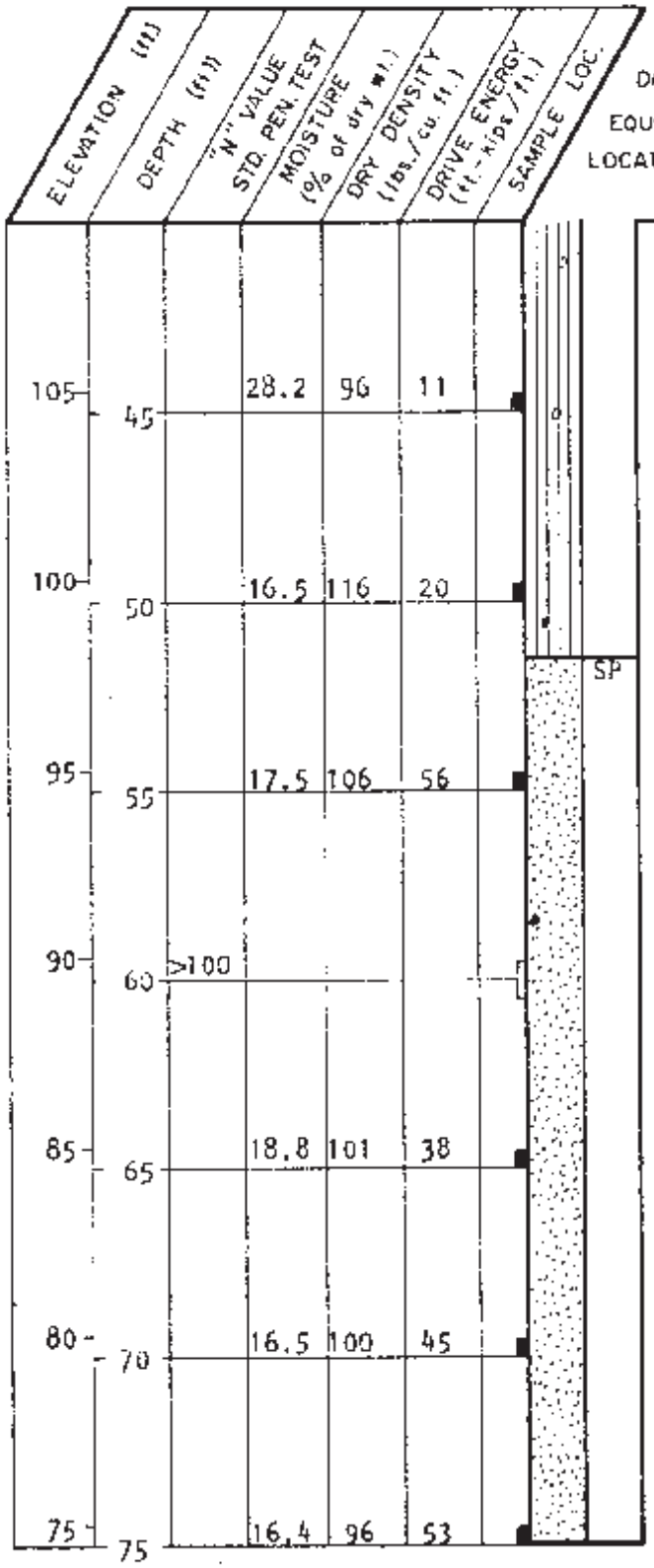
LeROY CRANDALL AND ASSOCIATES

BORING 3 (CONTINUED)

DATE DRILLED: September 12, 1977

EQUIPMENT USED: 5"-Diameter Rotary Wash

LOCATION:



SP SAND - fine, light brown

NOTE: Drilling mud used in drilling process. Water level not established. Boring reamed to a diameter of 9"; installed 4"-diameter PVC pipe for downhole seismic survey, backfilled with gravel

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.3b

BORING 4

DATE DRILLED: September 8, 1977

EQUIPMENT USED: 20"-Diameter Bucket

LOCATION:

ELEVATION 149.7

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.		
			10.6	118	3		ML	SANDY SILT - some Clay, brown
			10.1	115	8		ML	CLAYEY SILT - some Sand and few gravel, brown
145	5		6.5	112	10		SW	SAND - well graded, about 20 to 30% gravel
			7.2	111	6			
140	10		8.0	108	6			
			19.4	109	5			Layers of Sandy Silt
135	15							
130	20		6.0	114	13			
125	25		5.2	117	13			
120	30		4.6	108	8			

NOTE: Water not encountered. No caving.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.4

L. C. & A. SAMPLING: (Sampler Diameter - I.D. = 2.625", O.D. = 3.188")

5 ← Depth at which undisturbed sample taken

└— Energy required to drive L. C. & A. sampler 12", in ft.-kips per ft.:

	Driving Weight	Stroke
Rotary Wash Borings:	300 lbs.	2½'
Bucket Borings: 0' to 25' =	1,600 lbs.	1'
25' to 50' =	800 lbs.	1'
below 50' =	1,200 lbs.	1'

STANDARD PENETRATION TEST:

10 ← Depth at which test performed

└— Number of blows required to drive Standard Penetration sampler 12":

Driving Weight = 140 lbs. Stroke = 2½'

DATUM:

Elevations refer to datum of reference drawing; see Plate 1.

