NMG Geotechnical, Inc.

July 13, 2018

Project No. 16098-01

To: Toll Brothers
725 Town & Country Road, Suite 200
Orange, California 92868

Attention: Mr. Peter H. Kim

Subject: Preliminary Geotechnical Exploration, Proposed Development, Nakase Nursery Site, Tentative Tract 18142, Lake Forest, Orange County, California

In accordance with your request and authorization, NMG Geotechnical, Inc. (NMG) has performed preliminary geotechnical exploration at the site to evaluate the proposed residential development and school site. The purpose of our study was to evaluate the proposed development in light of the existing geotechnical conditions and provide geotechnical recommendations for grading and construction. Our scope of work included background research, site reconnaissance, geologic field mapping, review of historic aerial photographs, review of city files, drilling of hollow-stem auger borings, cone penetrometer tests (CPTs), excavation of backhoe pits/trenches, laboratory testing, geotechnical analysis, determination of preliminary remedial grading measures, and preparation of this report. We utilized the 100-scale Area Plan, prepared by Hunsaker and Associates (Hunsaker), dated February 23, 2018 and received by NMG on June 18, 2018, as a base map for our 80-scale Geotechnical Map (Plate 1).

The subject site is located on gentle hillside terrain that is underlain by sedimentary bedrock with alluvial deposits occupying the adjacent canyon areas. Significant amounts of undocumented fill cover the majority of the site and were placed prior to and during the nursery's operation. The planned grading consists largely of daylight cut in the central hill-top area and along Rancho and Bake Parkways and design fills in the adjacent canyon areas. The majority of the site boundaries will daylight against the existing streets (Rancho and Bake Parkways) and the existing commercial development along the southwest edge. The development along the southeast property line will be immediately adjacent to Serrano Creek.

The primary geotechnical mitigations for the proposed development will consist of removal of undocumented fill and unsuitable alluvial deposits to expose competent earth material and slope stabilization along the perimeter of the development area (e.g., Bake Parkway, Rancho Parkway, the Pacific Commercentre Business Park and Serrano Creek). Remedial grading along the perimeter will require protecting any existing improvements in place.

Based on our study, the proposed residential and school development is considered geotechnically feasible provided the geotechnical constraints at the site are mitigated during

future design and mass grading. This report includes our findings and conclusions and provides our recommendations for grading the subject development.

If you have any questions regarding this report, please contact our office. We appreciate the opportunity to provide our services.

Respectfully submitted,

NMG GEOTECHNICAL, INC.

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1.0 INTRODUCTION

1.1 Purpose and Scope

NMG Geotechnical, Inc. (NMG) has reviewed the 100-scale Area Plan for the proposed development at the Nakase Nursery site, Lake Forest, California. The purpose of this study was to evaluate the planned development in light of the existing geotechnical conditions in order to provide recommendations for grading and construction of the future residential and school site development. The Area Plan, prepared by Hunsaker & Associates, received by NMG on June 18, 2018 was reviewed for this study and enlarged to 80-scale for use as the base map of our accompanying Geotechnical Map (Plate 1).

The scope of services for this study included the following tasks:

- **Background Research:** Review of available geotechnical reports and maps and compilation of data onto the Area Plan. Review of stereoscopic aerial photographs dating back to the 1950s to review site history and evaluate geomorphic conditions. References and aerial photos reviewed are listed in Appendix A.
- **Site Reconnaissance:** Site reconnaissance to review the existing field conditions, photo document the site, and perform boring/CPT and trench location staking related to the subsurface exploration.
- **Geologic Field Mapping:** Geologic mapping to document bedrock exposures, geologic contacts, geomorphic features and condition of existing slopes.
- **Subsurface Exploration:** Excavation, sampling and surface logging of 20 hollow-stem auger borings, advancement and continuous logging of 23 Cone Penetration Tests (CPTs) and 22 test pits/trenches.
- **Laboratory Testing:** Laboratory testing consisting of moisture content, in situ density, maximum density, consolidation, direct shear, Atterberg limits, expansion index, soluble sulfate and grain size.
- **Geotechnical Analysis:** Compilation of data from our field mapping, subsurface exploration, and data from adjacent sites. The data is presented on the Geotechnical Map (Plate 1). Analysis was performed to provide remedial grading measures including slope stabilization and remedial removals. Geotechnical analysis also included preliminary liquefaction evaluation, settlement evaluation, and an estimation of earthwork shrinkage and bulking.
- **Plan Review:** The Area Plan was reviewed in light of the geologic site conditions and the collected geotechnical data, including the data from surrounding sites.
- **Geotechnical Recommendations for Design and Grading:** Based on the collected data, geotechnical recommendations for design and future mass grading were determined for the project.
- **Report Preparation:** Preparation of this geotechnical report with the accompanying illustrations and appendices. This report summarizes our findings, conclusions, and recommendations for the planned development.

1.2 Site Location and Conditions

The proposed residential and school site development is located on an approximate 120-acre parcel in the city of Lake Forest currently used as a plant nursery. The site is bounded by Bake Parkway to the northwest, Rancho Parkway to the northeast, Serrano Creek to the southeast and the Pacific Commercentre Business Park to the southwest, as depicted on Figure 1.

The site is accessible from Lake Forest Drive, adjacent to the Foothill Center retail parking lot. A paved road/alleyway provides access to the site. Dirt and gravel roads are present throughout the site and delineate the existing nursery plots.

The project is located in a gently sloping hillside terrain. The existing slope ratios range from 3H:1V to 12H:1V within and adjacent to the proposed development area. The total topographic relief within the subject site is nearly 75 feet, ranging from a high elevation of 750 feet mean sea level (msl) in the central portion of the site to a low elevation of 675 feet msl in the southwestern portion of the site.

The site has been historically used for agriculture (citrus groves) and nursery operations. There is an extensive dirt road network and some underground and overhead utilities (water, electric, cable, etc.) throughout the site and possibly a residential structure in the southeast portion of the site. Two Irvine Ranch Water District (IRWD) water lines within easements are located at varying depths along the southwest edge of the site, adjacent to the existing business park development. Storm drain inlet and outlet structures are located at the northeast and southwest portions of the site, respectively, and provide drainage for the existing nursery as well as the commercial developments upstream of the subject site. An active water well is also located on the site, which we understand extends approximately 1,100 feet deep. According to nursery representatives, water is pumped at approximately 380 feet below ground surface, at an average rate of 225 gallons per minute when in use.

1.3 Site History and Prior Grading

Historical stereographic aerial photographs and available satellite photographs dating from 1952 through 2017 (listed in Appendix A) were reviewed to determine past uses and conditions at the site. The following summarizes our aerial photographic review.

The property was graded to its current condition after the Nakase family purchased the land for use as a nursery in the late 1970s. Based on comparison of the 1949 USGS topographic map for this area to the current topography obtained by Hunsaker, the site has been raised substantially along Serrano Creek (5 to 15 feet) and adjacent to Rancho Parkway (4 to 10 feet). It appears that the site was lowered along portions of Bake Parkway by 3 to 8 feet and from the northern flank of the bedrock ridge by 5 to 12 feet and that material was placed in the northern portion of the site to level out the topography. Based on our subsurface exploration, we estimate that approximately 200,000 cubic yards of undocumented fill has been placed to create the current site conditions. Remedial grading was not performed for this work and the undocumented fill is underlain by unsuitable alluvium and slopewash materials.

Prior grading was also performed for the segments of Bake Parkway and Rancho Parkway adjacent to and within the subject site, although reports documenting the observation and testing were not found during our extensive background review. In the late 1990s, Rancho Parkway was graded in conjunction with the Home Depot commercial center development. Along Rancho Parkway, up to approximately 25 feet of fill was placed over alluvium in the two primary canyons and minor cut in the middle ridge was performed to create the road grades. According to the Nakase Nursery representatives, some fill was placed within their property to construct ascending slopes to reach design grades for Rancho Parkway. In the early 1990s, Bake Parkway was graded which consisted primarily of cuts into the hillside and fills up to 15 feet thick in the side canyon areas. Within the west corner of the subject site, adjacent to Bake Parkway and the business park, the grading of Bake Parkway allowed Nakase Brothers Nursery to continue using the corner of their property by constructing a 12H:1V fill slope descending toward the drainage channel within the nursery. Improvements to the storm drain structures within the site were also performed during this time.

1.4 Field Exploration

Field exploration conducted by NMG included excavation, surface logging and soil sampling of 20 hollow-stem auger borings, advancement of 23 cone penetrometer tests and excavation and logging of 22 trenches/test pits to evaluate the near-surface condition of the existing fill and alluvium/slopewash material throughout the subject site. The boring, CPT, and test pit logs are provided in Appendix B and the locations are depicted on the Geotechnical Map (Plate 1).

Relatively undisturbed soil ring samples were obtained from the exploratory borings with a 2.5-inch inside-diameter, split-barrel sampler. The drive samples were also used to obtain a measure of resistance of the soil to penetration (recorded as blows-per-foot on our geotechnical boring logs). Within the hollow-stem borings, samplers were driven with a 140-pound hammer, free-falling 30 inches. Bulk samples of onsite soil were collected from the hollow-stem cuttings and were used for additional soil identification purposes and laboratory testing. Soil samples were visually classified in accordance with the Unified Soil Classification System (USCS). Groundwater levels were measured in the borings prior to backfilling.

The Cone Penetration Test (CPT) uses an integrated electronic cone system which measures and records tip resistance, sleeve friction, and friction ratio parameters at 5-cm depth intervals by advancement of a 1.25 inch diameter, pointed steel probe that is hydraulically pushed into the ground at a constant rate. In granular soils, pore pressure measurements can also be taken to estimate the depth to groundwater. The CPT provides a more detailed subsurface profile and a better assessment of the potential liquefaction hazards. The CPT data was used with the adjacent boring information and laboratory test data to develop a consistent interpretation of the subsurface conditions.

The test pit exploration consisted of nineteen trenches (T-1 to T-22) excavated with a rubber tired backhoe to depths of 3.5 to 16 feet. The excavations were geotechnically logged by an engineering geologist, and samples were taken at selected intervals. Relatively undisturbed soil ring samples were obtained from the exploratory trenches with a 2.5-inch inside-diameter (ID), hand-driven, ring sampler. Representative bulk samples of onsite soil were collected from the

trenches and backhoe cuttings and used for additional soil identification purposes and laboratory testing.

1.5 Laboratory Testing

Laboratory testing was performed on representative samples of onsite soils collected during our field exploration to characterize their soil engineering properties.

The laboratory testing program included the following:

- In-place moisture content and dry density;
- Consolidation;
- Direct Shear;
- Atterberg Limits;
- Expansion Index;
- Soluble Sulfate;
- Grain-size distribution; and
- Maximum dry density and optimum moisture.

Laboratory tests were conducted in general conformance with applicable ASTM test standards. Laboratory test results are presented in Appendix C. The in-situ moisture content and dry density data are included on the geotechnical boring and trench logs (Appendix B).

1.6 Proposed Grading and Development

The plan reviewed for this study is the 100-scale Area Plan which shows five residential neighborhoods, a senior affordable housing parcel, an elementary school site, a central park, a multi-purpose water quality basin, and an open space habitat and restoration area along Serrano Creek as depicted on Plate 1. The proposed Area Plan also includes backbone streets providing access from Bake Parkway (A and C Streets) and from Rancho Parkway (B Street). Streets A, B and C provide the main circulation throughout the development. School traffic will circulate through BB Street, which connects to A and B Streets. Streets M, S and T provide access around the central park.

The planned development will require design cuts up to 40 feet deep and design fills on the order of 15 feet thick and locally up to 20 feet thick. The fill slopes are expected to be on the order of 5 to 15 feet in height throughout the site, including slopes for the proposed detention basin. The cut slopes are expected to range from 5 to 30 feet high, primarily along the perimeter of the site. Several smaller fill and cut slopes (less than 10 feet in height) are expected to achieve grades within the neighborhoods. We anticipate the design slopes will be at slope ratios of 2H:1V or flatter.

2.0 GEOTECHNICAL FINDINGS

2.1 Geologic Setting

The project site is located within the Peninsular Range geomorphic province at the southeastern margins of the middle to upper Miocene-age Los Angeles Basin. The site lies in the southwestern foothills of the Santa Ana Mountains. This province is bounded by the Whittier-Elsinore Fault Zone to the north and east and by the Newport-Inglewood Fault Zone to the south.

2.2 Earth Units

The site is primarily underlain by bedrock of the Tertiary-age Capistrano Formation (Oso Member). Quaternary-age slopewash and alluvial deposits and existing undocumented fill is present throughout the site. The limits of these earth units are depicted on the accompanying Geotechnical Maps (Plate 1).

Capistrano Formation, Oso Member (Map Symbol - Tco): This bedrock was deposited in a shallow marine environment during the Tertiary Period approximately 1.5 to 5 million years ago. It underlies the entire site and is exposed at the surface within the main ridge and along Bake and Rancho Parkways. In the excavations where it was encountered, it consists of white to pale yellow sandstone and silty sandstone, which is dense to very dense, and generally friable to locally cemented. A few exposures contain bedding highlighted by micaceous-rich beds; however, it is generally massive. Based on our experience with this bedrock unit, some micaceous clay beds and/or bentonitic clay beds may also be present.

Slopewash Material (Map Symbol - Qsw): Slopewash material flanks the lower portions of the bedrock slopes within the site. Slopewash is the product of residual weathering or from soil and bedrock materials that have been transported downslope. The slopewash material is typically yellowish- to grayish-brown, silty/clayey sands with occasional pebbles. The material ranges from loose near the surface to dense at depth and is damp to moist.

Alluvium (Map Symbol – Qal): Quaternary-age alluvial deposits are found in the major drainages and low-lying areas within the site. These sediments originated from the surrounding bedrock and bedrock units upstream of the subject site and have been transported primarily by water. The soil types of the alluvium are variable, generally consisting of silty/clayey well graded sands, sandy clays and silts and some clean sands at depth. Alluvial deposits within the northern portion of the site are in excess of 51.5 feet below ground surface (bgs).

Undocumented Artificial Fill (Map symbol – Afu): Undocumented artificial fill was encountered across the site generally associated with previous nursery activities, including access roads, in-filled old drainage channels, drainage basins and irrigation/water lines. The depth and/or nature of these fills are generally uncertain except where directly encountered in borings or trenches during our subsurface investigation. These fills are mostly derived from onsite soils and bedrock materials and consist of loosely compacted silty to clayey sands and sandy silts and clays with varying amounts of debris. These fill materials were placed over previous native ground where no remedial grading was performed.

We anticipate engineered fills to be present below Bake Parkway and Rancho Parkway and within the IRWD water line easement. However, the exact limits and nature of these fills are unknown at this time.

2.3 Geologic Structure

The general overall geologic structure within the site consists of a homoclinal sequence with bedding dipping gently (less than 20 degrees) towards the south and west. Local variations are apparent due to cross-bedding and paleo-erosional surfaces. Fife (1974) along with Morton and Miller (1976 and 1981) mapped the hills within the site as the Oso Member of the Capistrano Formation, surrounded by slopewash material along the lower slopes, and alluvium within the canyons.

The alluvium within the site was deposited by three streams that flow through and adjacent to the site (Fife, 1974). The alluvium is generally flat-lying, with a gentle dip toward the southwest (down-gradient).

2.4 Regional Faulting and Seismicity

Faulting: The site is not located within a fault-rupture hazard zone as defined by the Alquist-Priolo Special Studies Zones Act (Hart and Bryant, 2007). There are no known major or active faults mapped within the proposed development area, and no evidence of active faulting was observed during our investigation at the site. Therefore, the potential for primary ground rupture at the site is considered slight to nil.

Using the USGS deaggragation program (USGS, 2017) and the site coordinates of 33.6679 degrees north latitude and 117.6668 degrees longitude, the closest major active faults to the site are the San Joaquin Hills Blind Thrust located 6.8 kilometers (km) southwest of the site, the Elsinore Fault located approximately 19 km to the east of the site, and the Newport-Inglewood Fault (offshore) located approximately 21.5 km to the southwest of the site.

Seismicity: Properties in southern California are subject to seismic hazards of varying degrees depending upon the proximity, degree of activity, and capability of nearby faults. These hazards can be primary (i.e., directly related to the energy release of an earthquake such as surface rupture and ground shaking) or secondary (i.e., related to the effect of earthquake energy on the physical world which can cause phenomena such as liquefaction and ground lurching). Since there are no known major or seismically active faults mapped at the site, the potential for primary ground rupture is considered slight to nil. The primary seismic hazard for this site is ground shaking due to a future earthquake on one of the major regional active faults, such as the San Joaquin Hills Blind Thrust, Chino, Newport-Inglewood, Whittier-Elsinore, San Andreas, and San Jacinto faults.

Secondary Seismic Hazards: Secondary seismic hazards, such as tsunami and seiche, need not be considered since the site is located away from the ocean or confined bodies of water. Liquefaction potential at the site is discussed in the Section 2.8.

2.5 Surface Water and Groundwater

Currently, and for the majority of the year, Serrano Creek is essentially dry except during very heavy precipitation and within the southeast corner of the site where runoff from the nursery flows into the creek via small-diameter drain pipes. The primary surface flow entering the site is from a storm drain pipe under Rancho Parkway. This surface water flows through the site in an open ditch and exits the site at the southwest end into a storm drain inlet.

Groundwater was observed in many of the borings during our field exploration. Where encountered, groundwater ranges from 20 bgs in the southern portion of the site to 45 feet bgs in the northern portion of the site and appears to be perched within the alluvium and weathered bedrock materials at the contact with the underlying unweathered bedrock. Based on mapping by the State (CDMG, 2000), historic high groundwater at the site is on the order of 20 feet bgs.

2.6 Mass Movements

There are no landslides mapped at the site. Seismic hazard mapping by the State (CDMG, 2001) show no areas of potential seismically induced landslides within the subject site (Figure 2).

2.7 Slope Stability

There are numerous cut and fill slopes that will be required to achieve the planned development grades throughout the site. We anticipate the design slopes will be on the order of 30 feet in height or less and at a slope ratio of 2H:1V or less. The highest slopes will be adjacent to the business park.

The design cut slopes will need to be analyzed on a case-by-case basis when grading plans are available, however since the perimeter cut slopes will likely expose existing undocumented fill, alluvium or alluvium overlying sandstone bedrock we anticipate stabilization fill keys on the order of 15 to 20 feet wide by 5 feet deep will be adequate to provide global and surficial stability.

Due to the effects of liquefaction potential of the alluvium during a significant seismic shaking event, the exposed slope associated with Serrano Creek is subject to lateral movements. Based on our data review and preliminary liquefaction analysis, a seismic shear key will be needed to mitigate this condition. The lateral extent of the keyway excavation would need to start at the environmental setback boundary and the key will extend along the Serrano Creek edge.

2.8 Liquefaction Potential

Liquefaction is a phenomenon in which earthquake-induced cyclic stresses generate excess pore water pressure in low density (loose), saturated sandy soils and soft silts below the water table. This causes a loss of shear strength and, in many cases, ground settlement. For liquefaction to occur, all of the following conditions must be present:

- There must be severe ground shaking, such as occurs during a strong earthquake.

- The soil material must be saturated or nearly saturated (generally below the water table).
- The corrected normalized standard penetration test (SPT) blow counts $(N_{1)}60$ or the CPT tip resistance (Q) must be relatively low.
- The soil material must be granular (usually sands or silts) with, at most, only low plasticity. Clayey soils and silts of relatively high plasticity and dense sands are generally not subject to liquefaction.

Seismic hazard mapping by the State shows a significant portion of the site lies within potential liquefaction areas along the southerly edge of the property, paralleling Serrano Creek (Figure 2). We have explored this condition with CPTs, advanced to 50 feet bgs, in selected areas along this perimeter. Hollow-stem auger borings were also excavated, sampled, and logged to depths of 55 feet bgs. Based on our assessment of the collected subsurface information and using historic, some layers within the alluvial soils are subject to liquefaction. However, the remedial grading measures recommended herein (including the seismic shear key described above) are designed to significantly reduce the liquefaction potential.

2.9 Settlement Considerations

The amount of potential settlement can vary significantly over the site due to variations in the subsurface conditions and depths of the planned cuts and fills. In conducting our preliminary settlement assessment, we have assumed that remedial grading will be implemented to remove the upper unsuitable soils, that maximum fill loading will be no more than 20 feet over existing ground, and the proposed structures at the site will generally consist of two- to three-story residential and school buildings. After remedial and rough grading is complete, we anticipate the remaining long-term consolidation settlement to be on the order of 1 to 2 inches and differential settlement to be on the order of ½ inch to 1 inch over a 30-foot span.

2.10 Earthwork Shrinkage/Bulking and Subsidence

The loss or gain of volume (shrinkage or bulking, respectively) of excavated natural materials and re-compaction as fill, varies according to earth material type and location. This volume change is represented as a percentage shrinkage (volume loss) and as a percentage bulking (volume gain) after re-compaction of a unit volume of cut in this same material in its natural state. The onsite materials will have varying shrinkage or bulking characteristics. The following table presents the projected range of values for each type of material:

Earth Unit	***Approximate Percent Shrinkage/Bulking***
Alluvium/colluvium	10 percent shrinkage
Undocumented Fill	5 percent shrinkage
Slope Wash Deposits	5 percent shrinkage
Bedrock	2 percent bulking

Ground subsidence at the site is estimated to be on the order of 0.1 foot across the site.

2.11 Existing Utilities and Structures

There are several nursery irrigation pipelines that cross the property. There are also numerous existing buried and above-ground utilities that service the existing office trailers at the site. According to the nursery representatives, there may be an existing septic system and/or cesspool associated with the structure in the southeast portion of the site adjacent to Serrano Creek.

An existing storm drain outlet and inlet structure direct water onto and off the subject site. We understand that the storm drain system being designed for the site will connect these two structures to properly manage this drainage.

Numerous other utilities may have been installed along the perimeter of the project that will require tie-ins to the proposed project utilities. The tie-in locations may require geotechnical evaluation, for trench stability and/or settlement of the utilities, especially where the utilities are deeper than approximately 5 feet. Utilities associated with prior land use and not designated to be protected in place are to be removed during grading.

2.12 Engineering Characteristics of Onsite Soils

Laboratory testing of select onsite soils indicate that the grain size distribution of the samples have fine contents (Passing Sieve No. 200) in the range of 37 to 49 percent with clay contents in the range of 14 to 19 percent. The Atterberg limit tests indicate that the samples have liquid limits (LLs) in the range of 29 to 33 percent with plasticity indices (PIs) in the range of 15 to 21. The samples indicate that onsite soils have "low" to "medium" expansion potential with expansion indices ranging from 28 to 55. The soluble sulfate exposure of the samples is classified as "S0" per Table 19.3.1.1 of ACI-318-14. Laboratory test results are included in Appendix C.

2.13 Rippability and Generation of Oversize Material

The rippability characteristics of bedrock depend upon the rock type, hardness, the depth of weathering, degree of fracturing, and the structure of the rock. The deepest cuts within the site are on the order of 40 feet, and with remedial grading, cuts may be up to 45 feet deep.

Borings excavated throughout the site using hollow-stem auger drill rigs were excavated to a maximum depth of 30 feet into the bedrock without refusal. The equipment used to excavate these borings typically cannot excavate earth materials that are not rippable.

Based on exploration at the site and prior explorations and grading adjacent to the site, the bedrock is anticipated to be rippable with D-8 and D-9 bulldozers. Proper equipment selection and sound ripping techniques are important for effective earthwork operations. Deeper cuts may encounter local areas of cemented sandstone which will be the most difficult to excavate and oversize rock may be generated (rocks greater than 8 inches in the maximum diameter). NMG anticipates that a minor amount of oversize rock will be generated from localized cemented zones within the bedrock cut areas.

2.14 Perimeter Conditions

The subject rectangular shaped site is bounded on three sides by improved public areas and on one side by Serrano Creek. Specific geotechnical issues related to the perimeter conditions are discussed below.

Serrano Creek: The southeastern edge of the property is bounded by Serrano Creek. This boundary is approximately 2,600 feet long. The creek ranges from 10 to 14 feet deep for most of the length and 6 to 7 feet deep for the most southerly 500 feet near the entrance to the site. We understand that Serrano Creek is to remain in its natural state and there is an existing environmental setback line on both sides of the creek as previously documented by the environmental consultant, Glenn Lukos Associates.

Bake Parkway: Bake Parkway defines the northwest property line along the subject site. The grading to construct Bake Parkway encroached within the subject site, leaving areas of non-structural fill overlying unsuitable alluvium and slopewash material. Within the west corner of the site, recent borings and trenches indicated unsuitable fills generally 10 feet deep and locally up to 25 feet deep. Other potentially unsuitable fill areas may be located along Bake Parkway as well as undocumented fills placed by the nursery.

Rancho Parkway: Rancho Parkway was graded and constructed simultaneously with the construction of the Home Depot Center. According to nursery representatives, the grading of the Rancho Parkway encroached into the nursery property. An outlet structure also enters the site along this property edge which provides drainage for the commercial facilities and Rancho Parkway. We understand that a new storm drain system will be constructed to accommodate drainage from this outlet structure.

Pacific Commercentre Business Park: The property line adjacent to the Pacific Commercentre Business Park delineates the southwestern boundary of the subject site. This boundary includes an existing retaining wall near Bake Parkway and placement of fills on the order of 10-feet thick. We understand the proposed grading along this boundary consists of descending design cut and fill slopes. An existing IRWD easement exists which includes 12-inch domestic and reclaimed water lines traversing the entire length of the property boundary. We understand that Hunsaker is currently designing a realignment of the subject lines and will provide their plan at a later date. The geotechnical consultant should review the plans once they become available. An inlet structure also exits the site along this property edge and drains the subject site. We understand that the storm drain pipe connected to this inlet structure will be incorporated into the subject storm drain plan.

3.0 CONCLUSION AND RECOMMENDATIONS

3.1 General Conclusion and Recommendation

Based on the results of our subsurface exploration and review of the referenced reports, the proposed residential and school site development is considered acceptable from a geotechnical viewpoint provided the recommendations of this report and future plan reviews are incorporated during grading, design and construction. Our recommendations are considered minimum and may be superseded by more stringent requirements of others (i.e., governing agency, architect and/or structural engineer). Additional geotechnical reviews will be required once the grading plans are available. The grading and construction should be performed in accordance with the City of Lake Forest Grading Code and the grading specifications provided in Appendix D, except as superseded below.

3.2 Site Clearing and Preparation

Prior to grading, deleterious material (including highly organic topsoil, vegetation, trash, and construction debris) should be removed, and disposed of offsite. There are local large trees and local heavy vegetation that will require disposal offsite. Since the site has been utilized as a nursery for over 40 years, there are various remains of structures and numerous irrigation lines that cross the site. These items will need to be demolished and removed from the site.

Numerous concrete (PCC) improvements such as swales and rip-rap will require demolition. If the PCC is free of metals, it may be disposed of in the same manner specified for oversize rock in Appendix D. Rebar or other metals should not be placed in fill but disposed of offsite. PCC pieces that are greater than 18 inches in the maximum dimension should not be placed within the upper 15 feet of fill below design grade. Pulverized PCC may be used as select backfill or placed as general fill, but should not be used in the upper 5 feet of fill below design grade. We understand that the designed storm drain system will tie into the existing storm drain inlet and outlet structures within the site. Partial demolition of the existing structures may be necessary to tie in the existing utilities. Demolition of these structures is to be performed in accordance with the recommendations herein. Unsuitable soils below these existing structures may be subject to remedial removals.

3.3 General Earthwork and Grading

Grading and excavations should be performed in accordance with the City of Lake Forest Grading Code and the General Earthwork and Grading Specifications in Appendix D. Prior to placement of compacted fill, removal bottoms should be scarified a minimum of 6 inches, moisture-conditioned to over optimum, and compacted to a minimum 90 percent relative compaction. Relative compaction should be based upon ASTM Test Method D1557.

Fill material should be placed in loose lifts no greater than 8 inches in thickness and compacted prior to placement of the next lift. Ground sloping greater than 5H:1V should be prepared by benching into firm, competent material as fill is placed.

Moisture content of the fill should generally be a minimum of 2 to 3 percent over optimum moisture content. The grading contractor should note that the onsite soils generally are moist to very moist, however, the sandstone bedrock tends to have relatively low moisture contents in the upper approximately 30 feet (see boring logs in Appendix B). Significant amounts of water may need to be added in order to achieve the recommended moisture contents. Also, depending on the time of year grading commences, some onsite soils may be saturated which may require drying back prior to placement as fill.

Native materials that are relatively free of deleterious material should be suitable for use as compacted fill. If import soils are required in order to achieve design grades, they should be evaluated by the geotechnical consultant prior to and during transport to the site to verify their suitability.

3.4 Remedial Removals

The unsuitable earth materials should be removed prior to placement of proposed fill. Unsuitable materials at the site include topsoil, uncertified fills, slopewash, weathered alluvium, and weathered bedrock. The estimated depths for remedial removal generally range from 5 to 10 feet and locally up to 15 feet deep bgs. Undocumented fills should be completely removed down to native soils. The unsuitable topsoil and weathered alluvium below the undocumented fill should also be removed.

The removal bottoms should be carefully reviewed to make sure there are no buried trash fills or utilities/structures left in place. The geotechnical consultant should review and geotechnically map the removal bottoms prior to placement of fill. The removal bottoms should be scarified, moisture-conditioned and recompacted prior to placement of compacted fill.

3.5 Slope Stabilization

Once a rough grading plan is available, the plan should be reviewed and slope stability analysis performed where applicable. For preliminary purposes and based on our knowledge of the subsurface conditions, including shear strengths of the alluvium and bedrock unit, we anticipate stabilization fill keys will be required for all cut slopes measuring 10 feet or higher. The perimeter of the site along Serrano Creek should be provided with a seismic shear key in order to remove the near-surface liquefiable soils and provide lateral support for the development.

Keyway excavations should be mapped and evaluated by the geotechnical consultant to verify the anticipated geologic conditions. The keyways and excavations should be evaluated and accepted by the geotechnical consultant prior to placement of the subdrain and/or backfill. The keyway excavations should be provided with proper subdrainage in accordance with the standard details in Appendix D.

The reworked onsite soils are anticipated to provide adequate strength for the gross stability of the proposed fill and replacement fill slopes of up to approximately 15 feet in height at 2H:1V inclinations or flatter. It should be noted that some of the onsite materials that will be used for compacted fill are clean granular material with very little cohesion. We recommend that the fill materials used for the outer 15 feet of slopes be constructed with earth materials that have some

cohesive characteristics to help reduce the potential for erosion during storm events. If cohesive earth materials are not available, then finished slopes should be protected against erosion by using deeply and extensively rooted plants, spray-on protective coverings, and/or other special protective erosion control measures. Slope faces should be compacted to a minimum 90 percent relative compaction.

Temporary slopes will be created by the backcuts for the recommended stabilization fills as well as for remedial removals. Backcuts will be up to 20 feet in height and should be designed with a slope ratio of 1.5H:1V to 2H:1V, except where constrained by existing improvements along the perimeter of the site. The actual stability of the backcuts will depend on many factors, including exposed earth materials, slope ratio, and amount of time the excavation remains exposed. Proper remedial measures should be provided to protect the adjacent properties in-place.

3.6 Protection of Existing Utilities

Existing utilities that are to remain undisturbed should be located and visually marked prior to grading operations. Grading and construction activities over the pipelines should be performed in accordance with the requirements of the pipeline owner. Stockpiling of soils over these lines should not be allowed without prior approval by the utility owner. Excavations adjacent to any pipeline easement should be performed with care, so as not to undermine or destabilize the adjacent ground. Operation of heavy equipment and crossings over these lines with heavy equipment should be in conformance with the appropriate utility company guidelines (e.g., fill ramps, plating, etc.).

3.7 Rippability and Placement of Oversize Material

The bedrock at the site includes locally dense cemented sandstone that will be difficult to rip. We anticipate that the bedrock will be rippable, though, potentially difficult at times (using D-8 and D-9 bulldozers) in the planned excavations (design cuts and remedial excavations less than 50 feet deep).

Local excavations within the bedrock cuts may produce oversize rock (greater than 8 inches in size) that will require special placement in the fill. Oversize rock may be placed in fills deeper than 10 feet, and a minimum of 2 feet below the deepest utilities within the streets. Placement of oversize material should be performed in accordance with our General Earthwork and Grading Specifications in Appendix D. Grading operations should be planned so that the fills deeper than 15 feet can accept oversize rock from the cuts.

3.8 Lot Overexcavation

Final overexcavation recommendations should be based on review of the rough grading plan, once individual lot layouts are determined. The proposed grading is anticipated to expose cut and fill transitions at finish grade throughout the site. Lots fully or partially exposing bedrock should be overexcavated to a minimum depth of 5 feet below design grade and replaced with compacted fill to provide a uniform fill cap over each lot. Lots exposing alluvium or slopewash near the cut and fill transition may be subject to deeper overexcavation depths to achieve the nearby remedial

removal depths for similar materials. Deeper lot overexcavation/capping (up to 10 feet) may also be recommended during grading if highly differing earth materials are encountered on a given lot, such as in areas where highly expansive clay beds are encountered in the sandstone.

3.9 Groundwater

Groundwater is generally relatively deep at the site and is not expected to be encountered during remedial earthwork and rough grading. Depending on the time of year grading occurs, nuisance water and local seepage may be present, which may require local dewatering (sump pumps) and/or placement of crushed rock to stabilize the removal bottoms prior to fill placement. Subdrains are should be placed in the backcuts of the stabilization keys, as shown in the standard details provided in Appendix D.

3.10 Liquefaction Potential

A portion of the site is located in a mapped liquefaction hazard zone (Figure 2), adjacent to Serrano Creek. Based on the known subsurface conditions and implementation of the remedial recommendations during rough grading including a seismic shear key, we anticipate the potential for liquefaction across the site to be low. The remainder of the site is not in a potential liquefaction hazard zone.

3.11 Settlement Potential

Recommended remedial removals (Section 3.4) will remove the majority of the potentially collapsible and/or more compressible near-surface alluvium, slopewash, undocumented fill and weathered bedrock materials. Design fill loading is on the order of 15 feet and locally up to 20 feet, over the existing ground surface. After remedial and rough grading is complete, we anticipate the remaining long-term consolidation settlement to be on the order of 1 to 2 inches and differential settlement to be on the order of ½ inch to 1 inch over a 30-foot span.

3.12 Surface Drainage and Slope Maintenance

Surface drainage should be carefully taken into consideration during all grading, landscaping, and building construction. Positive surface drainage should be provided to direct surface water away from structures and slopes and toward the street or suitable drainage devices. Ponding of water adjacent to the structures should not be allowed. Paved areas should be provided with adequate drainage devices, gradients, and curbing to reduce run-off flowing from paved areas onto adjacent unpaved areas.

To reduce the erosion and slumping potential of the graded slopes, all permanent manufactured slopes should be protected from erosion by planting with appropriate vegetation or suitable erosion protection should be applied as soon as is practical. Proper drainage should be designed and maintained to collect surface waters and direct them away from slopes. The maintenance program should take into account the granular, more erodible nature of the soils that are likely to be present at the slope face at the completion of grading. Consideration should be given to the use of spray-on protective products and frequent use of straw waddles or other temporary runoff

control devices immediately after slopes are constructed. In addition, the design and construction of permanent improvements and landscaping should also provide appropriate mitigation measures for sandy soils. A rodent-control program should be established and maintained as well, to reduce the potential for damage related to burrowing.

3.13 Preliminary Feasibility of Infiltration

Our subsurface investigation within the site exposed mostly fine grained soils in the upper 20 feet throughout the site. Remedial and design earthwork will leave the site with a compacted fill blanket ranging from 5 to 35 feet thick overlying bedrock and alluvium. The historic high groundwater (i.e., design groundwater table) for the site is approximately 20 feet bgs. Infiltration systems are required to infiltrate no deeper than 10 feet above this design groundwater table. As such, the potential zones for infiltration across this site extremely limited, and is not likely feasible.

3.14 Future Geotechnical Review and Engineering Analysis

The geotechnical consultant should review future rough, improvement, precise grading plans and construction plans in light of the site-specific geotechnical conditions. Additional engineering analysis related to slope stability, remedial measures, liquefaction and settlement potential, expansive and corrosive soil characteristics should be performed based on the rough grading plan and finish design profile. This additional geotechnical analysis will be required to provide project-specific recommendations for rough and remedial grading, design of structures, and other improvements.

4.0 LIMITATIONS

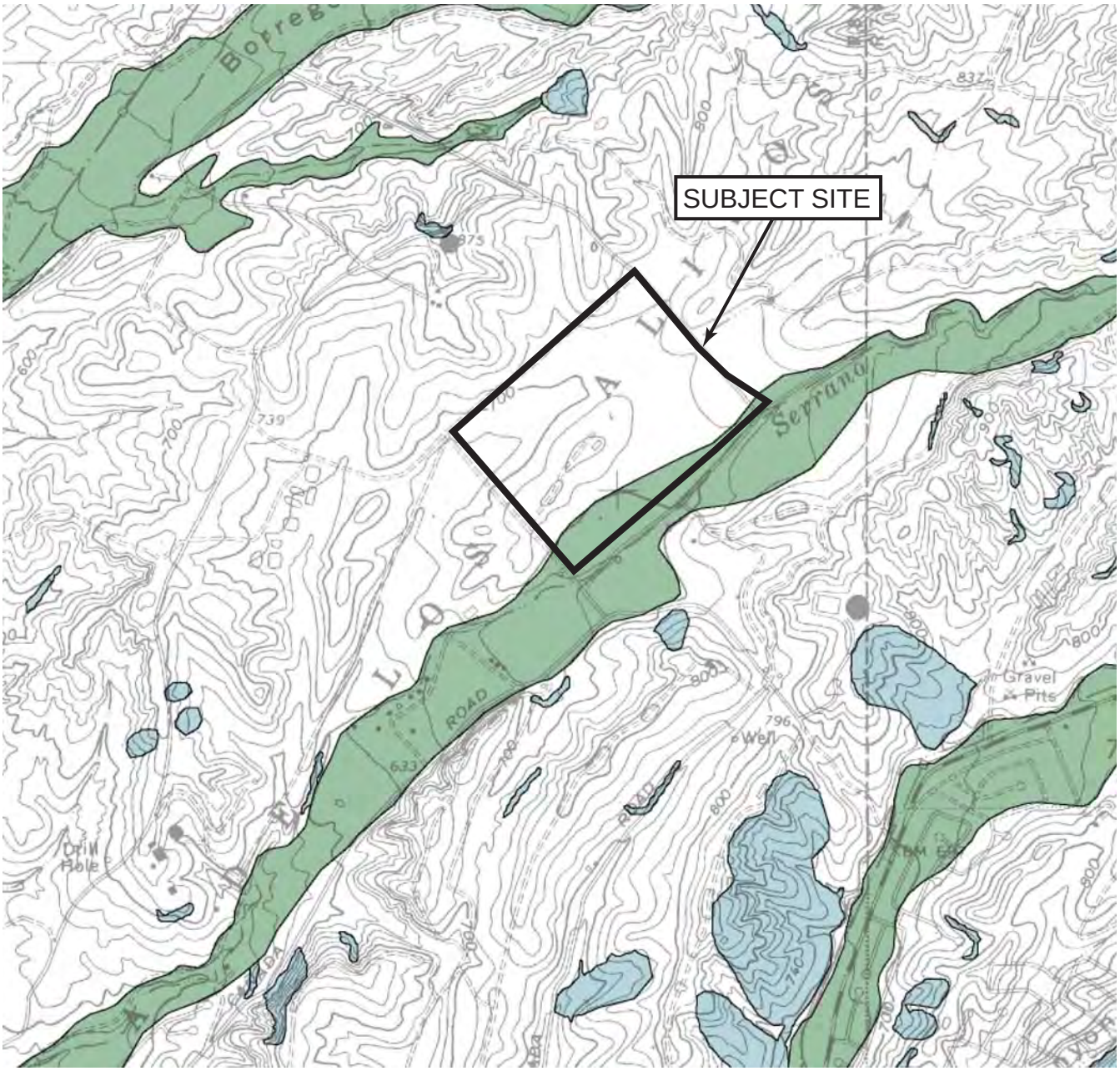
This report has been prepared for the exclusive use of our client, Toll Brothers Inc., based on the specific scope of services requested by Toll Brothers, Inc. for the Nakase Nursery project described herein. This report or its contents should not be used or relied upon for other projects or by other parties without the consent of NMG and the involvement of a geotechnical professional. The means and methods used by NMG for this study are based in part on local geotechnical standards of practice, care, and requirements of governing agencies. No warranty or guarantee, express or implied is given.

The findings, conclusions, and recommendations are professional opinions based on interpretations and inferences made from geologic and engineering data from specific locations and depths, observed or collected at a given time. By nature, geologic conditions can vary from point to point, can be very different in between points, and can also change over time. Grading and other project plans also are still being developed. Therefore, our conclusions and recommendations are by nature preliminary and are subject to verification and possible modification as plans develop.

Inherently, geotechnical recommendations are also preliminary until the geotechnical consultant observes and tests exposed subsurface conditions during grading and construction. The recommendations in place at that time are subject to modification at the discretion of the geotechnical consultant depending upon exposed geotechnical conditions.

Base Map: Google Earth, 2016

SITE LOCATION MAP	Project Number: 16098-01 By: WG Project Name: Toll Brothers / Lake Forest Nursery Date: 7/13/2018 Figure 1	NMG Geotechnical, Inc.



Liquefaction

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

Earthquake-Induced Landslides

Areas where previous occurance of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

BASE: DIVISION OF MINES AND GEOLOGY SEISMIC HAZARDS MAP,
EL TORO QUADRANGLE
Dated: Jan. 17, 2001

N

SEISMIC HAZARDS MAP	Project Number: 16098-01 By: WG Project Name: Toll Brothers / Lake Forest Nursery Date: 7/13/2018 Figure 2	NMG Geotechnical, Inc.

APPENDIX A

APPENDIX A

REFERENCES

California Division of Mines and Geology, 1973, Geo-Environmental Maps of Orange County, California, Preliminary Report 15.

California Division of Mines and Geology, 1981, Geologic Map of Orange County, California, Showing Mines and Mineral Deposits, Bulletin 204, Plate 1.

California Department of Conservation, Division of Mines and Geology (CDMG), 1997, Guidelines for Evaluation and Mitigating Seismic Hazards in California, Special Publication 117.

California Division of Mines and Geology, 1999, Fault-Rupture Hazard Zones in California, Special Publication 42, Revised 1997, 1 and 2 added 1999.

California Division of Mines and Geology, 2000, Seismic Hazard Evaluation of the El Toro 7.5-Minute Quadrangle, Orange County, California, SHZR 047.

California Division of Mines and Geology, 2001, Seismic Hazard Zones Map for the El Toro Quadrangle, Official Map, Released January 17, 2001.

Campbell, 1993, "Empirical Prediction of Near-Source Ground Motion From Large Earthquakes," Proceedings, International Workshop on Earthquake Hazard and Large Dams in the Himalaya Sponsored by the Indian National Trust for Art and Cultural Heritage (INTACH), New Delhi, India, January 15-16.

Fife, D.L., 1974, Geology of the South Half of the El Toro Quadrangle, Orange County, California, California Division of Mines and Geology Special Report 110.

Hart, E. W. and Bryant, W.A., 2007, Fault Rupture Hazard Zones in California, Alquist Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault zones Maps, Department of Conservation, Division of Mines and Geology, Special Publication 42, Revised 1997, Interim Revision 2007.

Jennings, C. W., 1994, Fault Activity Map of California and Adjacent Areas, with Locations and Ages of Recent Volcanic Eruptions, California Department of Conservation, Division of Mines and Geology, Geologic Data Map No. 6.

Morton, P. K., Miller, R. V., and Evans, J. R., et. al. 1976, Environmental Geology of Orange County, California, California Division of Mines and Geology, Open-File Report 79-8 LA.

Morton, P. K. and Miller, R. V., 1981, Geologic Maps of Orange County, California, showing Mines and Mineral Deposits, California Division of Mines and Geology, Bulletin 204.

NMG Geotechnical, Inc., 2017, Geotechnical Evaluation of Proposed Residential and School Site Development, Nakase Property, Lake Forest, California, Project No 16098-01, dated April 19, 2017.

Norcal Engineering, 1999, Report of Geotechnical Observation and Testing Of Precise Grading Operations, Proposed Home Depot Development, 2021 Lake Forest Drive, Lake Forest, California, Project Number 7563-98, October 20, 1999.

Rogers, T.H., 1965, Geologic Map of California, Olaf P. Jenkins Edition, Santa Ana Sheet, fourth printing 1978.

APPENDIX A

REFERENCES (Continued)

Schoellhamer, J.E., Kinney, D.M., Yerkes, R.F., and Vedder, J.G., 1954, Geologic Map of the Northern Santa Ana Mountains, Orange and Riverside Counties, California: U.S. Geol. Survey Oil and Gas Inv. Map OM-154.

Schoellhamer, J.E., Vedder, J.G., Yerkes, R.F., and Kinney, D.M., 1981, Geology of the Northern Santa Ana Mountains, California, USGS Professional Paper 420-D.

Southern California Earthquake Center (SCEC), University of Southern California, 1999, Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Liquefaction Hazards in California, dated March 1999.