CLASSIFICATION SYSTEM:

Unified Soil Classification System (Plate A-3)

KEY TO LOGS OF BORINGS

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amt. of fines)	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amt of fines)	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS (More than 50% of material is SMALLER than No. 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity; fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

PARTICLE SIZE LIMITS

SILT OR CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

NO. 200 NO. 40 NO. 10 NO. 4 ¾ in. 3 in. (12in)

U. S. STANDARD SIEVE SIZE

UNIFIED SOIL CLASSIFICATION SYSTEM

Reference:
The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical Memorandum No. 3-357, Vol 1, March, 1953. (Revised April, 1960)

LEROY CRANDALL & ASSOCIATES

PLATE A-3

Previous Investigation (63635)

JOB 63635 DATE 10-7-63 DR. GMC O.E. SL CHKD. MM

BORING 1

DATE DRILLED: September 28, 1963
EQUIPMENT USED: 18"-Diameter Rotary Bucket
ELEVATION 93.9*

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	SAMPLE	
90	0	10.7	121	ML	2" ASPHALTIC PAVING CLAYEY SILT - dark brown
		5.3	131	GM	SILTY GRAVEL - well graded, 35% to 40% fine sand, brown
		15.6	108	ML	SANDY SILT - light greyish-brown
80	10	18.0	103		
		15.7	105		
70	20	25.8	95		Large amount of sand and gravel
		14.2	118		
60	30	19.5	102	CL	SILTY CLAY - light greyish-brown
		19.1	100		
	40	14.7	101	ML	SANDY SILT - light greyish-brown
50				SM	SILTY SAND - fine, light greyish-brown Lenses of CLAY
		30.4	93		
	50	8.7	125	CL	LEAN CLAY - light greyish-brown 20% to 30% gravel
40				GM	SILTY GRAVEL - fine, 30% sand, light greyish-brown
	60	16.5	116		Layer of SANDY SILT

NOTE: Groundwater not encountered; no caving.

Soils classified in accordance with the Unified Soil Classification System

*Elevations refer to datum of reference drawing. (see Plot Plan)

LOG OF BORING

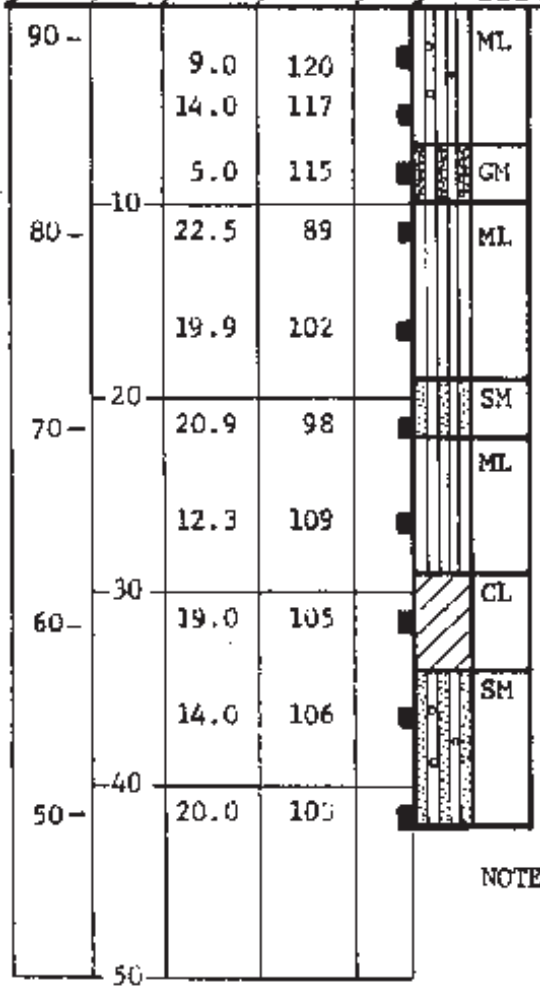
LEROY CRANDALL & ASSOCIATES

PLATE A-1A

JOB 63635 DATE 10-7-63 ms DR. GMC O.E. SC CHKD. PM

BORING 3

DATE DRILLED: September 28, 1963
EQUIPMENT USED: 18"-Diameter Rotary Bucket
ELEVATION 91.6



CLAYEY SILT - few gravel, brown

SILTY GRAVEL - well graded, 35% to 40% sand, brown

SANDY SILT - greyish-brown

SILTY SAND - fine, light greyish-brown

SANDY SILT - light greyish-brown

SILTY CLAY - light greyish-brown

SILTY SAND - fine, few gravel, brown

NOTE: Groundwater not encountered; slight raveling in sandy layers (from 18" to 20" in diameter).

LOG OF BORING

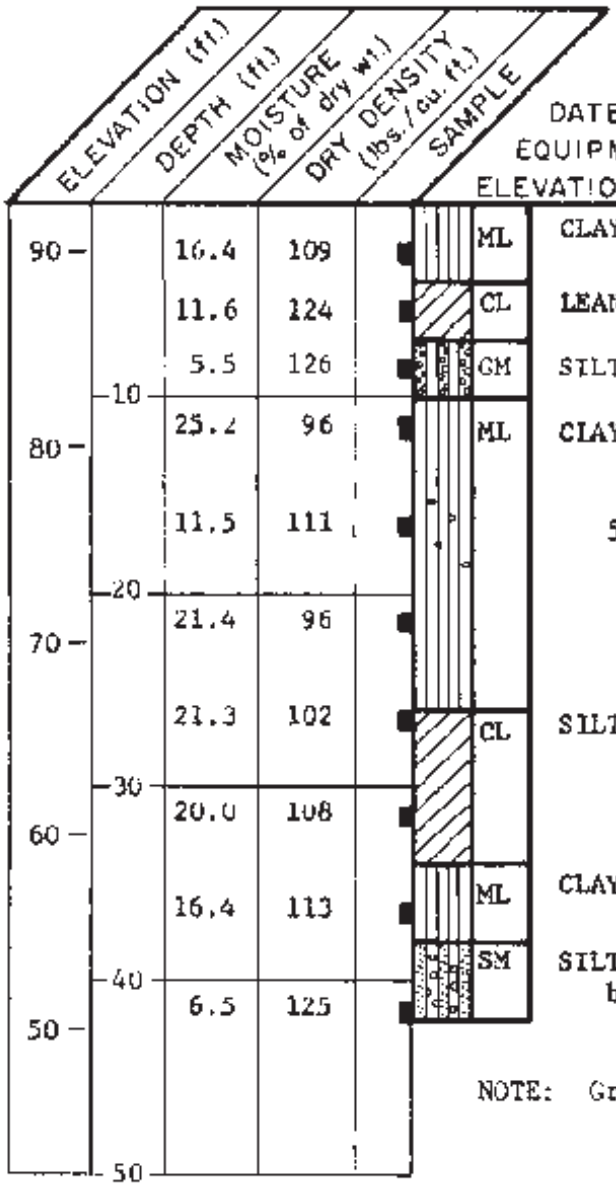
LEROY CRANDALL & ASSOCIATES

PLATE A-10

JOB 63635 DATE 10-7-63 DR. GHC CHKD.

BORING 4

DATE DRILLED: September 27, 1963
EQUIPMENT USED: 18"-Diameter Rotary Bucket
ELEVATION 92.4



CLAYEY SILT - brown

LEAN CLAY - few gravel, brown

SILTY GRAVEL - fine, 35% to 40% sand, brown

CLAYEY SILT - light greyish-brown

5% gravel

SILTY CLAY - reddish-brown

CLAYEY SILT - brown

SILTY SAND - well graded, 20% to 25% gravel, brown

NOTE: Groundwater not encountered; no caving.

LOG OF BORING

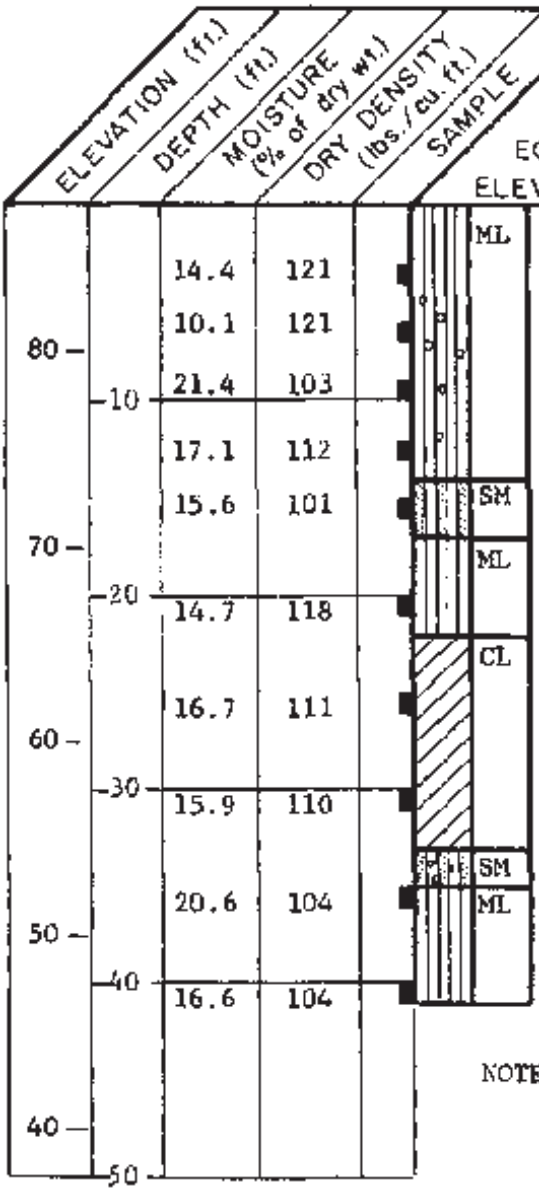
LEROY CRANDALL & ASSOCIATES

PLATE A-1D

JOB 63635 DATE 10-7-63 ma DR. Gmc O.E. SC CHKD. PM

BORING 5

DATE DRILLED: September 28, 1963
EQUIPMENT USED: 18"-Diameter Rotary Bucket
ELEVATION 87.5



CLAYEY SILT - dark brown

Few gravel
10% to 15% gravel
Less gravel

SILTY SAND - fine, light greyish-brown

CLAYEY SILT - light greyish-brown

SILTY CLAY - brown

SILTY SAND - fine, 5% to 10% gravel, brown

CLAYEY SILT - brown

NOTE: Groundwater not encountered; no caving.