Tan, S. S., Miller, R. V., Fife, D.L., 1984, Engineering Geology of the North Half of the El Toro Quadrangle, Orange County, California: California Division of Mines and Geology Open File Report 84-28.

U.S. Department of Agriculture, Soil Conservation Service and Forest Service, September, 1978, Soil Survey of Orange County and Western Part of Riverside County, California.

U. S. Geological Survey, 1981, Geology of the Northern Santa Ana Mountains, California; by Schoellhammer, Vedder, Yerkes and Kinney, U.S. Geological Survey, Professional Paper 420-D, 1981.

U.S. Geological Survey, 2017, Unified Hazard Tool, Dynamic: Conterminous US 2008 (v3.3.1) Deaggregation Program; web site address: https://earthquake.usgs.gov/hazards/interactive/

AERIAL PHOTOGRAPHS REVIEWED

Date	***Flight***	***Photograph No.***	***Scale***	***Source***
12/12/1952	AXK	35-37, 74-76		Continental
3/28/1959	261-726	139-142		Continental
9/20/1965	AXK 1FF	73	1:20,000	Continental
3/30/1967	2	105, 106, 132, 133		Continental
7/19/1971	ASL 94	39, 40	1:24,000	Continental
11/21/1972	72202	232, 233		Continental
10/29/1973	132-10	10, 11		Continental
1/13/1975	157	11-14,15 12-15, 16		Continental
1/24/1977	181-11	17, 18		Continental
12/18/1978	203	11-22, 23, 12-23, 24		Continental
2/25/1980	80033	159-161	1"=2,000'	Continental
1/31/1981	211	12-15,16		Continental
4/8/1983	218	12-17, 18	1"=2,000'	Continental
7/26/1988	C-3	205, 206		Continental
1/20/1992	685-11	8, 9	1"=2,000'	Continental
2/2/1993	C89-9	36, 37	1"=2,000'	Continental
1/28/1995	G102-39	97-99	1"=2,000'	Continental
9/11/1997	C116-39	20-23	1"=2,000'	Continental
3/2/1999	C-135-39	155-157	1"=2,000'	Continental
1946-2005	--	--	--	Historic Aerials.com
1994-2009	--	--	--	Google Earth

APPENDIX B

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	9/3/16	Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California		
Approximate Groundwater Depth:	22.5 Feet		
Comments			

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Sheet 1 of 3

Total Depth Drilled (ft)	55.7
Approximate Ground Surface Elevation (ft)	687.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	Surface: Nursery **Artificial Fill, Undocumented (Afu)**			
						SM	**Alluvium (Qal)**			
	5		D-1	18			@ 5': Light olive brown silty fine to medium SAND, moist, medium dense, trace caliche, trace gravel.	8.1	114.1	DS
680										
	10		D-2	19			@ 10': Pale yellow brown silty fine to medium SAND, moist, medium dense, trace silty layering.	4.6	112.3	
	15		D-3	18		SP	@ 15': Light brown fine to medium SAND, moist, medium dense, trace fine to coarse gravel.	11.4	97.9	
670						SC	Tip: Brown clayey fine SAND, very moist, stiff.			
	20		D-4	21		SM	@ 20': Light olive brown silty fine SAND, saturated, medium dense, micaceous.	20.0	107.4	
	25									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25		D-5	58		SM-SC	@ 25': Olive silty/clayey fine to medium SAND, saturated, very dense, micaceous.	15.6	115.2	
660										
	30						Very hard drilling, cobbles.			
	35		D-6	27			@ 35': Olive silty/clayey fine to medium SAND, saturated, medium dense, weathered bedrock look, fractures/cracks infilled with clayey soil, pinhole pores.	20.4	105.0	
650										
	40									
	45		D-7	37		SM	@ 45': Olive silty fine SAND, saturated, very dense, micaceous.	21.0	106.6	
640										
	50		D-8	50/1"		SM	**Capistrano Formation, Oso Member (Tco)** @ 50': No Recovery.			

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	55	D-9	SB-1	50/4" 50/4"			@ 55': No Recovery. @ 55.3': Greenish gray to olive silty fine to medium SANDSTONE, saturated, hard, micaceous.			
630										
							Notes: Total Depth: 55.7 Feet. Groundwater Encountered at 22.5 Feet After 15 Minutes. Backfilled With Cuttings and Tamped.			
	60									
	65									
620										
	70									
	75									
610										
	80									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	9/3/16	Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California, Bulk		
Approximate Groundwater Depth:	37.6 Feet		
Comments			

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Sheet 1 of 3

Total Depth Drilled (ft)	55.3
Approximate Ground Surface Elevation (ft)	712.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM-SC	Surface: Nursery **Artificial Fill, Undocumented (Afu)**			
710			B-1							B-1 @ 0'-5' AL, DS, MD
	5		D-1	8			@ 5': Dark brown silty/clayey SAND, moist, medium dense, mottled, trace mica, trace pinhole pores.	11.4	111.5	
	10		D-2	50			@ 10': Upper: Dark brown silty/clayey fine SAND, moist, very dense, mottled.	3.0		Sample Disturbed
700						GP	**Alluvium (Qal)** Lower: Brown fine to coarse sandy GRAVEL, damp, very dense, sub-angular meta-volcanic clasts, friable.			
	15		D-3	19		SP	@ 15': Pale yellow fine to coarse SAND, damp, medium dense, highly friable, trace fine gravel.	3.5	108.3	CN
	20		D-4	13			@ 20': Pale yellow fine to coarse SAND, damp, medium dense, highly friable, fine to medium gravel.	3.2	112.3	
690			B-2			SM	Tip: Light olive brown silty fine sand, moist, medium dense.			B-2 @ 20'-25'
	25									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25		D-5	18		SM	@ 25': Light olive brown silty fine SAND, moist, medium dense, trace mica, slightly friable, trace fine gravel.	14.0	106.0	
	30		D-6	23		SM-SC	@ 30': Olive brown silty/clayey fine SAND, very moist, medium dense, pinhole pores, trace mica, caliche.	17.9	110.6	
680										
	35		D-7	13		SP	@ 35': Upper: Pale yellow fine to medium SAND, saturated, medium dense, friable, black MnO staining.	41.2	79.2	
						CL	Lower: Light olive brown silty CLAY, saturated, stiff, pinhole pores, root stains, micaceous. ▼			
	40		D-8	18		SM-SC	@ 40': Upper: Dark brown silty/clayey fine SAND, saturated, medium dense, pinhole pores.	19.1	109.0	
670						SM	**Capistrano Formation, Oso Member (Tco)** Tip: Yellow brown silty fine to medium SANDSTONE. @ 42': Very hard drilling			
	45									
	50		D-9	50/5"			@ 50': Olive brown silty fine to coarse SAND, saturated, very dense, weathered.	16.6	113.0	
660										

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	55	■ D-10	50/4"			@ 55': Olive brown silty fine to coarse SAND, saturated, very dense.	12.3	121.6	
	60								
650									
	65								
	70								
640									
	75								
	80								
630									

Notes:
Total Depth: 55.3 Feet.
Groundwater Encountered at 37.6 Feet After 10 Minutes.
Backfilled With Cuttings and Tamped.

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	9/3/16	Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California, Bulk		
Approximate Groundwater Depth:	44.6 Feet		
Comments			

B- 3

Sheet 1 of 2

Total Depth Drilled (ft)	51.5
Approximate Ground Surface Elevation (ft)	722.5 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	Surface: Nursery **Artificial Fill, Undocumented (Afu)**			
720			B-1							B-1 @ 0'-5'
	5		D-1	4		SM	**Alluvium (Qal)** @ 5': Brown silty fine SAND, moist, loose, mica, friable.	8.5	101.5	CN
	10		D-2	26		SP	@ 10': Pale yellow brown gravelly fine to coarse SAND, damp, medium dense, friable, subangular clasts.	1.9	109.0	
710										
	15		D-3	23		SM	@ 15': Light brown silty fine SAND, moist, medium dense, caliche, trace pinhole pores, trace gravel (Oso member).	13.3	112.2	DS
	20		D-4	26		SM-SC	@ 20': Light brown silty/clayey fine SAND, moist, medium dense, caliche, trace pinhole pores.	17.5	107.6	
700										
	25									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25		D-5	22		SM-SC	@ 25': Light brown silty/clayey fine SAND, moist, medium dense, caliche, trace pinhole pores.	20.9	102.9	
	30		D-6	22		ML	@ 30': Brown SILT, very moist, stiff, micaceous, powdery texture.	26.5	95.2	CN
690										
	35		D-7	16		SM	@ 35': Upper: Olive gray silty fine SAND, very moist, medium dense, micaceous, pinhole pores.	8.1	104.2	
						SC	Lower: Brown clayey SAND, very moist, medium dense, micaceous.			
	40		D-8	27		ML-CL	@ 40': Brown sandy SILT/CLAY, saturated, very stiff, micaceous, pinhole pores, caliche.	29.5	95.8	
						SM	Tip: Gray silty fine to medium SAND, saturated, medium dense.			
680							▼			
	45		D-9	28		SP	@ 45': Upper (Not in Sample): Yellow brown fine to coarse SAND, saturated, medium dense, friable.	26.3	99.0	
						SM-SC	Lower (In Sample): Gray brown silty/clayey fine SAND, saturated, medium dense.			
						CL	Tip: Brown sandy CLAY, saturated, very stiff.			
	50		D-10	57		SP	@ 50': Pale yellow brown fine to coarse SAND, saturated, very dense, friable, trace fine to coarse gravel.	16.5	113.0	
670							Notes: Total Depth: 51.5 Feet. Groundwater Encountered at 44.6 Feet After 15 Minutes. Backfilled with Cuttings and Tamped.			

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	9/3/16	Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California, Bulk		
Approximate Groundwater Depth:	44.6 Feet		
Comments			

B- 4

Sheet 1 of 2

Total Depth Drilled (ft)	51.5
Approximate Ground Surface Elevation (ft)	717.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0		B-1			SC	Surface: Nursery **Artificial Fill, Undocumented (Afu)**			
	5		D-1	34			@ 5': Brown clayey fine to coarse SAND, very moist, medium dense.	12.5	125.4	
710										
	10		D-2	14		SM-SC	**Alluvium (Qal)** @ 10': Upper (Not in Sample): Light brown silty/clayey SAND, moist, medium dense.	4.4	105.5	CN
						SP	Lower (In Sample): White fine to coarse SAND, moist, medium dense, friable.			
	15		D-3	26		SC	@ 15': Upper: Brown clayey fine to coarse SAND, moist, medium dense.	13.8	108.3	
						SM	Lower: Brown fine to coarse silty SAND, moist, medium dense, friable. Tip: Silty fine to coarse SAND with trace clayey lense.			
700										
	20		D-4	36		SP	@ 20': White fine to coarse SAND, moist, medium dense, highly friable, trace mica.	5.0	101.0	
	25									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25		D-5	12		SC	@ 25': Dark brown clayey fine to coarse SAND, very moist to wet, medium dense, pinhole pores, confining layer?	14.2	116.6	
690										
	30		D-6	16			@ 30': Dark brown clayey fine to coarse SAND, very moist to wet, medium dense, pinhole pores, trace FeO staining.	17.6	108.1	
	35		D-7	67		SM-SC	@ 35': Dark brown silty/clayey fine to medium SAND, wet, very dense, pinhole pores, trace FeO staining.	12.4	121.9	
680										
	40		D-8	62			@ 40': Dark brown silty/clayey fine to medium SAND, wet, very dense, pinhole pores, trace FeO staining.	11.6	121.5	
	45		D-9	48		SM	@ 45': Light olive brown silty fine to medium SAND, saturated, very dense, micaceous.	14.9	116.7	
670										
	50		D-10	64		SM	**Capistrano Formation, Oso Member (Tco)** @ 50': White medium to coarse SANDSTONE, saturated, very dense, friable, trace fine gravel.	12.0	118.1	
							Notes: Total Depth: 51.5 Feet. Groundwater Encountered at 44.6 Feet After 7 Minutes. Backfilled with Cuttings and Tamped.			

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	9/3/16	Logged By	TBF
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California		
Approximate Groundwater Depth:	30.7 Feet		
Comments			

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Sheet 1 of 2

Total Depth Drilled (ft)	51.5
Approximate Ground Surface Elevation (ft)	691.8 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	Surface: Nursery **Artificial Fill, Undocumented (Afu)**			
690			B-1							B-1 @ 0-'5'
	5		D-1	12			@ 5': Upper: Gray to olive silty fine SAND, damp, loose.	7.0	116.6	
						SC	Lower: Dark brown to black clayey fine to coarse SAND, damp, loose,			
	10		D-2	27		SC-CL	**Alluvium (Qal)** @ 10': Brown clayey fine SAND/fine sandy CLAY, very moist, medium dense/very stiff, caliche.	18.2	108.8	DS
680			B-2							B-2 @ 10'-15' DS, MD, AL, GS
	15		D-3	15		SM	@ 15': Upper: Light brown silty fine SAND, loose, very moist, micaceous.	25.4	98.6	CN
						CL	Lower: Black fine sandy CLAY, stiff, very moist.			
	20		D-4	12		SC	@ 20': Light brown slightly clayey fine to coarse SAND, moist, loose.	17.6	107.3	
670										
	25									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25		D-5	50		SM	@ 25': Light brown slightly silty fine SAND, moist, dense.	8.7	116.5	
	30		D-6	20		SC	@ 30': Grayish brown clayey fine to coarse SAND, wet, medium dense.	18.7	110.7	
660										
	35		D-7	29		SP	**Capistrano Formation, Oso Member (Tco)** @ 35': Light brown fine to medium SANDSTONE, wet, medium dense, friable.	18.4	106.4	
	40		D-8	71/5"			@ 40': Light brown fine to medium SANDSTONE, wet, dense, friable.	21.0	106.7	
650										
	45									
	50		D-9	65			@ 50': Upper: Light brown fine to medium SANDSTONE, wet, dense, friable.	19.2	108.8	
						SM	Lower: Brown silty fine SANDSTONE, wet, dense.			
640							Notes: Total Depth: 51.5 Feet. Groundwater Encountered at 30.7 Feet After 20 Minutes. Backfilled with Cuttings and Tamped.			

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	9/3/16	Logged By	TBF
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California		
Approximate Groundwater Depth:	43.3 Feet		
Comments			

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Sheet 1 of 2

Total Depth Drilled (ft)	51.5
Approximate Ground Surface Elevation (ft)	719.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SC	Surface: Nursery **Artificial Fill, Undocumented (Afu)**			
			B-1							B-1 @ 0'-5' DS, GS, MD, AL
	5		D-1	12			@ 5': Upper: Black clayey SAND, moist, loose.	12.7	116.6	
						SC	**Alluvium (Qal)** Lower: Strong brown clayey SAND, damp, loose, micaceous.			
710										
	10		D-2	17		SM-ML	@ 10': Light brown silty fine SAND/fine sandy SILT, moist, medium dense/stiff.	23.4	96.3	
			B-2							B-2 @ 10'-15'
	15		D-3	14		SM	@ 15': Light brown silty, slightly clayey fine SAND, moist, loose, trace fine sub-angular to sub-rounded gravel.	11.3	113.5	CN
700										
	20		D-4	17		SC	@ 20': Light brown clayey fine-medium SAND, moist, medium dense.	18.3	105.2	
	25									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25		D-5	35		SP	@ 25': Light brown fine to coarse SAND, damp to moist, trace sub-angular/sub-rounded fine gravel, friable.	3.5	109.5	
690										
	30		D-6	43			@ 30': White fine to coarse SAND, damp to moist, medium dense, friable.	3.6	105.8	
	35		D-7	21		SM	@ 35': Upper: White silty fine to coarse SAND, moist to very moist, medium dense.	19.1	100.7	
						CL	Lower: Dark brown silty CLAY, very moist, stiff, micaceous.			
680										
	40		D-8	22			@ 40': Black silty CLAY, very moist to wet, stiff.	28.0	95.1	
	45		D-9	32		SM	@ 45': Grayish brown silty fine to coarse SAND, saturated, medium dense, micaceous.	17.7	109.7	
670										
	50		D-10	33		CL	@ 50': Upper: Black to brown fine sandy CLAY, saturated, very stiff.	15.6	110.0	
						SM	Lower: Pale brown silty fine to coarse silty SAND, saturated, medium dense.			

Notes:
Total Depth: 51.5 Feet.
Groundwater Encountered at 43.3 Feet After 15 Minutes.
Backfilled With Cuttings and Tamped.

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	12/12/17	Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California		
Approximate Groundwater Depth:	No Groundwater Encountered		
Comments			

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Sheet 1 of 2

Total Depth Drilled (ft)	25.5
Approximate Ground Surface Elevation (ft)	694.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					CL	**Artificial Fill, Undocumented (Afu)** Surface: Gravel Road Base. Yellowish brown sandy silty CLAY, moist, stiff, few pebbles.			
690			D-1	19		SM-SC	@ 2.5': Mottled brown to olive silty/clayey fine SAND, moist, medium dense.	6.6	116.2	
	5		D-2	37			@ 5': Mottled brown to light olive brown silty/clayey fine to coarse SAND, moist, medium dense.	11.0	123.0	
			D-3	27		SM-SC	**Slopewash Material (Qsw)** @ 7.5': Yellowish brown silty/clayey fine to medium SAND, moist, medium dense, trace pinhole pores, ~2" diameter well-rounded gravel in upper rings.	12.2	114.4	
	10		D-4	26		SC	@ 10': Dark yellowish brown clayey fine to coarse SAND, moist, medium dense, pedogenic surfaces.	13.6	115.1	
680						SM	**Capistrano Formation, Oso Member (Tco)** Tip: Pale olive silty fine SANDSTONE, moist, medium dense, micaceous.			
	15		D-5	90/9"			@ 15': Pale olive silty fine to medium SANDSTONE, moist, very dense, micaceous, trace FeO stained.	7.1	107.9	
	20		D-6	50/6"			@ 20': Pale olive silty fine to medium SANDSTONE, moist, very dense, micaceous, trace FeO stained.	10.6	106.5	
670	25									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25		D-7	50/6"		SM	@ 25': Light olive gray silty fine to medium SANDSTONE, moist, very dense, friable, micaceous, FeO stained.	7.4	113.6	
							Notes: Total Depth: 25.5 Feet. No Groundwater Encountered. Backfilled with Cuttings and Tamped.			
	30									
660										
	35									
	40									
650										
	45									
	50									
640										

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	12/12/17	Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California		
Approximate Groundwater Depth:	No Groundwater Encountered		
Comments			

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Sheet 1 of 2

Total Depth Drilled (ft)	25.5
Approximate Ground Surface Elevation (ft)	704.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					CL	**Artificial Fill, Undocumented (Afu)** Surface: Gravel Road Base. Yellowish brown sandy silty CLAY, moist, stiff, few pebbles.			
700										
	5		D-1	10		SM	**Slopewash Material (Qsw)** @ 5': Very dark grayish brown silty fine SAND, moist, loose to medium dense, trace FeO stained.	7.8	109.9	
			D-2	36		SM-SC	@ 7.5': Yellowish brown silty/clayey fine SAND, moist, medium dense, micaceous, trace pinhole pores.	12.1	118.8	
	10		D-3	33			@ 10': Yellowish brown silty/clayey fine SAND, moist, medium dense, micaceous.	11.9	118.1	
690										
	15		D-4	19		SM	@ 15': Yellowish brown silty fine to medium SAND, moist, medium dense, sugary appearance, slightly friable.	11.8	105.4	
	20		D-5	77/11"		SM	**Capistrano Formation, Oso Member (Tco)** @ 20': Light brownish gray silty fine SANDSTONE, moist, very dense, micaceous, MnO stained.	11.9	119.4	
680										
	25									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25	■	D-6	50/6"		SM	@ 25': Gray silty fine SANDSTONE, moist, very dense, micaceous, MnO stained.	11.1	104.1	
							Notes: Total Depth: 25.5 Feet. No Groundwater Encountered. Backfilled with Cuttings and Tamped.			
	30									
670										
	35									
	40									
660										
	45									
	50									
650										

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	12/12/17	Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California, Bulk		
Approximate Groundwater Depth:	No Groundwater Encountered		
Comments			

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Sheet 1 of 2

Total Depth Drilled (ft)	31.5
Approximate Ground Surface Elevation (ft)	716.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	**Artificial Fill, Undocumented (Afu)** Surface: Gravel Road Base. @ 1': Dark brown clayey SAND with gravel, moist.			
						SM-SC	**Alluvium (Qal)**			
	5		D-1	9			@ 5': Brown to dark brown silty/clayey fine SAND, moist, loose, pinhole pores, micaceous.	10.8	111.2	
710			B-1							
			D-2	10		SM	@ 7.5': Brown silty fine to medium SAND, moist, loose to medium dense, trace pinhole pores, caliche stringers, slightly micaceous.	6.1	109.1	B-1 @ 5'-10'
	10		D-3	12		ML-CL	@ 10': Upper: Light brown SILT/CLAY, moist, stiff, pinholes pores, abundant caliche stringers.	16.0	103.2	
						SP-SM	Lower: Very pale brown silty fine to medium SAND, moist, loose to medium dense, friable, trace gravel <1" in diameter.			
	15		D-4	8		SM	@ 15': Light yellowish brown silty fine to medium SAND, moist, loose, caliche stringers, trace pinhole pores, trace gravel <0.5" in diameter, micaceous.	10.0	106.2	
700										
	20		D-5	11		SM-SC	@ 20': Brown silty/clayey fine to medium SAND, moist, loose to medium dense, pinhole pores, caliche stringers, micaceous.	14.3	108.8	
						CL	Tip: Brown silty CLAY, moist, stiff, abundant caliche, pinhole pores.			
	25									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25					SM-ML	@ 25': Upper (Not in Sample): Grayish brown silty fine SAND/sandy SILT, moist, medium dense/stiff, pinhole pores, caliche, micaceous.	12.8	104.9	
690			D-6	15		SM-SC	Lower: Grayish brown silty/clayey fine SAND, moist, medium dense, pinhole pores, trace caliche, micaceous.			
	30		D-7	16		SP-SM	@ 30': Light yellowish brown silty fine to coarse SAND, moist, medium dense, trace subangular gravel ~1" in diameter, trace caliche.	10.7	99.2	
						ML	Tip: Gray SILT, moist, stiff, caliche, pinhole pores.			
							Notes: Total Depth: 31.5 Feet. No Groundwater Encountered. Backfilled with Cuttings and Tamped.			
	35									
680										
	40									
	45									
670										
	50									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	12/12/17	Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California, Bulk		
Approximate Groundwater Depth:	No Groundwater Encountered		
Comments			

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Sheet 1 of 2

Total Depth Drilled (ft)	25.8
Approximate Ground Surface Elevation (ft)	717.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					CL	**Artificial Fill, Undocumented (Afu)** Surface: Graded Road Base. Very dark brown to black silty CLAY, moist, medium stiff.			
						CL	**Alluvium (Qal)**			
	5		D-1	17			@ 5': Very dark brown to black silty CLAY, moist, stiff, trace root hairs, trace gravel.	17.7	109.6	
710			B-1							B-1 @ 5'-10'
	10		D-2	13		SM	@ 10': Light olive brown silty fine SAND, moist, medium dense, caliche stringers, pinhole pores, micaceous.	11.8	114.7	
	15		D-3	33		SC	@ 15': Light olive brown clayey fine to coarse SAND, moist, medium dense, micaceous.	11.8	118.7	
700										
	20		D-4	22		SM	**Capistrano Formation, Oso Member (Tco)** @ 20': Pale brown to light gray silty fine to coarse SANDSTONE, moist, medium dense, micaceous, friable, slightly weathered.	7.8	113.3	
	25									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25		D-5	80/10"		SM	@ 25': Pale yellow silty fine to coarse SANDSTONE, moist, very dense, friable, micaceous.	6.8	113.7	
690							Notes: Total Depth: 25.8 Feet. No Groundwater Encountered. Backfilled with Cuttings and Tamped.			
	30									
	35									
680										
	40									
	45									
670										
	50									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	12/18/17	Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California		
Approximate Groundwater Depth:	No Groundwater Encountered		
Comments			

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Sheet 1 of 2

Total Depth Drilled (ft)	36.5
Approximate Ground Surface Elevation (ft)	716.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SC	Surface: Gravel Road Base. **Artificial Fill, Undocumented (Afu)** Yellowish brown clayey fine to coarse SAND, moist, loose.			
						SC	**Alluvium (Qal)**			
710	5		D-1	6			@ 5': Yellowish brown clayey fine to coarse SAND, moist, loose, pinhole pores, caliche.	9.1	108.5	
	10		D-2	16		SM	@ 10': Brown silty fine SAND, moist, medium dense, some caliche stringers, pinhole pores, micaceous.	16.5	106.7	
700	15		D-3	16		SM-SC	@ 15': Brown silty/clayey fine SAND, moist, medium dense, trace caliche and pinhole pores.	9.5	115.8	
	20		D-4	12		SP	@ 20': Light yellowish brown fine to coarse SAND, damp, loose/medium dense, friable, pinhole pores, micaceous, upper rings were slightly silty.	2.4	103.5	
						SC-CL	Tip: Brown clayey fine SAND/sandy CLAY, damp, loose/medium stiff.			
	25									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25					SM-SC	@ 25': Light brown silty/clayey fine to medium SAND, moist, medium dense, few pinhole pores, caliche stringers.	11.3	115.8	
690			D-5	14						
	30					SP	@ 30': Pale yellow fine to medium SAND, damp, medium dense, friable, MnO stained, micaceous.	3.2	104.1	
			D-6	40						
	35					ML	@ 35': Upper (Not in Sample): Light brown very fine sandy SILT, moist, very stiff, micaceous.	7.3	118.3	
680			D-7	24		SC	Lower: Brown clayey fine to coarse SAND, moist, medium dense, micaceous.			
							Notes: Total Depth: 36.5 Feet. No Groundwater Encountered. Backfilled with Cuttings and Tamped.			
	40									
	45									
670										
	50									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	12/12/17	Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California, Bulk		
Approximate Groundwater Depth:	No Groundwater Encountered		
Comments			

B-12

Sheet 1 of 2

Total Depth Drilled (ft)	30.4
Approximate Ground Surface Elevation (ft)	736.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	Surface: Dirt Road. **Capistrano Formation, Oso Member (Tco)**			
730	5		D-1	85/9"			@ 5': White to pale yellow silty fine to medium SANDSTONE, moist, very dense, micaceous, friable.	4.8	109.8	
	10		D-2	80/9"			@ 10': White to pale yellow silty fine SANDSTONE, moist, very dense, micaceous, friable.	10.5	107.7	
720	15		B-1							B-1 @ 10'-20'
	20		D-3	50/4"			@ 20': White to pale yellow silty fine SANDSTONE, moist, very dense, micaceous, friable.	6.5	101.6	
			B-2							B-2 @ 20'-30'
	25									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25									
710			B-2							B-2 @ 20'-30'
	30		D-4	50/5"		SM	@ 30': White to pale yellow silty fine SANDSTONE, moist, very dense, micaceous, friable.	6.9	103.3	
							Notes: Total Depth: 30.4 Feet. No Groundwater Encountered. Backfilled with Cuttings and Tamped.			
	35									
700										
	40									
	45									
690										
	50									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled		Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California		
Approximate Groundwater Depth:			
Comments			

B-13

Sheet 1 of 2

Total Depth Drilled (ft)	40.0
Approximate Ground Surface Elevation (ft)	750.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
750	0									
	5		D-1							
740	10		D-2							
	15									
730	20		D-3							
	25									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
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NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25									
720	30		D-4							
	35									
710	40		D-5							
	45									
700	50									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	12/18/17	Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California		
Approximate Groundwater Depth:	25.3 Feet		
Comments			

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Sheet 1 of 2

Total Depth Drilled (ft)	35.5
Approximate Ground Surface Elevation (ft)	735.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					CL	**Artificial Fill, Undocumented (Afu)** Surface: Gravel Road Base.			
							Alluvium (Qal) Pale olive to brown sandy CLAY, very moist, medium stiff.			
730	5		D-1	12			@ 5': Pale olive to brown sandy CLAY, very moist, medium stiff, caliche stringers, trace pinhole pores, micaceous.	18.6	104.7	
	10		D-2	11		SM-SC	@ 10': Brown silty/clayey fine SAND, moist, loose to medium dense, some pencil-tip pores and pinhole pores, caliche, micaceous.	11.4	112.0	
720	15		D-3	50		SC	@ 15': Brown clayey/gravelly fine to coarse SAND, moist to very moist, dense, gravel in tip and lower rings, trace pinhole pores.	12.9	123.0	
						GP-GC	@ 17': Rig chatter, possible gravel layer.			
	20		D-4	66/10"		SM	@ 20': Yellowish brown clayey fine to medium SAND, moist to very moist, very dense.	13.9	113.8	
						GC	Tip: Yellowish brown sandy/clayey gravel.			
710	25									

LOG OF BORING

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NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
710	25		D-5	27		SM-SC	@ 25': Upper (Not in Sample): Pale yellow silty/clayey fine SAND, saturated, medium dense.	23.7	99.7	
						CL	Lower: Pale yellow CLAY, saturated, very stiff, caliche pinhole pores.			
	30		D-6	70/10"		SC-GC	@ 30': Dark yellowish brown clayey medium to coarse SAND/clayey GRAVEL, saturated, very dense, micaceous, gravel is subangular.	12.9	118.5	
						SM	**Capistrano Formation (Tco)** @ 32': Rig almost hit refusal.			
700	35		D-7	50/6"			@ 35': Light gray silty fine to medium SAND, saturated, very dense, micaceous, slightly friable.	16.5	112.0	
							Notes: Total Depth: 35.5 Feet. Groundwater Encountered at 25.3 Feet After 10 Minutes. Backfilled with Cuttings and Tamped.			
	40									
690	45									
	50									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
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PROJECT NO. 16098-01

NMG

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	12/12/17	Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California, Bulk		
Approximate Groundwater Depth:	23.5 Feet		
Comments			

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Sheet 1 of 2

Total Depth Drilled (ft)	36.5
Approximate Ground Surface Elevation (ft)	684.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					CL	**Artificial Fill, Undocumented (Afu)** Surface: Gravel Road Base. Very dark brown to black CLAY, very moist, soft to medium stiff.			
680			B-1							B-1 @ 0'-7.5'
	5		D-1	6			@ 5': Mottled very dark brown to black CLAY, very moist, soft to medium stiff, organic odor, root hairs.	21.2	102.5	
			D-2	16			@ 7.5': Upper (Not in Sample): Dark brown to black CLAY, moist to very moist, stiff, large angular quartzite cobble within sampler's upper rings.	13.8	117.9	
						SC	**Alluvium (Qal)** Lower: Olive brown clayey fine SAND, moist to very moist, medium dense, root hairs, pinhole pores, caliche.			
	10		D-3	11			@ 10': Olive brown clayey fine SAND, moist to very moist, medium dense, root hairs, pinhole pores, abundant caliche.	13.9	115.0	
670										
	15		D-4	14		CL	@ 15': Dark grayish brown sandy CLAY, very moist, stiff, caliche, pinhole pores, roots up to 6" long.	19.5	105.7	
	20		SB-1 D-5	12			@ 20': Brown silty CLAY, very moist, medium stiff, wood fragments in sample, caliche, pinhole pores, some clayey sand in upper rings (not in sample).	21.6	100.8	SB-1 @ 20'
660										
	25									

LOG OF BORING

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NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25		D-6	11		SC	@ 25': Gray clayey fine to medium SAND, saturated, loose to medium dense, caliche, trace pinhole pores.	20.0	101.1	
	30		D-7	38		SP-SM	@ 30': Gray silty fine to coarse SAND, saturated, medium dense, friable, trace gravel.	12.9	119.2	
650										
	35		D-8	52			@ 35': Gray silty fine to coarse SAND, saturated, very dense, gravel and very coarse sand in sampler tip.	13.9	120.3	
							Notes: Total Depth: 36.5 Feet. Groundwater Encountered at 23.5 Feet After 10 Minutes. Backfilled with Cuttings and Tamped.			
	40									
640										
	45									
	50									
630										

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

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Date(s) Drilled	12/18/17	Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California		
Approximate Groundwater Depth:	No Groundwater Encountered		
Comments			

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Sheet 1 of 2

Total Depth Drilled (ft)	26.5
Approximate Ground Surface Elevation (ft)	687.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	**Artificial Fill, Undocumented (Afu)** Surface: Gravel Road Base.			
			D-1	22			@ 2.5': Upper: Pale yellow to grayish brown silty fine to coarse SAND, moist, medium dense, micaceous, coarse gravel in upper sample rings.	11.5	110.0	
						SC	Lower: Pale yellow clayey fine to coarse SAND, moist, medium dense, micaceous.			
	5		D-2	17		SM-SC	**Alluvium (Qal)** @ 5': Brown silty/clayey fine to coarse SAND, moist, medium dense, trace pinhole pores, micaceous.	6.6	111.4	
680						SP	Tip: Pale yellow fine to medium SAND, damp, medium dense, friable.			
			D-3	6			@ 7.5': Upper (Not in Sample): Gray fine SAND, moist, loose, friable.	13.4	111.2	
						SM-SC	Lower: Dark brown silty/clayey fine to coarse SAND, moist, loose, trace pinhole pores, micaceous.			
	10		D-4	24		SC	@ 10': Dark brown clayey fine to coarse SAND, moist to very moist, medium dense, trace pinhole pores, micaceous, trace gravel.	12.8	121.5	
	15		D-5	21		SM-SC	@ 15': Brown silty/clayey fine to coarse SAND, very moist, medium dense, trace pinhole pores, micaceous.	14.0	117.5	
670										
	20		D-6	31			@ 20': Brown silty/clayey fine to coarse SAND, very moist, medium dense, trace pinhole pores, micaceous.	14.8	114.7	
	25									

LOG OF BORING

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NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25		D-7	25		CL	@ 25': Upper: Brown CLAY, very moist, very stiff, caliche, trace pinhole pores, micaceous.	41.1 33.1	88.0 94.9	
						SC	Lower: Brown clayey fine to medium SAND, very moist, medium dense, micaceous.			
660							Notes: Total Depth: 26.5 Feet. Groundwater Not Encountered. Backfilled with Cuttings and Tamped.			
	30									
	35									
650										
	40									
	45									
640										
	50									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

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Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	12/12/17	Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California, Bulk		
Approximate Groundwater Depth:	33.9 Feet		
Comments			

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Sheet 1 of 2

Total Depth Drilled (ft)	50.4
Approximate Ground Surface Elevation (ft)	701.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	**Artificial Fill (Afu)** Surface: Gravel Road Base. Brown silty fine SAND, moist, loose.			
700										
			D-1	13		SM	**Alluvium (Qal)** @ 2.5': Brown silty fine SAND, moist, medium dense, trace pinhole pores, trace caliche, micaceous.	6.8	113.1	
	5		D-2	14		SC	@ 5': Brown clayey fine SAND, very moist, medium dense, few zones of sandy CLAY, pinhole pores, caliche, micaceous.	15.7	111.6	
			B-1 D-3	17		SM	@ 7.5': Brown silty fine to medium SAND, very moist, medium dense, pinhole pores, caliche stringers, micaceous.	15.8	114.4	B-1 @ 5'-10'
	10		D-4	34		SC-CL	@ 10': Dark gray to dark brown clayey fine SAND/sandy CLAY, very moist, medium dense/very stiff, abundant caliche, pinhole pores.	14.0	116.0	
690										
	15		D-5	9		SP	@ 15': Upper (Not in Sample): Light gray fine to coarse SAND, damp to moist, loose, friable, micaceous.	12.7	109.8	
						SM	Lower: Gray silty fine to coarse SAND, moist, loose, trace pinhole pores, caliche, trace gravel.			
	20		D-6	23		SP	@ 20': Light gray fine to coarse SAND, damp to moist, medium dense, friable, micaceous, trace clayey sand in upper rings, not in sample.	5.2	110.4	
680										
	25									

LOG OF BORING

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Lake Forest, California
PROJECT NO. 16098-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25		D-7	20		CL	@ 25': Upper: Very dark gray CLAY, wet to saturated, stiff, caliche, zones of coarse SAND, well-defined contacts between clay and sand.	27.2	96.3	
						SM-SC	Lower: Gray silty/clayey fine to coarse SAND, wet to saturated, medium dense, micaceous.			
	30		D-8	16		SP	@ 30': Upper: White to light gray medium to coarse SAND, saturated, medium dense.	20.3	104.5	
670						CH	Lower: Black CLAY, saturated, stiff, highly plastic.			
	35		D-9	33		SP	@ 35': Gray fine to coarse SAND, saturated, medium dense, friable.	16.9	113.5	
	40		D-10	42		SM	@ 40': Upper: Dark gray silty fine SAND, saturated, medium dense, MnO stained.	15.3	110.9	
660						SP	Lower: Gray fine to coarse SAND, saturated, medium dense, friable.			
	45		D-11	50/5"		SM	**Capistrano Formation, Oso Member (Tco)** @ 45': Pale yellow silty fine to medium SANDSTONE, saturated, very dense, trace MnO stained, micaceous.	13.9	118.2	
	50		D-12	50/5"		SP-SM	@ 50': Pale yellow silty fine to coarse SANDSTONE, trace MnO stained, micaceous.	16.1	112.9	
650							Notes: Total Depth: 50.4 Feet. Groundwater Encountered at 33.9 Feet After 15 Minutes. Backfilled with Cuttings and Tamped.			

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	12/18/17	Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California		
Approximate Groundwater Depth:	48.1 Feet		
Comments			

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Sheet 1 of 2

Total Depth Drilled (ft)	51.5
Approximate Ground Surface Elevation (ft)	724.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SC	**Artificial Fill, Undocumented (Afu)** Surface: Gravel Road Base. **Alluvium (Qal)** Very dark grayish brown clayey fine to coarse SAND, moist, loose to medium dense.			
720										
	5		D-1	18			@ 5': Very dark grayish brown clayey fine to coarse SAND, moist, medium dense, micaceous, trace pinhole pores.	10.5	123.8	
	10		D-2	21		SM-SC	@ 10': Brown to light brown silty/clayey fine to coarse SAND, moist, medium dense, micaceous, trace pinhole pores.	11.7	105.7	
710										
	15		D-3	20		SC	@ 15': Brown to light brown clayey fine to coarse SAND, moist, medium dense, micaceous, no visible pores.	14.2	112.1	
	20		D-4	31			@ 20': Brown to light brown clayey fine to coarse SAND, moist, medium dense, micaceous.	12.9	112.8	
						SP	Tip: White fine to coarse SAND, moist, medium dense, friable.			
700										
	25									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25		D-5	17		SP	@ 25': Upper: White fine to coarse SAND, moist, medium dense.	10.0	114.6	
						SC	Lower: Grayish brown clayey fine to coarse SAND, moist to very moist, medium dense.			
	30		D-6	18		SC-CL	@ 30': Dark gray to grayish brown clayey fine SAND/sandy CLAY, wet, medium dense/stiff, FeO stained, possible root hairs.	18.1	108.1	
690										
	35		D-7	44		SP	@ 35': Gray fine to coarse SAND, moist, medium dense, friable, micaceous, trace gravel.	3.3	123.4	
	40		D-8	25		SC	@ 40': Brown clayey fine to coarse SAND, wet, medium dense, micaceous.	15.0	113.0	
680										
	45		D-9	33			@ 45': Brown clayey fine to coarse SAND, saturated, medium stiff, some zones of clay.	15.8	112.5	
	50		D-10	48			@ 50': Gray clayey fine to coarse SAND, saturated, medium dense, FeO stained, micaceous, few zones of clay, possibly weathered bedrock?	14.0	116.9	
							Notes: Total Depth: 51.5 Feet. Groundwater Encountered at 48.1 Feet After 10 Minutes. Backfilled with Cuttings and Tamped.			
670										

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	12/18/17	Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California		
Approximate Groundwater Depth:	No Groundwater Encountered		
Comments			

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Sheet 1 of 2

Total Depth Drilled (ft)	26.5
Approximate Ground Surface Elevation (ft)	699.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM-SC	**Artificial Fill (Afu)** Surface: Gravel Road Base. Mottled light yellow to dark brown silty clayey fine to medium SAND, moist, medium dense.			
	5		D-1	17			@ 5': Mottled light yellow to dark brown silty clayey fine to medium SAND, moist, medium dense.	11.3	115.1	
			D-2	11			@ 7.5': Mottled light yellow to dark brown silty clayey fine to medium SAND, moist, medium dense.	12.7	113.8	
690	10		D-3	15		SM	@ 10': Mottled pale yellow to light yellowish brown, silty fine to medium SAND, moist, medium dense, trace nylon rope fibers.	8.3	113.3	
	15		D-4	42			@ 15': Mottled pale yellow to light yellowish brown, silty fine to medium SAND, moist, medium dense, circular zones of slightly gray sand.	13.3	115.6	
680	20		D-5	18		SM-SC	@ 20': Gray to brownish gray silty clayey fine to medium SAND, very moist, mottled, nylon rope fragment in sample.	14.1	119.3	
	25									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California
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NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25		D-6	41		SC	**Slopewash Material (Qsw)** @ 25': Dark brown clayey fine to medium SAND, very moist, medium dense, root stained pores, caliche nodules, effervescent with acid.	14.6	117.4	
670	30						Notes: Total Depth: 26.5 Feet. Groundwater Not Encountered. Backfilled with Cuttings and Tamped.			
	35									
660	40									
	45									
650	50									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	12/18/17	Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California		
Approximate Groundwater Depth:	No Groundwater Encountered		
Comments			

B-20

Sheet 1 of 2

Total Depth Drilled (ft)	31.5
Approximate Ground Surface Elevation (ft)	699.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SC	**Artificial Fill, Undocumented (Afu)** Surface: Gravel Road Base.			
			D-1	34			@ 2.5': Mottled grayish brown to brown clayey fine to coarse SAND, very moist, medium dense, micaceous.	12.1	124.0	
	5		D-2	31		CL	@ 5': Upper: Brown to black CLAY, very moist, very stiff.	12.4	120.4	
						SC	Lower: Brown clayey fine to medium SAND, very moist, medium dense, laminated surfaces, visible thin layers of fill.			
			D-3	24			@ 7.5': Mottled brown clayey fine to medium SAND, very moist, medium dense, micaceous.	14.4	116.3	
690										
	10		D-4	28		SC	**Alluvium (Qal)** @ 10': Brown to dark brown clayey fine to coarse SAND, very moist, medium dense, trace pinhole pores, micaceous.	13.7	119.0	
	15		D-5	36			@ 15': Brown clayey fine to coarse SAND, moist, medium dense, micaceous, trace gravel.	10.6	112.7	
680										
	20		D-6	56			@ 20': Upper (Not in Sample): Gray clayey fine to coarse SAND, moist, medium dense, micaceous.	3.3	109.4	
						SP	Lower: White fine to medium SAND, damp to moist, medium dense to dense, micaceous, friable.			
	25									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25		D-7	41		SP	@ 25': Upper: Gray fine to coarse SAND, damp to moist, medium dense, micaceous, friable.	3.7	109.7	
						SC	Lower: Brown to olive brown clayey fine to coarse SAND, damp to moist, medium dense, micaceous.			
670										
	30		D-8	53			@ 30': Brownish gray clayey fine to coarse SAND, moist, dense, micaceous.	9.5	115.5	
							Notes: Total Depth: 31.5 Feet. Groundwater Not Encountered. Backfilled with Cuttings and Tamped.			
	35									
660										
	40									
	45									
650										
	50									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

Report: HOLLOW STEM; Project: 16098-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/13/18

Date(s) Drilled	12/18/17	Logged By	ZKH
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140 lbs @ 30" Drop
Sampling Method(s)	Modified California		
Approximate Groundwater Depth:	No Groundwater Encountered		
Comments			

B-21

Sheet 1 of 2

Total Depth Drilled (ft)	41.5
Approximate Ground Surface Elevation (ft)	728.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SC	**Artificial Fill, Undocumented (Afu)** Surface: Gravel Base Road.			
							Alluvium (Qal) Very dark brown to gray clayey fine to coarse SAND, moist, loose to medium dense.			
	5		D-1	27			@ 5': Very dark brown to gray clayey fine to coarse SAND, moist, medium dense, trace pinhole pores, micaceous.	11.0	124.6	
720										
	10		D-2	17			@ 10': Brown to grayish brown clayey fine to coarse SAND, moist, medium dense, trace pinhole pores, micaceous.	9.9	118.6	
	15		D-3	31		SM-SC	@ 15': Dark brown silty/clayey fine to coarse SAND, moist, medium dense, few pinhole pores, micaceous, trace caliche.	12.1	119.5	
710										
	20		D-4	39		SC	@ 20': Gray clayey fine to coarse SAND, moist, medium dense, trace gravel, caliche, trace pinhole pores, FeO stained.	11.5	121.2	
	25									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25		D-5	41		SC	@ 25': Gray clayey fine to coarse SAND, damp to moist, medium dense, trace pinhole pores, micaceous.	13.3	119.8	
700						SM	Tip: Light gray silty fine to coarse SAND, damp to moist, medium dense, micaceous.			
	30		D-6	32		SM-SC	@ 30': Gray to brown silty/clayey fine to coarse SAND, very moist, medium dense, micaceous.	14.3	116.0	
	35		D-7	25		SM	@ 35': Light gray silty fine to medium SAND, moist, medium dense, micaceous.	5.9	114.4	
690										
	40		D-8	33		SP	@ 40': Gray fine to medium SAND, moist, medium dense, trace coarse sand in upper rings, micaceous.	6.0	112.9	
							Notes: Total Depth: 41.5 Feet. Groundwater Not Encountered. Backfilled and Tamped with Cuttings.			
	45									
680										
	50									

LOG OF BORING

Toll Brothers/Lake Forest Nursery
Lake Forest, California

PROJECT NO. 16098-01

NMG

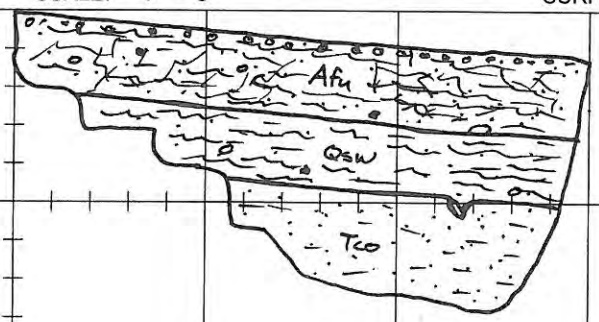
NMG Geotechnical, Inc.

Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	ZKH/TD
Project Number:	16098-01	Elevation:	704 ±
Equipment:	JCB 214 Backhoe	Location:	Southern End

TRENCH NO.: **T-1**

GEOLOGIC ATTITUDES	DESCRIPTION: DATE: 12/11/17	GEOLOGIC UNIT	ENGINEERING PROPERTIES: U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0-2': Yellowish brown sandy silty CLAY, moist, stiff, few rounded pebbles.	Afu	CL			
	Slopewash Material (Qsw) @ 2-4': Yellowish brown sandy silty CLAY, moist, stiff, moderate caliche begins from 2.5' to 3.5', some pebbles.	Qsw	CL			
	Capistrano Formation, Oso Member (Tco) @ 4': Weathered at 4' to 5', pale brownish yellow silty fine SANDSTONE, moist, very dense, trace clayey SANDSTONE, decrease in caliche.	Tco	SM	B-1 @ 6.8'		
	Notes: Total Depth: 7.0 Feet. No Groundwater Encountered. Backfilled with Cuttings.					

GRAPHIC REPRESENTATION: NE Wall SCALE: 1" = 5' SURFACE SLOPE: 6° TREND: <--N34°W--



LOG OF TRENCH NO: T-1

TRENCH 16098-01.GPJ 1/8/18 15:24

NMG Geotechnical, Inc.

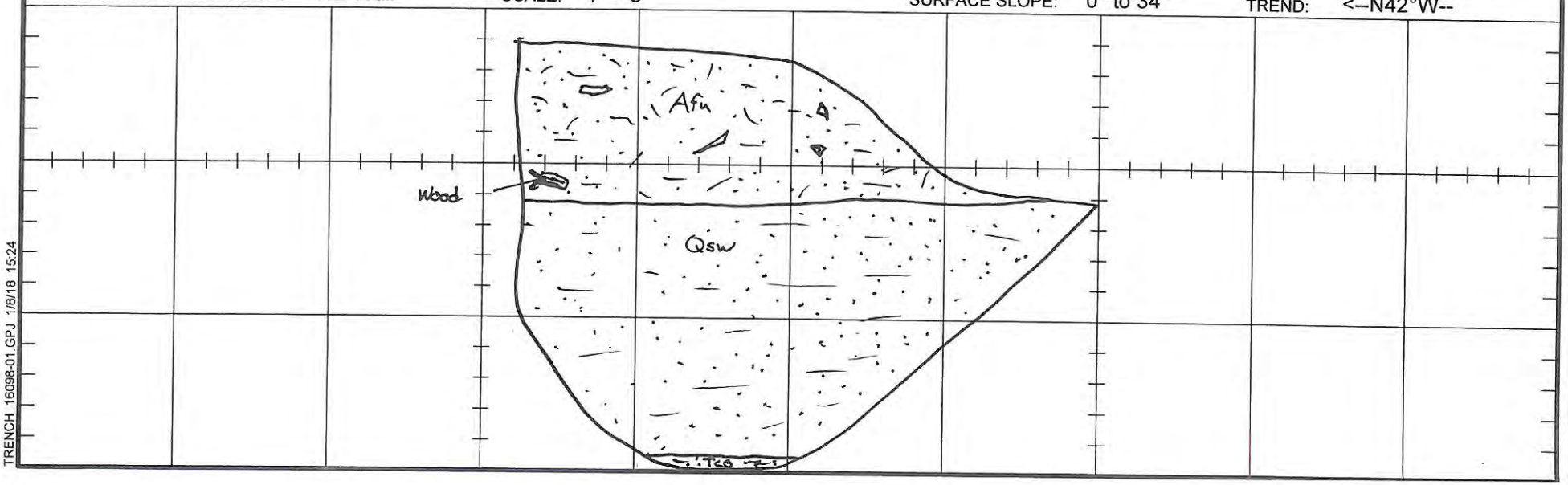
Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	ZKH/TD
Project Number:	16098-01	Elevation:	719 ±
Equipment:	JCB 214 Backhoe	Location:	Southern End

TRENCH NO.: **T- 2**

GEOLOGIC ATTITUDES	DESCRIPTION: (DATE: 12/11/17)	GEOLOGIC UNIT	ENGINEERING PROPERTIES: U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0'-5': Mottled medium brown silty fine to medium SAND, damp, loose to medium dense, scattered concrete pipe fragments, wood debris.	Afu	SM			
	Slopewash Material (Qsw) @ 5'-11': Olive brown to brown silty fine SAND, moist, grades to wet below 11', loose to medium dense, slightly micaceous. @ 11'-13.5': Dark yellow brown silty fine to medium SAND, moist to wet, medium dense, slightly micaceous.	Qsw	SM			
	Capistrano Formation, Oso Member (Tco) @ 13.5': Yellowish brown silty fine SANDSTONE, moist to wet, medium dense, increasingly micaceous with depth, weathered in upper 0.5'.	Tco	SM			

Notes:
Total Depth: 14.0 Feet.
No Groundwater Encountered.
Backfilled with Cuttings.

GRAPHIC REPRESENTATION: NE Wall SCALE: 1" = 5' SURFACE SLOPE: 0° to 34° TREND: <--N42°W--



LOG OF TRENCH NO: T- 2

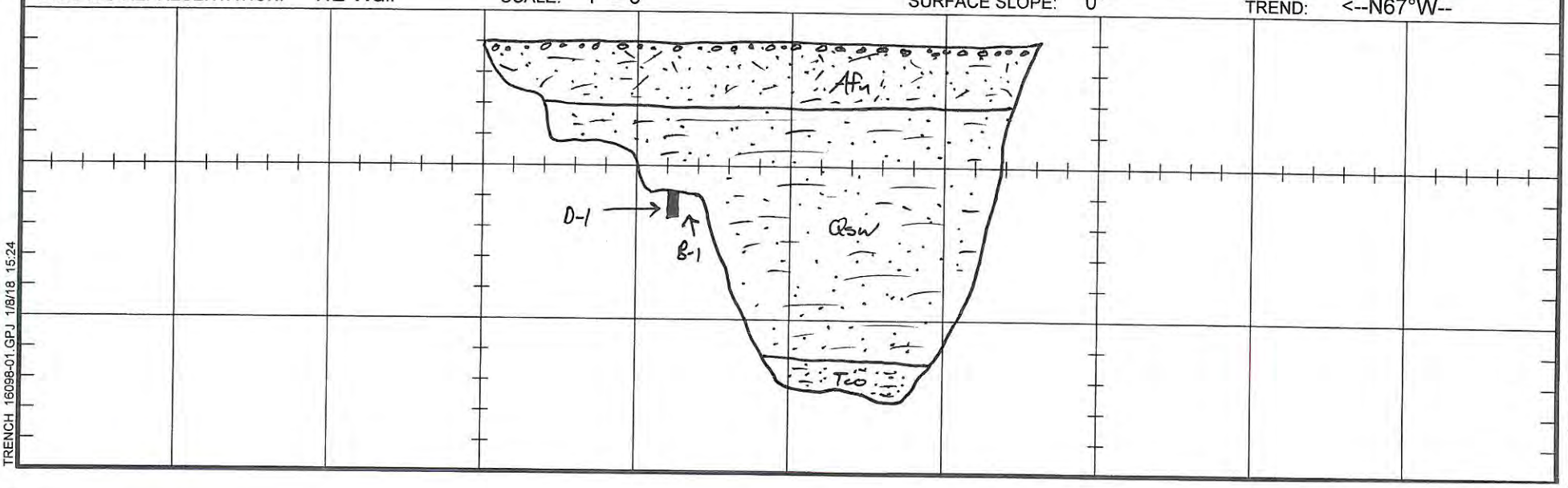
TRENCH 16098-01.GPJ 1/8/18 15:24

NMG Geotechnical, Inc.

Project Name: Toll Brothers/Lake Forest Nursery	Logged By: ZKH/TD	TRENCH NO.:	ENGINEERING PROPERTIES
Project Number: 16098-01	Elevation: 715 ±	T- 3	
Equipment: JCB 214 Backhoe	Location: Central Portion		

GEOLOGIC ATTITUDES	DESCRIPTION: DATE: 12/11/17	GEOLOGIC UNIT	U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0'-2': Mottled gray to brown silty fine SAND, damp to moist, loose, scattered gravel at surface.	Afu	SM			
	Slopewash Material (Qsw) @ 2': Brown silty fine SAND, moist to wet, loose at 2', grades to medium dense by 4', no visible pores, slightly micaceous, trace clay. @ 5': Brown silty fine SAND, moist to wet, medium dense, slightly micaceous. @ 6': Light yellowish brown silty fine SAND, wet, medium dense.	Qsw	SM	D-1 @ 5' B-1 @ 5'	11.34	112.0
	Capistrano Formation, Oso Member (Tco) @ 10.5': Light olive silty fine SANDSTONE, moist, very dense, slightly micaceous. @ 11.5': Coarsens downward to silty fine to medium SANDSTONE, moist, very dense.	Tco	SM			
	Notes: Total Depth: 11.5 Feet. No Groundwater Encountered. Backfilled with Cuttings.					

GRAPHIC REPRESENTATION: NE Wall SCALE: 1" = 5' SURFACE SLOPE: 0° TREND: <--N67°W--



LOG OF TRENCH NO: T- 3

TRENCH 16098-01.GPJ 1/8/18 15:24

NMG Geotechnical, Inc.

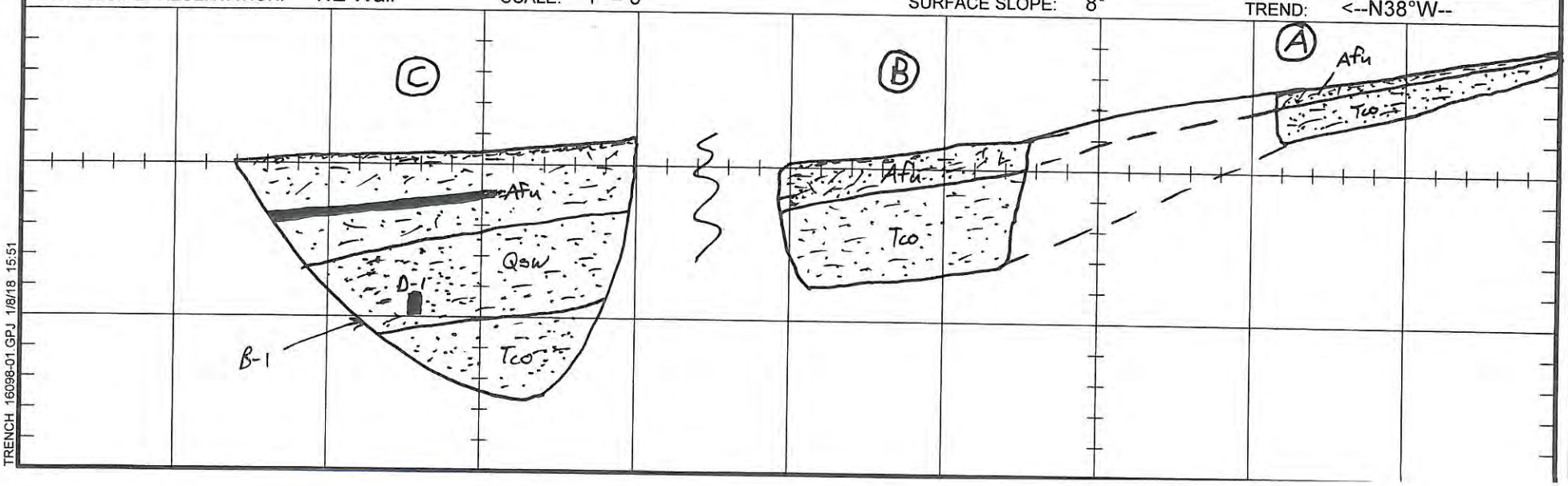
Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	ZKH/TD
Project Number:	16098-01	Elevation:	703 to±713
Equipment:	JCB 214 Backhoe	Location:	Western Perimeter

TRENCH NO.: **T- 4**

GEOLOGIC ATTITUDES	DESCRIPTION: (DATE: 12/11/17)	GEOLOGIC UNIT	ENGINEERING PROPERTIES: U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	(A) Artificial Fill, Undocumentend (Afu) @ 0'-0.3': Pale olive yellow silty SAND, dry, abundant mulch in upper 2" to 3".	Afu	OH/SM			
	Capistrano Formation, Oso Member (Tco) @ 0.3': Pale olive to yellow silty fine to medium SANDSTONE, moist, very dense, FeO stained.	Tco	SM			
	(B) Artificial Fill, Undocumentend (Afu) @ 0'-2': Brown silty fine SAND with some clay, damp to moist, loose, abundant mulch in upper 2" to 3".	Afu	OH/SM			
	Capistrano Formation, Oso Member (Tco) @ 2': Olive yellow silty fine SANDSTONE, moist, medium dense to dense, caliche stringers, massive, slightly micaceous.	Tco	SM			
	(C) Artificial Fill, Undocumentend (Afu) @ 0'-3': Pale olive silty fine SAND, moist, loose. @ 1 to 1.6': Mixture of dark brown to olive brown silty fine SAND, moist, loose to medium dense. @ 2" thick asphalt layer, 2" to 3" thick mulch on the surface.	Afu	OH/SM			
	Slopewash Material (Qsw) @ 3': Dark brown silty fine to coarse SAND, moist, medium dense, slightly friable. Clean fine to coarse SAND on downslope side of trench.	Qsw	SM/SP	D-1 @ 4.5' B-1 @ 4.5'-5.5'	10.97	116.9
	Capistrano Formation, Oso Member (Tco) @ 6': Yellowish brown fine to coarse SANDSTONE, moist to wet, medium dense, weathered. @ 8': Yellowish olive fine to medium SANDSTONE, moist to wet, very dense, massive.	Tco	SM			

Notes:
Total Depth: 9 Feet.
No Groundwater Encountered.
Backfilled with Cuttings.

GRAPHIC REPRESENTATION: NE Wall SCALE: 1" = 5' SURFACE SLOPE: 8° TREND: <--N38°W--



LOG OF TRENCH NO: T- 4

TRENCH 16098-01.GPJ 1/8/18 15:51

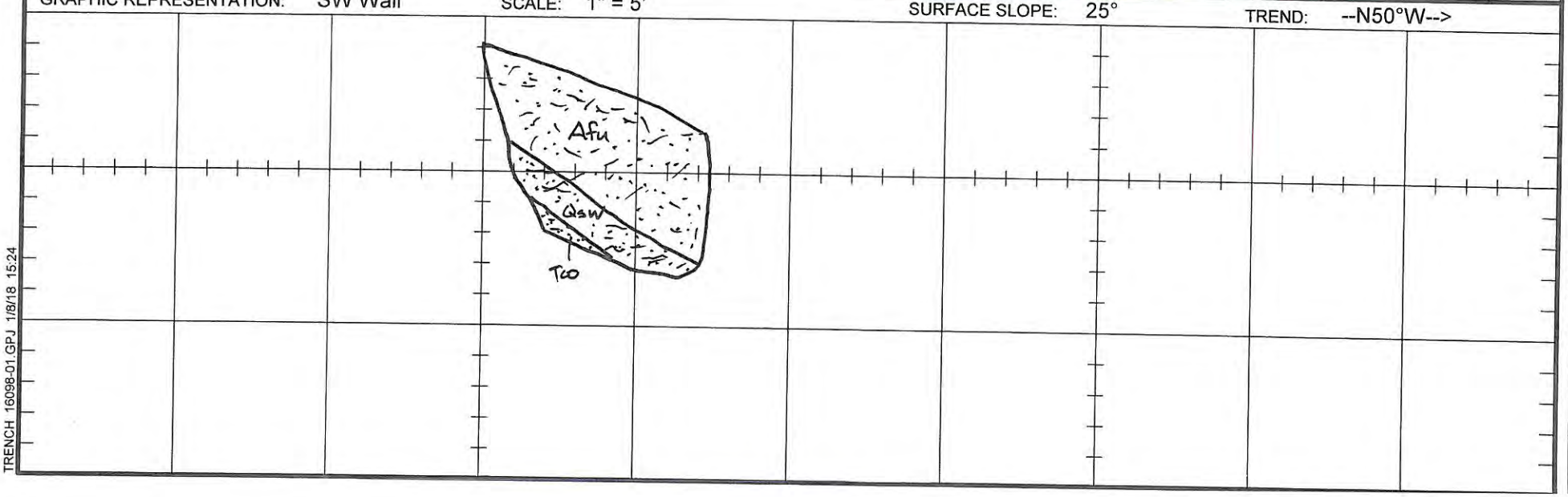
NMG Geotechnical, Inc.

Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	ZKH/TD
Project Number:	16098-01	Elevation:	706 to ±710
Equipment:	JCB 214 Backhoe	Location:	Central Portion

TRENCH NO.: **T- 5**

GEOLOGIC ATTITUDES	DESCRIPTION: (DATE: 12/15/17)	GEOLOGIC UNIT	ENGINEERING PROPERTIES: U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0'-3': Mottled grayish brown silty SAND, damp to moist, loose.	Afu	SM			
	Slopewash Material (Qsw) @ 3'-5': Dark brown silty/clayey fine to medium SAND, moist, loose.	Qsw	SM-SC			
	Capistrano Formation, Oso Member (Tco) @ 5': Olive silty fine SANDSTONE, moist, very dense, micaceous, slightly cemented.	Tco	SM			
	Notes: Total Depth: 6 Feet. No Groundwater Encountered. Backfilled with Cuttings.					

GRAPHIC REPRESENTATION: SW Wall SCALE: 1" = 5' SURFACE SLOPE: 25° TREND: --N50°W-->



LOG OF TRENCH NO: T- 5

TRENCH 16098-01.GPJ 1/8/18 15:24

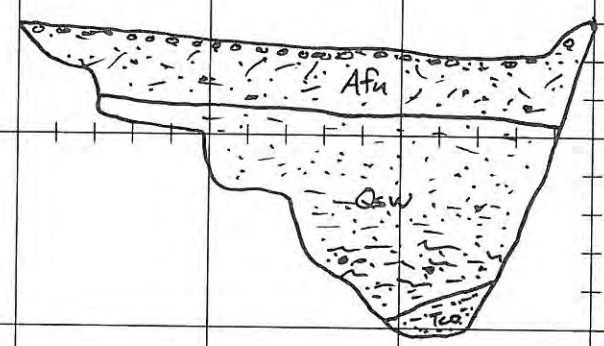
NMG Geotechnical, Inc.

Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	ZKH/TD
Project Number:	16098-01	Elevation:	700 ±
Equipment:	JCB 214 Backhoe	Location:	Central Portion Near Well

TRENCH NO.: **T- 6**

GEOLOGIC ATTITUDES	DESCRIPTION: DATE: 12/15/17	GEOLOGIC UNIT	ENGINEERING PROPERTIES: U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0'-2': Grayish brown silty fine SAND, moist, loose to medium dense, plastic debris, scattered gravel, trace roots.	Afu	SM			
	Slopewash Material (Qsw) @ 2'-3': Brown silty fine SAND, moist, loose to medium dense, friable.	Qsw	SM			
	@ 3'-4': Light brown medium to coarse SAND, with scattered gravel, moist, medium dense, highly friable.		SP			
	@ 4'-4.8': Light yellow brown silty fine SAND, moist, loose to medium dense.		SM			
	@ 4.8'-6': Light brown silty/clayey fine SAND, scattered gravel, moist, loose to medium dense, micaceous, grades medium dense by 5'.		SM-SC			
	Capistrano Formation, Oso Member (Tco) @ 6': Weathered pale olive silty fine to medium SANDSTONE, moist, very dense, slightly cemented, caliche.	Tco	SM			
	Notes: Total Depth: 7.0 Feet. No Groundwater Encountered. Backfilled with Cuttings.					

GRAPHIC REPRESENTATION: NE Wall SCALE: 1" = 5' SURFACE SLOPE: 3° TREND: <--N48°W--



LOG OF TRENCH NO: T- 6

TRENCH 16098-01.GPJ 1/8/18 15:24

NMG Geotechnical, Inc.

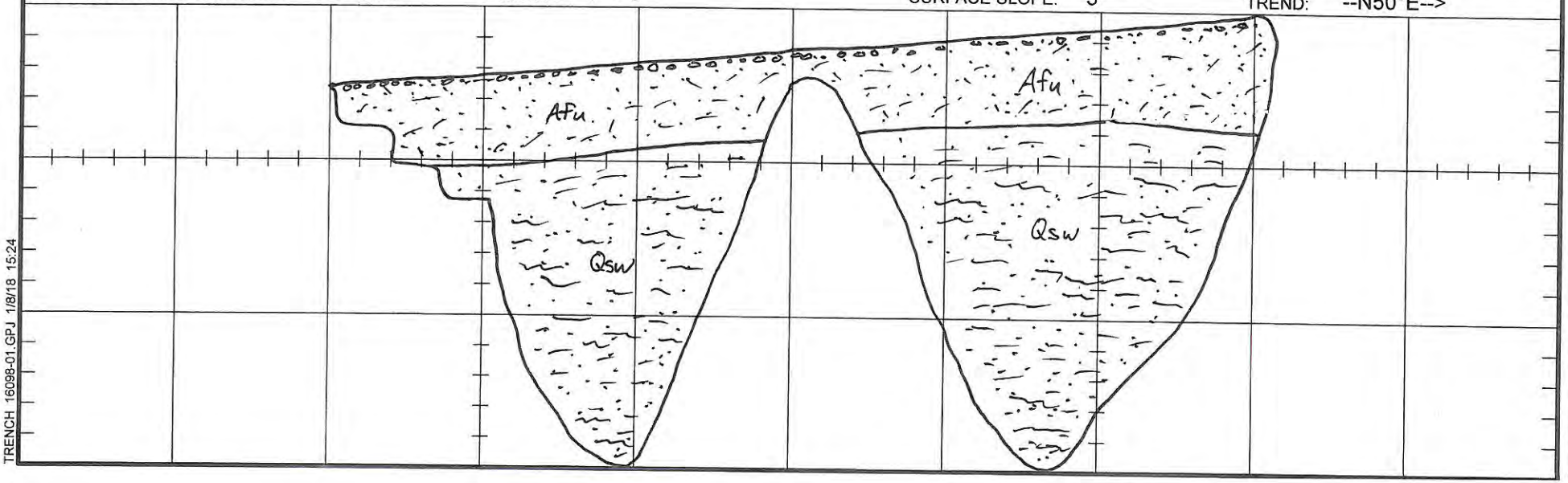
LOG OF TRENCH NO: T-7

Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	ZKH/TD
Project Number:	16098-01	Elevation:	721 ±
Equipment:	JCB 214 Backhoe	Location:	North Central

TRENCH NO.: **T-7**

GEOLOGIC ATTITUDES	DESCRIPTION: DATE: 12/15/17	GEOLOGIC UNIT	ENGINEERING PROPERTIES: U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0': 2" of 3/4" gravel. @ 0.2': Layered 3" to 6" thick gray silty SAND, damp, medium dense.	Afu	GP SM			
	@ 0.5'- 4': Dark brown silty fine to medium SAND, moist, loose to medium dense, slightly friable, scattered gravel, organics at contact with unit below.					
	Slopewash Material (Qsw) @ 3'-4': Brown silty fine to medium SAND, moist, loose to medium dense.		SM			
	@ 4': Dark brown clayey fine to medium SAND, moist, medium dense, trace pinhole pores, trace root hairs, slightly micaceous.	Qsw	SC			
	@ 7': Brown silty fine to medium SAND, moist to wet, medium dense, fine sand is slightly clayey.		SM			
	@ 9': Strong brown and lighter brown with depth silty fine SAND, wet, medium dense, trace pores, slightly friable.					
	@ 12.5': Light brown silty fine to coarse SAND, wet, medium dense, friable, micaceous. @ 13.5': Light brown clayey fine to medium SAND, wet, medium dense to dense.		SC			
	Notes: Total Depth: 14.0 Feet. No Groundwater Encountered. Backfilled with Cuttings.					

GRAPHIC REPRESENTATION: NW Wall SCALE: 1" = 5' SURFACE SLOPE: 3° TREND: --N50°E-->



TRENCH 16098-01.GPJ 1/8/18 15:24

NMG Geotechnical, Inc.

LOG OF TRENCH NO: T-8

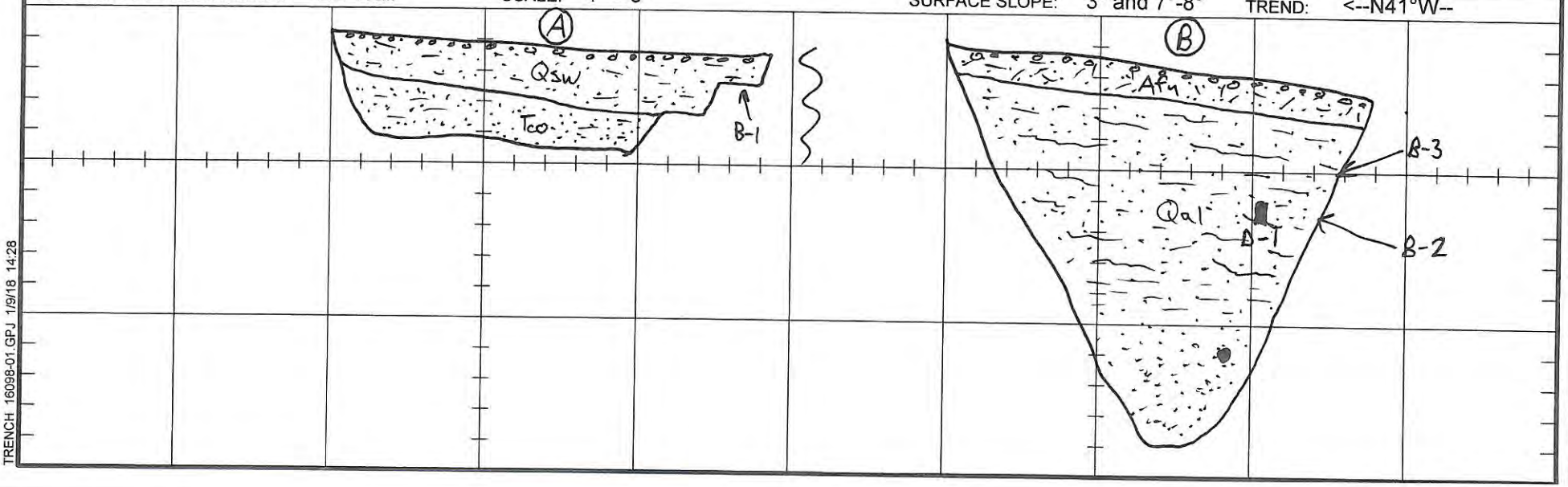
Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	ZKH
Project Number:	16098-01	Elevation:	731 and 729
Equipment:	JCB 214 Backhoe	Location:	North Central

TRENCH NO.: **T-8**

GEOLOGIC ATTITUDES	DESCRIPTION: (DATE: 12/15/17)	GEOLOGIC UNIT	ENGINEERING PROPERTIES: U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	(A) Slopewash Material (Qsw) @ 0'-3': Brown silty fine to medium SAND, moist, loose to medium dense, 6" chucks of SANDSTONE clast at base.	Qsw	SM			
	Capistrano Formation, Oso Member (Tco) @ 3': White to gray silty fine to coarse SANDSTONE, moist, very dense, micaceous, friable.	Tco	SP-SM	B-1 @ 1'-2'		
	(B) Artificial Fill, Undocumented (Afu) @ 0'-1': Gray to brown silty fine to medium SAND, damp, loose, layered, trace plastic debris.	Afu	SM			
	Alluvium (Qal) @ 1'-7': Dark brown silty/clayey fine to coarse SAND, moist, trace pinhole pores, micaceous.	Qal	SC/SM	B-3 @ 3'-4'		
	@ 7': Yellowish brown silty medium to coarse SAND, moist, loose to medium dense, trace 6" to 8" cobble @ 8'.		SM/SP	D-1 @ 4' B-2 @ 4'-5'	8.58	110.0
	@ 8'-9': Pale yellow brown to pale brownish yellow medium to coarse SAND, moist to very moist, friable, trace cobble at 9.5'.		SP			

Notes:
Total Depth: 13.0 Feet.
No Groundwater Encountered.
Backfilled with Cuttings.

GRAPHIC REPRESENTATION: NE Wall SCALE: 1" = 5' SURFACE SLOPE: 3° and 7°-8° TREND: <--N41°W--



TRENCH 16098-01.GPJ 1/9/18 14:28

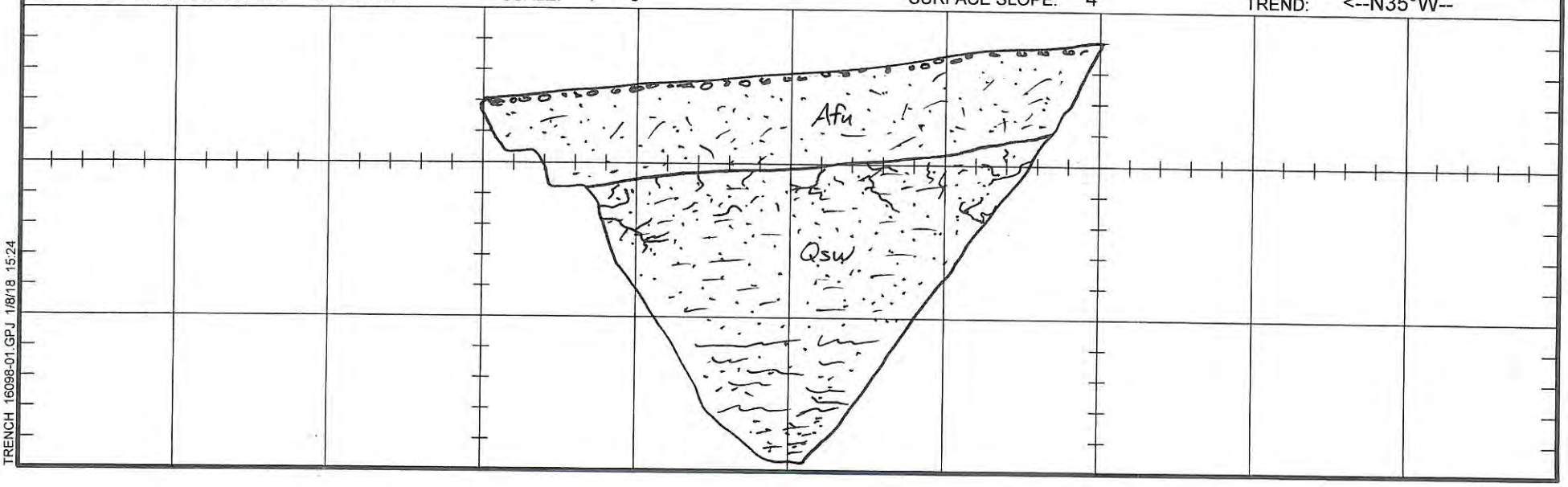
NMG Geotechnical, Inc.

Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	TD
Project Number:	16098-01	Elevation:	723 ±
Equipment:	JCB 214 Backhoe	Location:	North Central

TRENCH NO.: **T- 9**

GEOLOGIC ATTITUDES	DESCRIPTION: DATE: 12/15/17	GEOLOGIC UNIT	ENGINEERING PROPERTIES U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0'-2": Gravel with SAND, dry.	Afu	GP			
	@ 0.2'-3': Gray and dark brown silty fine to medium SAND, moist, loose to medium dense, layered, slightly friable, trace plastic debris.		SM			
	Slopewash Material (Qsw) @ 3': Brown silty fine to medium SAND, moist to wet, loose, highly friable, some coarse sand, abundant root hairs down to 5.5', some 1/2" roots.	Qsw	SM			
	@ 5.5': Light brown silty fine to coarse SAND, wet, loose to medium dense, friable, micaceous. @ 8': Light brown silty/clayey medium to coarse SAND, wet, medium dense, FeO stained, micaceous.		SM-SC			
	@ 13': Light brown silty fine to coarse SAND, wet, medium dense, friable.		SM-SP			
	Notes: Total Depth: 13.0 Feet. No Groundwater Encountered. Backfilled with Cuttings.					

GRAPHIC REPRESENTATION: NE Wall SCALE: 1" = 5' SURFACE SLOPE: 4° TREND: <--N35°W--



LOG OF TRENCH NO: T- 9

TRENCH 16098-01.GPJ 1/8/18 15:24

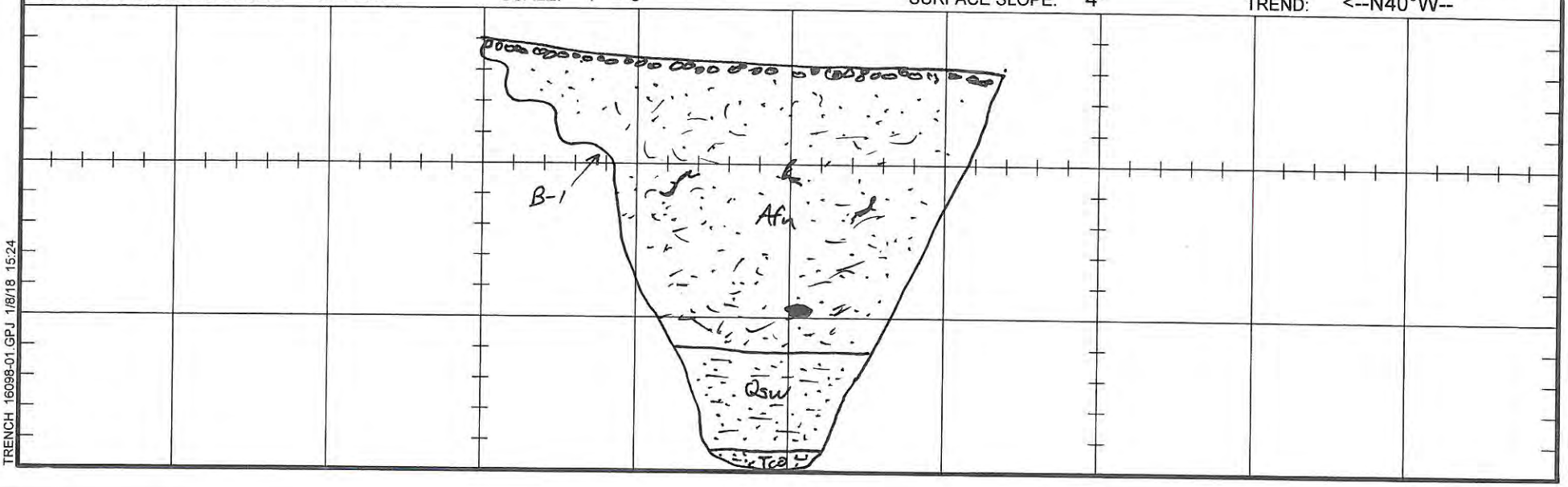
NMG Geotechnical, Inc.

LOG OF TRENCH NO: T-10

Project Name: Toll Brothers/Lake Forest Nursery	Logged By: ZKH/TD	TRENCH NO.:	ENGINEERING PROPERTIES
Project Number: 16098-01	Elevation: 694 ±	T-10	
Equipment: JCB 214 Backhoe	Location: West Corner		

GEOLOGIC ATTITUDES	DESCRIPTION: DATE: 12/11/17	GEOLOGIC UNIT	U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0'-0.5": Gravelly SAND at surface. Below is brown silty fine to medium SAND, moist, loose, scattered debris/plastic, trace clay. @ 4': Green plastic ribbon debris. @ 9'-11': Grades to olive brown silty SAND, very moist, loose to medium dense, micaceous, plastic bag debris.	Afu	GP SM	B-1 @ 4'-5		
	Slopewash Material (Qsw) @ 10': Olive silty fine SAND, moist, medium dense, caliche.	Qsw	SM			
	Capristrano Formation, Oso Member (Tco) @ 13.5': Gray silty fine to medium SANDSTONE, moist, dense, slightly cemented, slightly micaceous.	Tco	SM			
	Notes: Total Depth: 14.0 Feet. No Groundwater Encountered. Backfilled with Cuttings.					

GRAPHIC REPRESENTATION: NE Wall SCALE: 1" = 5' SURFACE SLOPE: 4° TREND: <--N40°W--



TRENCH 16098-01.GPJ 1/8/18 15:24

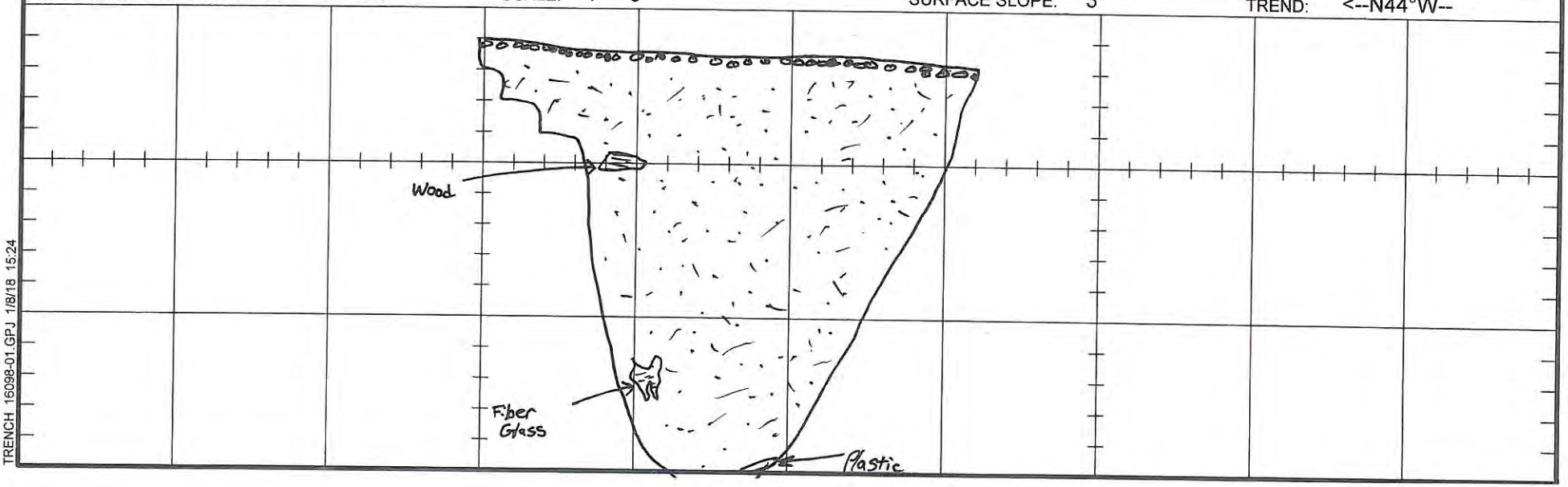
NMG Geotechnical, Inc.

Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	ZKH/TD
Project Number:	16098-01	Elevation:	700 ±
Equipment:	JCB 214 Backhoe	Location:	West Corner

TRENCH NO.: **T-11**

GEOLOGIC ATTITUDES	DESCRIPTION: DATE: 12/11/17	GEOLOGIC UNIT	ENGINEERING PROPERTIES U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0': Yellowish brown silty fine SAND, moist, loose to medium dense. @ 4': Scattered wood debris. @ 7': Yellowish brown silty fine to medium SAND, wet, loose to medium dense. @ 11': Fiber glass debris, approximately 4"x10". @ 11'-14': Pale yellowish brown silty fine to medium SAND, moist, loose to medium dense, scattered plastic pipe debris, scattered cemented nodules. @ 15': Plastic debris.	Afu	SM SM			
	Notes: Total Depth: 16.0 Feet. No Groundwater Encountered. Backfilled with Cuttings.					

GRAPHIC REPRESENTATION: NE Wall SCALE: 1" = 5' SURFACE SLOPE: 3° TREND: <--N44°W--



LOG OF TRENCH NO: T-11

TRENCH 16098-01.GPJ 1/8/18 15:24

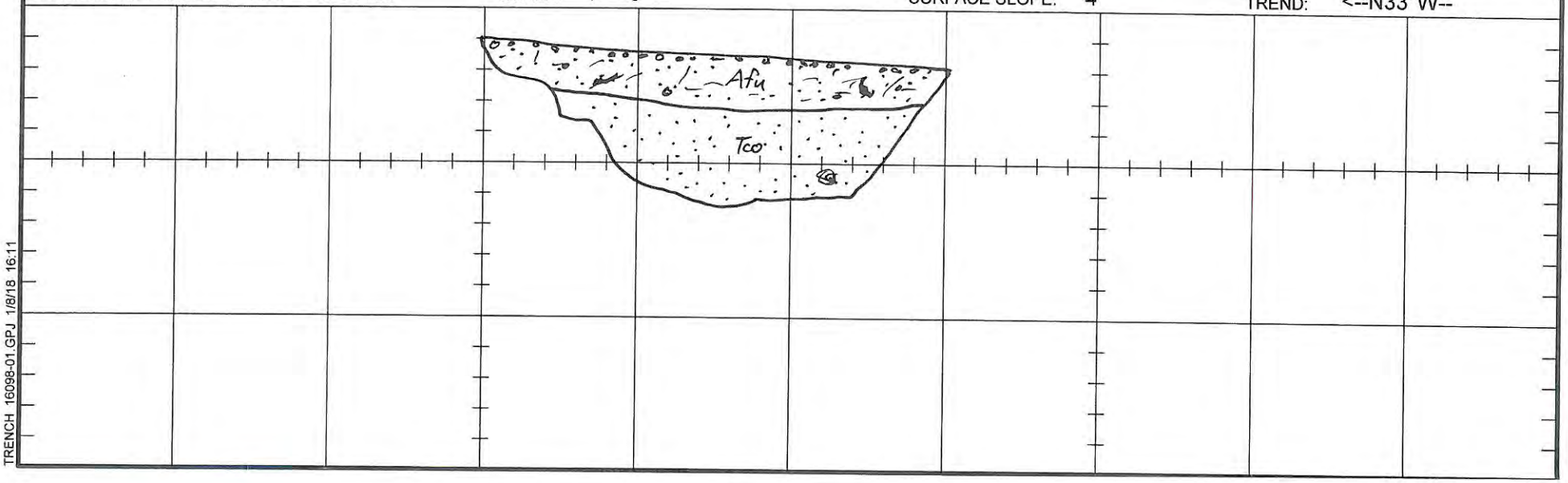
NMG Geotechnical, Inc.

Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	ZKH/TD
Project Number:	16098-01	Elevation:	700 ±
Equipment:	JCB 214 Backhoe	Location:	NW Portion Along Bake Pkwy

TRENCH NO.: **T-12**

GEOLOGIC ATTITUDES	DESCRIPTION:	DATE: 12/11/17	GEOLOGIC UNIT	ENGINEERING PROPERTIES: U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0'-1.5': Olive brown silty fine SAND, wet, scattered pebbles, trace plastic debris.		Afu	SM			
	Capristrano Formation, Oso Member (Tco) @ 1.5': White to pale olive silty fine to coarse SANDSTONE, moist, medium dense to very dense, scattered concretions.		Tco	SP			
	Notes: Total Depth: 5.0 Feet. No Groundwater Encountered. Backfilled with Cuttings.						