LOG OF BORING

LEROY CRANDALL & ASSOCIATES

PLATE A-1E

JOB 63635 DATE 10-7-63ms DR CMC O.E. CHKD. RM

BORING 6

DATE DRILLED: September 27, 1963
EQUIPMENT USED: 18"-Diameter Rotary Bucket
ELEVATION 87.7

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	SAMPLE		
80	10	13.5	114		ML	CLAYEY SILT - dark brown
		7.2	126			
		13.4	119			Greyish-brown
		17.7	105			Few gravel
		16.7	112			
70	20	20.4	101			Lenses of SILTY SAND
		24.0	102			
		18.4	110		CL	SILTY CLAY - light greyish-brown
60	30	6.9	115		ML	CLAYEY SILT - brown
						5% to 10% gravel
		13.0	109			Less gravel
50	40	18.4	107			
		13.9	117		CL	SANDY CLAY - reddish-brown
40	50	6.6	117		SM	SILTY SAND - fine, light brown
		4.7	104		SP	SAND - fine, yellowish-brown
30	60	4.1	97			

NOTE: Groundwater not encountered; slight caving below 52' (from 18" to 24" diameter).

LOG OF BORING

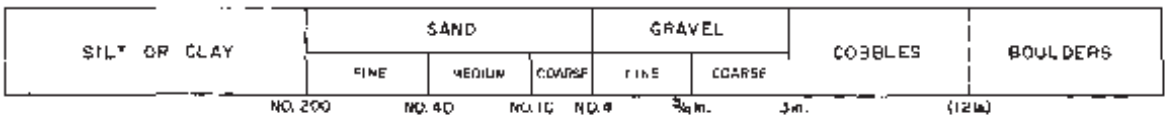
LEROY CRANDALL & ASSOCIATES

PLATE A-1F

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of material is LARGER than No 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amt. of fines)	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amt. of fines)	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS (More than 50% of material is SMALLER than No. 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

PARTICLE SIZE LIMITS



UNIFIED SOIL CLASSIFICATION SYSTEM

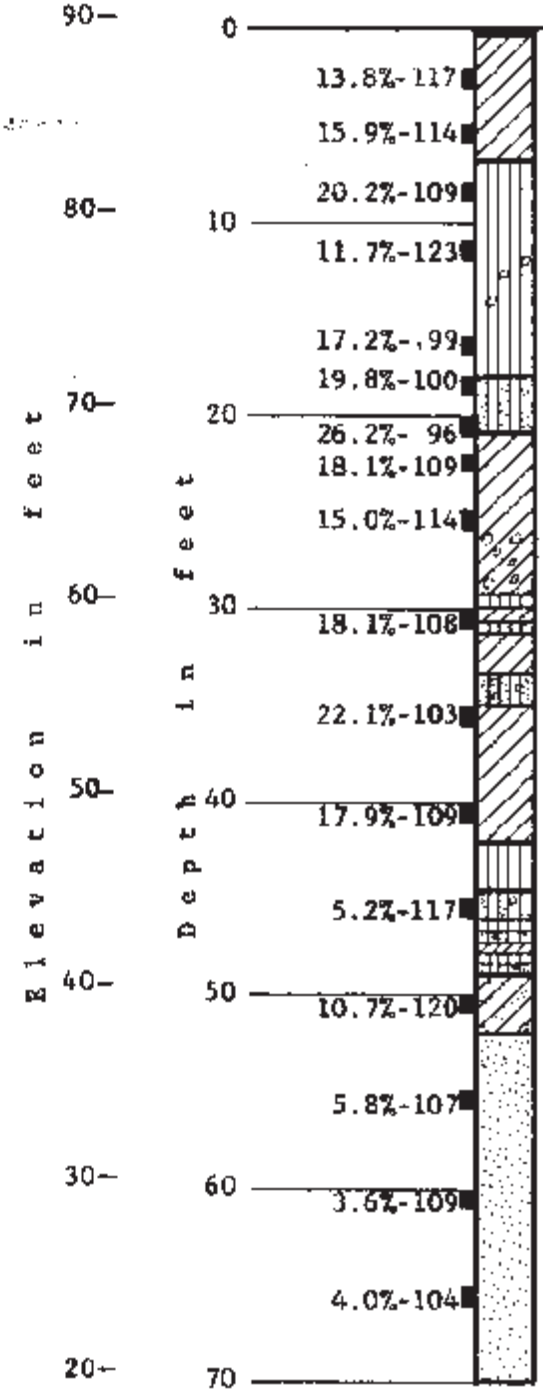
Reference:
The Unified Soil Classification System, Corps of Engineers, U. S. Army Technical Memorandum No 3-357, Vol. 1, March, 1953. (Revised April, 1960)

LEROY CRANDALL & ASSOCIATES

PLATE A-2

Previous Investigation (63125)

LOG OF BORING 1
18"-Diameter Rotary Bucket Hole
Drilled February 22, 1963



Elevation 89.3*

2½" ASPHALTIC PAVING
LEAN CLAY - large amount of silt, greyish-brown
Slightly jointed
SILT - large amount of clay, greyish-brown

Few gravel

Large amount of very fine sand

SILTY SAND - sand very fine, large amount of silt, lenses of silt, brown
LEAN CLAY - medium amount of silt, reddish-brown

25% gravel

Layer of SILT
Layer of SILTY SAND

Layer of SILTY SAND - 20% gravel

SILT - small amount of sand and clay, brown
SILTY SAND - sand predominantly fine, medium amount of silt, 5% gravel, brown
Layers of SILT and CLAY
CLAYEY SAND - sand fine, medium amount of clay, reddish-brown
POORLY GRADED SAND - fine, medium amount of fines, mottled yellowish-brown

(No progress due to heavy caving)

NOTE: Groundwater not encountered; patchy raveling in gravelly layers. Caving badly from 55' to 70' (from 18" to 48" in diameter).

* See Plot Plan for location and elevation of benchmark.

(FOR KEY TO TEST DATA, SEE PLATE A-1B.)

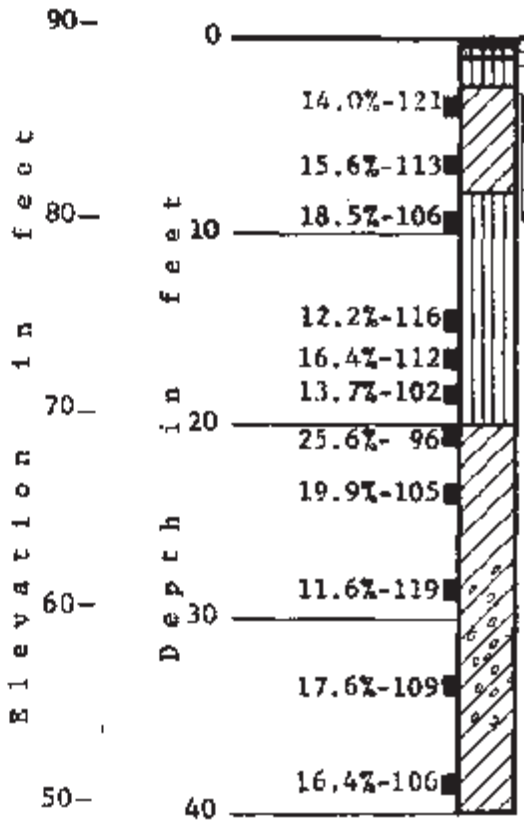
LEROY CRANDALL & ASSOCIATES

PLATE A-1A

JOB 63125 DATE 3-7-63 BY

JOB 63125 DATE BY Geoms/Speaks

LOG OF BORING 2
18"-Diameter Rotary Bucket Hole
Drilled February 22, 1963



NOTE: Groundwater not encountered; no caving.

KEY:

16.4%-106 — Indicates depth at which undisturbed sample obtained
Dry density in pounds per cubic foot
Field moisture content in percent of dry weight

Soils classified in accordance with the Unified Soil Classification System.

LEROY CRANDALL & ASSOCIATES

PLATE A-1B

IDENTIFICATION, CLASSIFICATION AND DESCRIPTION OF SOILS

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS & SUBDIVISIONS			STANDARD NAMES AND SOIL GROUP DESCRIPTIONS	SYMB.	DESCRIPTIVE INFORMATION TO BE ADDED TO THE STANDARD NAMES FOR DESCRIPTION
COARSE GRAINED SOILS Less than one-half the total soil passing the #200 mesh sieve.	GRAVELLY SOILS More than one-half the coarse grains passing the No. 4 sieve	GRAVELS "clean" material Little or no fines	WELL GRADED GRAVEL (GW) Well-graded gravels or gravel-sand mixtures, little or no fines.		Maximum size, angularity and surface conditions, friability or hardness, and approximate percentage of sand, if any.
			POORLY GRADED GRAVEL (GP) Poorly graded gravels or sand-gravel mixtures, little or no fines.		Maximum size, predominant size, angularity, surface conditions, friability or hardness, and approximate percentage of sand, if any.
		GRAVEL WITH FINES "dirty" material Apprec. amount of fines	SILTY GRAVEL (GM) Silty gravels, or poorly graded gravel-sand-silt mixtures.		Maximum size, predominant size, friability or hardness, describe fines as being very silty, moderately silty, or slightly silty.
			CLAYEY GRAVEL (GC) Clayey gravels or gravel-sand-clay mixtures.		Well or poorly graded, maximum size, predominant size if poorly graded, angularity, friability or hardness; describe fines as slightly, moderately, or very clayey or type of binder in well graded gravels with clay binder.
	SANDY SOILS More than one-half the coarse grains passing the No. 4 sieve.	SANDS "clean" material Little fines	WELL GRADED SAND (SW) Well graded sands or gravelly sands, little or no fines.		Angularity, particle shape, friability or hardness, approximate color, percentage of gravel, if any.
			POORLY GRADED SAND (SP) Poorly graded sands or gravelly sands, little or no fines.		Coarse, medium, or fine particle, particle shape, clean or slightly dirty, approximate percentage of gravel, if any.
		SANDS WITH FINES "dirty" material Apprec. amount of fines	SILTY SAND (SM) Silty sands or poorly graded sand-silt mixtures.		Fine, medium, or coarse particles, shape and hardness of particles, large, medium or small proportion of silt, color, approximate percentage of gravel, if any.
			CLAYEY SAND (SC) Clayey sands or sand-clay mixture.		Well graded or poorly graded, predominant size if poorly graded, quality of binder if well graded, large medium, or small amount of clay, color, approximate percentage of gravel, if any.
FINE GRAINED SOILS More than one-half the total soil passing the #200 mesh sieve.	SILT AND CLAY SOILS with low compressibility		SILT (ML) Inorganic silts and very fine sand, silty or clayey fine sands.		Presence of clay or sand, and color, degree of plasticity, if any.
			LEAN CLAY (CL) Inorganic clays of low to medium plasticity, gravelly or sandy.		Degree of plasticity, silt, sand, or gravel content, and color.
			ORGANIC SILT (OL) Organic silts and organic silt-clays of low plasticity.		Visibility of organic material, odor, plasticity, and color.
	SILT AND CLAY SOILS with high compressibility		ELASTIC SILT (MH) Very compressible silts, micaceous or diatomaceous sandy or silt soil.		Presence of clay, degree of plasticity, and color.
			FAT CLAY (CH) Very compressible clays, inorganic clays of high plasticity.		Color, presence of gravel and other significant factors.
			ORGANIC CLAY (OH) Organic clays of medium to high plasticity, very compressible.		Odor, degree of plasticity, and color.
ORGANIC SOILS			PEAT (PT) Peat and other highly organic swamp soils.		Odor, presence of fibrous material, color.