GRAPHIC REPRESENTATION: NE Wall SCALE: 1" = 5' SURFACE SLOPE: 4° TREND: <--N33°W--



LOG OF TRENCH NO: T-12

TRENCH 16098-01.GPJ 1/8/18 16:11

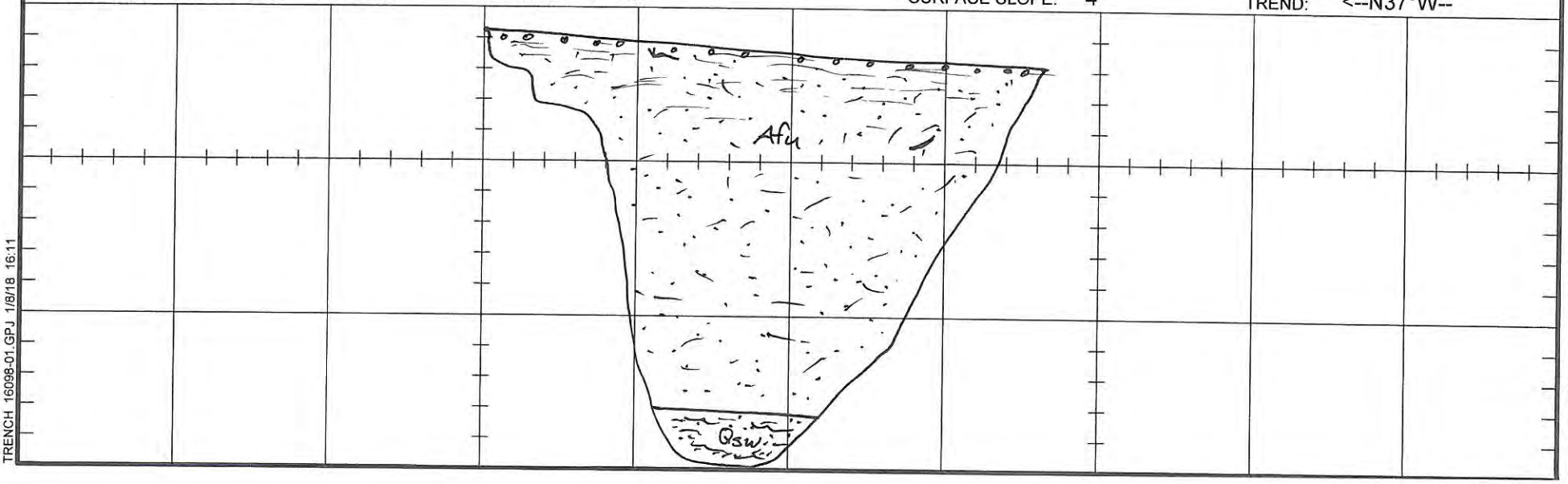
NMG Geotechnical, Inc.

Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	ZKH
Project Number:	16098-01	Elevation:	696 ±
Equipment:	JCB 214 Backhoe	Location:	NW Portion Along Bake Pkwy

TRENCH NO.: **T-13**

GEOLOGIC ATTITUDES	DESCRIPTION: DATE: 12/11/17	GEOLOGIC UNIT	ENGINEERING PROPERTIES: U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0': Mottled olive brown to brown silty fine to medium SAND, moist, loose to medium dense, trace plastic debris, distinct visible lifts of fill.	Afu	SM			
	@ 5': White to pale yellow silty fine SAND, moist to wet, loose to medium dense.		SM			
	Slopewash Material (Qsw) @ 12': Brown silty/clayey fine SAND, moist, medium dense, slightly blocky, pinhole pores.	Qsw	SM-SC			
	Notes: Total Depth: 14.0 Feet. No Groundwater Encountered. Backfilled with Cuttings.					

GRAPHIC REPRESENTATION: NE Wall SCALE: 1" = 5' SURFACE SLOPE: 4° TREND: <--N37°W--



LOG OF TRENCH NO: T-13

TRENCH 16098-01.GPJ 1/8/18 16:11

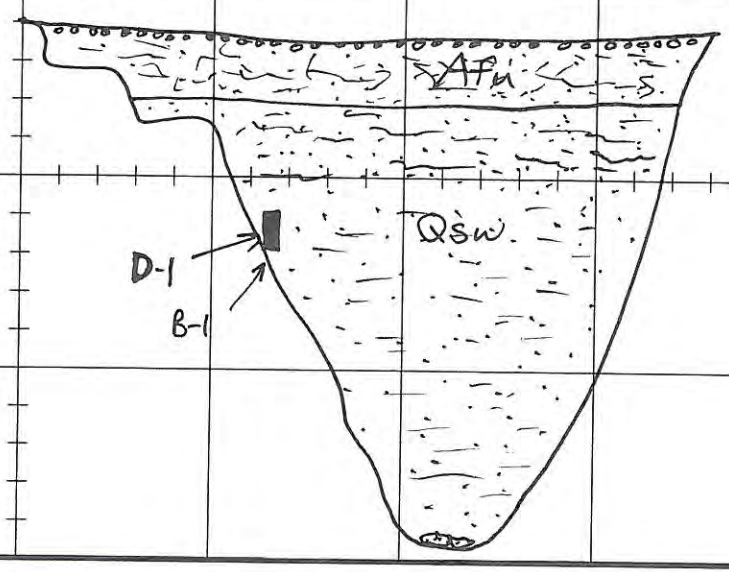
NMG Geotechnical, Inc.

Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	ZKH
Project Number:	16098-01	Elevation:	695 ±
Equipment:	JCB 214 Backhoe	Location:	Adjacent to Bake Pkwy

TRENCH NO.: **T-14**

GEOLOGIC ATTITUDES	DESCRIPTION: DATE: 12/11/17	GEOLOGIC UNIT	ENGINEERING PROPERTIES U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0'-2': Dark brown to black silty/clayey fine to medium SAND, moist, loose to medium dense, olive sand layer at base of fill.	Afu	SM-SC			
	Slopewash Material (Qsw) @ 2': Brown silty/clayey fine SAND, moist, medium dense, trace pores.	Qsw	SM-SC			
	@ 5' SAMPLE: Brown silty fine SAND, moist, medium dense, trace pinhole pores, caliche.		SM	D-1 @ 5' B-1 @ 5'-6'	9.5	112.0
	@ 9'-12': Trace 1/4" pores from roots. No roots in pores. Slightly more dense.					
	@ 13.5': Trace fragments of SANDSTONE bedrock.					
	Notes: Total Depth: 13.5 Feet. No Groundwater Encountered. Backfilled with Cuttings.					

GRAPHIC REPRESENTATION: NE Wall SCALE: 1" = 5' SURFACE SLOPE: 0° TREND: <--N40°W--



LOG OF TRENCH NO: T-14

TRENCH 16098-01.GPJ 1/8/18 15:24

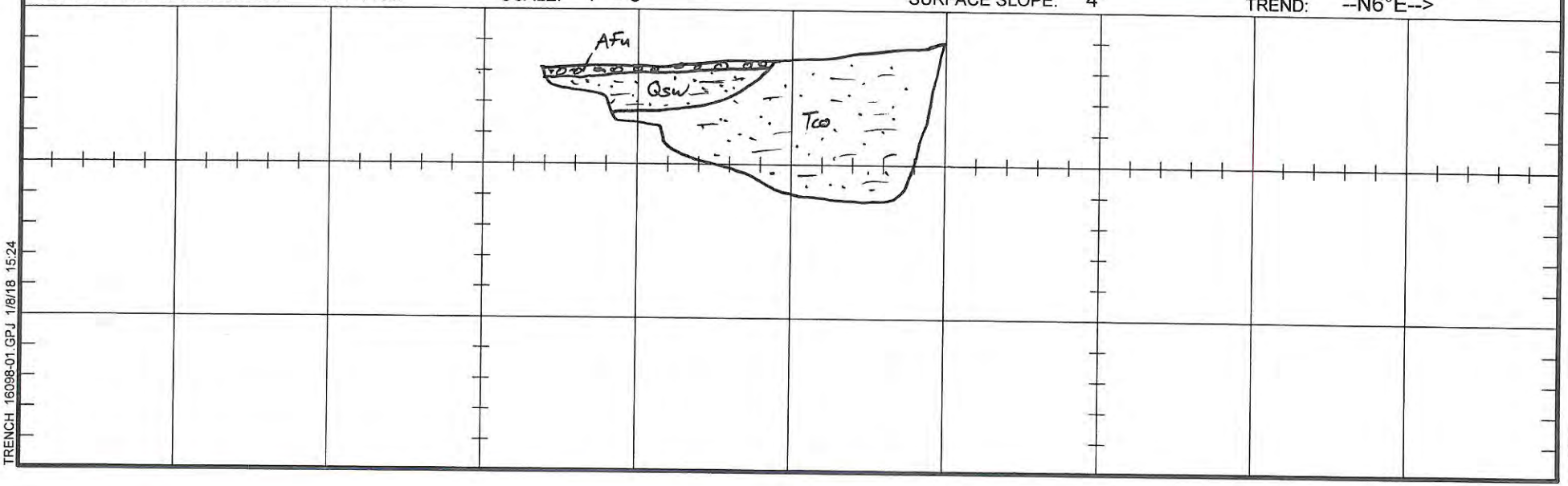
NMG Geotechnical, Inc.

LOG OF TRENCH NO: T-15

Project Name: Toll Brothers/Lake Forest Nursery	Logged By: ZKH	TRENCH NO.:	ENGINEERING PROPERTIES
Project Number: 16098-01	Elevation: 726 ±	T-15	
Equipment: JCB 214 Backhoe	Location: Adjacent to Bake Pkwy		

GEOLOGIC ATTITUDES	DESCRIPTION: DATE: 12/11/17	GEOLOGIC UNIT	U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0'-1.5': Upper 6" gravelly SAND. @ 0.5': Light brown silty SAND, moist.	Afu	GP SM			
	Slopewash Material (Qsw) @ 1.5': Light brown fine to medium silty SAND, moist, loose to medium dense.	Qsw	SM			
25, 17SE	**Capistrano Formation, Oso Member (Tco)** @ 0'-5': White to pale yellow silty fine to medium SANDSTONE, damp to moist, very dense, micaceous.	Tco	SM			
	Notes: Total Depth: 5.0 Feet. No Groundwater Encountered. Backfilled with Cuttings.					

GRAPHIC REPRESENTATION: NW Wall SCALE: 1" = 5' SURFACE SLOPE: 4° TREND: --N6°E-->



TRENCH 16098-01.GPJ 1/8/18 15:24

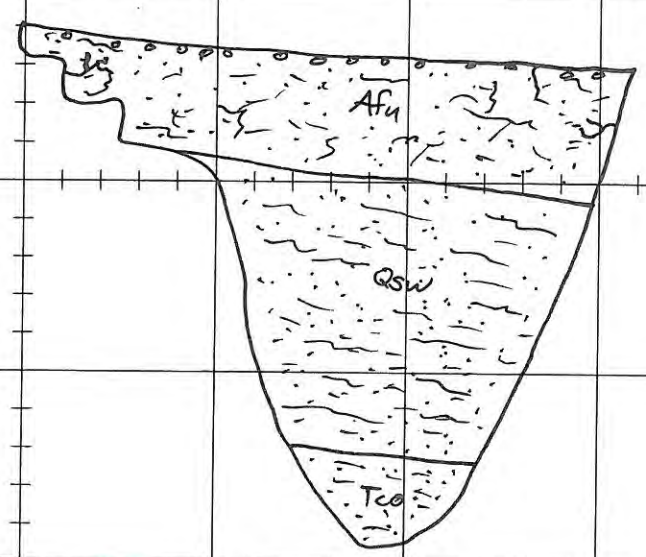
NMG Geotechnical, Inc.

Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	ZKH
Project Number:	16098-01	Elevation:	718 ±
Equipment:	JCB 214 Backhoe	Location:	Adjacent to Bake Pkwy

TRENCH NO.: **T-16**

GEOLOGIC ATTITUDES	DESCRIPTION: DATE: 12/11/17	GEOLOGIC UNIT	ENGINEERING PROPERTIES: U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0'-3': Dark brown mottled silty/clayey fine to medium SAND, moist, loose, trace roots.	Afu	SM-SC			
	Slopewash Material (Qsw) @ 3': Dark brown silty/clayey fine to medium SAND, moist, loose to medium dense, trace pinhole pores. @ 5': Slightly more dense.	Qsw	SM-SC			
	Capristrano Formation, Oso Member (Tco) @ 11': Weathered bedrock @ 12': Yellow brown to olive silty fine to medium SANDSTONE, moist, dense, slightly friable, micaceous.	Tco	SM			
	Notes: Total Depth: 13.0 Feet. No Groundwater Encountered. Backfilled with Cuttings.					

GRAPHIC REPRESENTATION: NE Wall SCALE: 1" = 5' SURFACE SLOPE: 4° TREND: <--N33°W--



LOG OF TRENCH NO: T-16

TRENCH 16098-01.GPJ 1/8/18 15:24

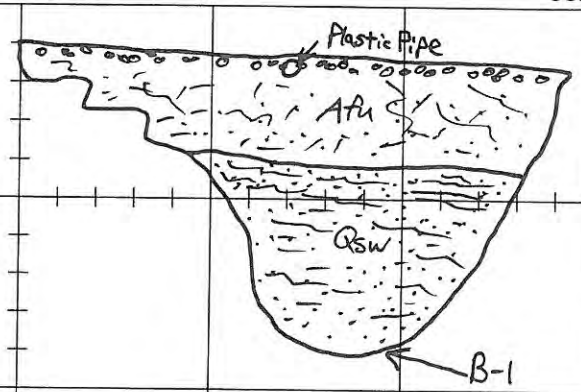
NMG Geotechnical, Inc.

Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	ZKH
Project Number:	16098-01	Elevation:	713 ±
Equipment:	JCB 214 Backhoe	Location:	Adjacent to Bake Pkwy

TRENCH NO.: **T-17**

GEOLOGIC ATTITUDES	DESCRIPTION: DATE: 12/11/17	GEOLOGIC UNIT	ENGINEERING PROPERTIES U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0'-2': Dark brown/black to white silty/clayey SAND, moist, loose, pipe debris in upper foot.	Afu	SM-SC			
	Slopewash (Qsw) @ 2': Dark brown clayey fine to medium SAND, wet, loose, pinhole pores, trace roots.	Qsw	SC			
	@ 3.5': Brown to dark grayish brown silty/clayey fine to coarse SAND, wet, medium dense, pinhole pores.		SM-SC			
	@ 7': Slightly more dense, less pores.			B-1 @ 7.0'		
	Notes: Total Depth: 7.0 Feet. No Grounwater Encountered. Backfilled with Cuttings.					

GRAPHIC REPRESENTATION: NE Wall SCALE: 1" = 5' SURFACE SLOPE: 3° TREND: <--N34°W--



LOG OF TRENCH NO: T-17

NMG Geotechnical, Inc.

Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	ZKH
Project Number:	16098-01	Elevation:	715 ±
Equipment:	JCB 214 Backhoe	Location:	Central Portion Near Drainage

TRENCH NO.: **T-18**

GEOLOGIC ATTITUDES	DESCRIPTION: DATE: 12/15/17	GEOLOGIC UNIT	ENGINEERING PROPERTIES U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0'-1.5': Light brown silty fine to medium SAND, damp to moist, loose, gravel in upper 3".	Afu	GP SM			
	Capistrano Formation, Oso Member (Tco) @ 1.5': Olive fine to coarse SANDSTONE, moist to wet, friable.	Tco	SP			
	Notes: Total Depth: 2.0 Feet. No Groundwater Encountered. Backfilled with Cuttings.					

GRAPHIC REPRESENTATION: NW Wall SCALE: 1" = 5' SURFACE SLOPE: 0° TREND: --N43°E-->

LOG OF TRENCH NO: T-18

TRENCH 16098-01.GPJ 1/8/18 15:24

NMG Geotechnical, Inc.

LOG OF TRENCH NO: T-19

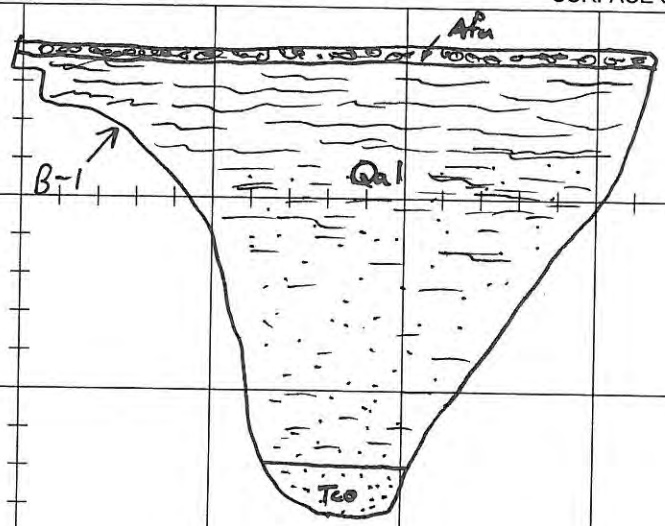
Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	ZKH
Project Number:	16098-01	Elevation:	710 ±
Equipment:	JCB 214 Backhoe	Location:	Central Portion Near Drainage

TRENCH NO.: **T-19**

GEOLOGIC ATTITUDES	DESCRIPTION: (DATE: 12/15/17)	GEOLOGIC UNIT	ENGINEERING PROPERTIES: U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0': Brown silty sandy GRAVEL, loose, damp.	Afu	GM/GP			
	Alluvium (Qal) @ 0.5'-3': Very dark brown CLAY, wet, medium stiff, plastic, some ~1" tree roots, micaceous, trace pinhole pores, caliche. @ 3'-5.5': Brown sandy clayey SILT, wet, medium stiff, trace pinhole pores, abundant caliche, micaceous. @ 8': Brown silty SAND, very moist, medium dense.	Qal	CL ML SM	B-1 @ 2'		
	Capistrano Formation, Oso Member (Tco) @ 11': Pale olive fine to coarse SANDSTONE, moist, very dense, slightly cemented, caliche, micaceous, slightly friable where not cemented.	Tco	SP			

Notes:
Total Depth: 12.0 Feet.
No Groundwater Encountered.
Backfilled with Cuttings.

GRAPHIC REPRESENTATION: NW Wall SCALE: 1" = 5' SURFACE SLOPE: 0° TREND: --N45°E-->



TRENCH 16098-01.GPJ 1/8/18 15:24

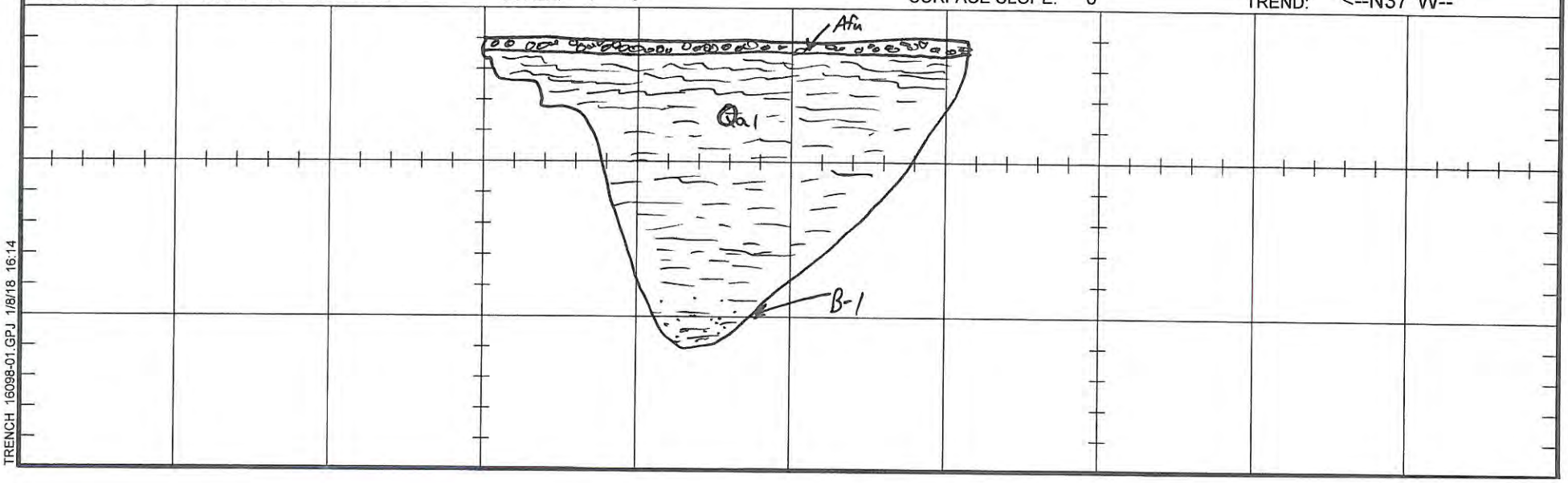
NMG Geotechnical, Inc.

Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	ZKH
Project Number:	16098-01	Elevation:	707 ±
Equipment:	JCB 214 Backhoe	Location:	Central Portion, Near Serrano Creek

TRENCH NO.: **T-20**

GEOLOGIC ATTITUDES	DESCRIPTION:	DATE: 12/15/17	GEOLOGIC UNIT	ENGINEERING PROPERTIES: U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0'-0.5': Gravelly silty SAND, moist to saturated, loose.		Afu	SM			
	Alluvium (Qal) @ 0.5'-1.5': Dark brown sandy CLAY, moist to wet, medium stiff.		Qal	CL			
	@ 1.5'-9': Brown clayey SILT, moist to very moist, medium stiff, some pinhole and pencil-tip pores, root hairs, moderate caliche.			ML			
	@ 9'-10': Brown silty fine SAND/sandy SILT, moist, medium dense, some pinhole pores, moderate caliche.			SM-ML	B-1 @ 9'-10'		
	Notes: Total Depth: 10.0 Feet. No Groundwater Encountered. Backfilled with Cuttings.						

GRAPHIC REPRESENTATION: NE Wall SCALE: 1" = 5' SURFACE SLOPE: 0° TREND: <--N37°W--



LOG OF TRENCH NO: T-20

TRENCH 16098-01.GPJ 1/8/18 16:14

NMG Geotechnical, Inc.

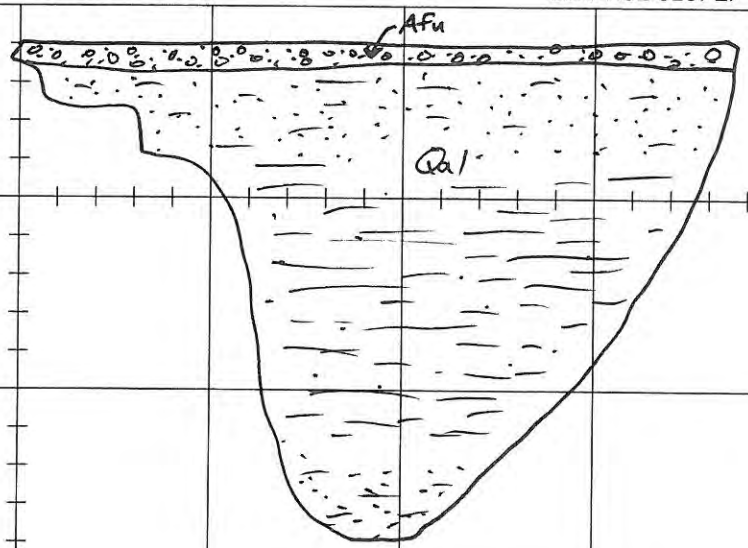
Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	ZKH
Project Number:	16098-01	Elevation:	717 ±
Equipment:	JCB 214 Backhoe	Location:	Central Portion, Near Serrano Creek

TRENCH NO.: **T-21**

GEOLOGIC ATTITUDES	DESCRIPTION: DATE: 12/15/17	GEOLOGIC UNIT	ENGINEERING PROPERTIES: U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0'-0.5': Gravelly SAND.	Afu	SP/GP			
	Alluvium (Qal) @ 0.5'-3': Brown silty fine SAND, moist, loose to medium dense.	Qal	SM			
	@ 3': Yellowish brown sandy SILT, moist to very moist, loose to medium dense, caliche, some pinhole pores, micaceous.		ML			
	@ 11': Brown silty SAND, moist, medium dense, caliche.		SM			

Notes:
Total Depth: 13.0 Feet.
No Groundwater Encountered.
Backfilled with Cuttings.

GRAPHIC REPRESENTATION: NE Wall SCALE: 1" = 5' SURFACE SLOPE: 0° TREND: <--N45°W--



LOG OF TRENCH NO: T-21

TRENCH 16098-01.GPJ 1/8/18 15:24

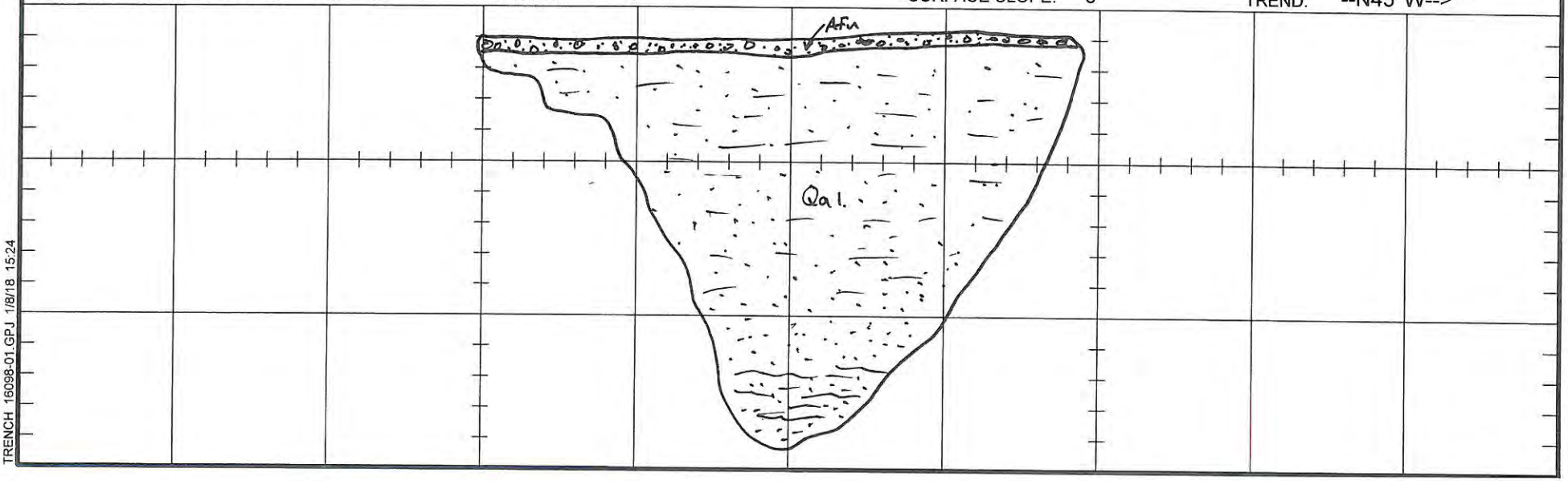
NMG Geotechnical, Inc.

Project Name:	Toll Brothers/Lake Forest Nursery	Logged By:	ZKH
Project Number:	16098-01	Elevation:	730 ±
Equipment:	JCB 214 Backhoe	Location:	Central Portion, Near Rancho Pkwy

TRENCH NO.: **T-22**

GEOLOGIC ATTITUDES	DESCRIPTION:	DATE: 12/15/17	GEOLOGIC UNIT	ENGINEERING PROPERTIES: U.S.C.S.	SAMPLE NO.	MOISTURE CONTENT (%)	DRY DENSITY (pcf)
	Artificial Fill, Undocumented (Afu) @ 0'-0.5': Gray to brown silty fine SAND, damp, loose, some gravel.		Afu	SM			
	Alluvium (Qal) @ 0.5'-5': Brown silty fine to medium SAND, moist, loose to medium dense, pinhole pores, root hairs, roots to 5'. @ 4': Pedogenic surfaces, some gravel and cobbles. @ 9': Sandier, less silt, fine to medium SAND, moist, grades to clean SAND by 10'. @ 11': Silty/clayey fine to coarse SAND, moist, medium dense, abundant pinhole pores, few pencil-tip pores, caliche, trace roots.		Qal	SM SP SM-SC			
	Notes: Total Depth: 13.0 Feet. No Groundwater Encountered. Backfilled with Cuttings.						

GRAPHIC REPRESENTATION: SE Wall SCALE: 1" = 5' SURFACE SLOPE: 0° TREND: --N45°W-->



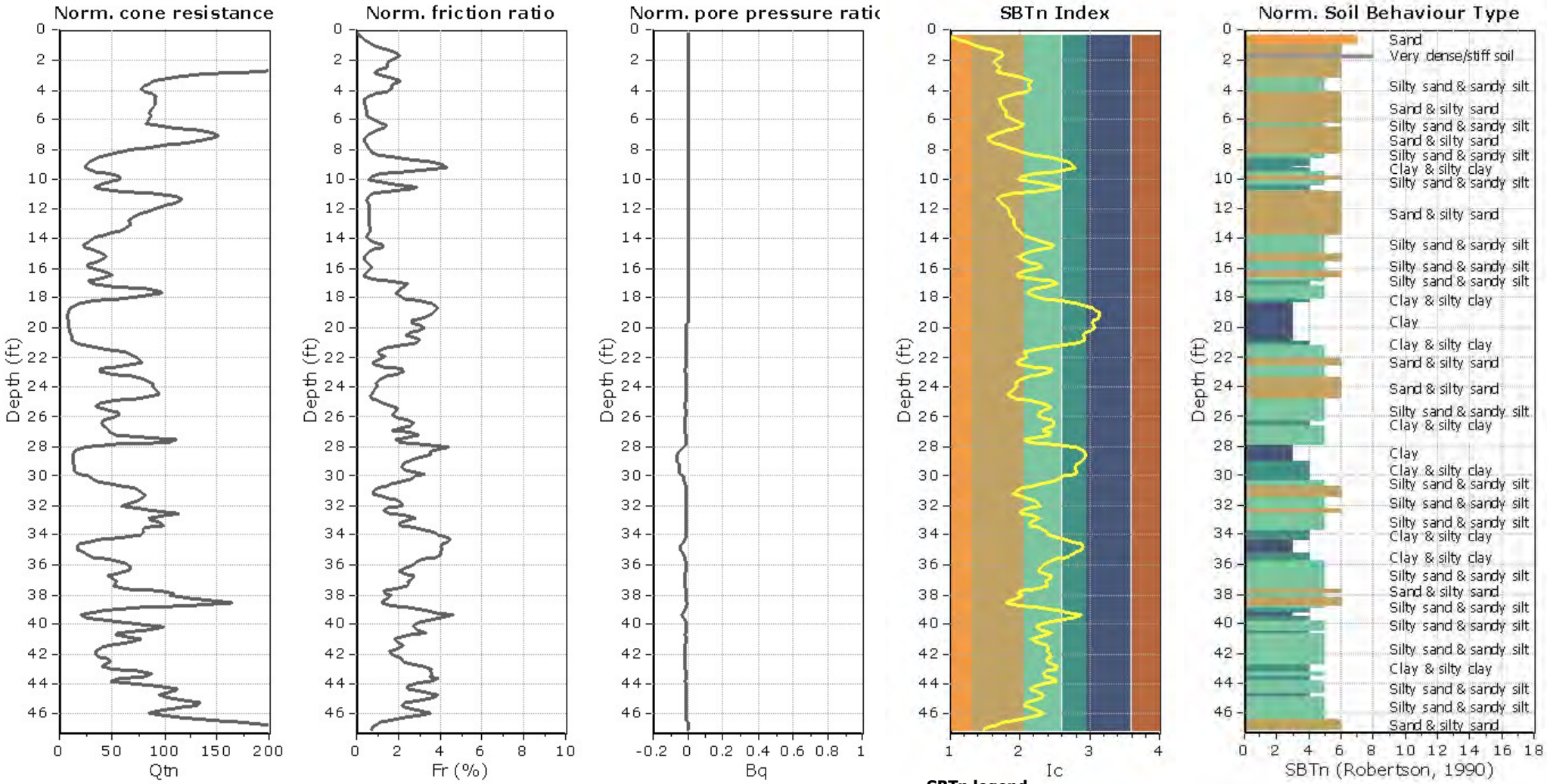
LOG OF TRENCH NO: T-22

TRENCH 16098-01.GPJ 1/8/18 15:24

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-1
Total depth: 47.08 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



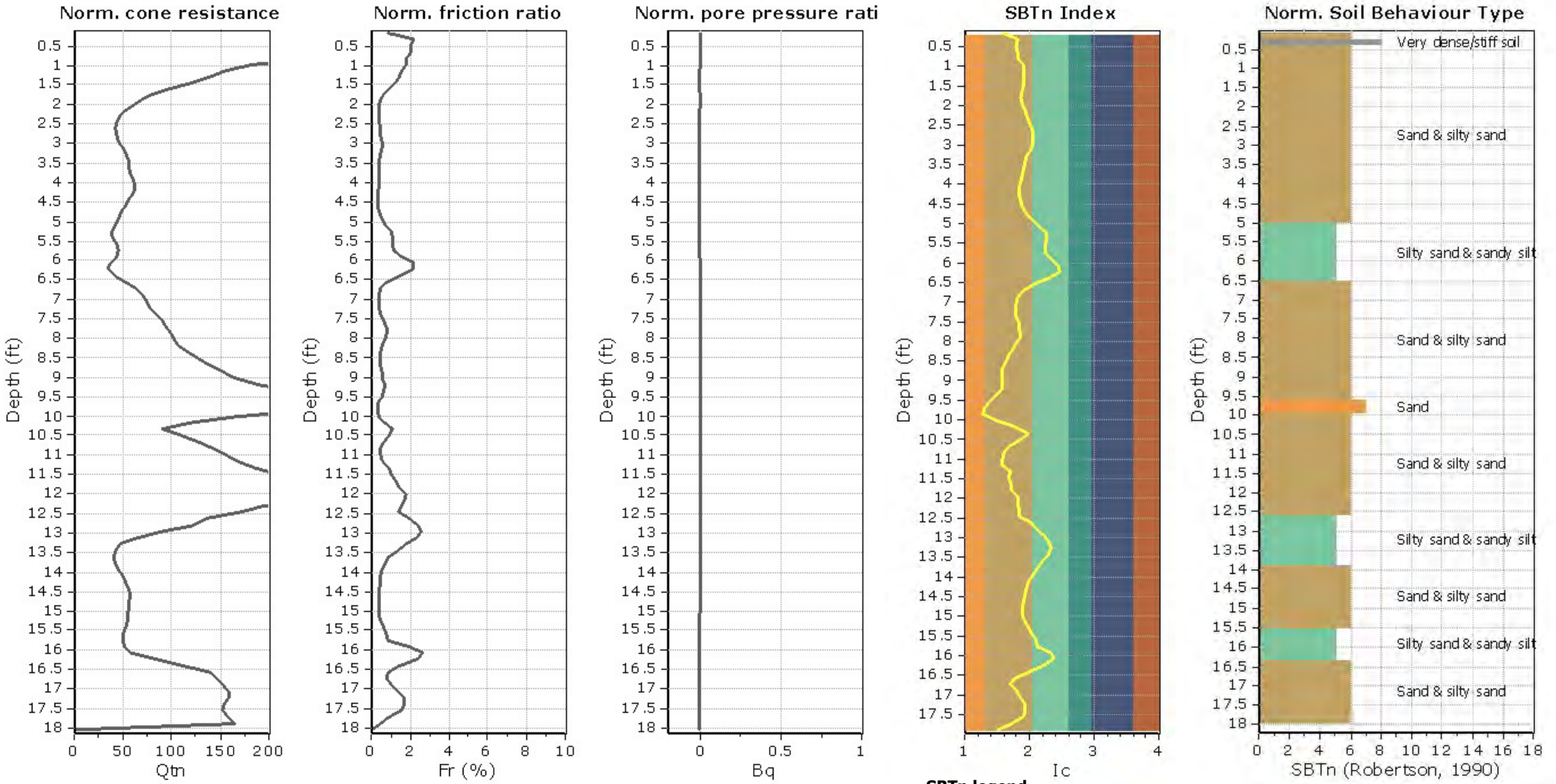
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-2
Total depth: 18.04 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



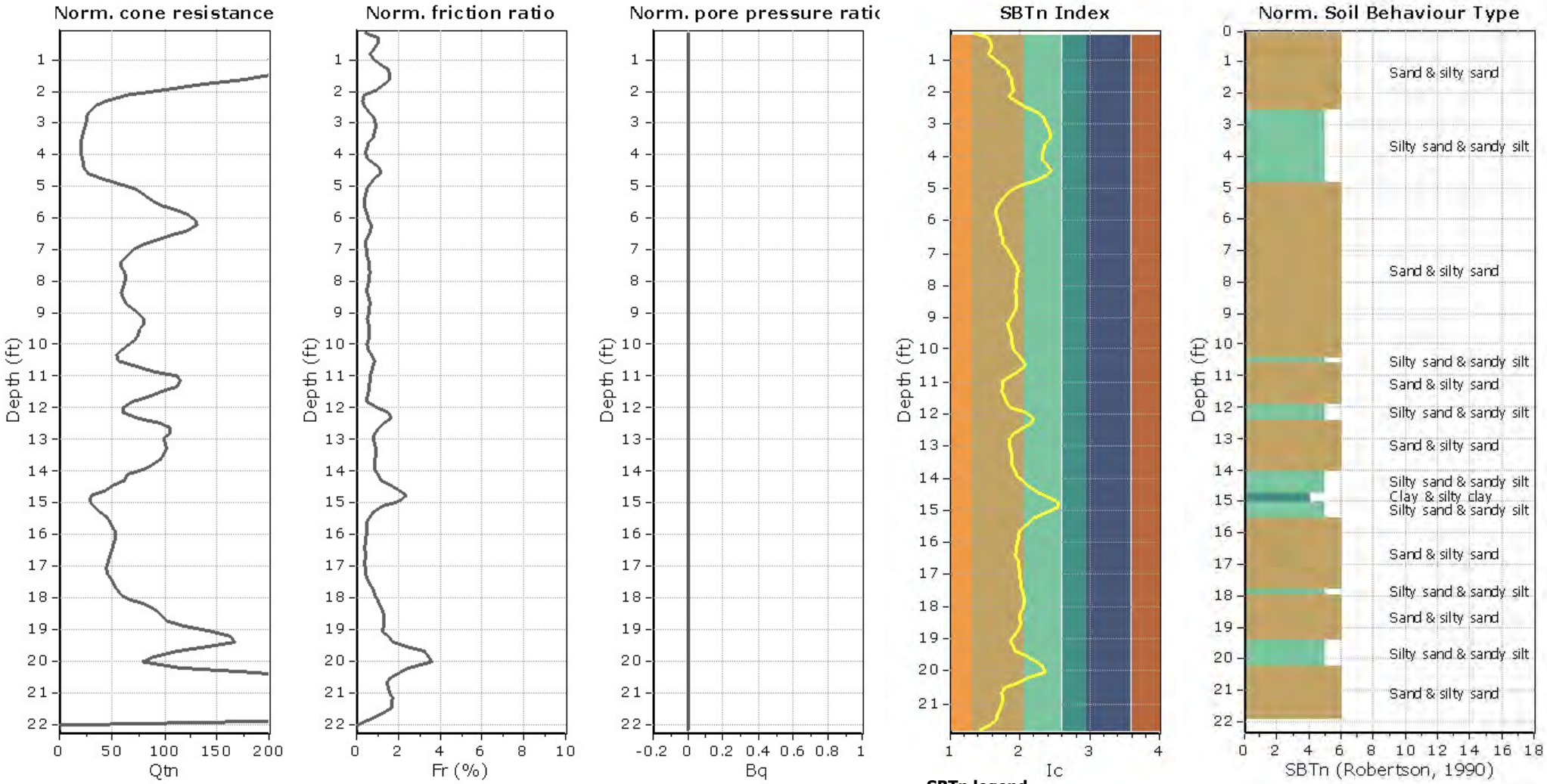
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-2A
Total depth: 22.15 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



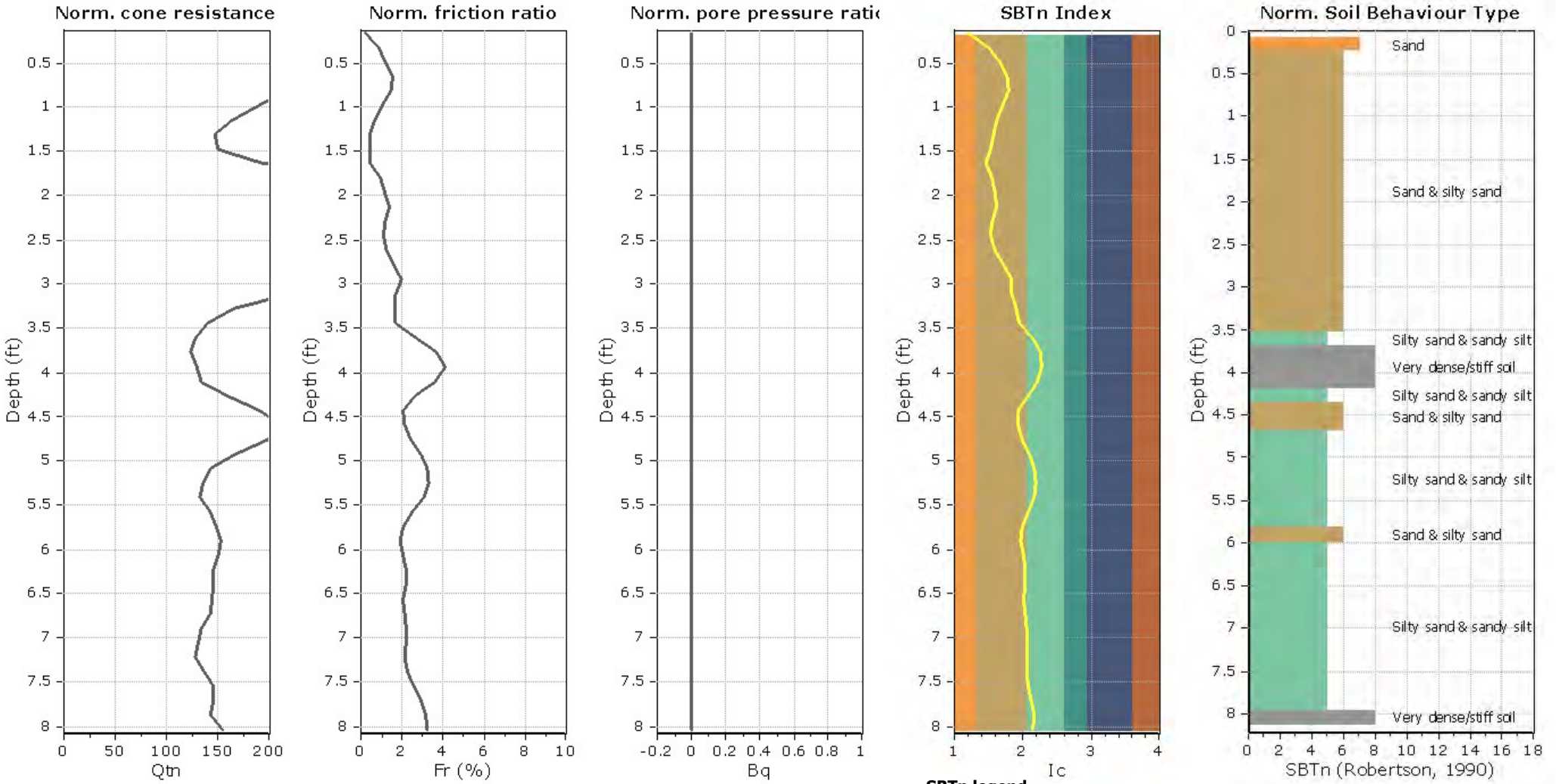
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-3
Total depth: 8.04 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



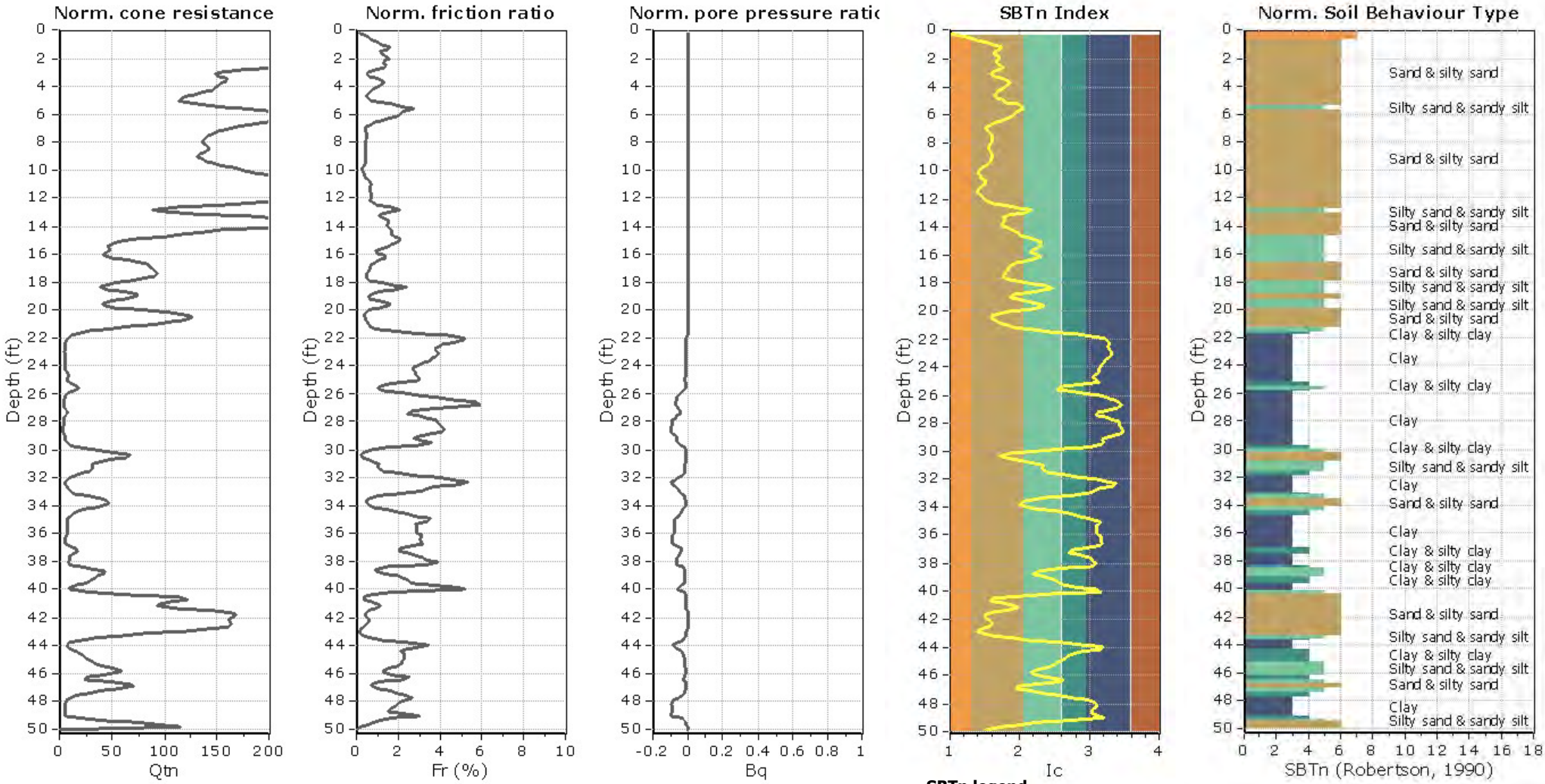
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-4
Total depth: 50.03 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