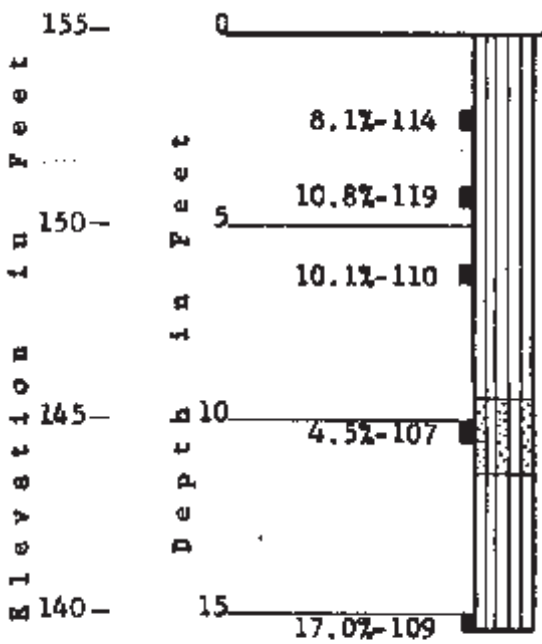
LEROY CRANDALL & ASSOCIATES

PLATE A-2

Previous Investigation (60540)

JOB 60590 DATE 12-2-60 BY MGO

LOG OF BORING 1
18"-Diameter Rotary Bucket Hole
Drilled November 18, 1960



Elevation 154.9*

SILT - contains medium amount of clay, brown

Contains medium amount of gravel, small amount of fine sand, light brown

Layer of SILTY SAND - sand fine, medium amount of silt, contains medium amount of gravel, brown

Contains, medium amount of fine sand, small amount of gravel, brown

NOTE: Groundwater not encountered; no caving.

KEY:

17.0%-109 — Indicates depth at which undisturbed sample obtained
Dry density in pounds per cubic foot
Field moisture content in percent of dry weight

Soils classified in accordance with the Unified Soil Classification System.

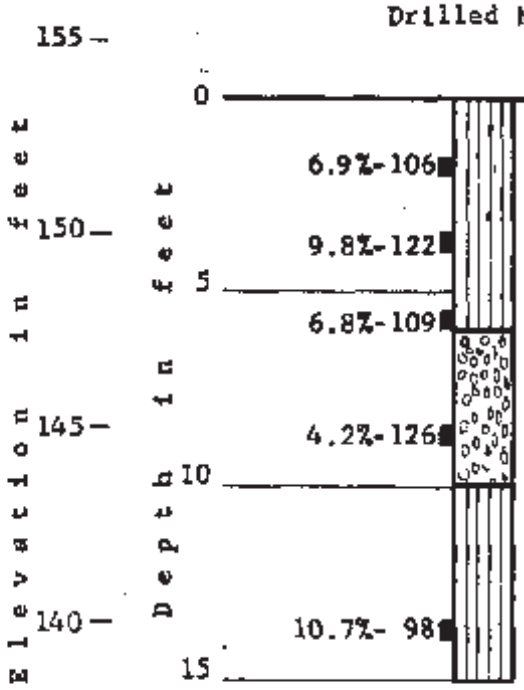
* Elevations refer to datum of survey of site by Sullivan, Psomas & Young, dated November, 1960.

LEROY CRANDALL & ASSOCIATES

PLATE A-1A

JOB 60590 DATE 12-5-60 BY [illegible]

LOG OF BORING 2
18"-Diameter Rotary Bucket Hole
Drilled November 18, 1960



Elevation 153.5

SILT - contains medium amount of clay, some gravel, brown

Contains large amount of small gravel, medium amount of fine sand

POORLY GRADED GRAVEL - small, contains medium amount of silt, greyish-brown

SILT - contains medium amount of clay, brown

Contains large amount of fine sand

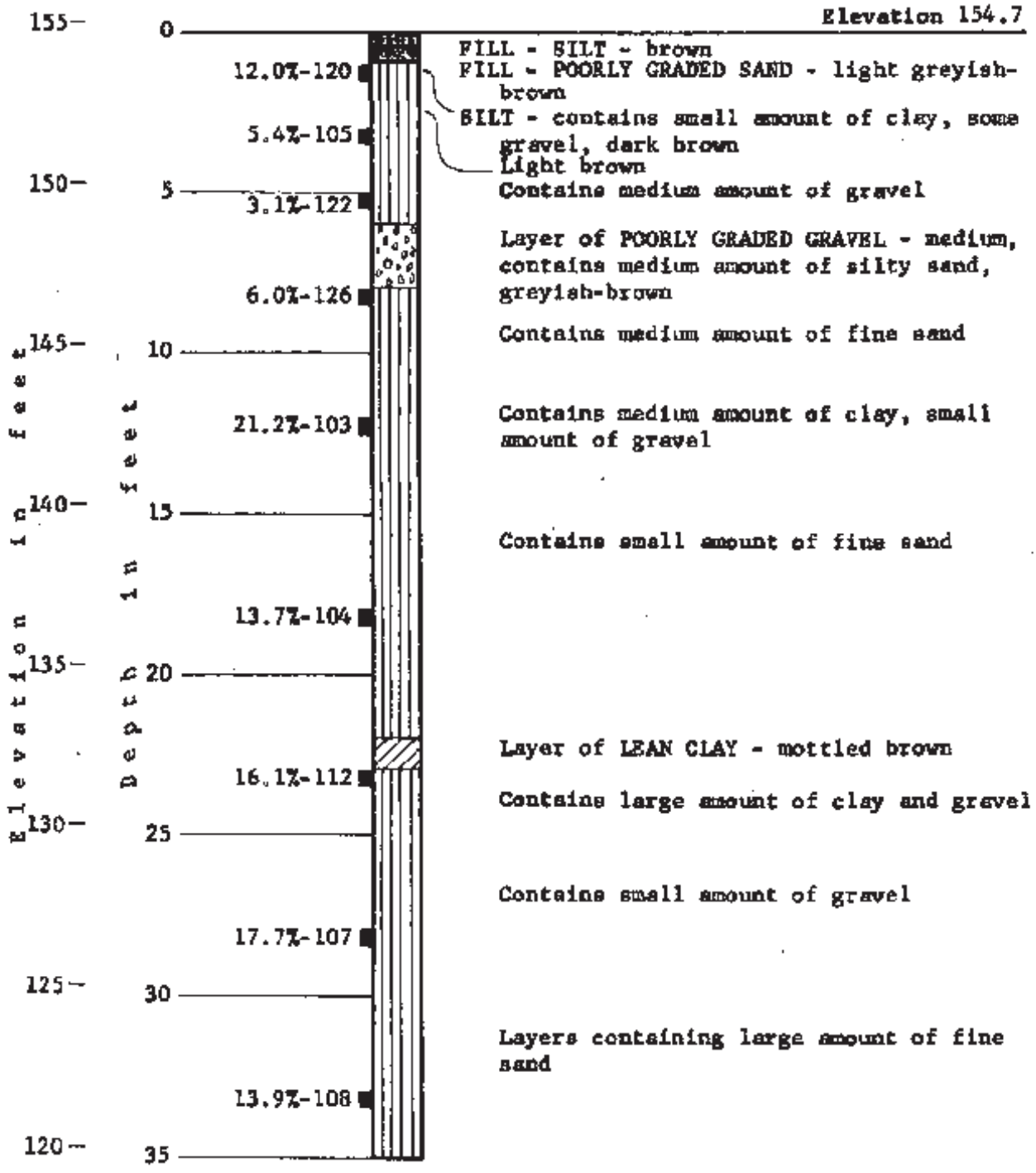
NOTE: Groundwater not encountered; no caving.

LEROY CRANDALL & ASSOCIATES

PLATE A-1B

JOB 60340 DATE 12-3-60 BY MEG

LOG OF BORING 3
18"-Diameter Rotary Bucket Hole
Drilled November 18, 1960



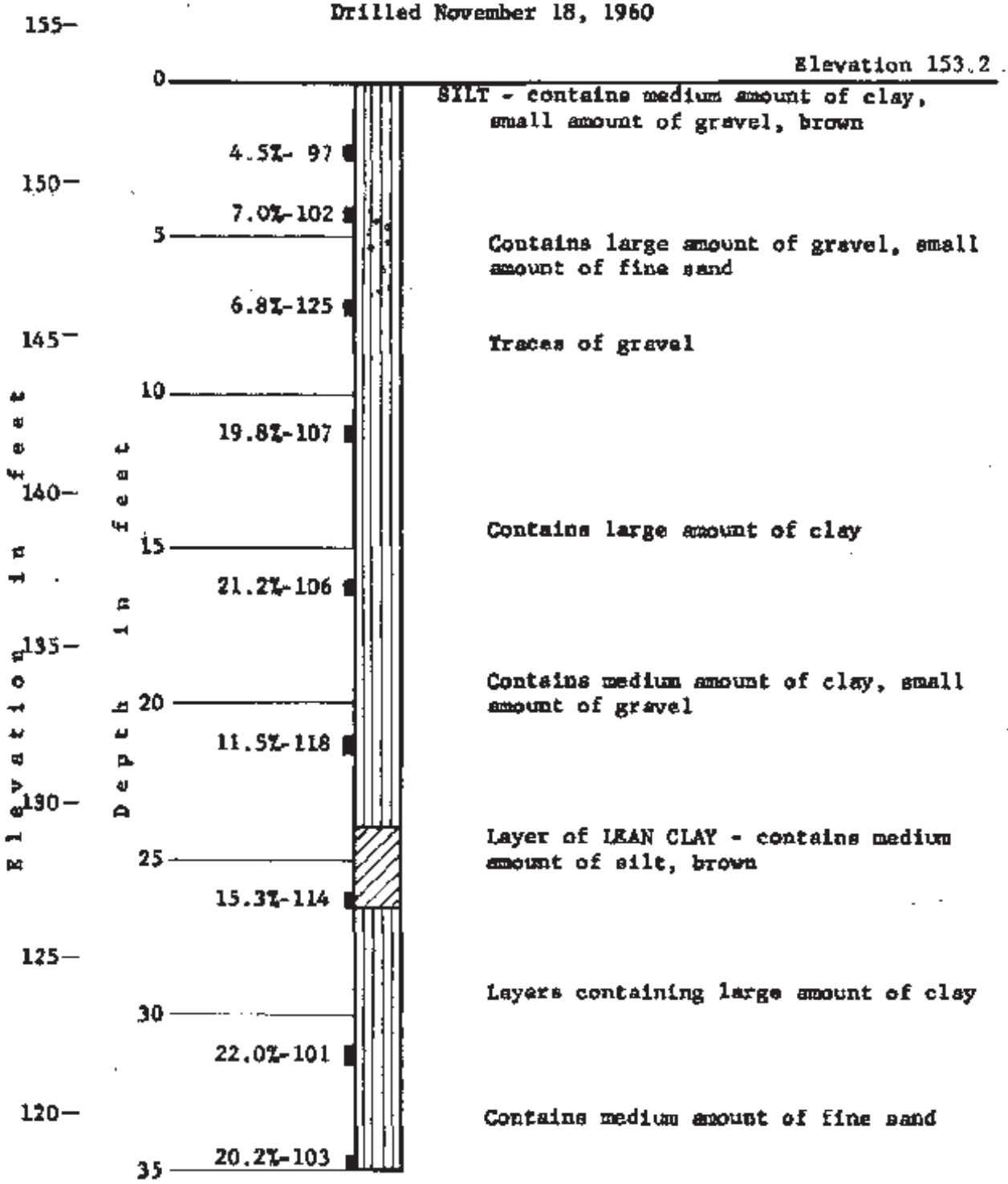
NOTE: Groundwater not encountered; no caving.