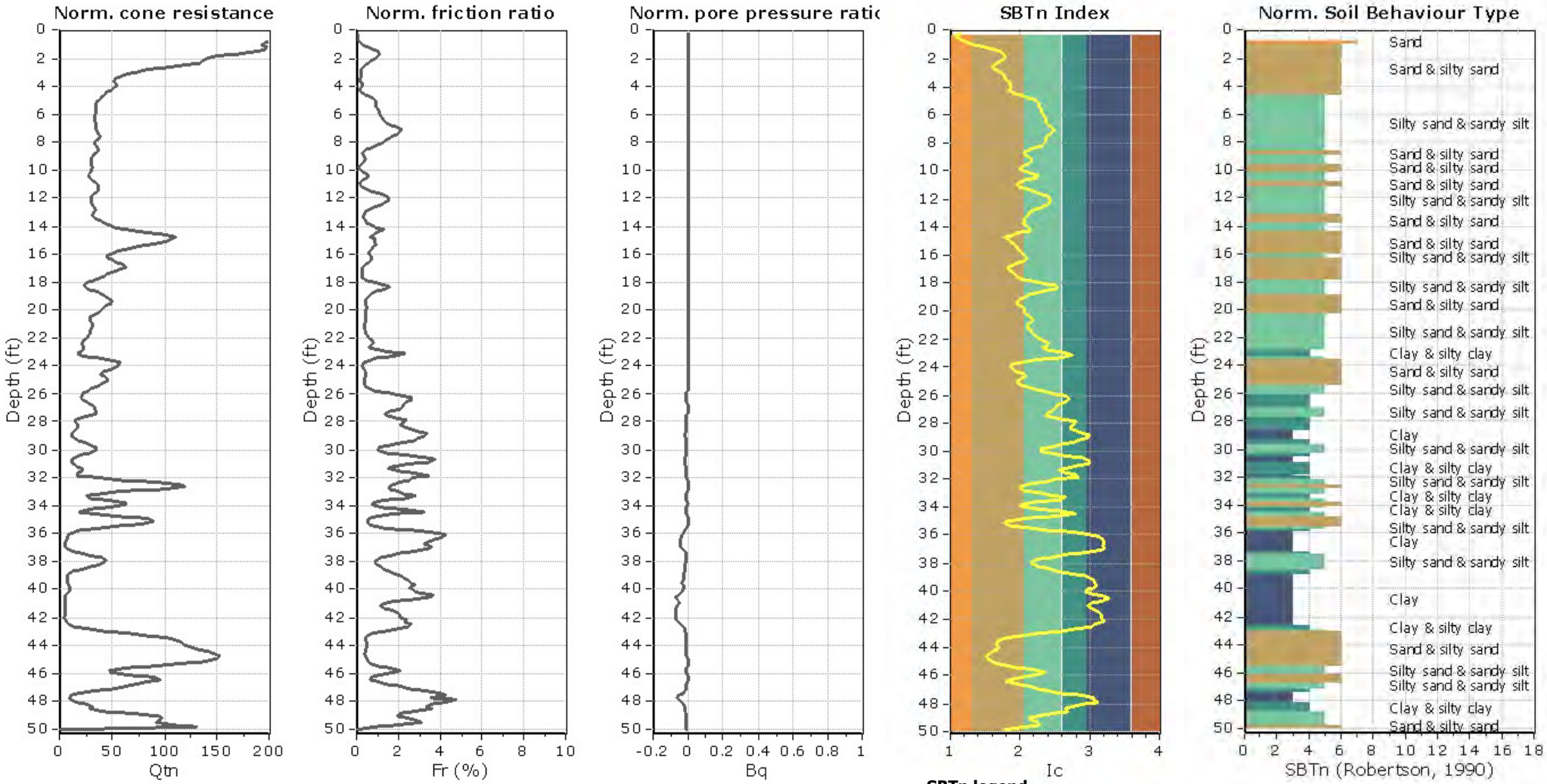
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-5
Total depth: 50.03 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



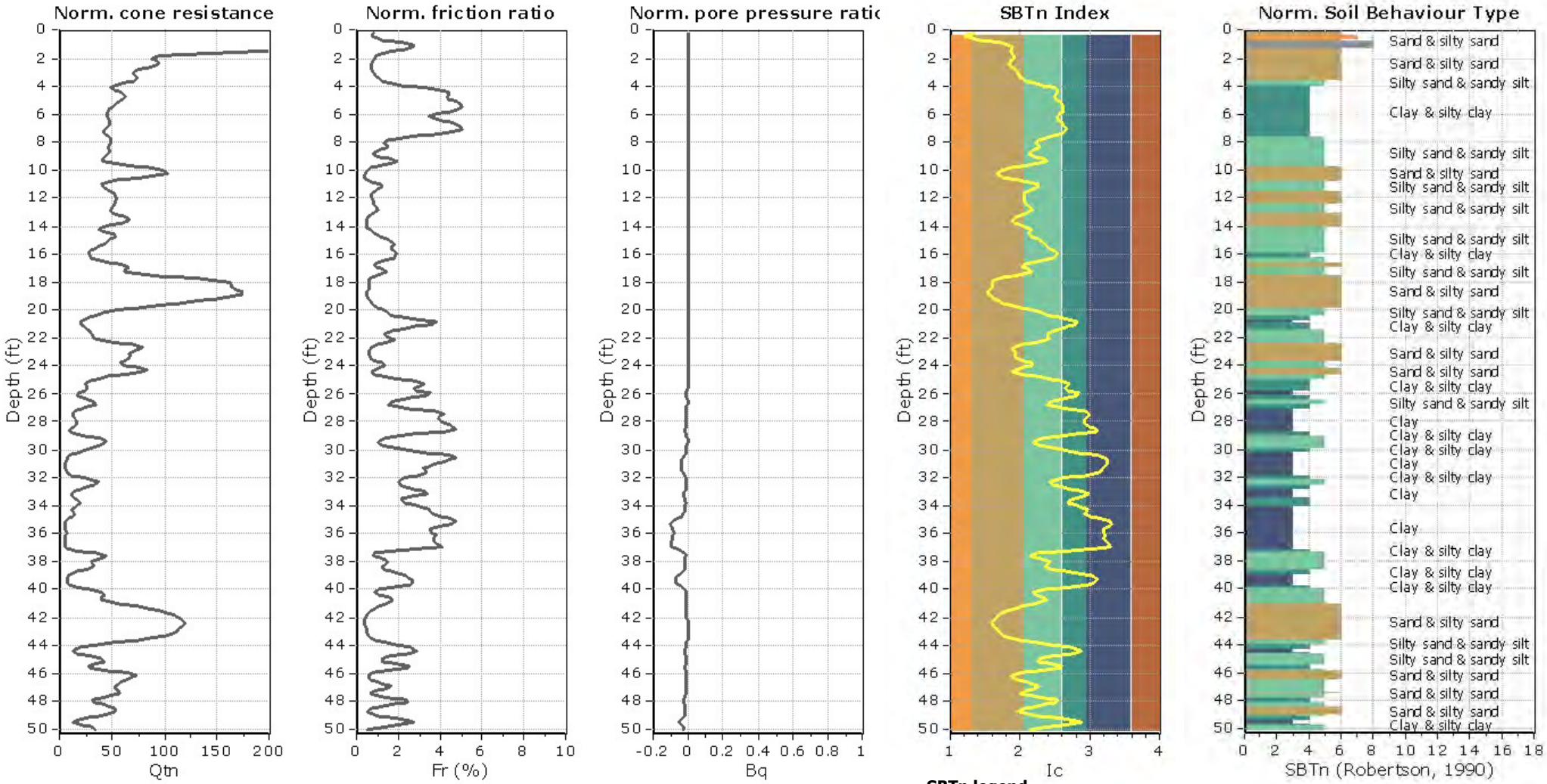
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-6
Total depth: 50.03 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



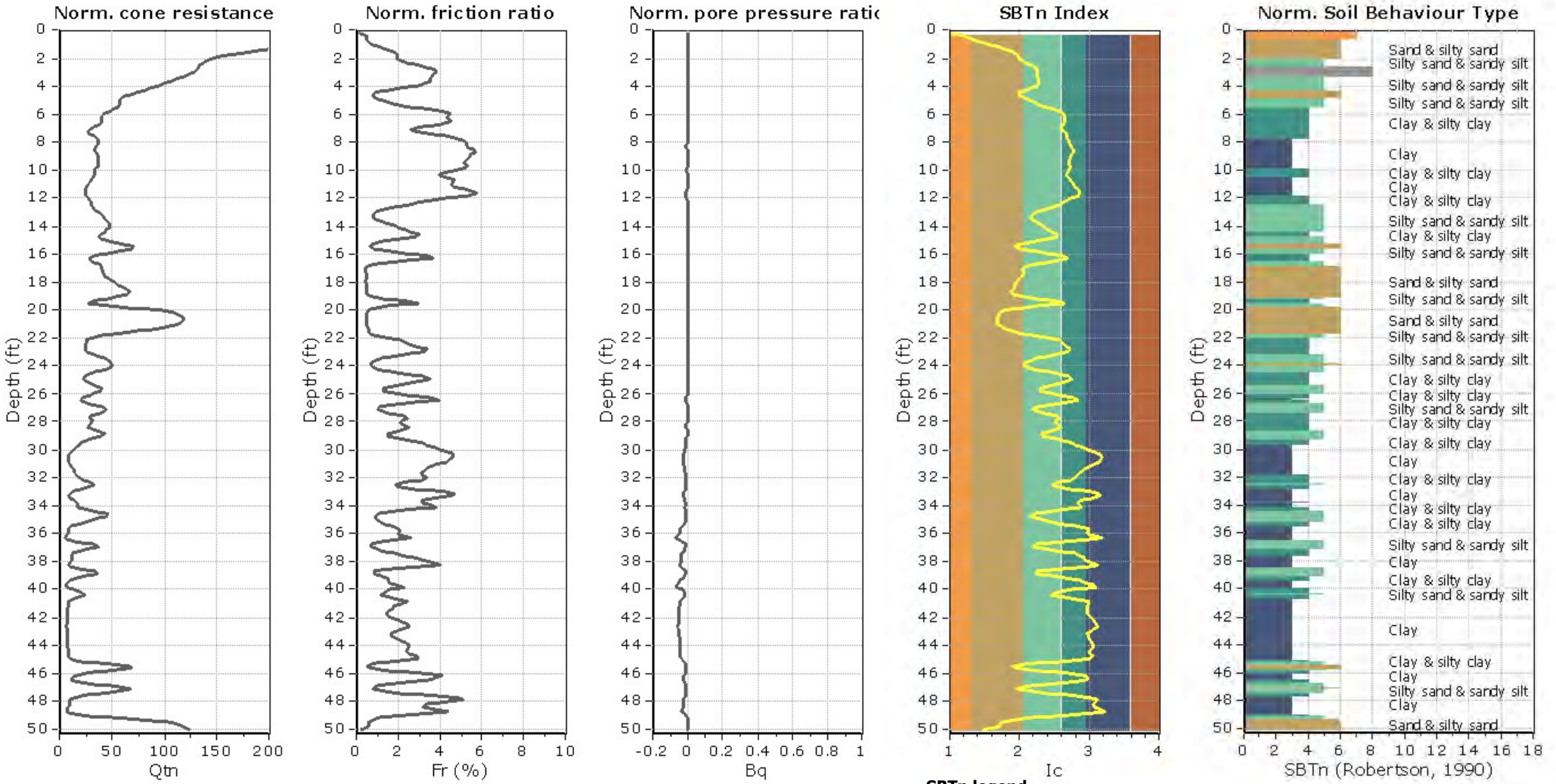
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-7
Total depth: 50.03 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



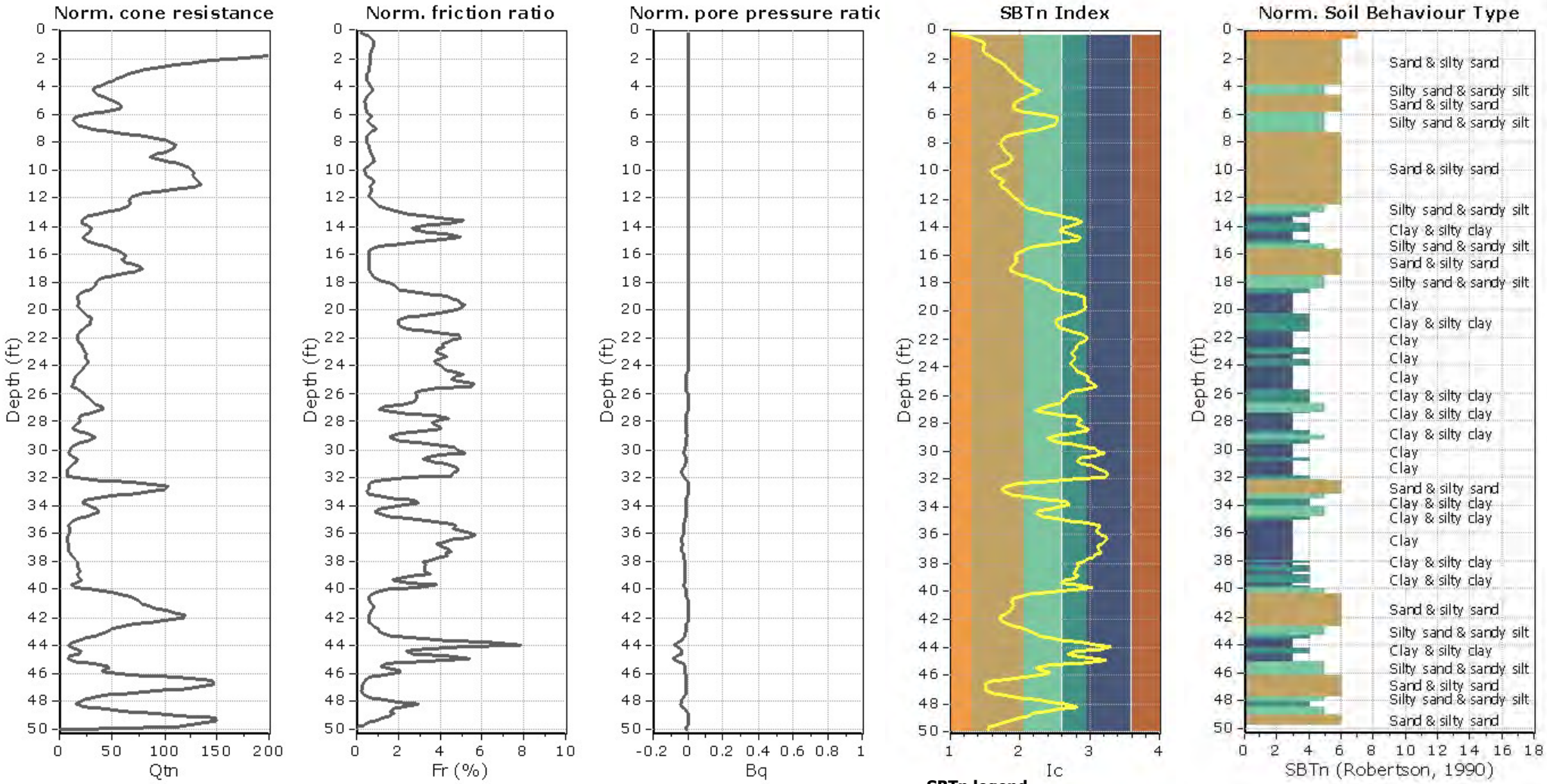
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-8
Total depth: 50.03 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



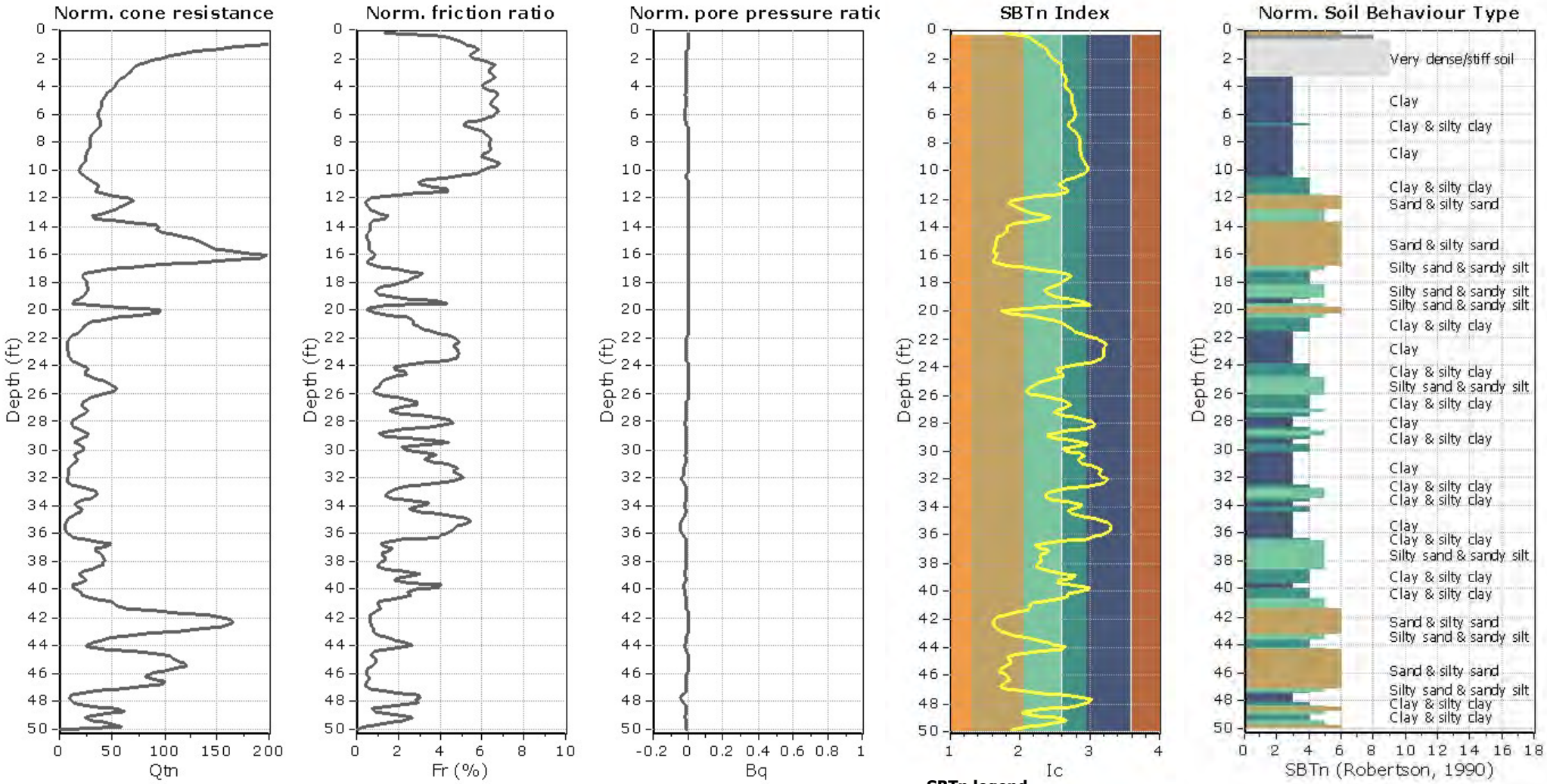
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-9
Total depth: 50.03 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



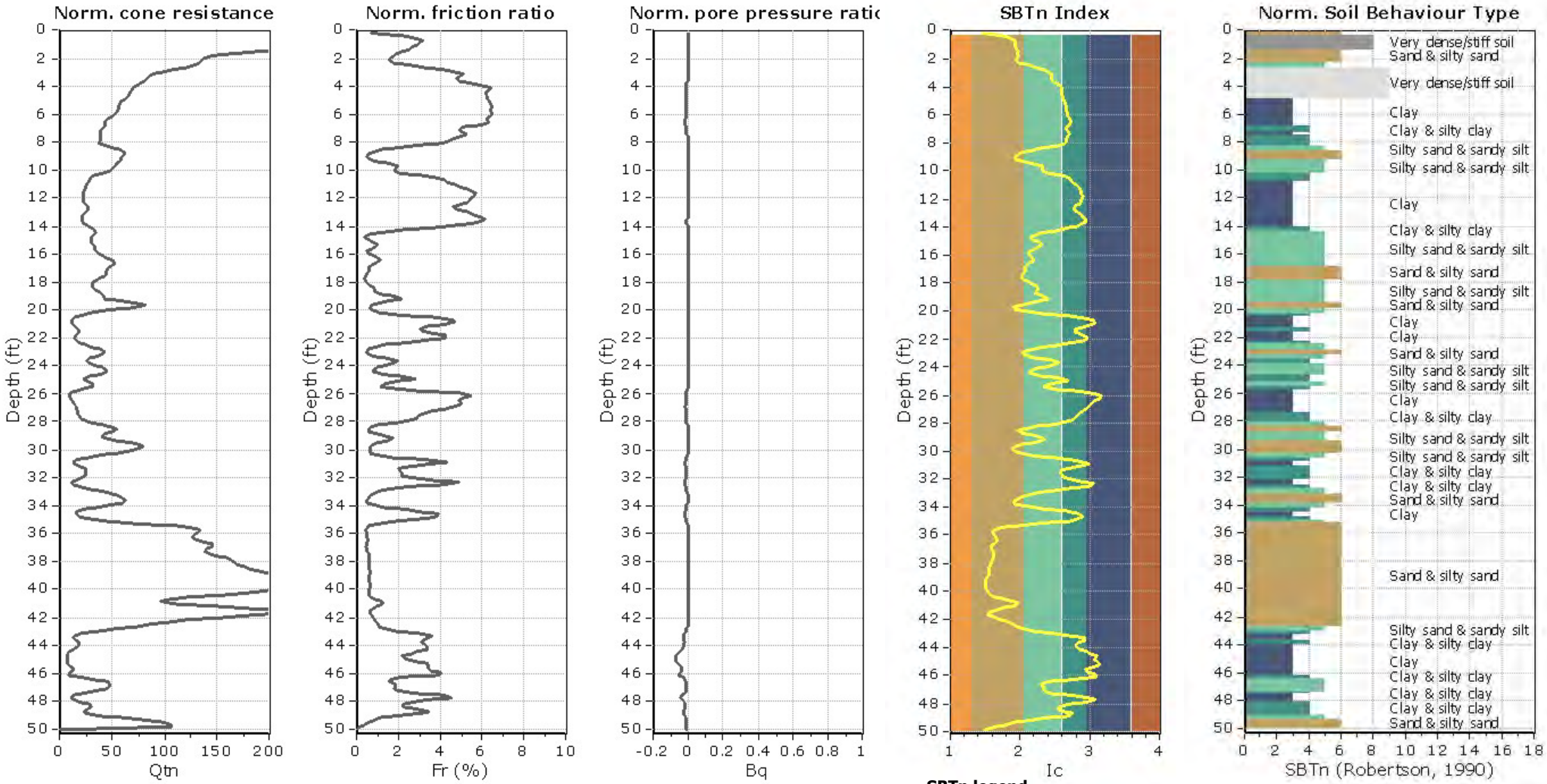
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-10
Total depth: 50.03 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



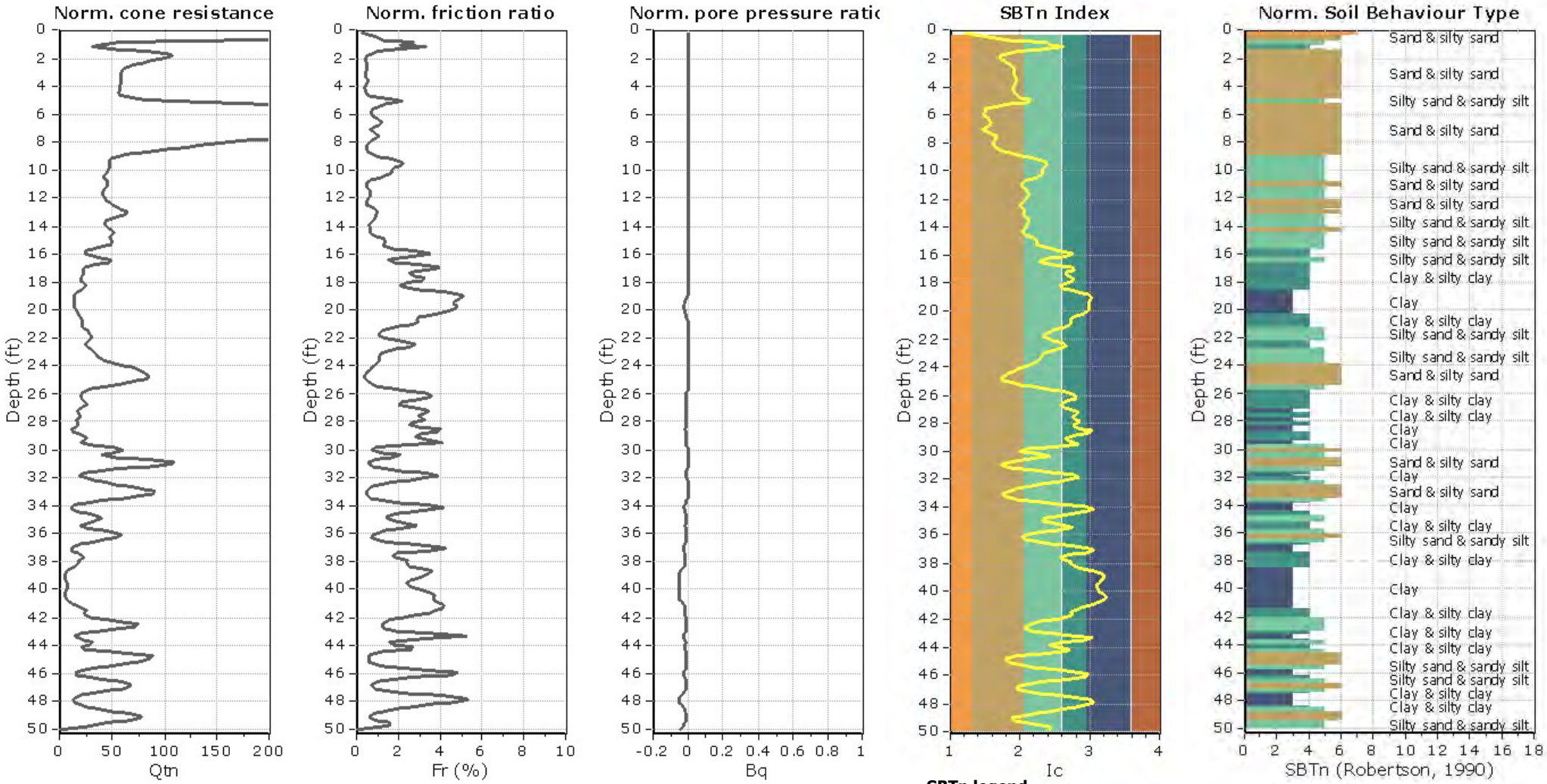
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-11
Total depth: 50.03 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
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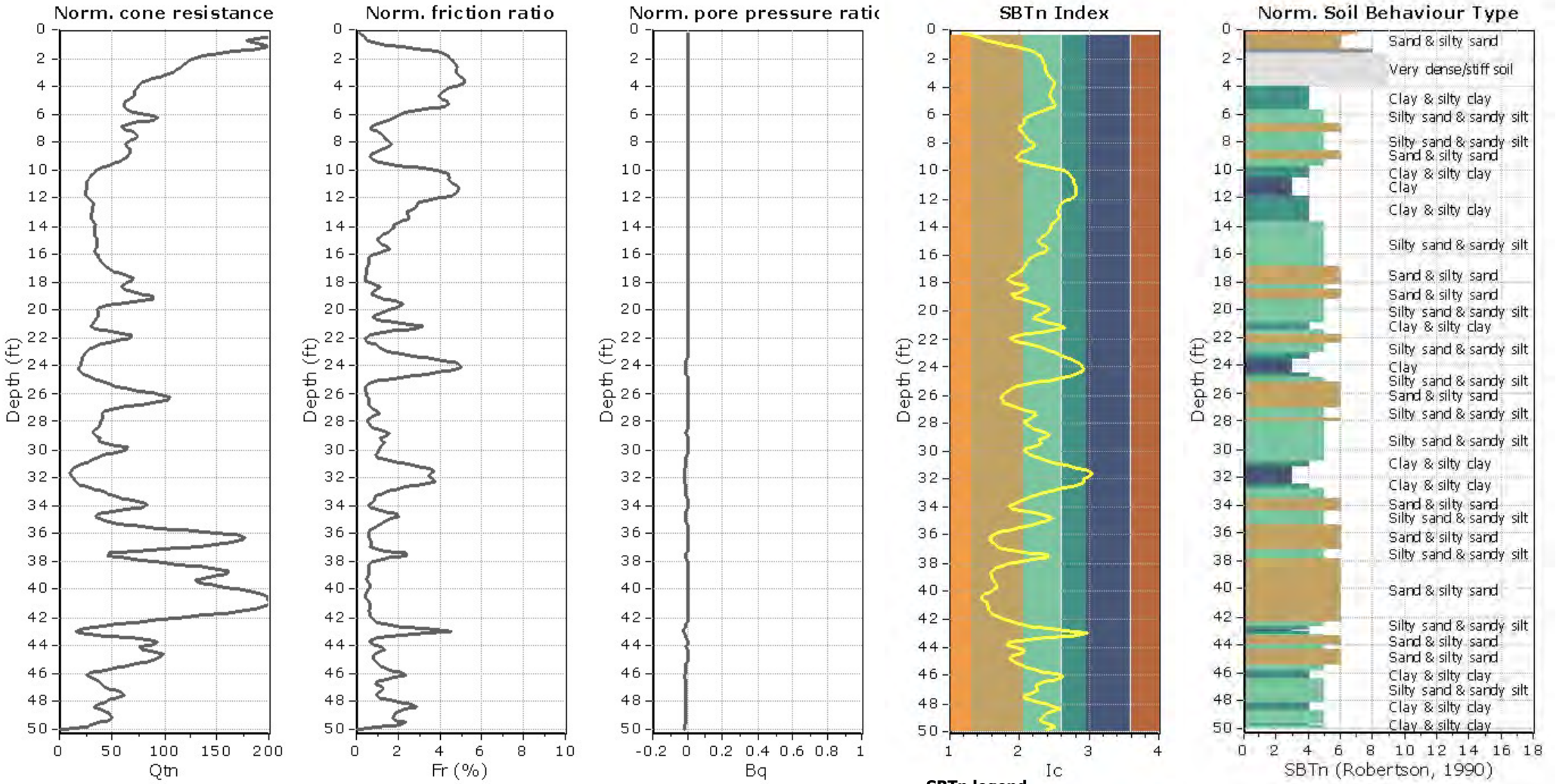
Irvine, CA 92614
(949) 442-2442

CPT: CPT-12
Total depth: 50.03 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



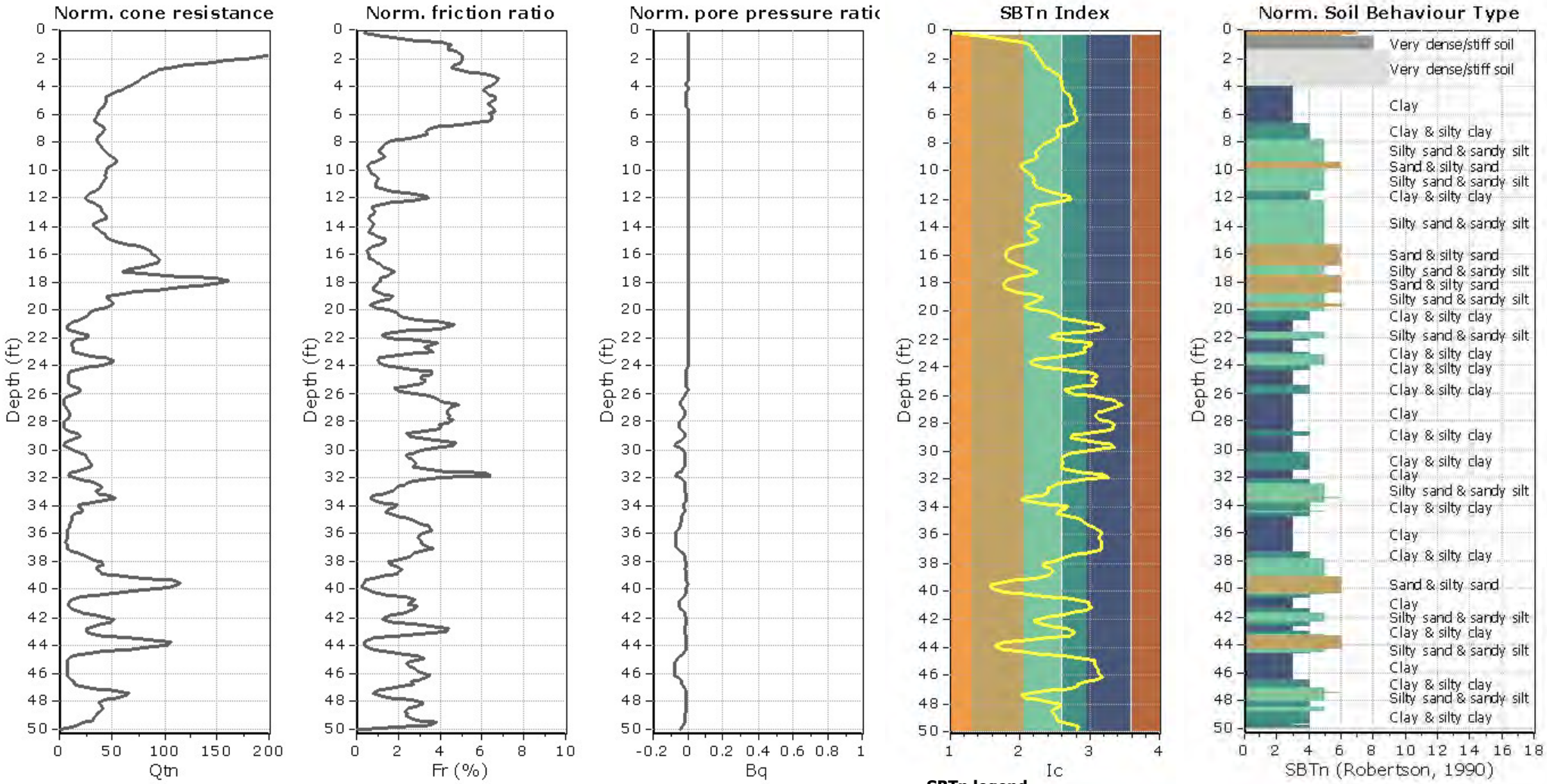
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-13
Total depth: 50.03 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



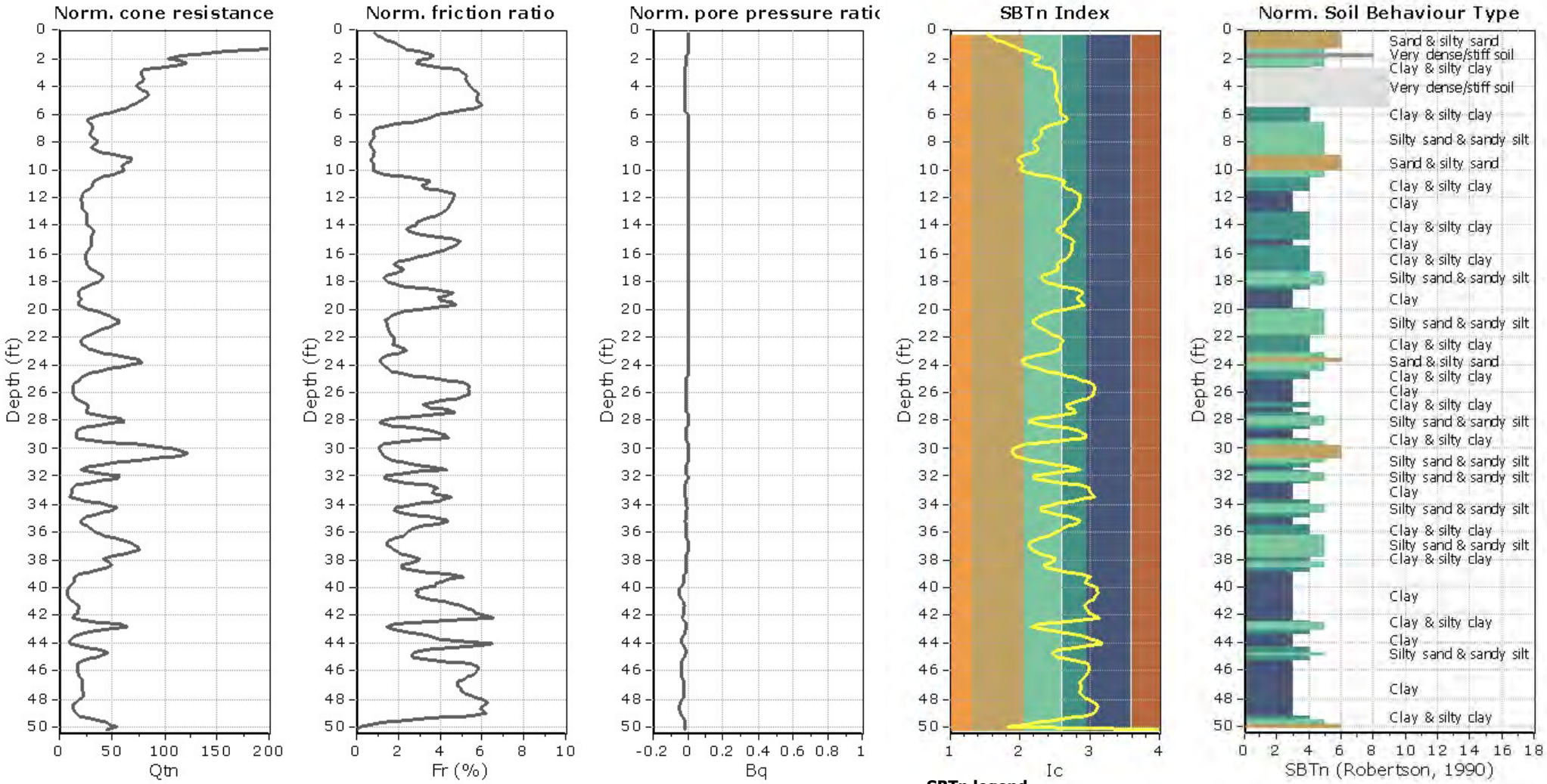
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-14
Total depth: 50.20 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



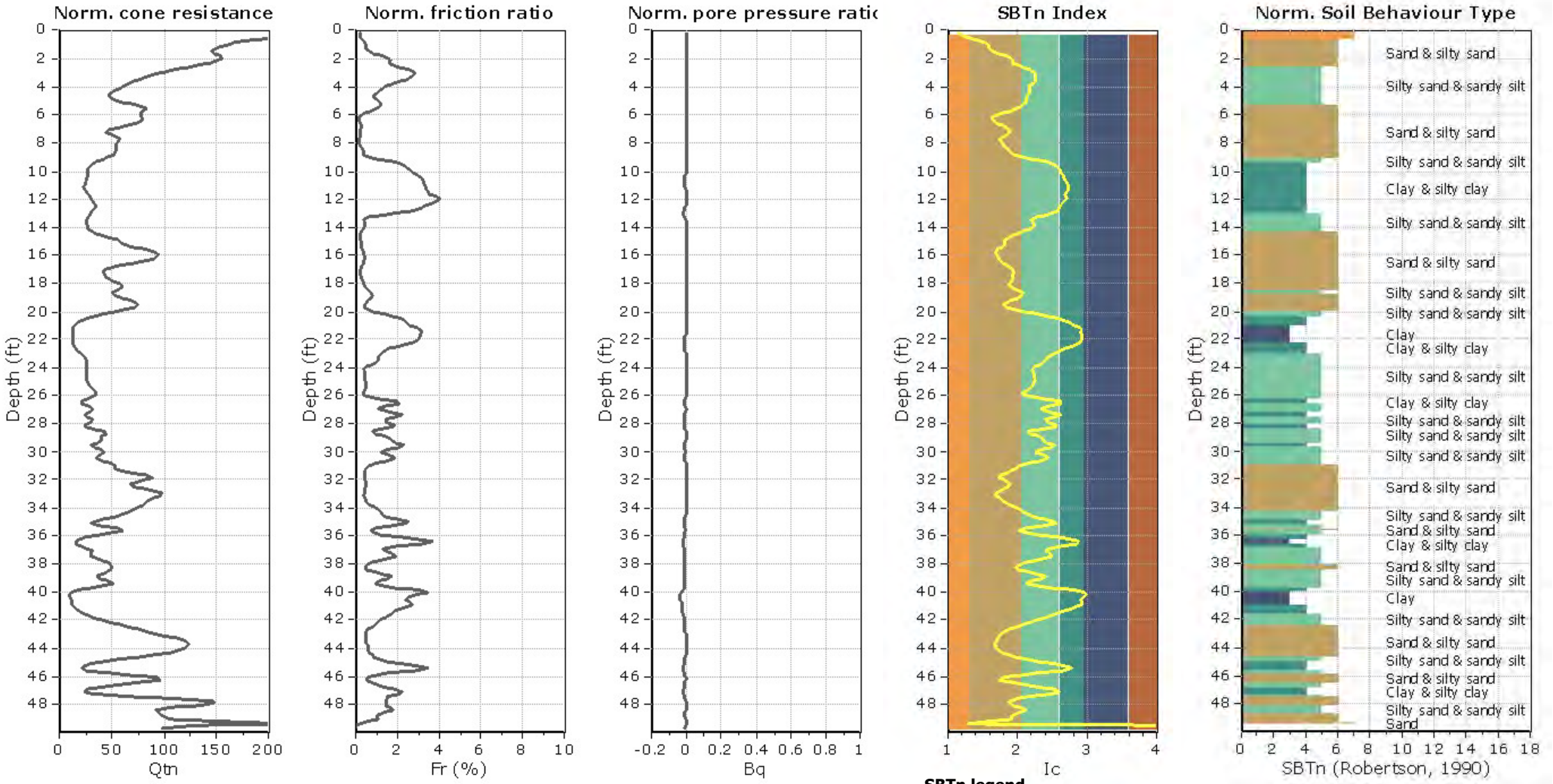
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-15
Total depth: 49.70 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



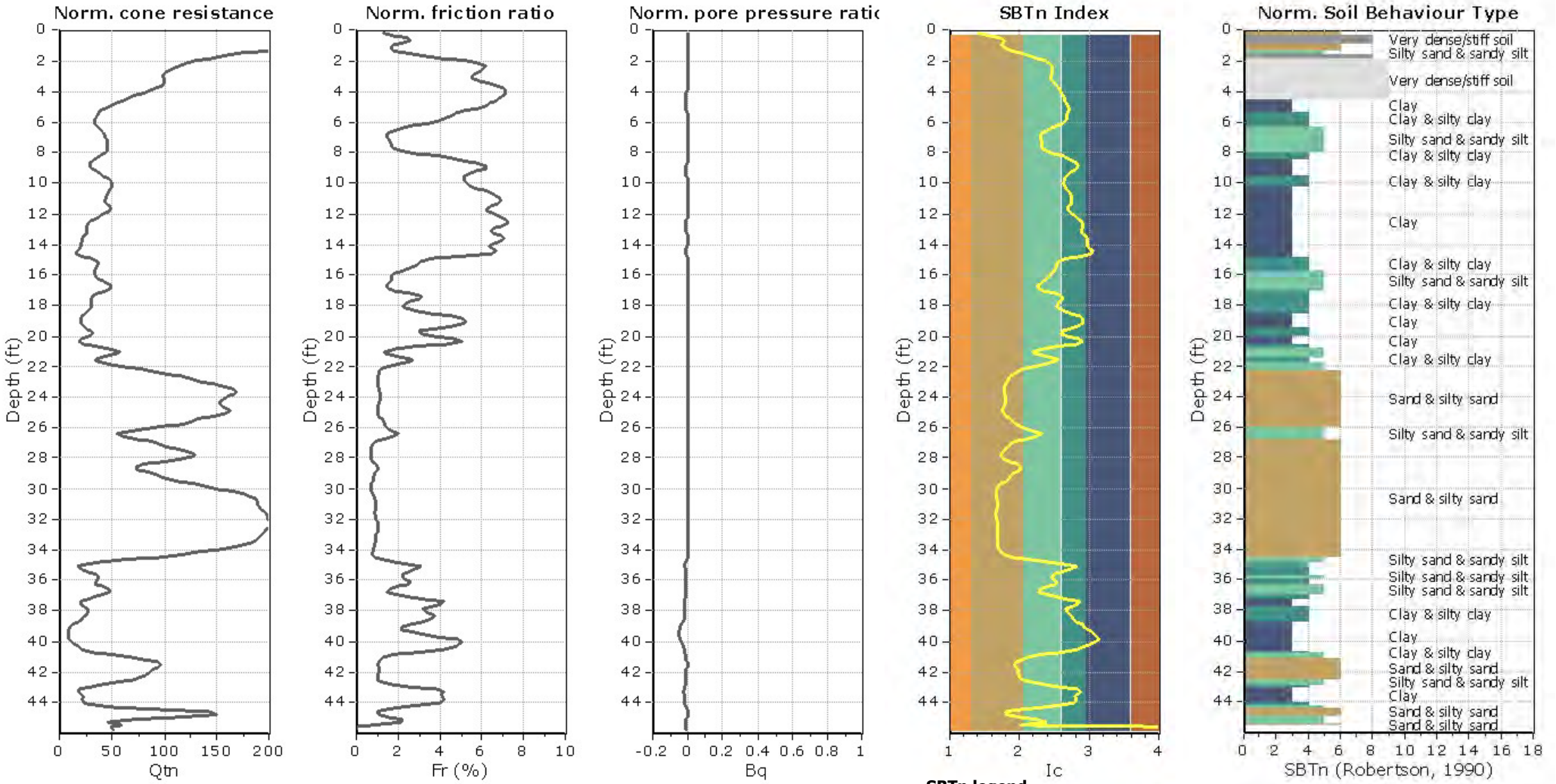
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-16
Total depth: 45.77 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



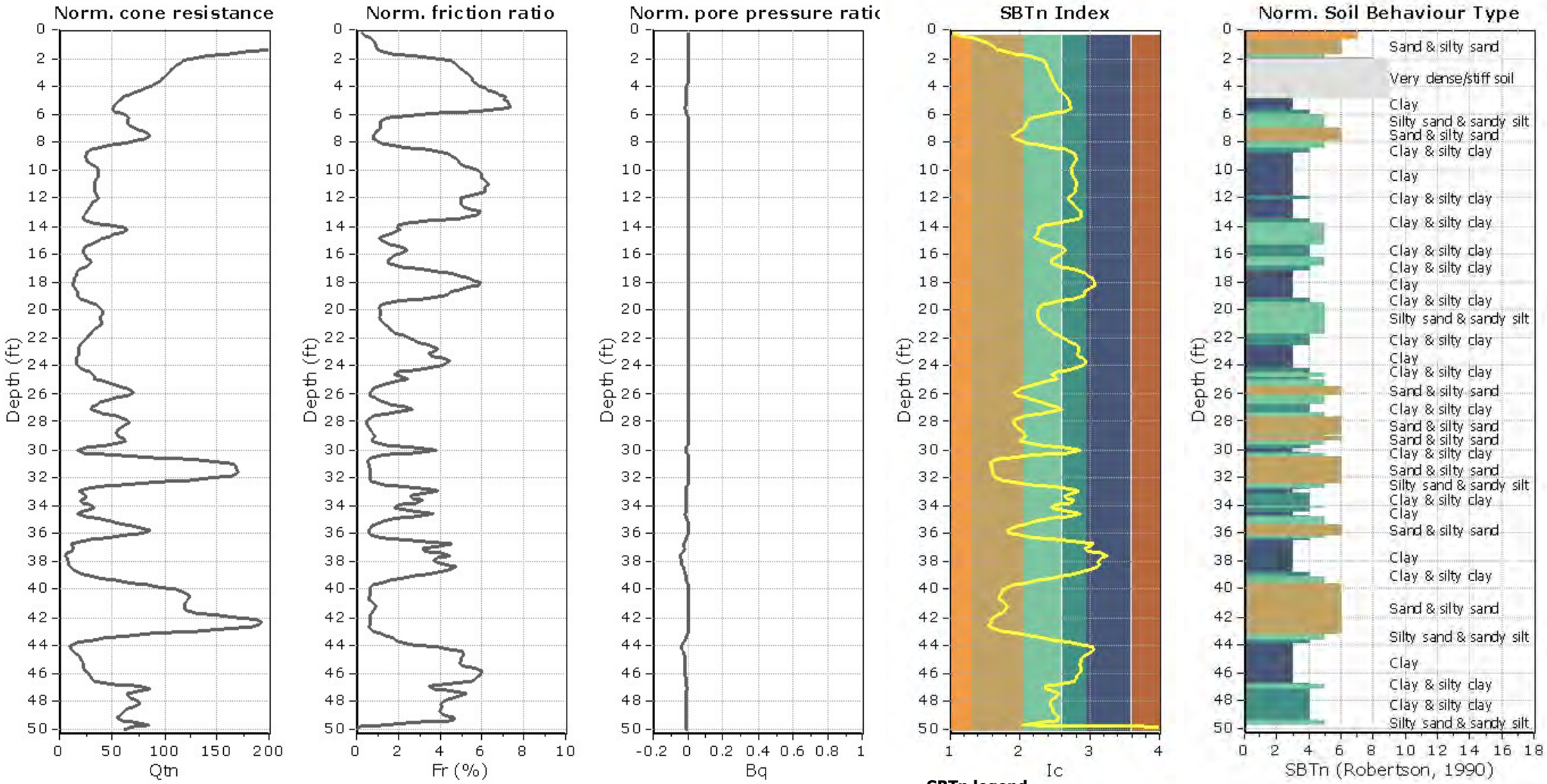
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-17
Total depth: 50.03 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



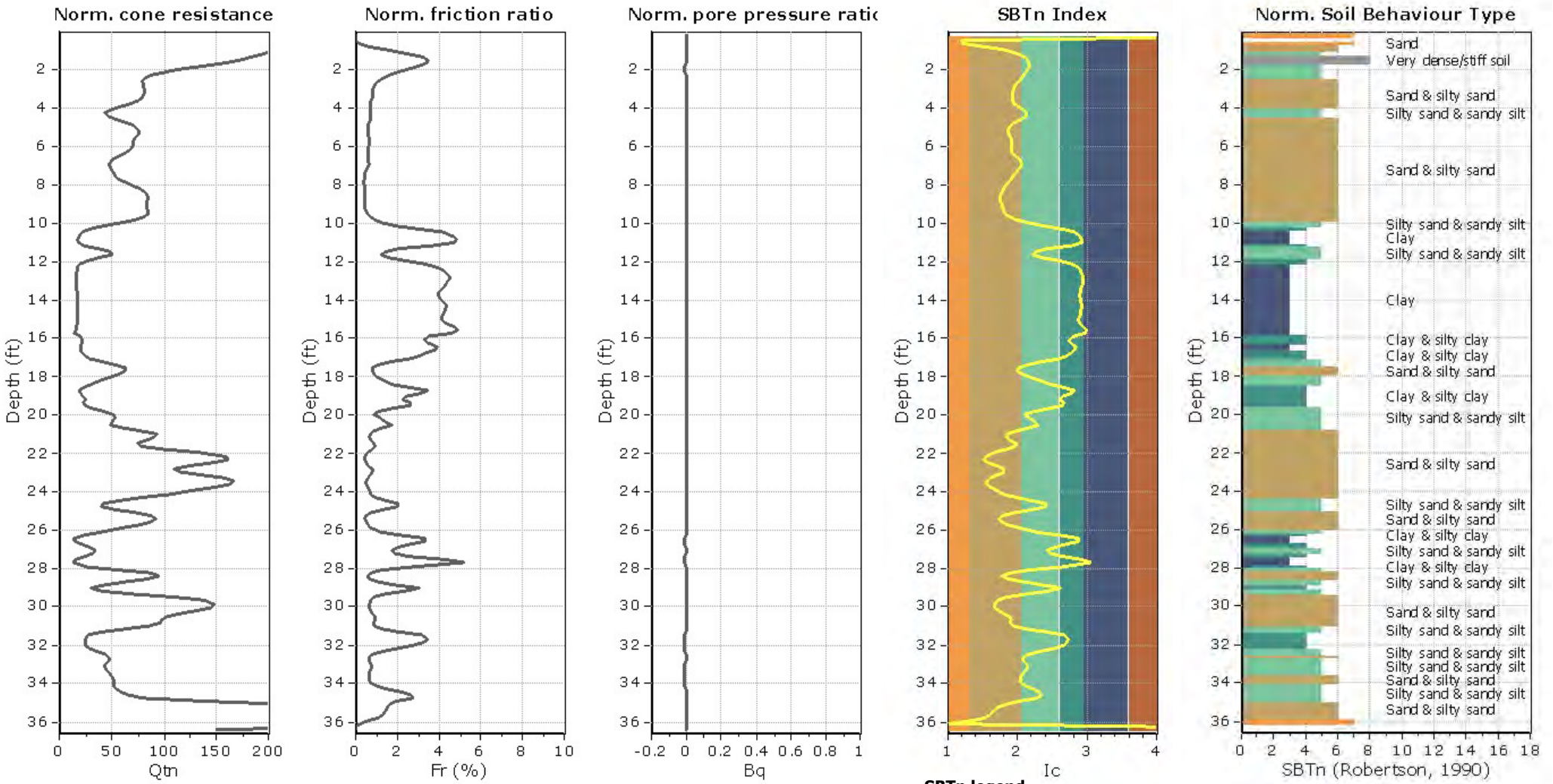
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-18
Total depth: 36.42 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



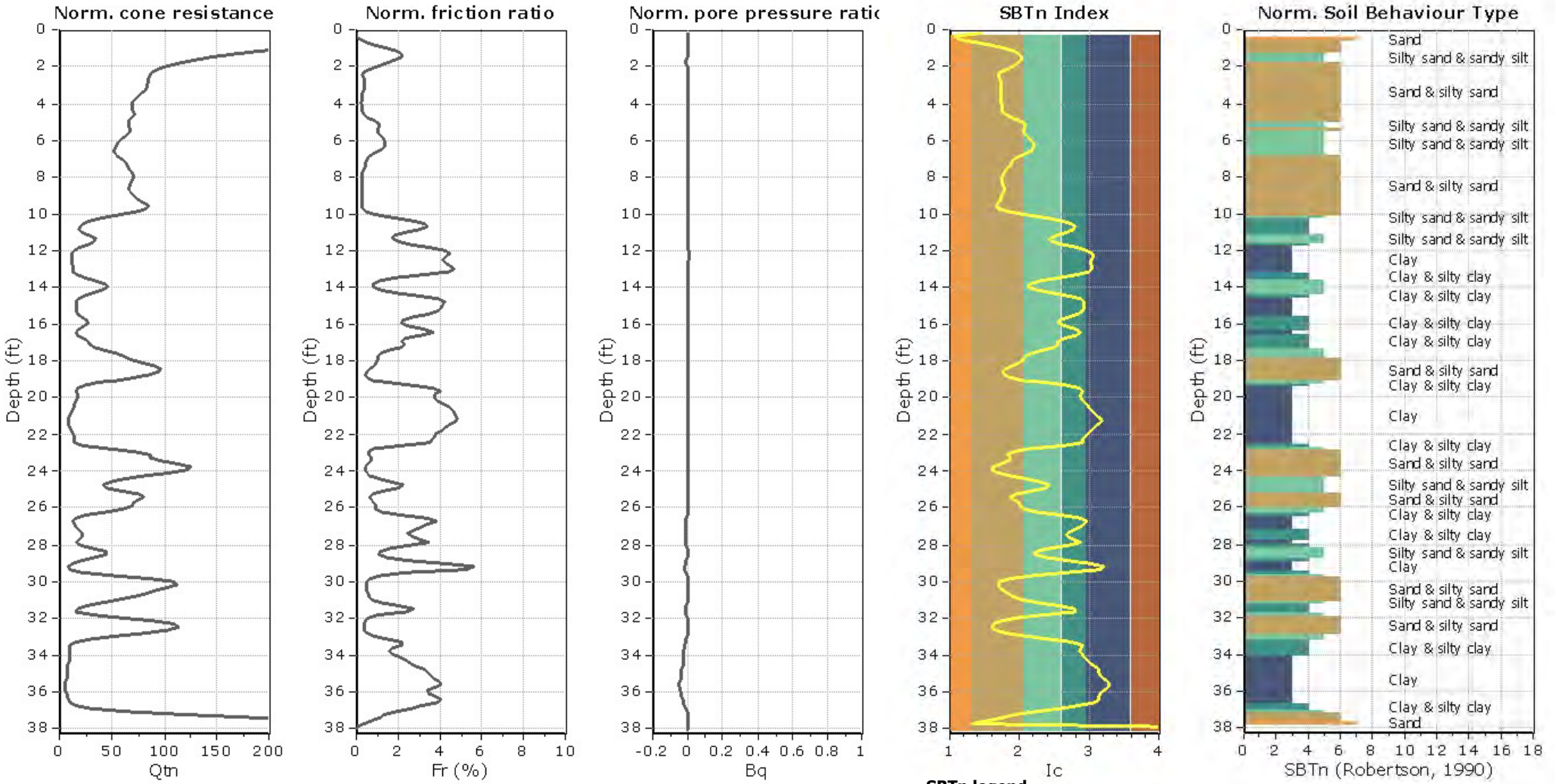
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-18B
Total depth: 38.06 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



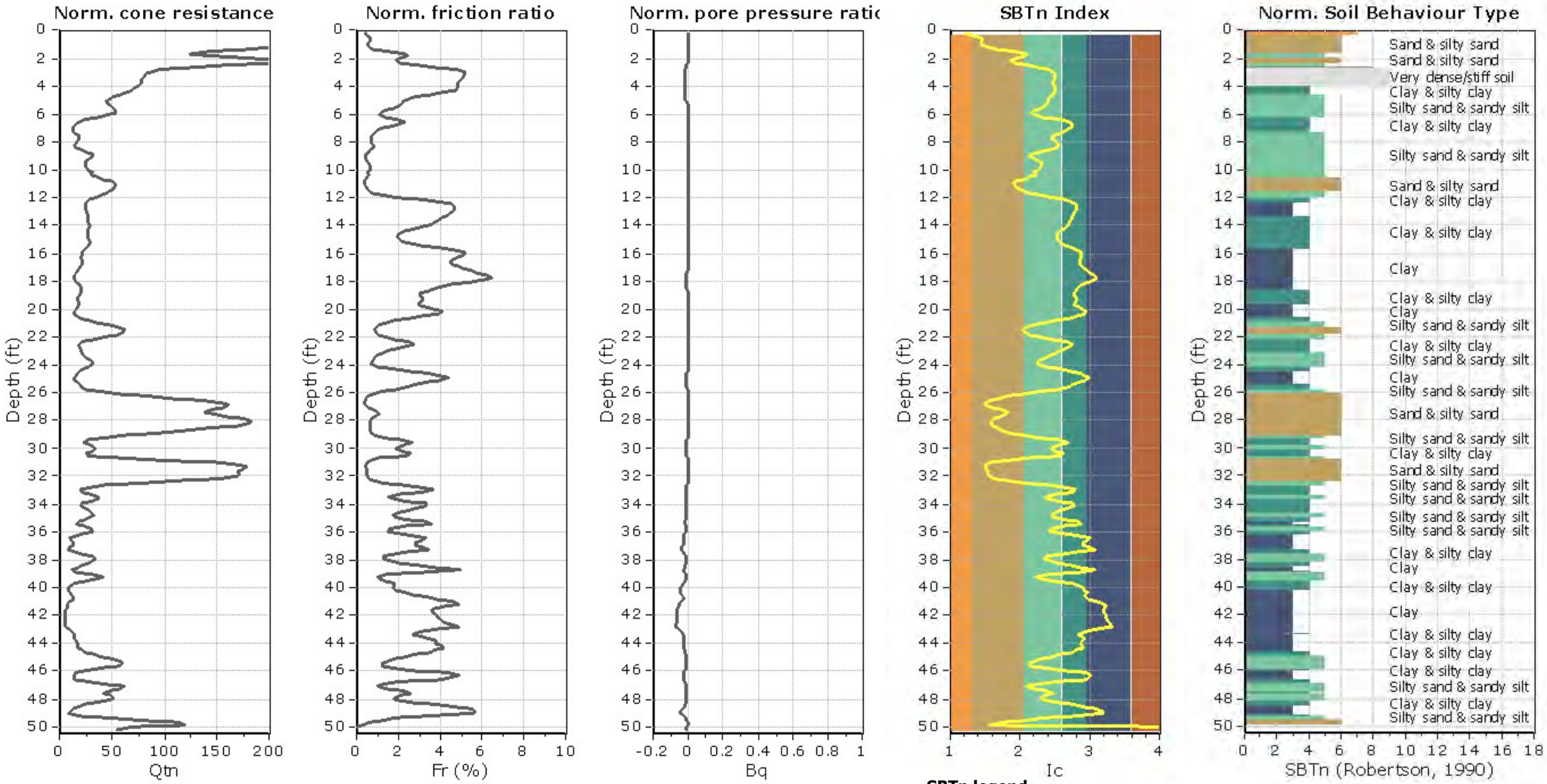
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-19
Total depth: 50.20 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



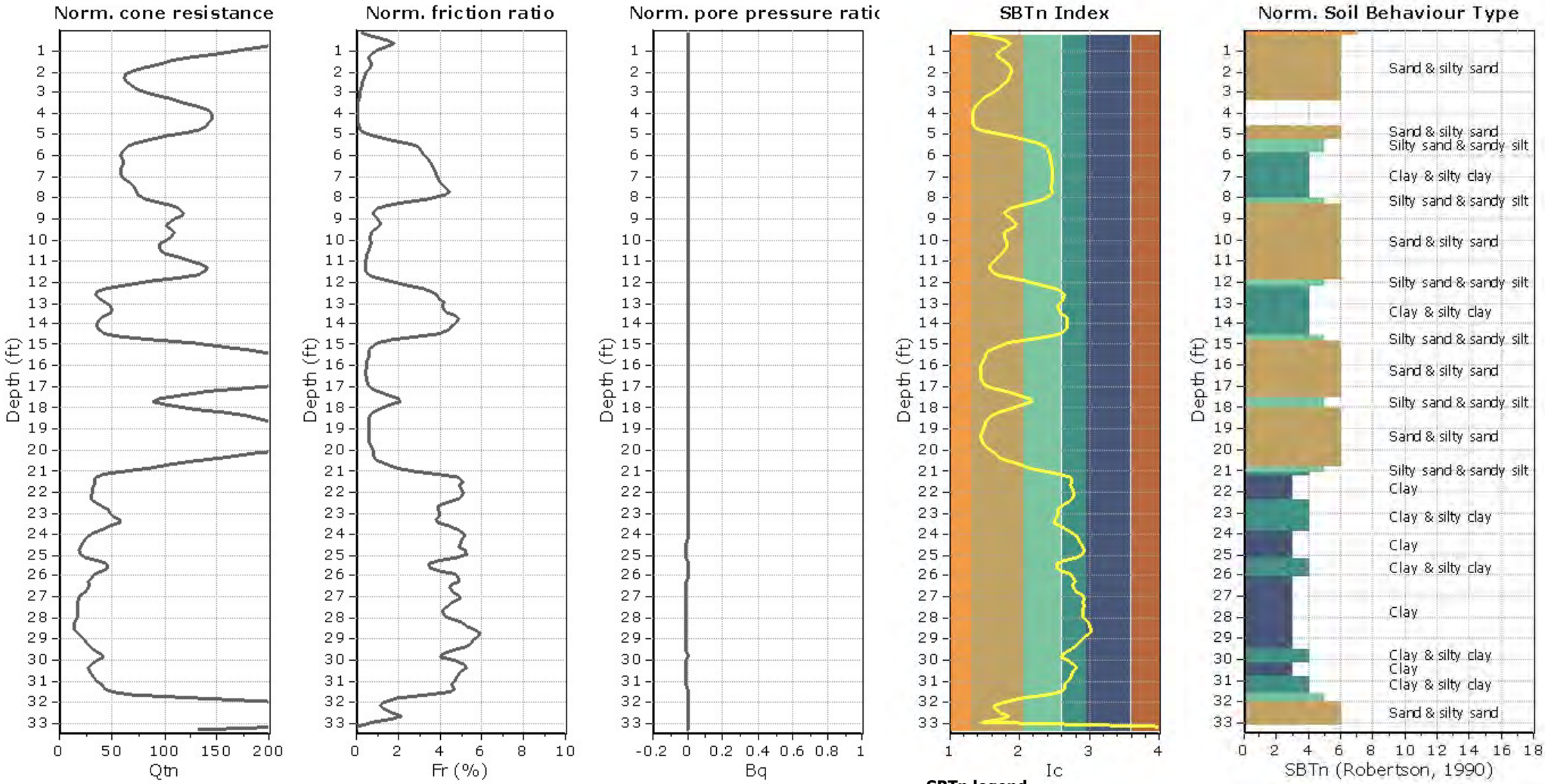
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-20
Total depth: 33.30 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



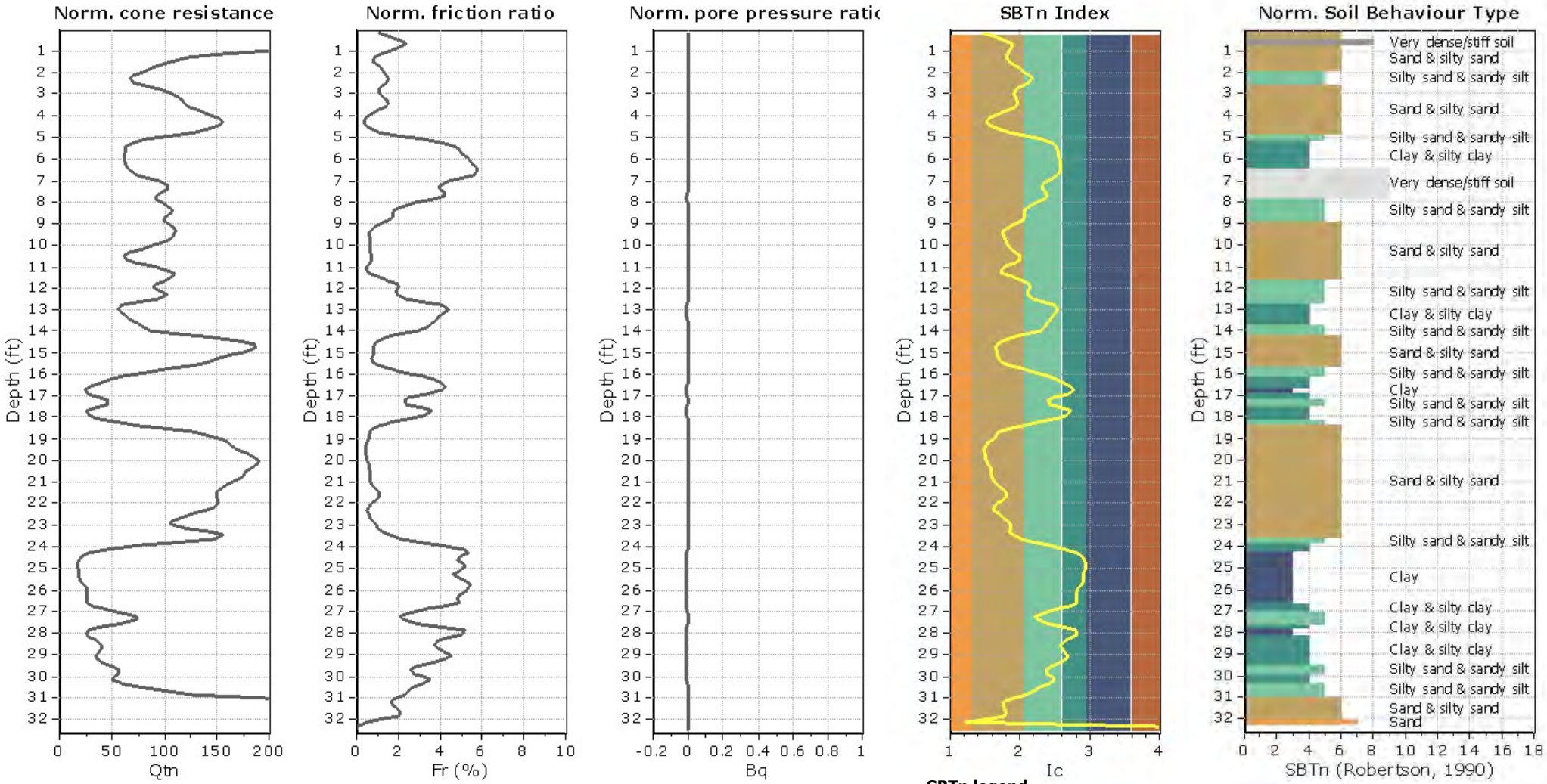
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-20B
Total depth: 32.48 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



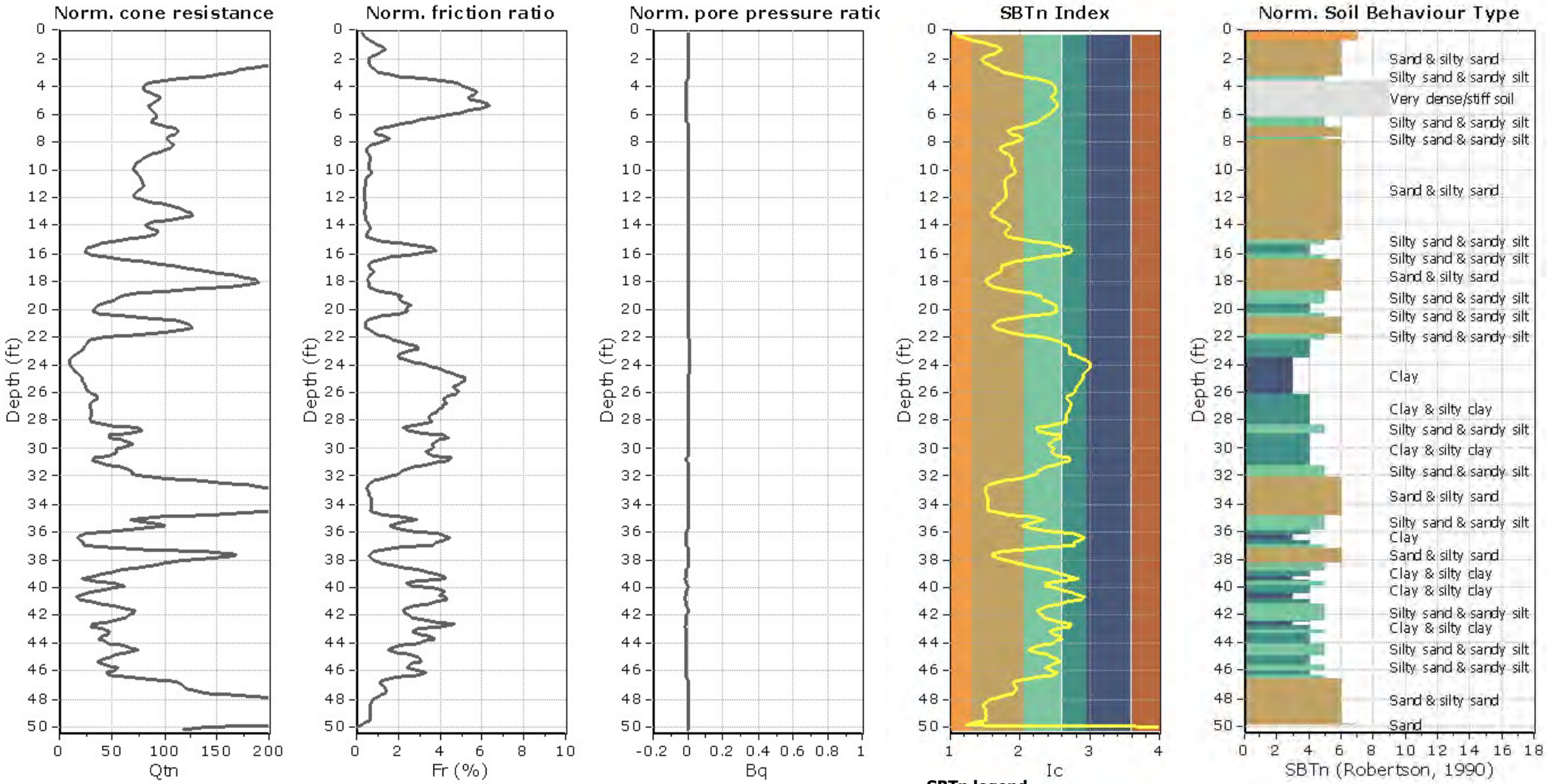
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-21
Total depth: 50.20 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



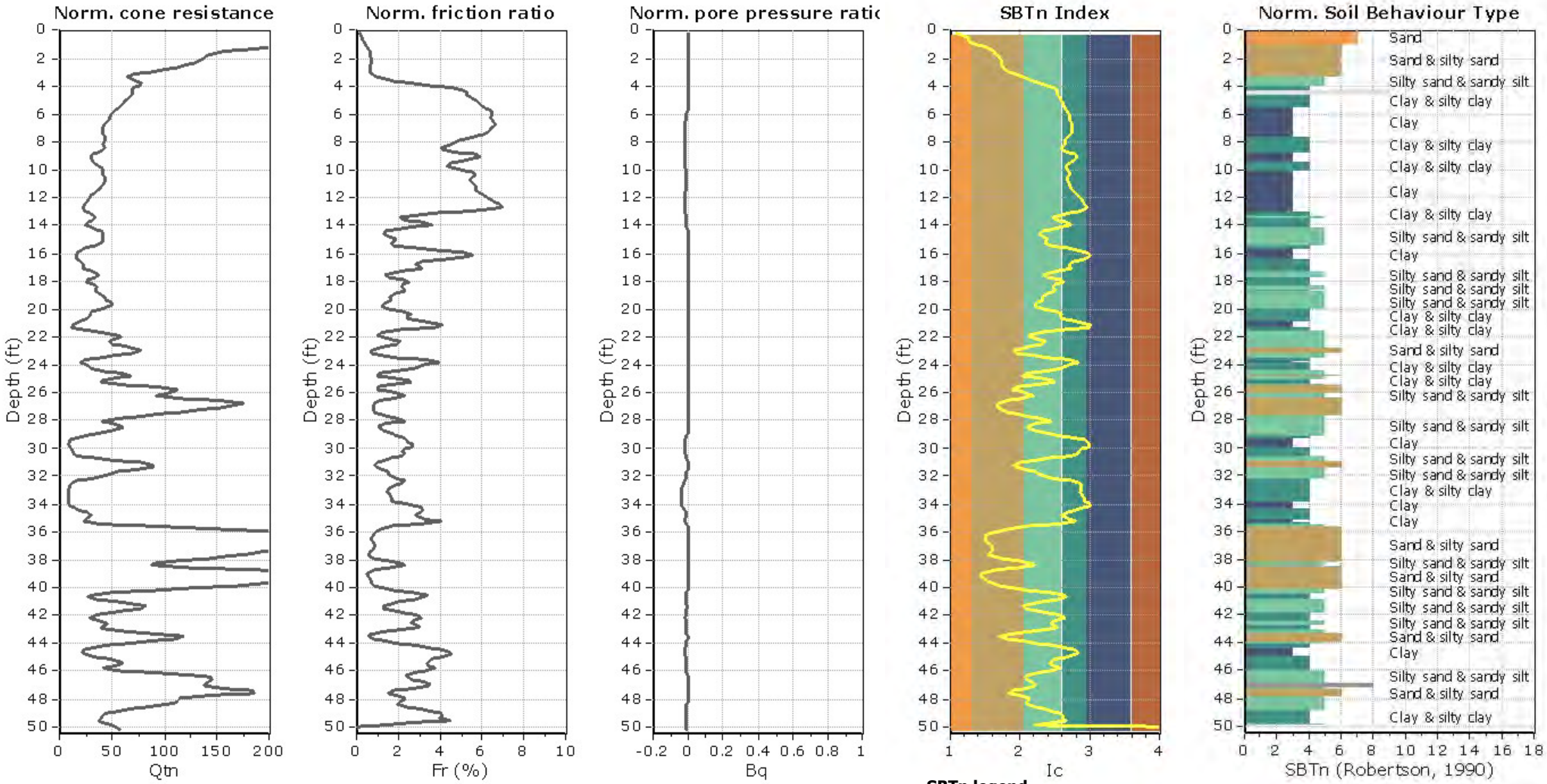
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-22
Total depth: 50.20 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



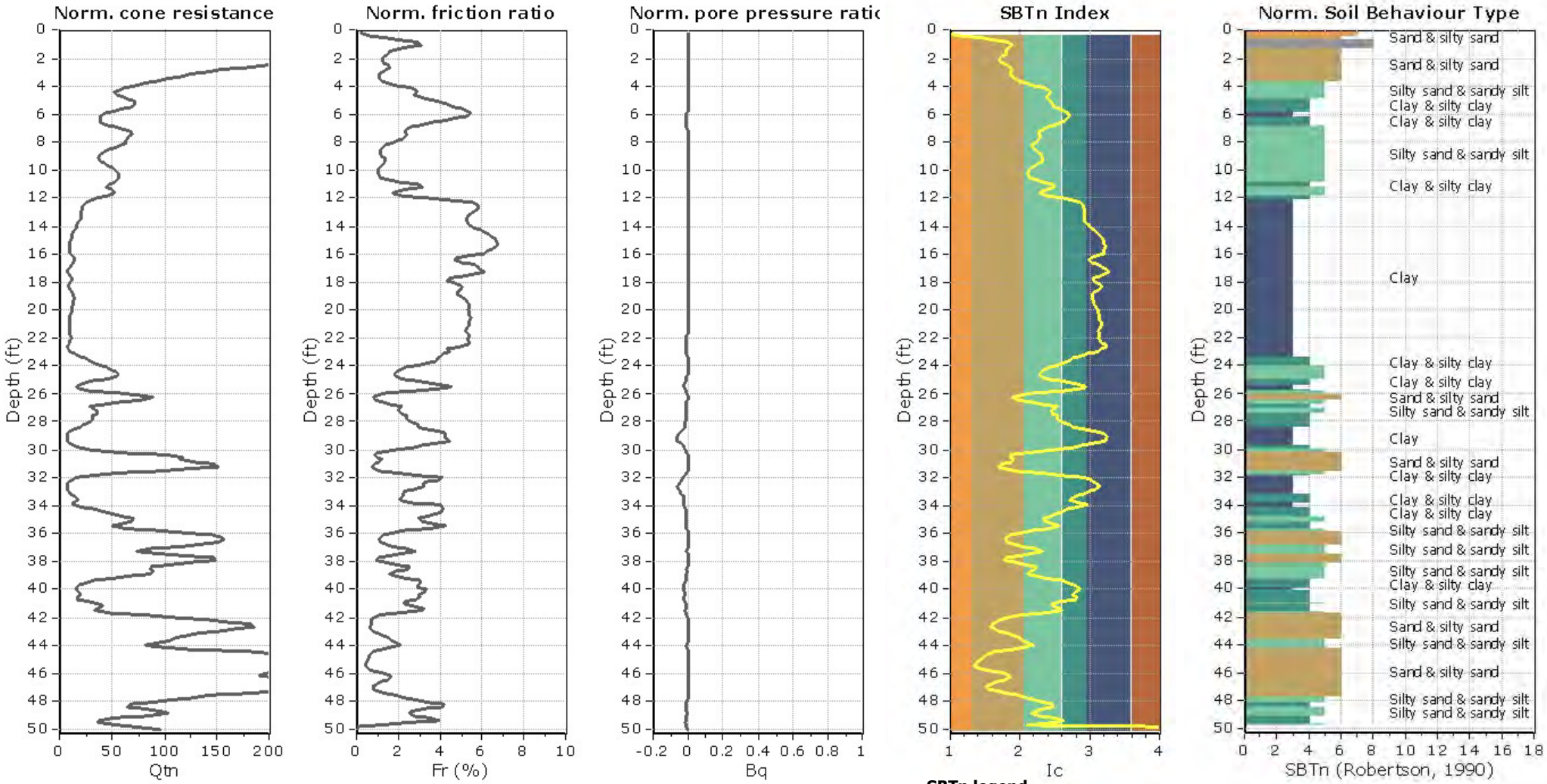
SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

NMG Geotechnical
17991 Fitch
Irvine, CA 92614
(949) 442-2442

CPT: CPT-23
Total depth: 50.03 ft, Date: 9/30/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Vertek
Cone Operator: Kehoe Testing

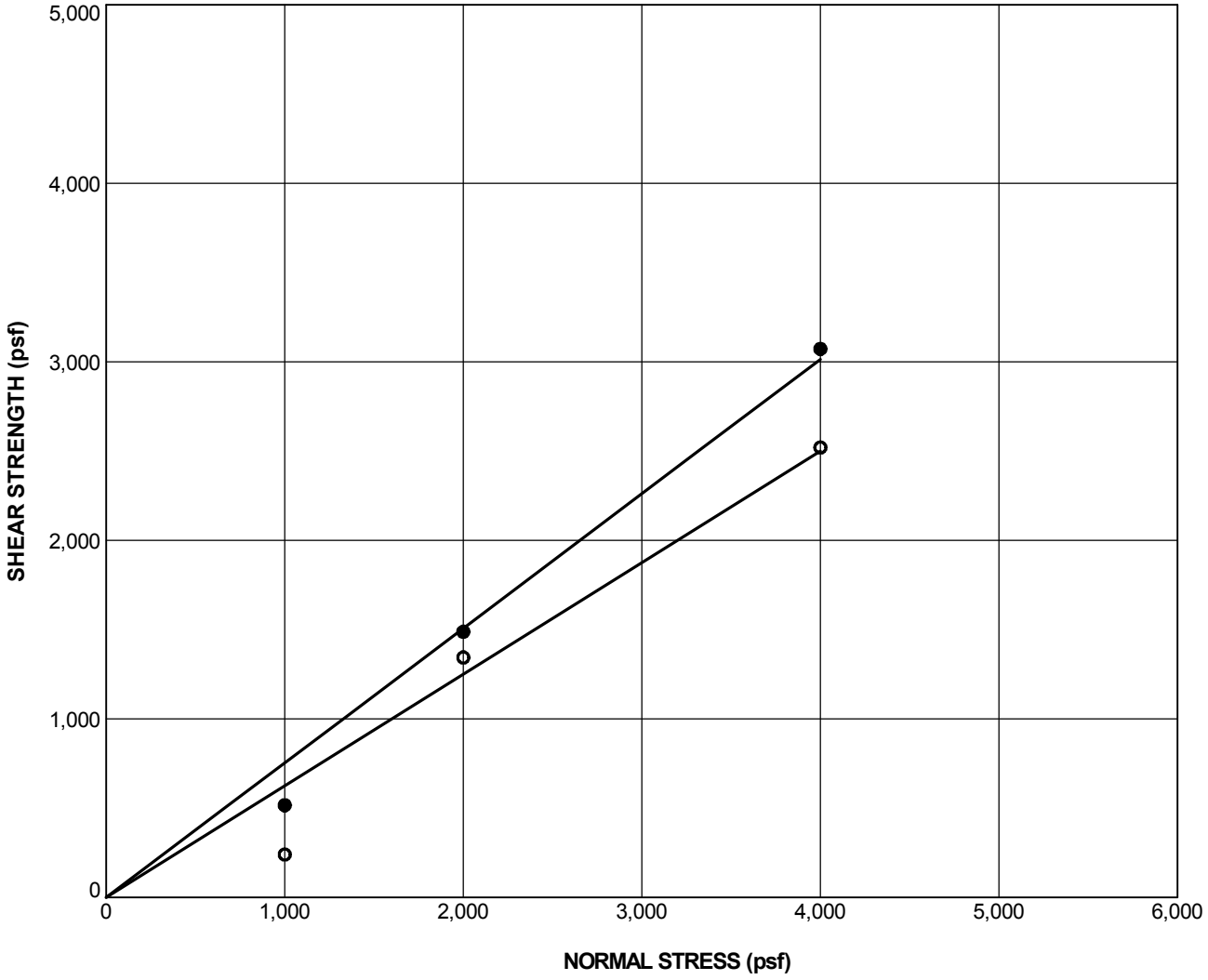
Project: **Toll Bros./Lake Forest Nursery**
Location: **Lake Forest, CA**



SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

APPENDIX C



Boring No. B- 1		Sample No. D-5		Depth: 25.0 ft	
Sample Description:	(Qal) Gray clayey silty SAND			USCS:	SM-SC
Liquid Limit:		Plasticity Index:		Percent Passing No. 200 Sieve:	
Moisture Content (%):	24.9	Dry Density (pcf):	106.8	Degree of Saturation (%):	100
Sample Type:	Undisturbed	Rate of Shear (in./min.):	0.005		

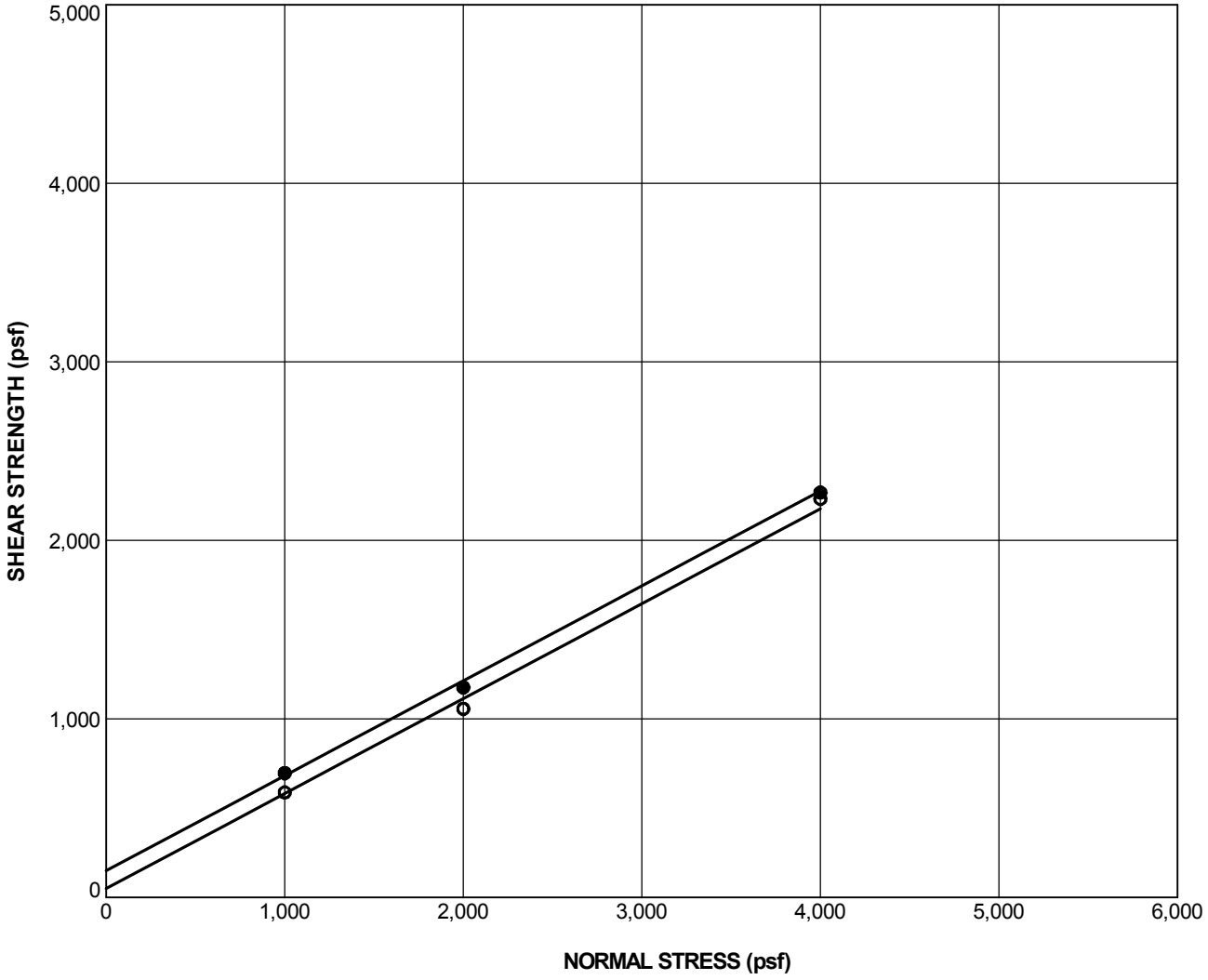
SHEAR STRENGTH PARAMETERS

Parameter	Peak ●	Ultimate ○
Cohesion (psf)	0	0
Friction Angle (degrees)	37.0	32.0