LEROY CRANDALL & ASSOCIATES

PLATE A-1C

JOB 60590 DATE 12-7-60 BY MEMO

LOG OF BORING 4
18"-Diameter Rotary Bucket Hole
Drilled November 18, 1960



NOTE: Groundwater not encountered; no caving.

LEROY CRANDALL & ASSOCIATES

PLATE A-1D

IDENTIFICATION, CLASSIFICATION AND DESCRIPTION OF SOILS

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS & SUBDIVISIONS			STANDARD NAMES AND SOIL GROUP DESCRIPTIONS	SYMB.	DESCRIPTIVE INFORMATION TO BE ADDED TO THE STANDARD NAMES FOR DESCRIPTION
COARSE GRAINED SOILS Less than one-half the total soil passing the 200 mesh sieve.	GRAVELLY SOILS Less than one-half the coarse grains passing the No. 4 sieve	GRAVELS "clean" material Little or no fines	WELL GRADED GRAVEL (GW) Well-graded gravels or gravel-sand mixtures, little or no fines.		Maximum size, angularity and surface conditions, friability or hardness, and approximate percentage of sand, if any.
			POORLY GRADED GRAVEL (GP) Poorly graded gravels or sand-gravel mixtures, little or no fines.		Maximum size, predominant size, angularity, surface conditions, friability or hardness, and approximate percentage of sand, if any.
		GRAVEL WITH FINES "dirty" material Apprec. amount of fines	SILTY GRAVEL (GM) Silty gravels, or poorly graded gravel-sand-silt mixtures.		Maximum size, predominant size, friability or hardness; describe fines as being very silty, moderately silty, or slightly silty.
			CLAYEY GRAVEL (GC) Clayey gravels or gravel-sand-clay mixtures.		Well or poorly graded, maximum size, predominant size if poorly graded, angularity, friability or hardness; describe fines as slightly, moderately, or very clayey or type of binder in well graded gravels with clay binder.
	SANDY SOILS More than one-half the coarse grains passing the No. 4 sieve.	SANDS "clean" material Little fines	WELL GRADED SAND (SW) Well graded sands or gravelly sands, little or no fines.		Angularity, particle shape, friability or hardness, approximate color, percentage of gravel, if any.
			POORLY GRADED SAND (SP) Poorly graded sands or gravelly sands, little or no fines.		Coarse, medium, or fine particle, particle shape, clean or slightly dirty, approximate percentage of gravel, if any.
		SANDS WITH FINES "dirty" material Apprec. amount of fines	SILTY SAND (SM) Silty sands or poorly graded sand-silt mixtures.		Fine, medium, or coarse particles, shape and hardness of particles, large, medium or small proportion of silt, color, approximate percentage of gravel, if any.
			CLAYEY SAND (SC) Clayey sands or sand-clay mixture.		Well graded or poorly graded, predominant size if poorly graded, quality of binder if well graded, large, medium, or small amount of clay, color, approximate percentage of gravel, if any.
FINE GRAINED SOILS More than one-half the total soil passing the 200 mesh sieve.	SILT AND CLAY SOILS with low compressibility		SILT (ML) Inorganic silts and very fine sand, silty or clayey fine sands.		Presence of clay or sand, and color, degree of plasticity, if any.
			LEAN CLAY (CL) Inorganic clays of low to medium plasticity, gravelly or sandy.		Degree of plasticity, silt, sand, or gravel content, and color.
			ORGANIC SILT (OL) Organic silts and organic silt-clays of low plasticity.		Visibility of organic material, odor, plasticity, and color.
	SILT AND CLAY SOILS with high compressibility		ELASTIC SILT (MH) Very compressible silts, micaceous or diatomaceous sandy or silt soil.		Presence of clay, degree of plasticity, and color.
			FAT CLAY (CH) Very compressible clays, inorganic clays of high plasticity.		Color, presence of gravel and other significant factors.
			ORGANIC CLAY (OH) Organic clays of medium to high plasticity, very compressible.		Odor, degree of plasticity, and color.
ORGANIC SOILS			PEAT (PT) Peat and other highly organic swamp soils.		Odor, presence of fibrous material, color.

LEROY CRANDALL & ASSOCIATES

PLATE A-2