DIRECT SHEAR TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



Boring No. B- 2		Sample No. B-1		Depth: 0.0 ft	
Sample Description:	(Afu) Dark grayish brown clayey SAND			USCS:	SC
Liquid Limit:	29	Plasticity Index:	15	Percent Passing No. 200 Sieve:	37
Moisture Content (%):	17.5	Dry Density (pcf):	117.4	Degree of Saturation (%):	100
Sample Type:	Remolded to 91%	Rate of Shear (in./min.):	0.005		

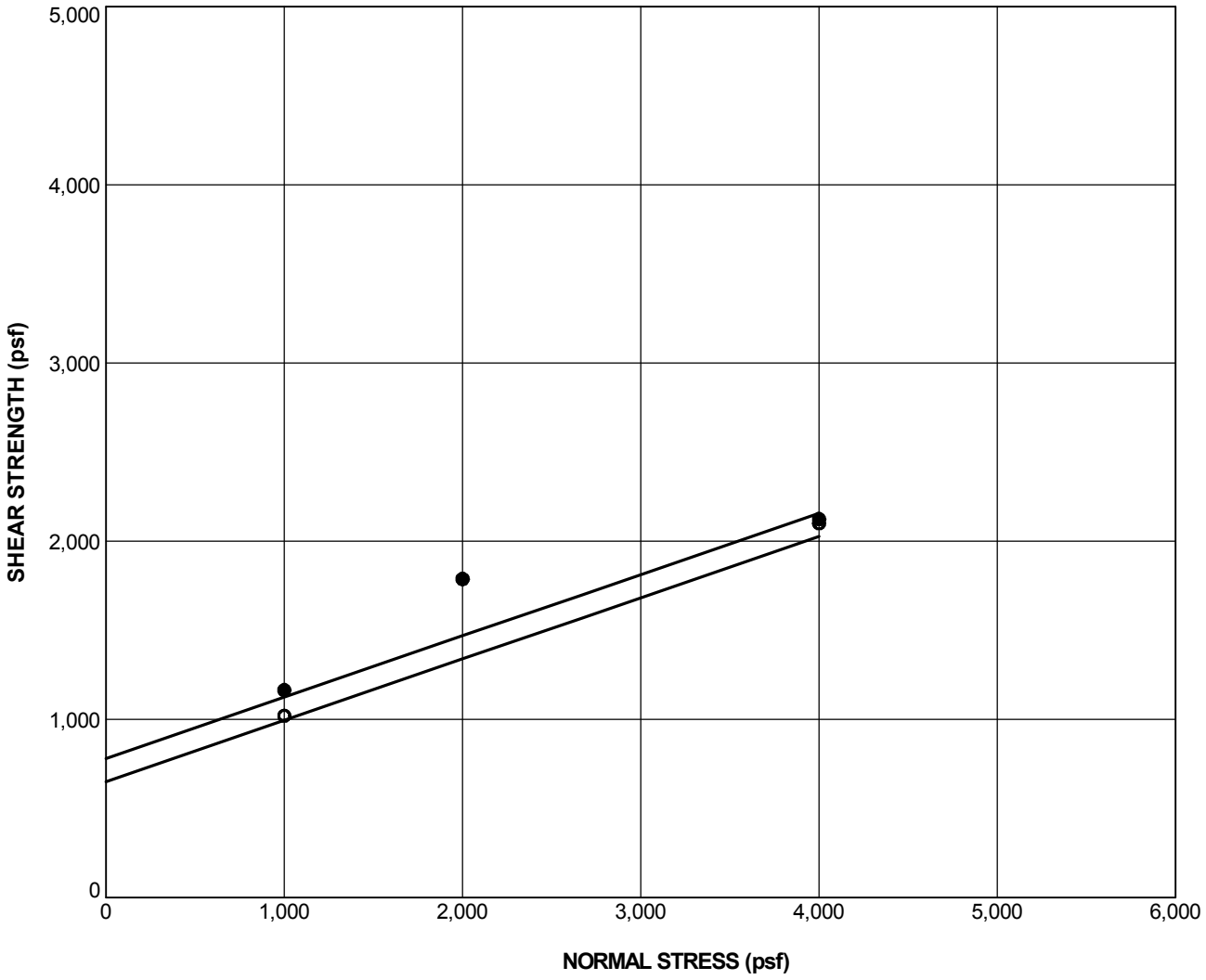
SHEAR STRENGTH PARAMETERS

Parameter	Peak ●	Ultimate ○
Cohesion (psf)	150	50
Friction Angle (degrees)	28.0	28.0

DIRECT SHEAR TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



Boring No. B- 3		Sample No. D-3		Depth: 15.0 ft	
Sample Description:	(Qal) Light brown silty SAND			USCS:	SM
Liquid Limit:		Plasticity Index:		Percent Passing No. 200 Sieve:	
Moisture Content (%):	22.4	Dry Density (pcf):	104.3	Degree of Saturation (%):	98
Sample Type:	Undisturbed	Rate of Shear (in./min.):	0.005		

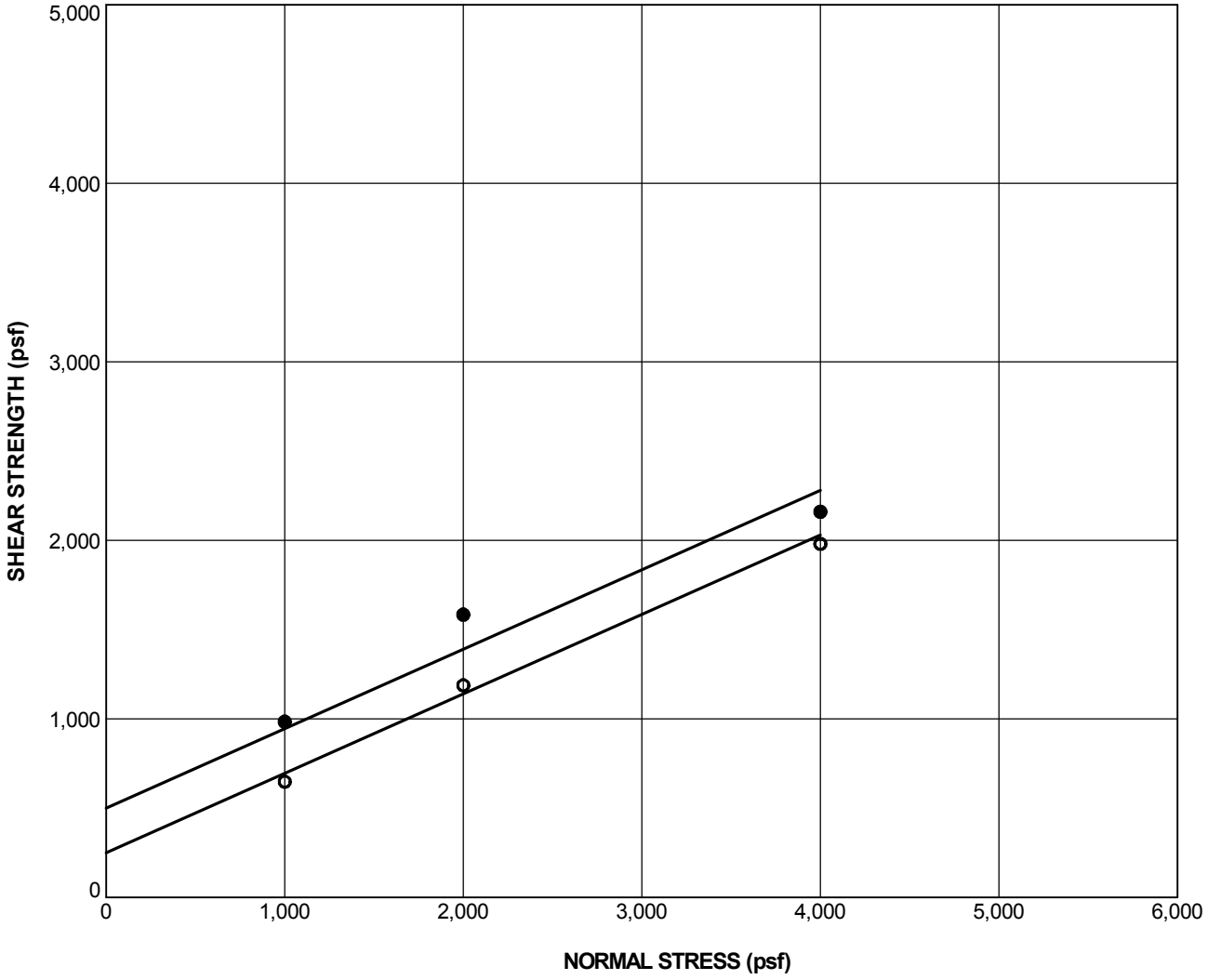
SHEAR STRENGTH PARAMETERS

Parameter	Peak ●	Ultimate ○
Cohesion (psf)	780	650
Friction Angle (degrees)	19.0	19.0

DIRECT SHEAR TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



Boring No. B- 5		Sample No. D-2		Depth: 10.0 ft	
Sample Description:	(Qal) Brown clayey SAND/sandy CLAY			USCS:	SC-CL
Liquid Limit:		Plasticity Index:		Percent Passing No. 200 Sieve:	
Moisture Content (%):	24.2	Dry Density (pcf):	108.8	Degree of Saturation (%):	100
Sample Type:	Undisturbed	Rate of Shear (in./min.):	0.005		

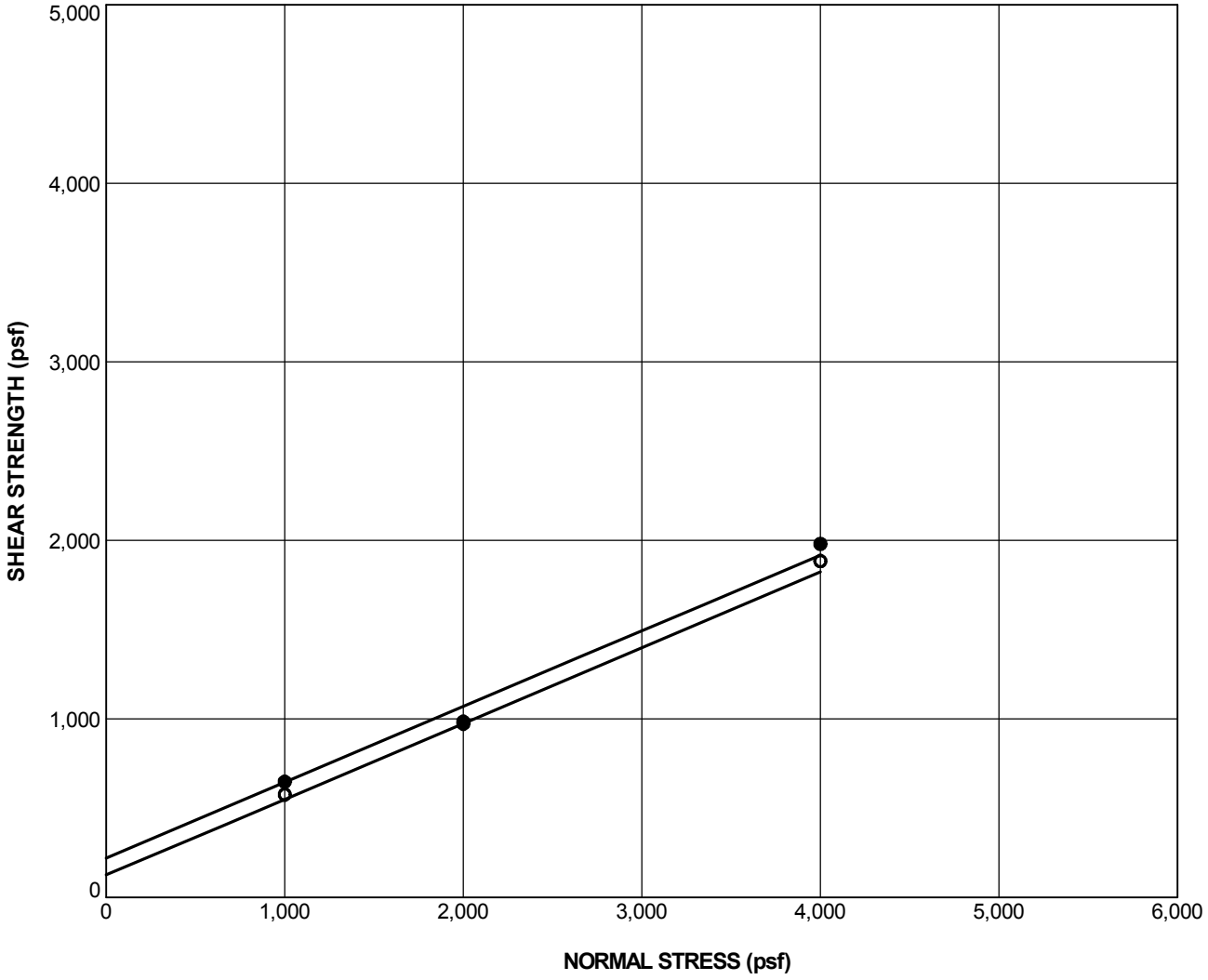
SHEAR STRENGTH PARAMETERS

Parameter	Peak ●	Ultimate ○
Cohesion (psf)	500	250
Friction Angle (degrees)	24.0	24.0

DIRECT SHEAR TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



Boring No. B- 5		Sample No. B-2		Depth: 10.1 ft	
Sample Description:	(Qal) Grayish brown sandy CLAY			USCS:	CL
Liquid Limit:	33	Plasticity Index:	21	Percent Passing No. 200 Sieve:	52
Moisture Content (%):	17.7	Dry Density (pcf):	116.9	Degree of Saturation (%):	100
Sample Type:	Remolded to 91%	Rate of Shear (in./min.):	0.005		

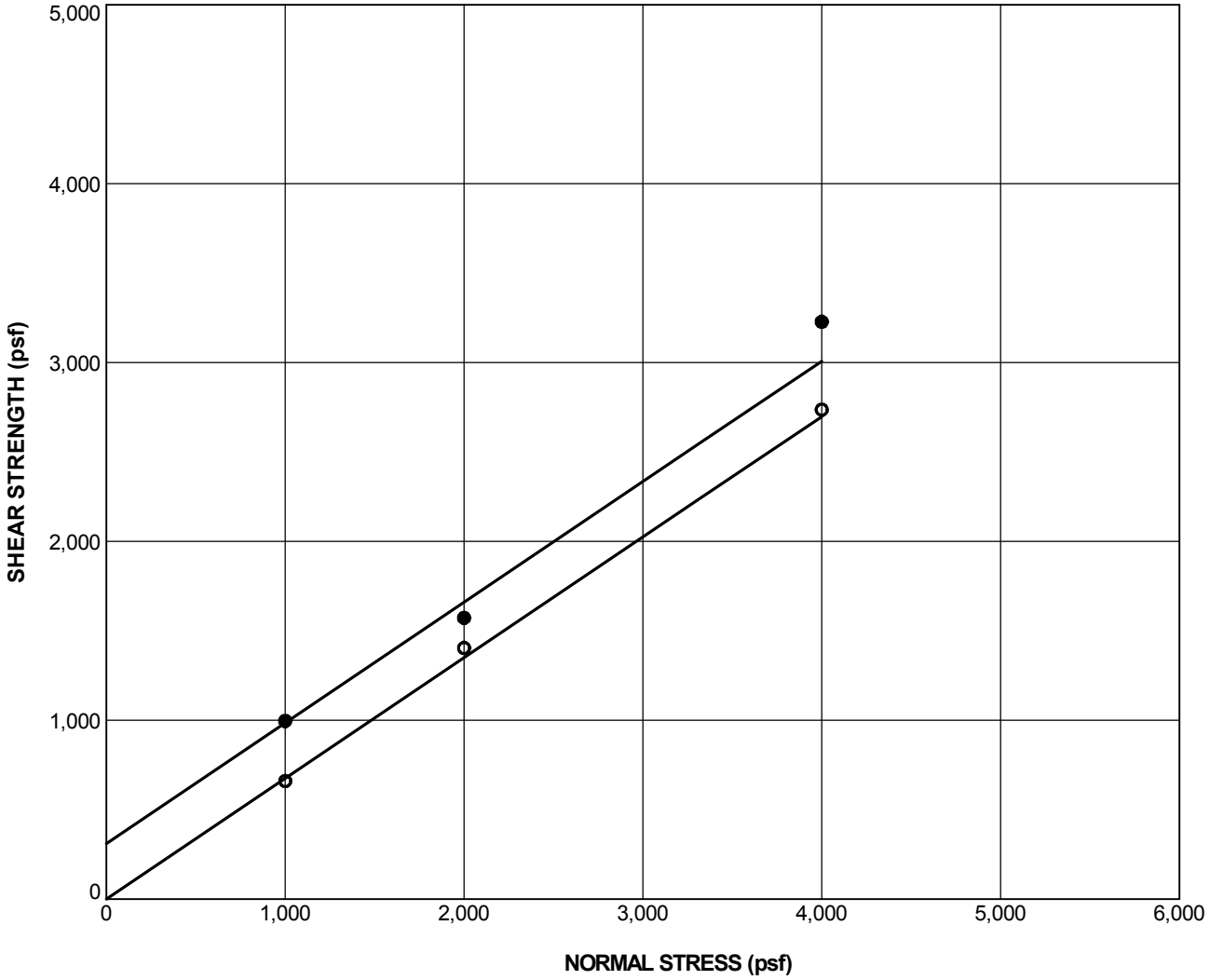
SHEAR STRENGTH PARAMETERS

Parameter	Peak ●	Ultimate ○
Cohesion (psf)	220	125
Friction Angle (degrees)	23.0	23.0

DIRECT SHEAR TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



Boring No. B- 6		Sample No. B-1		Depth: 0.0 ft	
Sample Description:	(Afu) Brown gray clayey SAND			USCS:	SC
Liquid Limit:	33	Plasticity Index:	18	Percent Passing No. 200 Sieve:	49
Moisture Content (%):	18.0	Dry Density (pcf):	116.0	Degree of Saturation (%):	100
Sample Type:	Remolded to 91%	Rate of Shear (in./min.):	0.005		

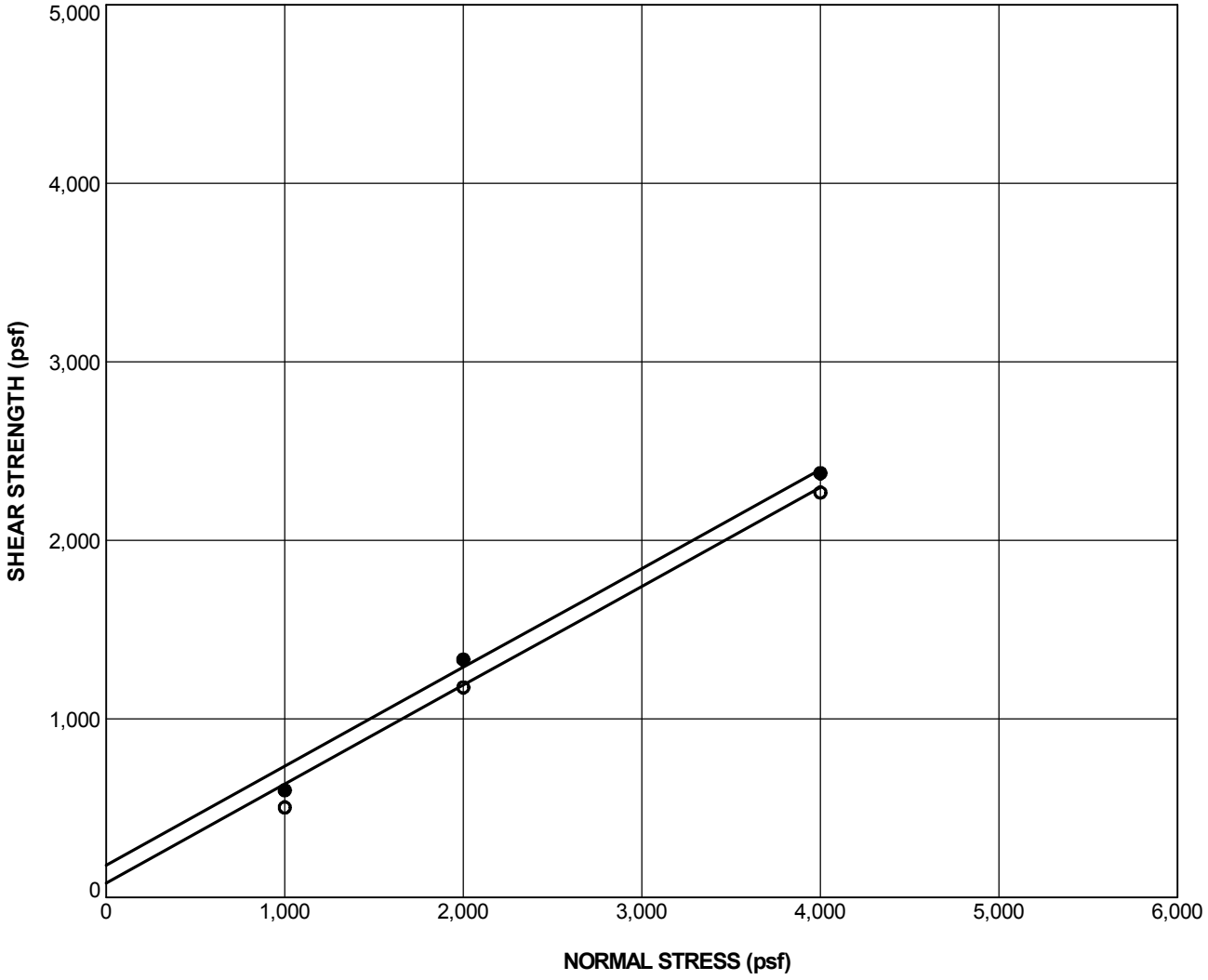
SHEAR STRENGTH PARAMETERS

Parameter	Peak ●	Ultimate ○
Cohesion (psf)	310	0
Friction Angle (degrees)	34.0	34.0

DIRECT SHEAR TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



Boring No. B-19		Sample No. D-1		Depth: 5.0 ft	
Sample Description:	Gray silty calyey SAND			USCS:	SC
Liquid Limit:		Plasticity Index:		Percent Passing No. 200 Sieve:	
Moisture Content (%):	21.2	Dry Density (pcf):	109.3	Degree of Saturation (%):	100
Sample Type:	Undisturbed	Rate of Shear (in./min.):	0.005		

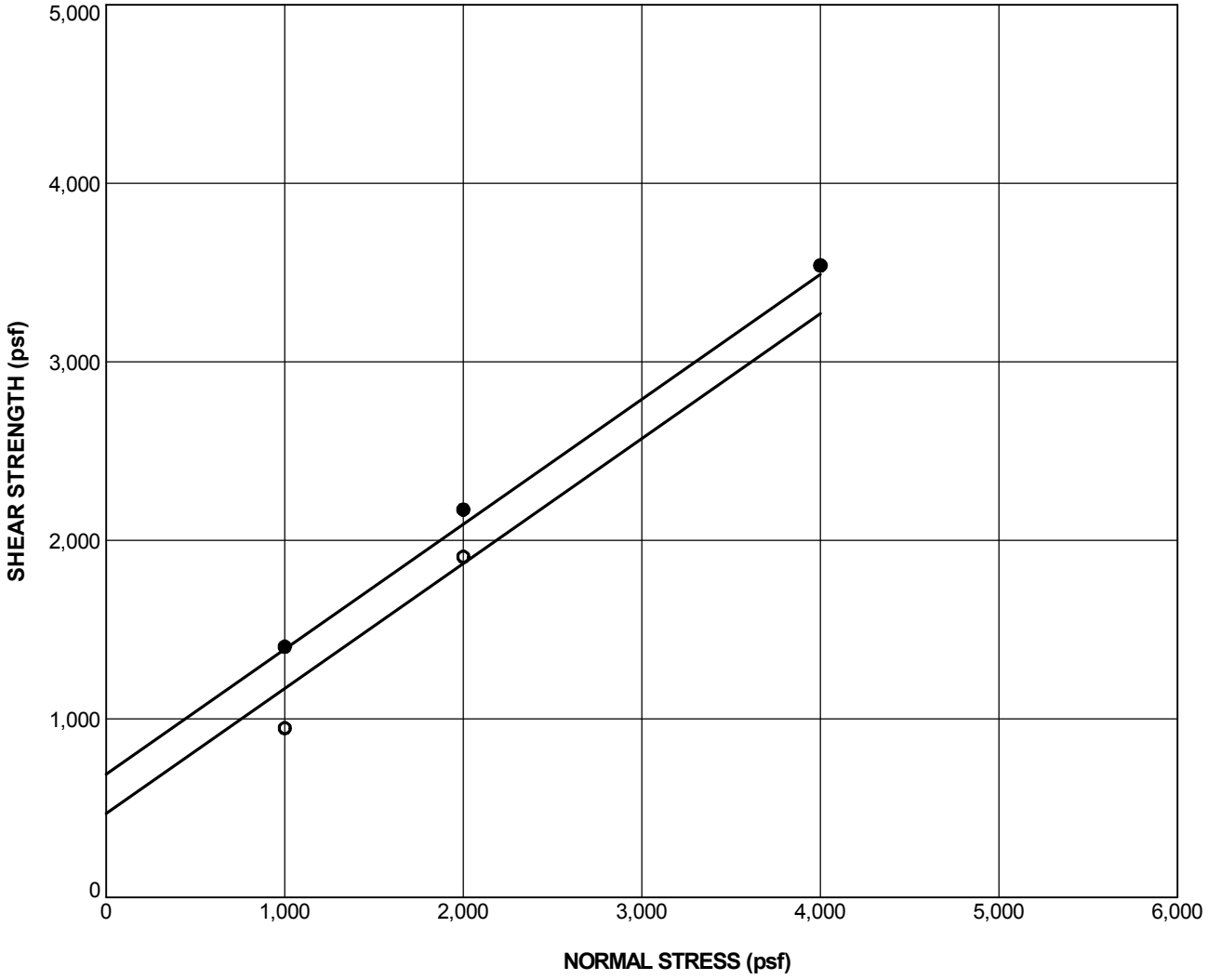
SHEAR STRENGTH PARAMETERS

Parameter	Peak ●	Ultimate ○
Cohesion (psf)	180	80
Friction Angle (degrees)	29.0	29.0

DIRECT SHEAR TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



Boring No. B-20		Sample No. D-1		Depth: 2.5 ft	
Sample Description:	Grayish brown clayey SAND			USCS:	SC
Liquid Limit:		Plasticity Index:		Percent Passing No. 200 Sieve:	
Moisture Content (%):	17.6	Dry Density (pcf):	118.6	Degree of Saturation (%):	100
Sample Type:	Undisturbed	Rate of Shear (in./min.):	0.005		

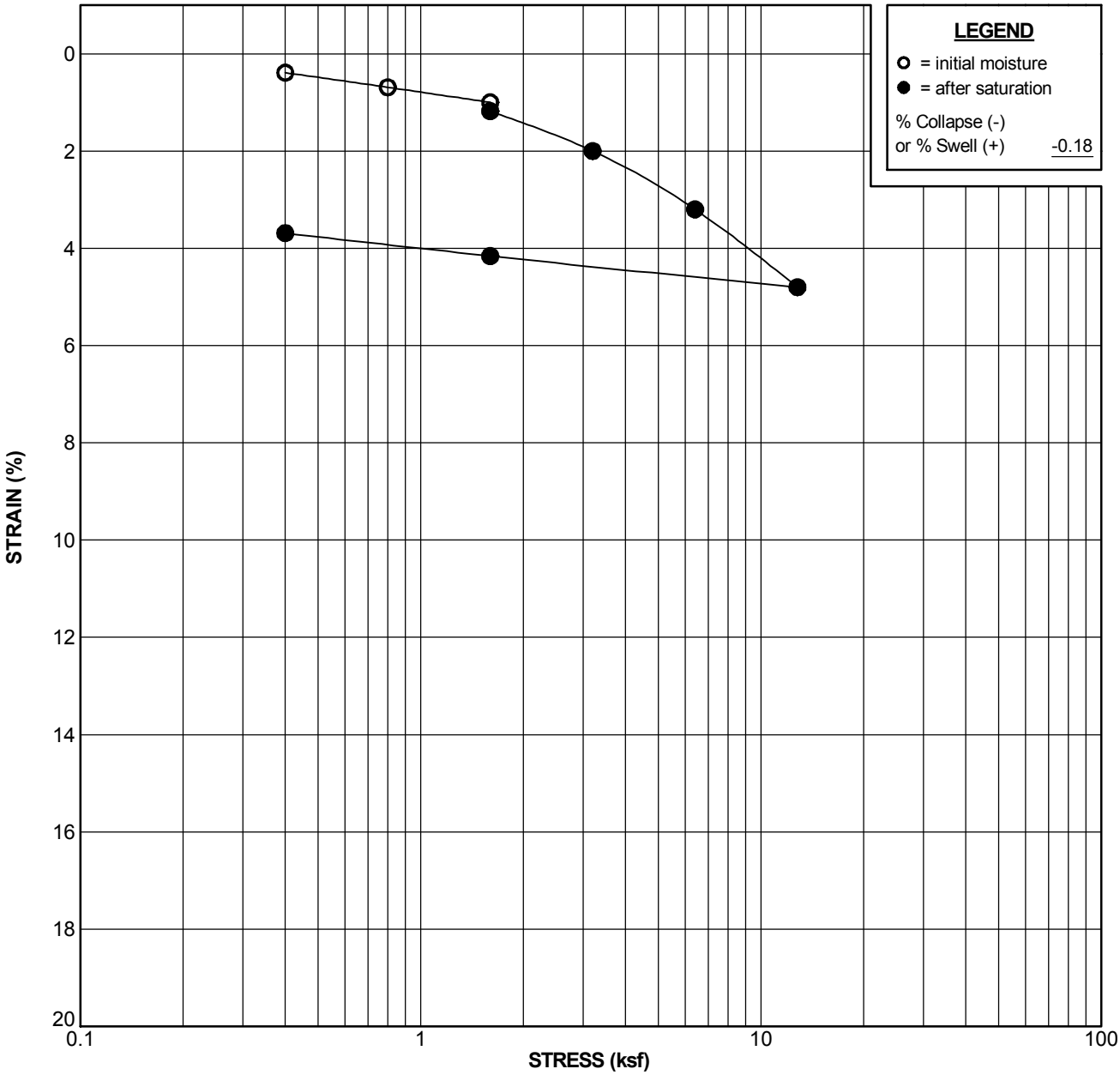
SHEAR STRENGTH PARAMETERS

Parameter	Peak ●	Ultimate ○
Cohesion (psf)	690	470
Friction Angle (degrees)	35.0	35.0

DIRECT SHEAR TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



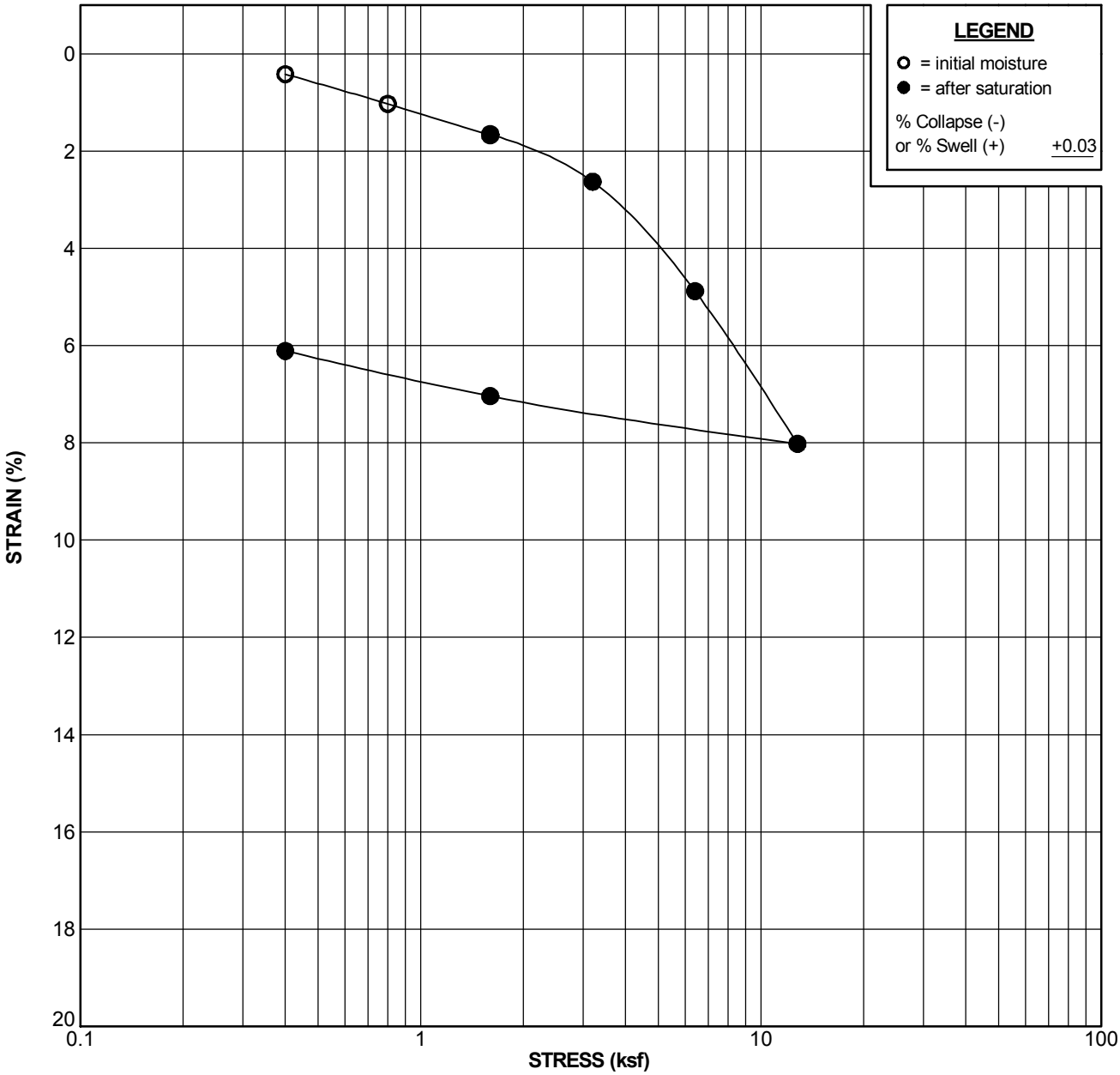
Boring No. B- 2	Sample No. D-3	Depth: 15.0 ft
Sample Description: (Qal) Light yellowish brown silty SAND		USCS: SM
Liquid Limit:	Plasticity Index:	Percent Passing No. 200 Sieve:

Test Stage	Moisture Content (%)	Dry Density (pcf)	Degree of Saturation (%)	Void Ratio
Initial	12.3	94.5	42.4	0.783
Final	24.3	98.0	91.2	0.719

CONSOLIDATION TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



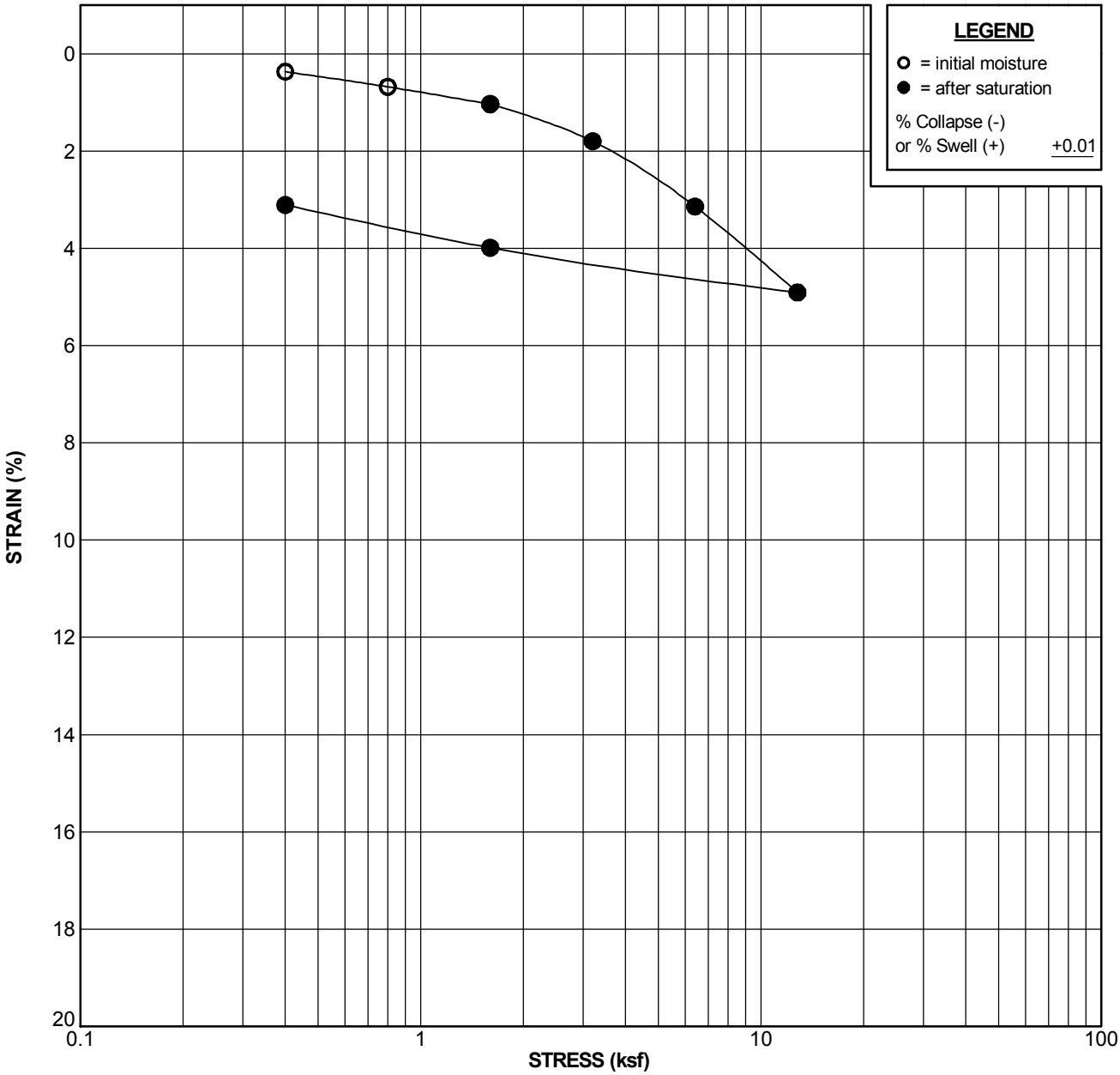
Boring No. B- 3	Sample No. D-1	Depth: 5.0 ft
Sample Description: (Qal) Brown silty SAND		USCS: SM
Liquid Limit:	Plasticity Index:	Percent Passing No. 200 Sieve:

Test Stage	Moisture Content (%)	Dry Density (pcf)	Degree of Saturation (%)	Void Ratio
Initial	21.4	92.2	69.8	0.827
Final	23.9	97.8	89.3	0.723

CONSOLIDATION TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



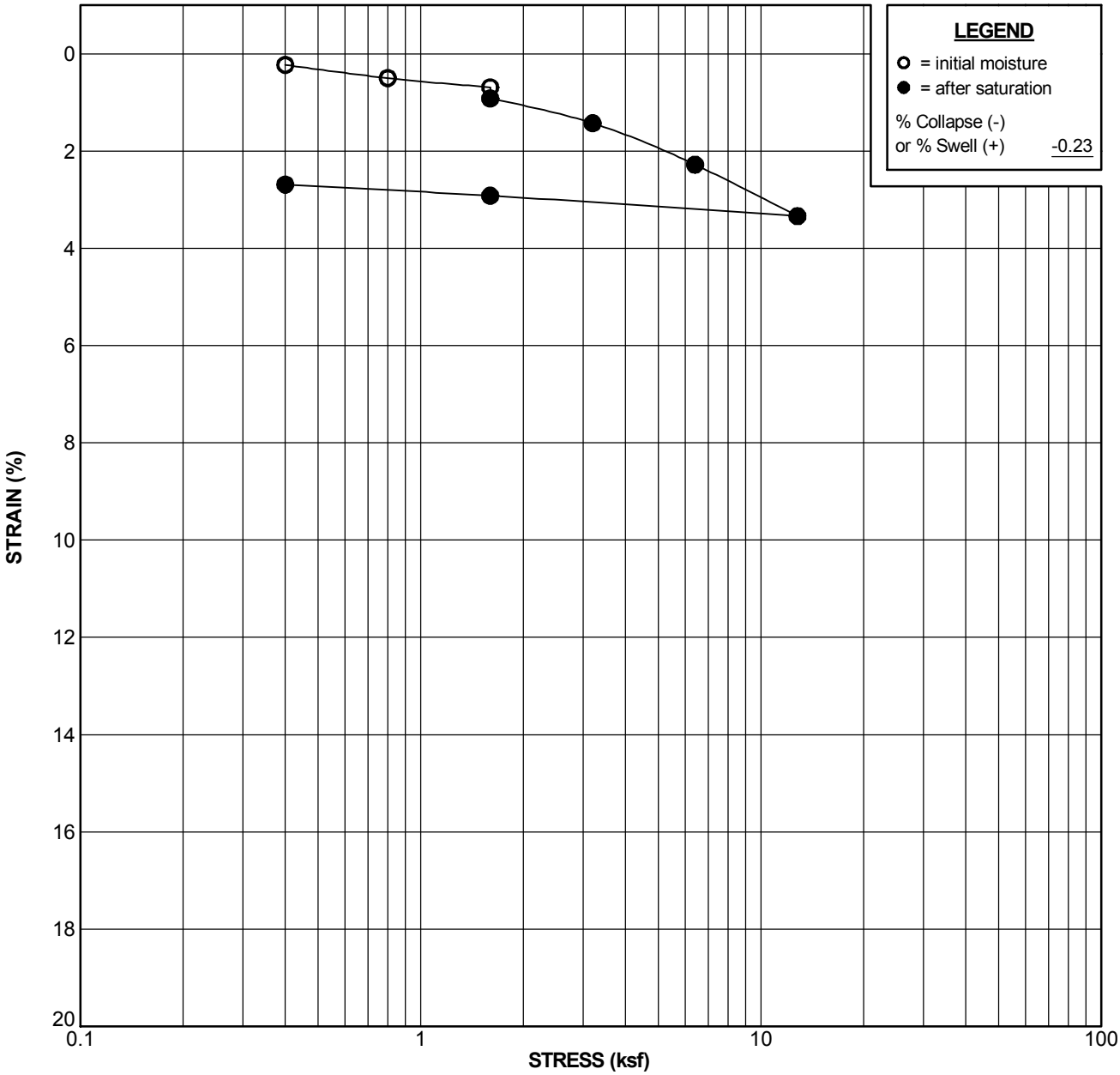
Boring No. B- 3	Sample No. D-6	Depth: 30.0 ft
Sample Description: (Qal) Brown sandy SILT		USCS: ML
Liquid Limit:	Plasticity Index:	Percent Passing No. 200 Sieve:

Test Stage	Moisture Content (%)	Dry Density (pcf)	Degree of Saturation (%)	Void Ratio
Initial	24.6	94.8	85.5	0.777
Final	25.5	97.7	95.0	0.724

CONSOLIDATION TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



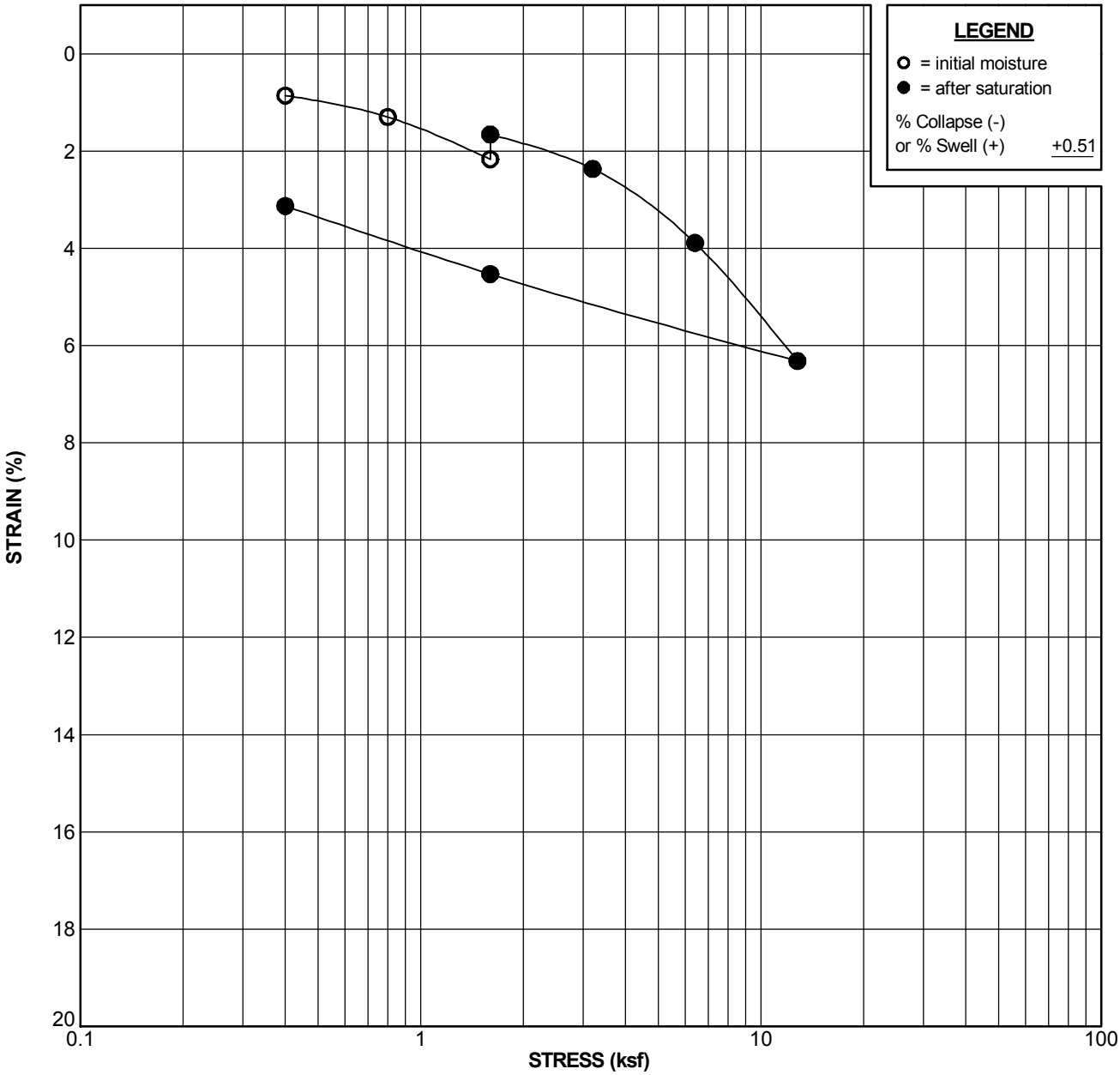
Boring No. B- 4	Sample No. D-2	Depth: 10.0 ft
Sample Description: (Qal) Light gray silty SAND		USCS: SM
Liquid Limit:	Plasticity Index:	Percent Passing No. 200 Sieve:

Test Stage	Moisture Content (%)	Dry Density (pcf)	Degree of Saturation (%)	Void Ratio
Initial	6.6	102.7	27.8	0.641
Final	17.2	105.5	77.8	0.597

CONSOLIDATION TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



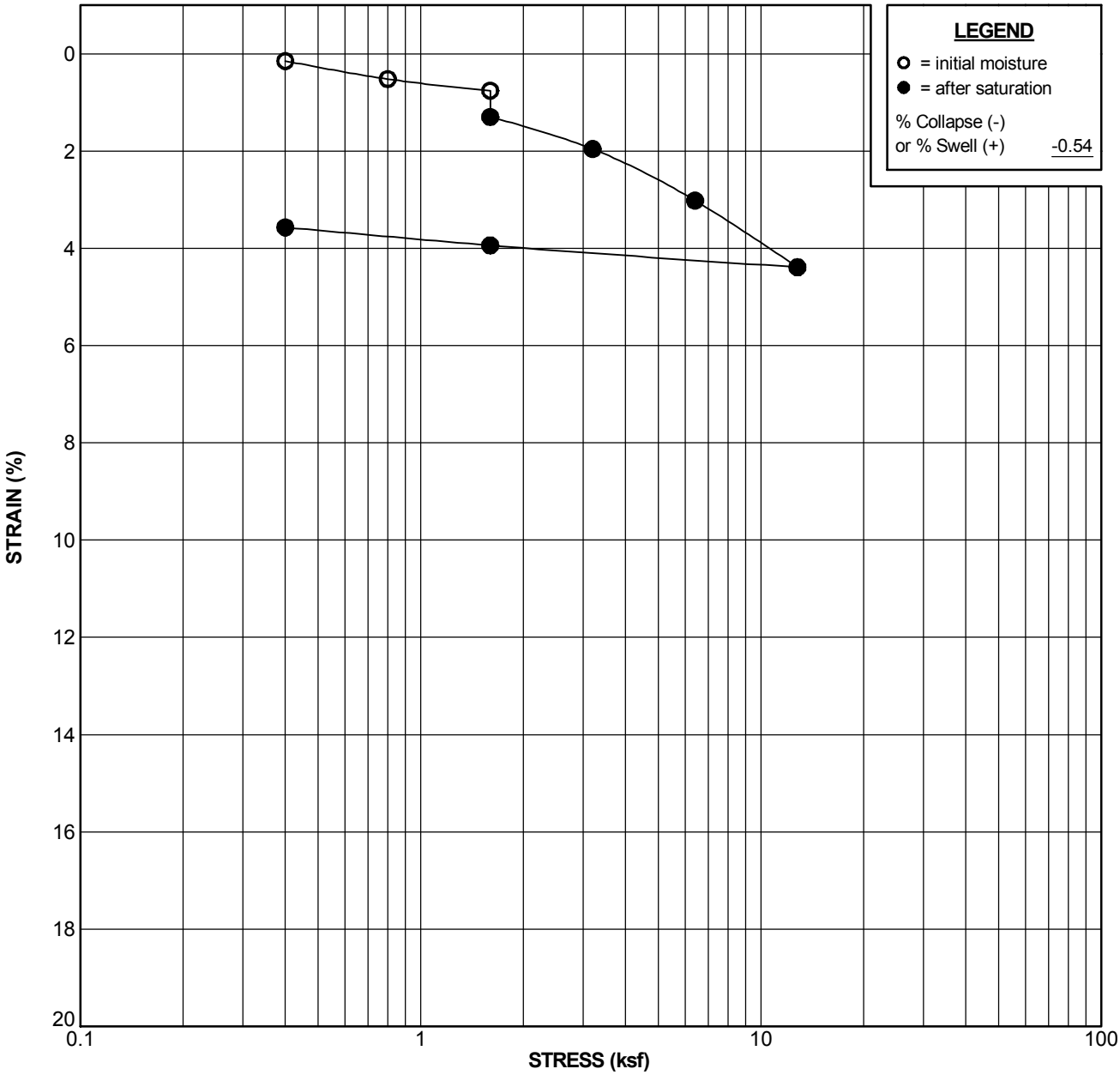
Boring No. B- 5	Sample No. D-3	Depth: 15.0 ft
Sample Description: (Qal) Dark brown silty CLAY		USCS: CL
Liquid Limit:	Plasticity Index:	Percent Passing No. 200 Sieve:

Test Stage	Moisture Content (%)	Dry Density (pcf)	Degree of Saturation (%)	Void Ratio
Initial	18.7	98.2	70.5	0.716
Final	19.6	101.3	79.8	0.663

CONSOLIDATION TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



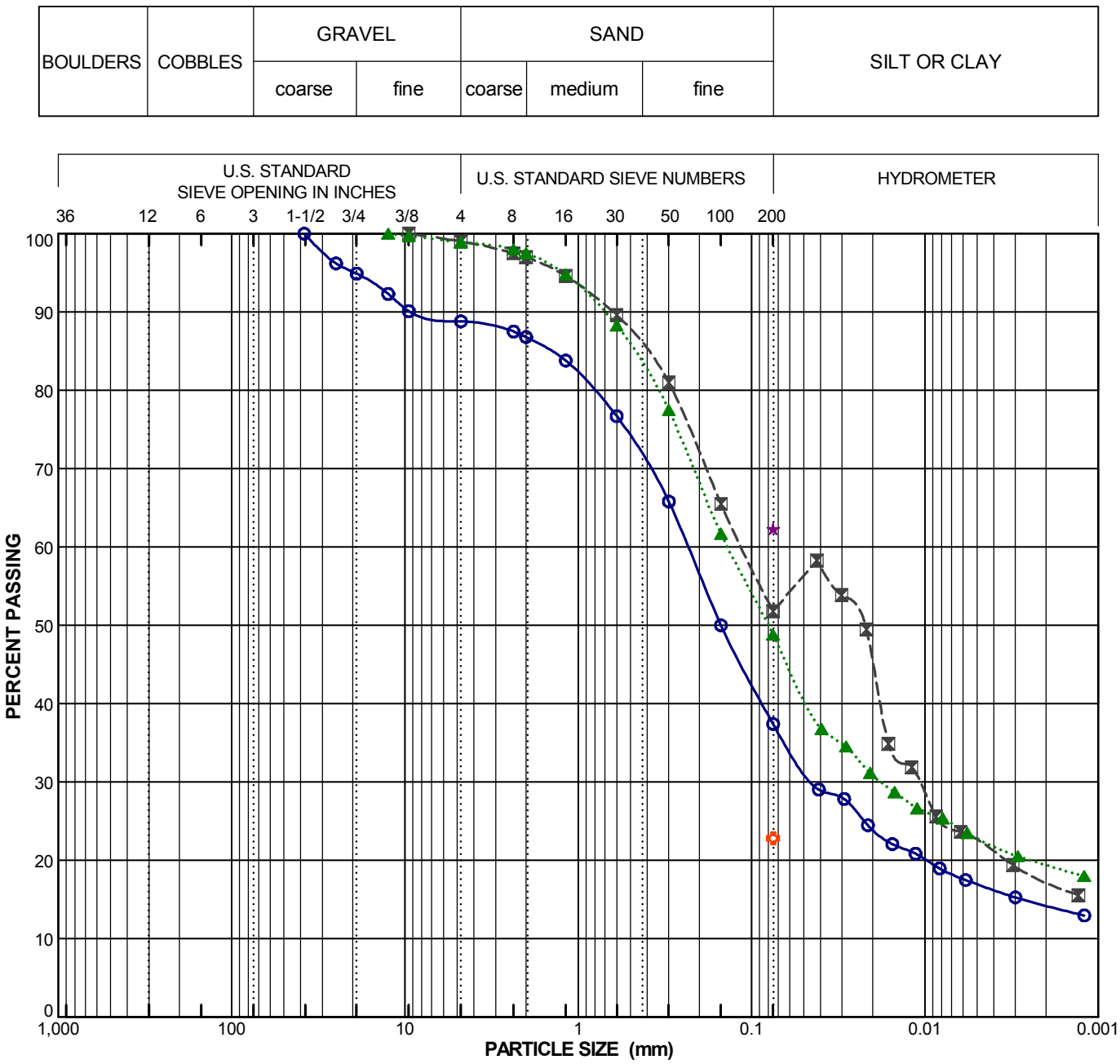
Boring No. B- 6	Sample No. D-3	Depth: 15.0 ft
Sample Description: (Qal) Brown silty SAND		USCS: SM
Liquid Limit:	Plasticity Index:	Percent Passing No. 200 Sieve:

Test Stage	Moisture Content (%)	Dry Density (pcf)	Degree of Saturation (%)	Void Ratio
Initial	8.2	108.9	40.5	0.547
Final	15.7	112.8	85.9	0.494

CONSOLIDATION TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



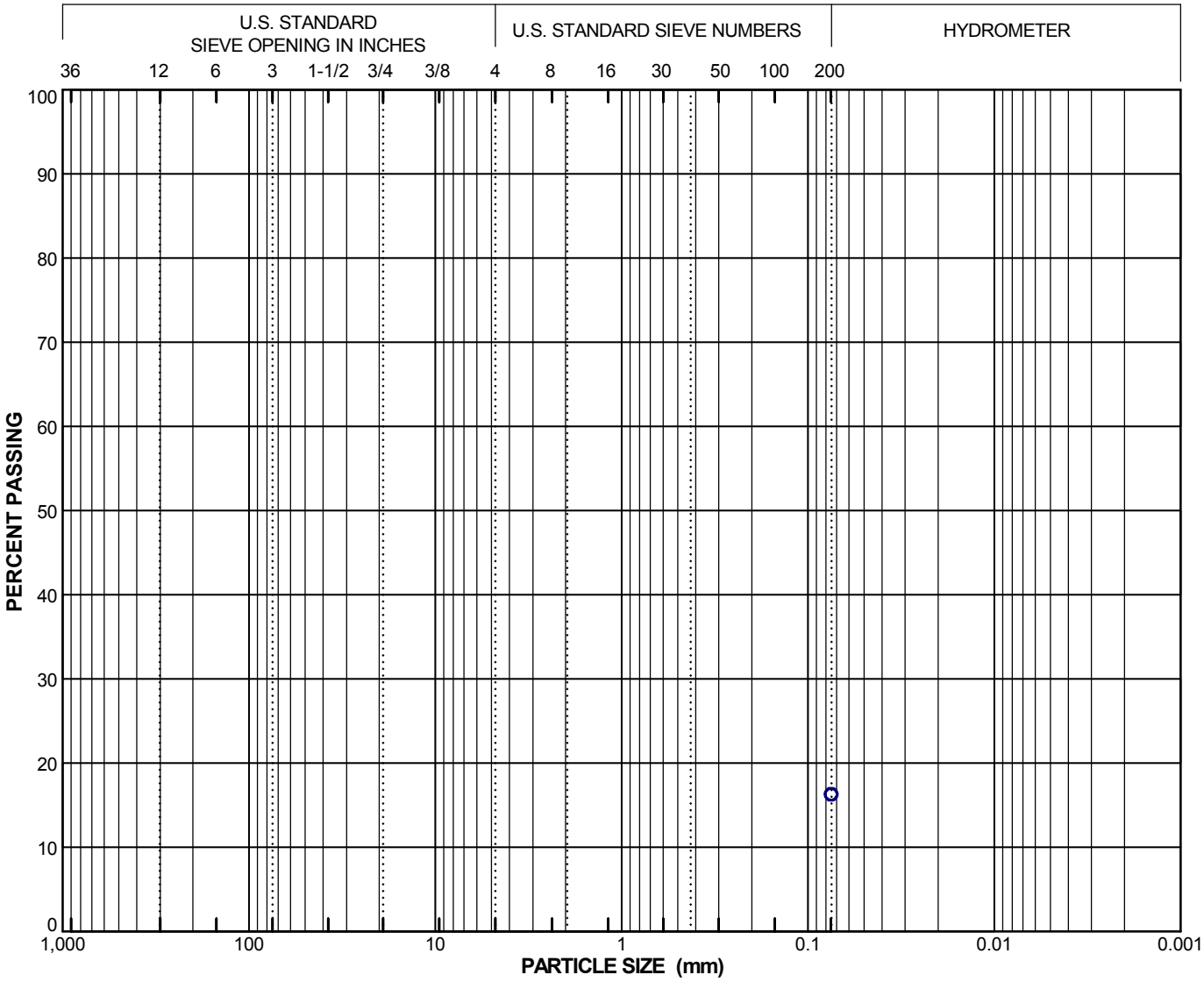
Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
○	B- 2	B-1	0.0		29	15	1.07			37	14	SC
⊠	B- 5	B-2	10.1		33	21	1.24			52	17	CL
▲	B- 6	B-1	0.0		33	18	0.95			49	19	SC
★	B-10	B-1	15.0							62		CL
✿	B-12	B-1	7.5							23		SM

PARTICLE SIZE DISTRIBUTION

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

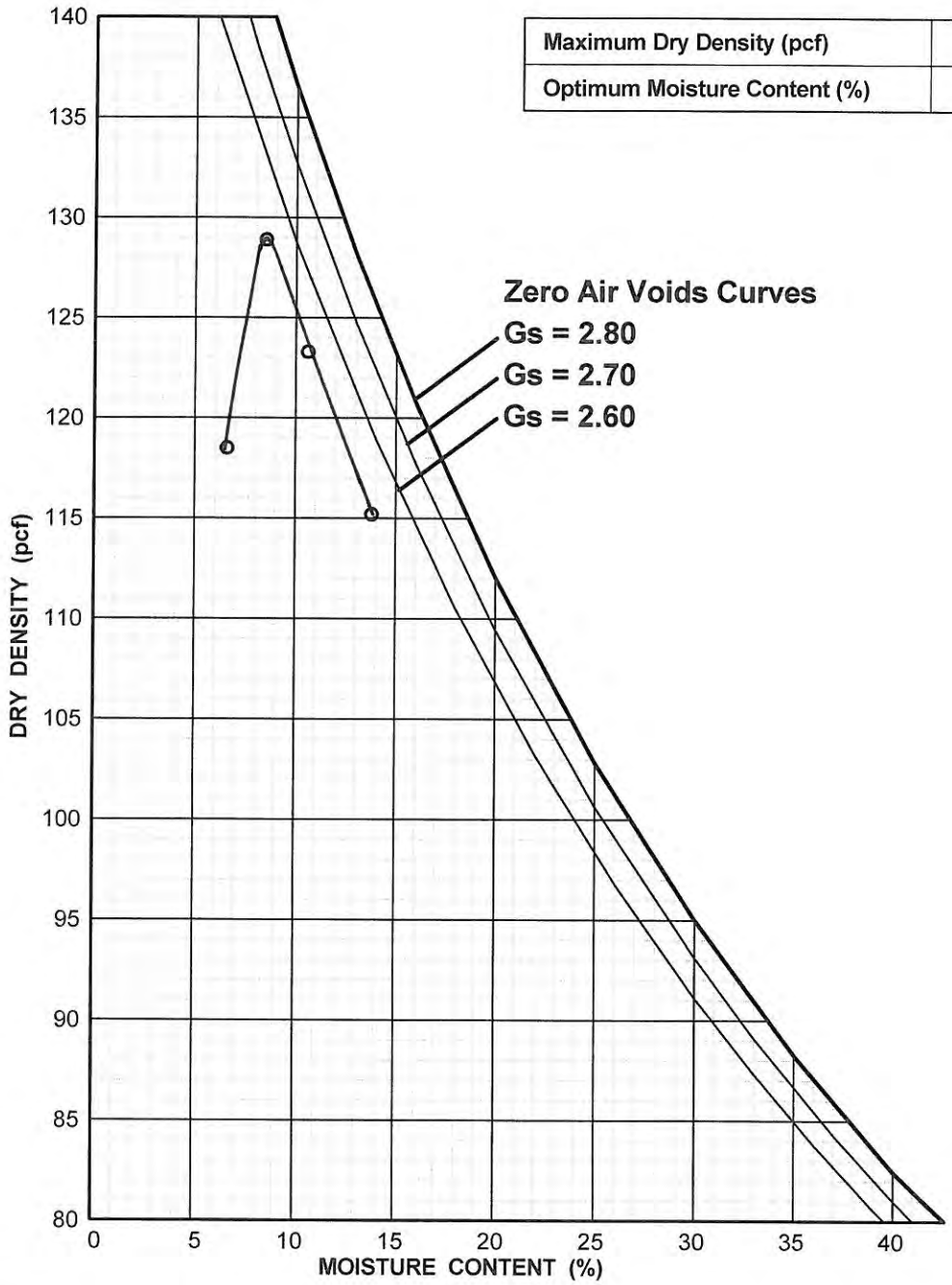


Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2µ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2µ (%)	USCS
○	T- 8	B-1	1.5							16		SM

PARTICLE SIZE DISTRIBUTION

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



Maximum Dry Density (pcf)	129.0
Optimum Moisture Content (%)	8.5

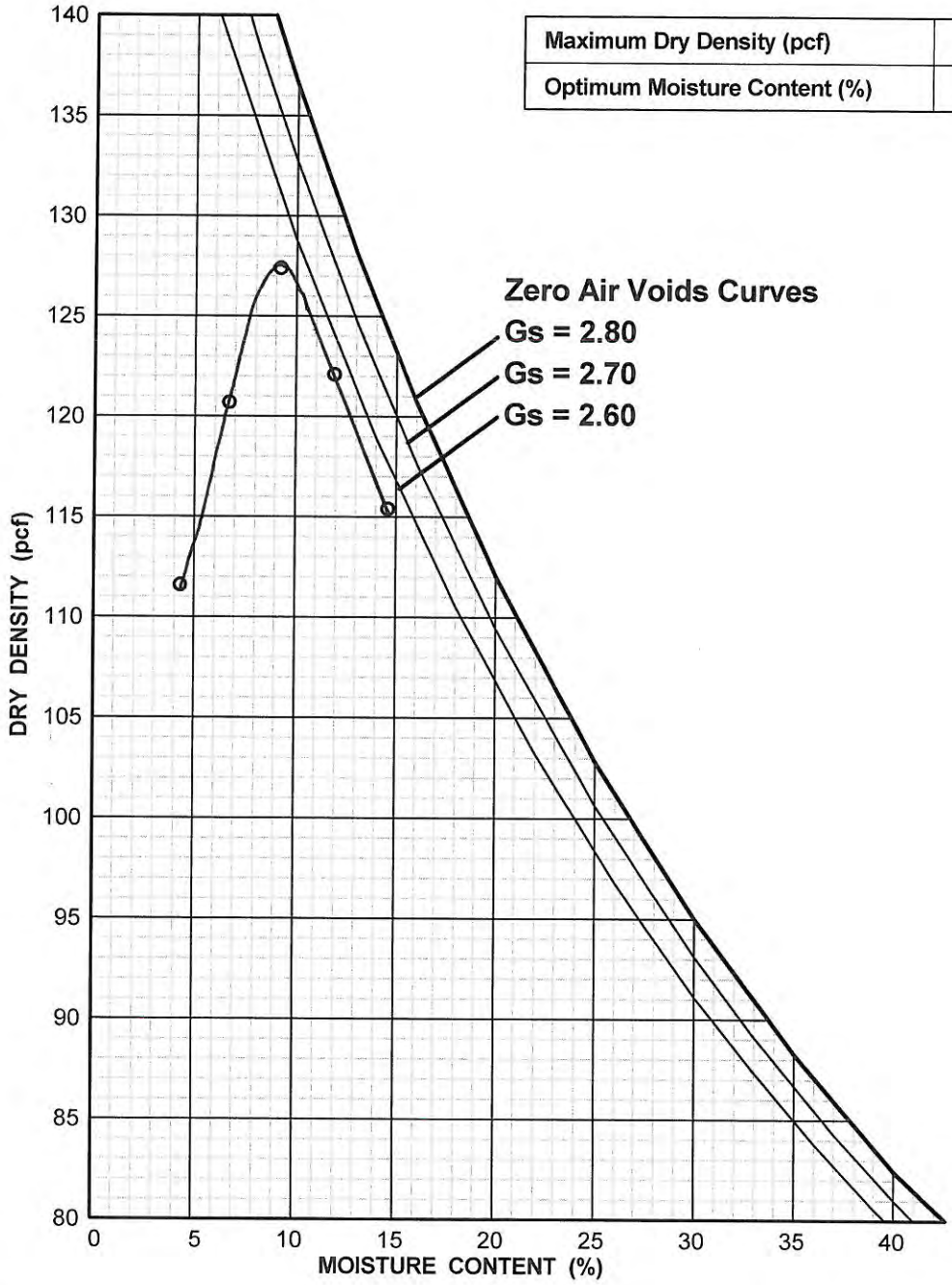
Boring No. B- 2	**Sample No. B-1**	**Depth: 0.0 ft**
Sample Description: (Afu) Dark grayish brown clayey SAND		**USCS:** SC
Liquid Limit: 29	**Plasticity Index:** 15	**Percent Passing No. 200 Sieve:** 37
Comments: 1557A		

COMPACTION TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.

Template: NMCOMP; Prj ID: 16098-01.GPJ; Printed: 7/13/18



Maximum Dry Density (pcf)	128.5
Optimum Moisture Content (%)	9.0

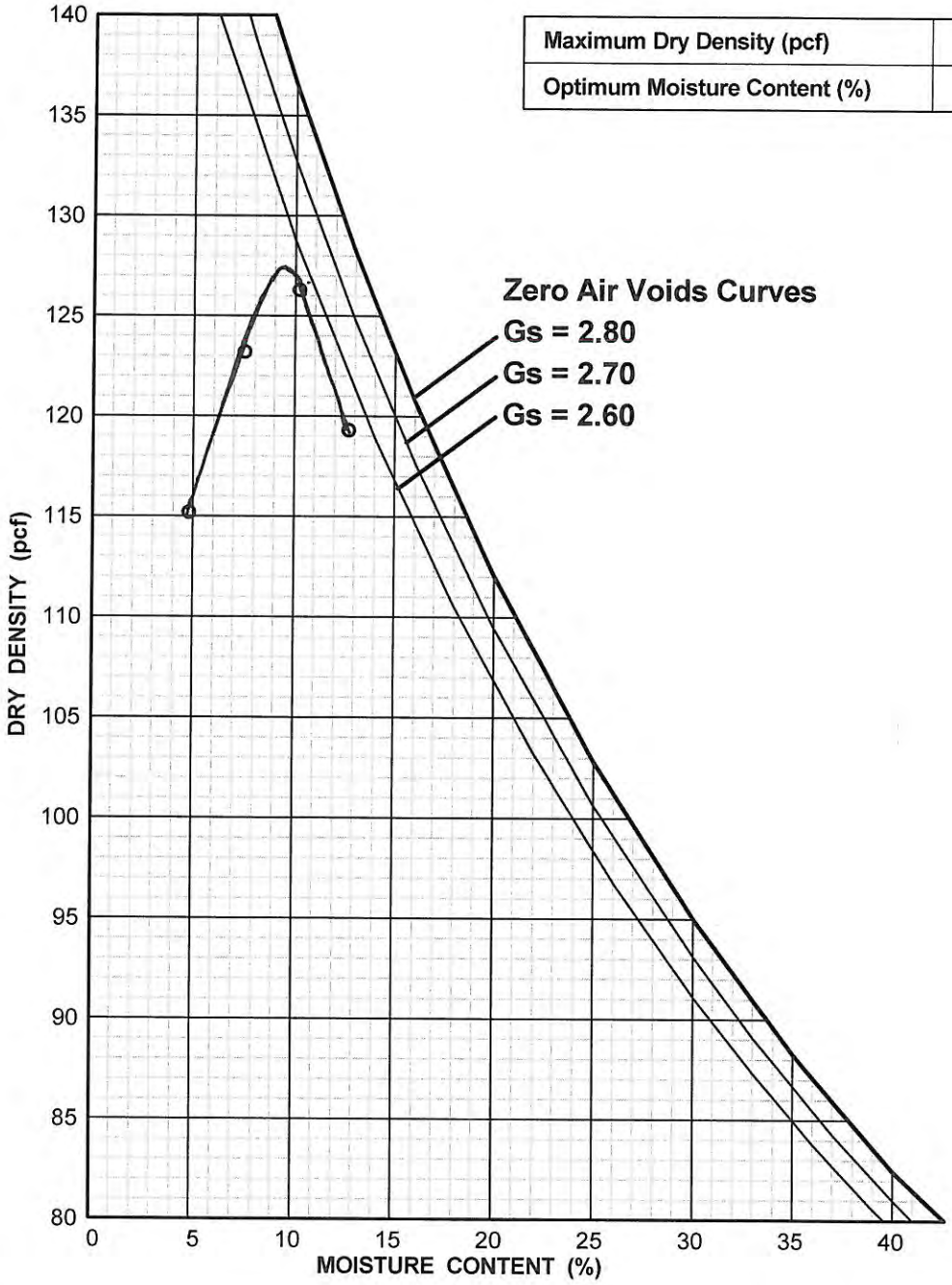
Boring No. B- 5	**Sample No. B-2**	**Depth: 10.1 ft**
Sample Description: (Qal) Grayish brown sandy CLAY		**USCS:** CL
Liquid Limit: 33	**Plasticity Index:** 21	**Percent Passing No. 200 Sieve:** 52
Comments: 1557A		

COMPACTION TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.

Maximum Dry Density (pcf)	127.5
Optimum Moisture Content (%)	9.5

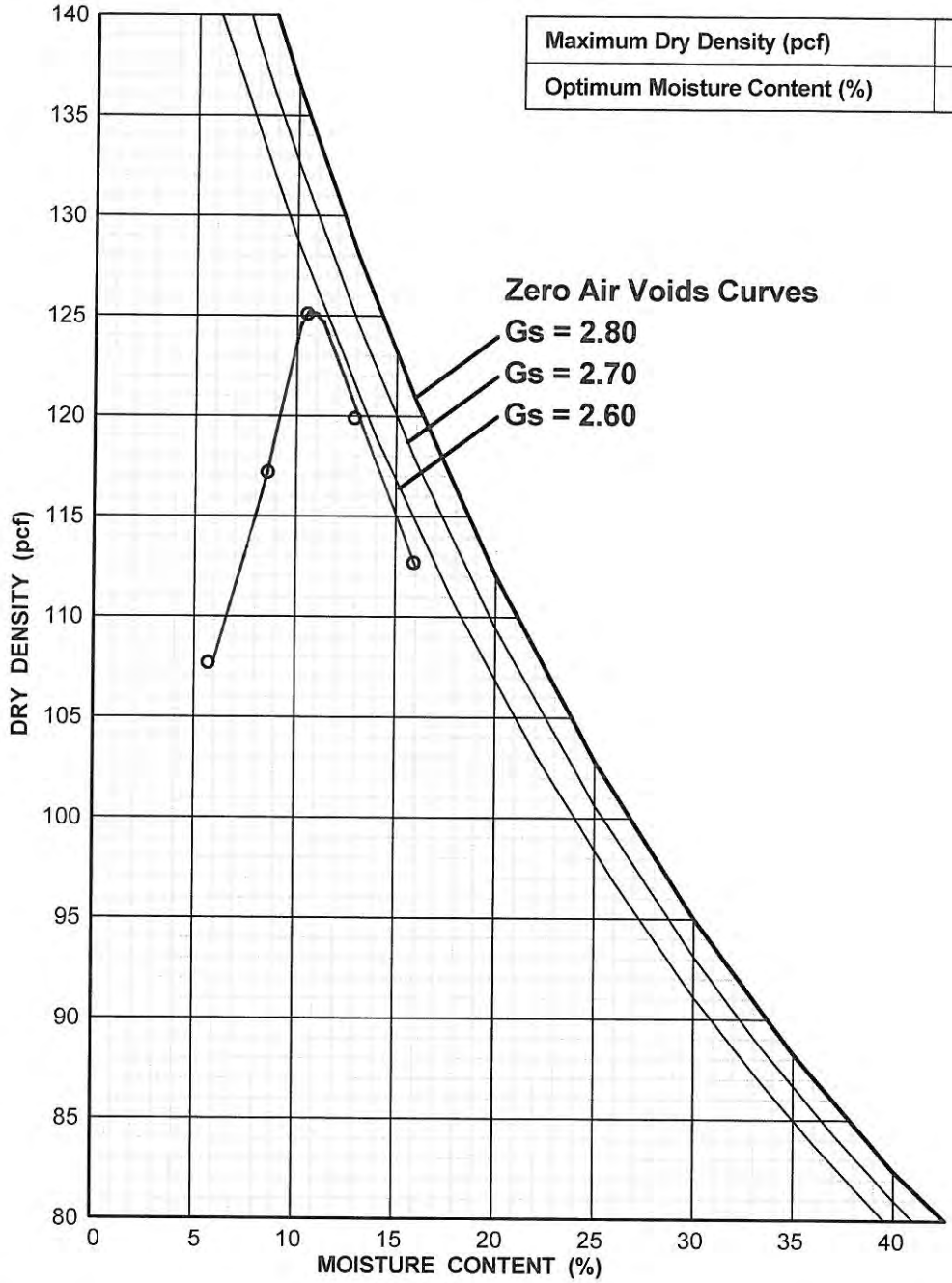


Boring No. B- 6	**Sample No. B-1**	**Depth: 0.0 ft**
Sample Description: (Afu) Brown gray clayey SAND		**USCS:** SC
Liquid Limit: 33	**Plasticity Index:** 18	**Percent Passing No. 200 Sieve:** 49
Comments: 1557A		

COMPACTION TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



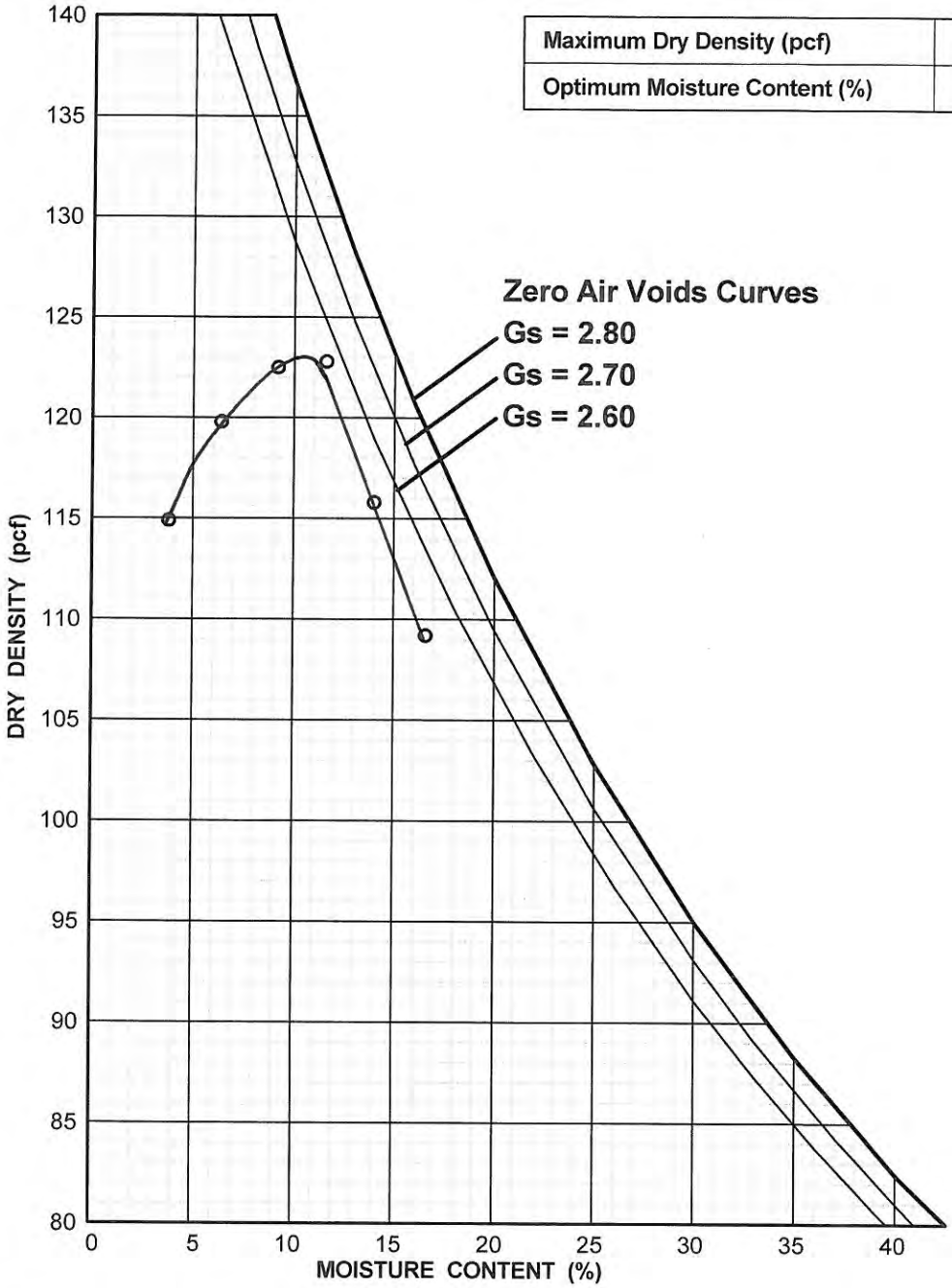
Maximum Dry Density (pcf)	125.0
Optimum Moisture Content (%)	11.0

Boring No. B-10	**Sample No. B-1**	**Depth: 15.0 ft**
Sample Description: Dark brown sandy CLAY		**USCS:** CL
Liquid Limit:	**Plasticity Index:**	**Percent Passing No. 200 Sieve:** 62
Comments: 1557A		

COMPACTION TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



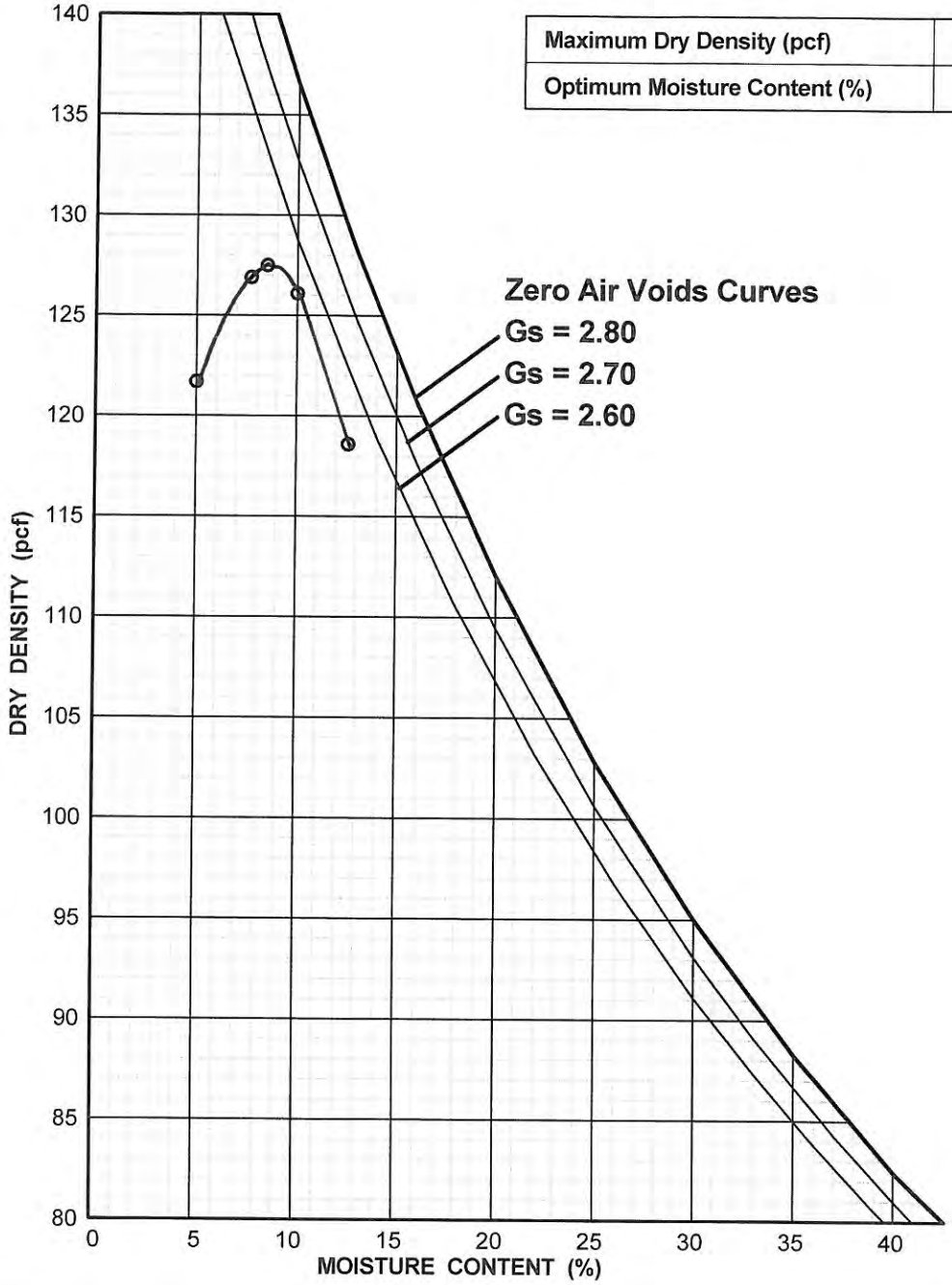
Maximum Dry Density (pcf)	123.0
Optimum Moisture Content (%)	10.5

Boring No. B-12	**Sample No. B-1**	**Depth: 7.5 ft**
Sample Description: Olive gray silty SAND		**USCS:** SM
Liquid Limit:	**Plasticity Index:**	**Percent Passing No. 200 Sieve:** 23
Comments: 1557A		

COMPACTION TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



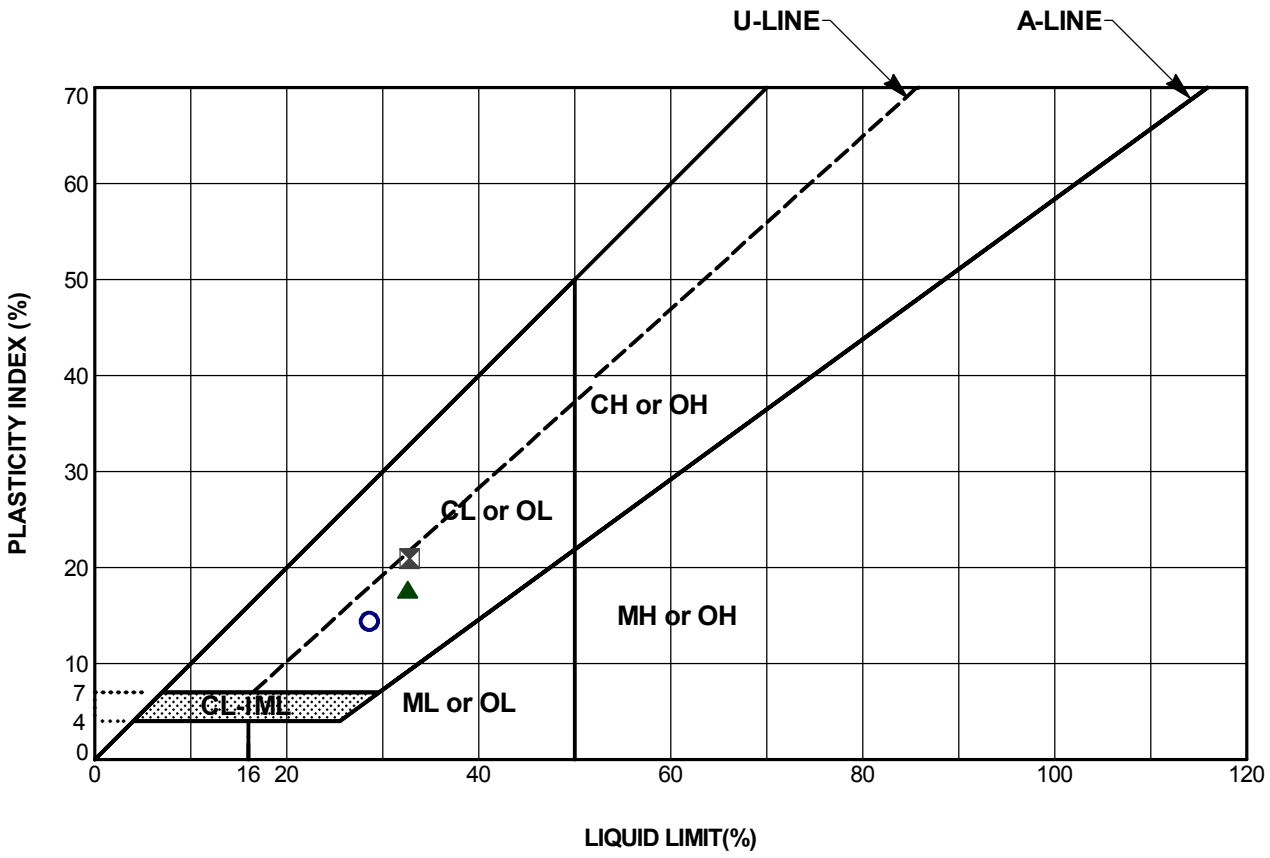
Maximum Dry Density (pcf)	127.5
Optimum Moisture Content (%)	8.5

Boring No. T- 8	**Sample No. B-1**	**Depth: 1.5 ft**
Sample Description: Brown silty SAND		**USCS:** SM
Liquid Limit:	**Plasticity Index:**	**Percent Passing No. 200 Sieve:** 16
Comments: 1557A		

COMPACTION TEST RESULTS

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.



Symbol	Boring Number	Sample Number	Depth (feet)	Passing No. 200 Sieve (%)	LL	PI	USCS	Description
○	B- 2	B-1	0.0	37	29	15	SC	(Afu) Dark grayish brown clayey SAND
⊠	B- 5	B-2	10.1	52	33	21	CL	(Qal) Grayish brown sandy CLAY
▲	B- 6	B-1	0.0	49	33	18	SC	(Afu) Brown gray clayey SAND

PLASTICITY CHART

Toll Brothers/Lake Forest Nursery
Lake Forest, California
PROJECT NO. 16098-01

NMG Geotechnical, Inc.

Sample	*Compacted Moisture (%)*	*Compacted Dry Density (pcf)*	*Final Moisture (%)*	*Volumetric Swell (%)*	*Expansion Index[1] Value/Method*		*Expansive Classification[2]*	*Soluble Sulfate (%)*	*Sulfate Exposure[3]*
B-2 B-1 0-5'	10.0	113.9	15.8	2.5	28	B	Low	0.05	S0
B-5 B-2 10-15'	11.0	108.3	20.2	5.3	55	B	Medium	0.05	S0
B-6 B-1 0-5'	9.5	109.6	19.7	4.3	42	B	Low	0.06	S0

Test Method:

ASTM D4829

HACH SF-1 (Turbidimetric)

Notes:

1. Expansion Index (EI) method of determination*:*
   [A] E.I. determined by adjusting water content to achieve a 50 ±1% degree of saturation
   [B] E.I. calculated based on measured saturation within the range of 40% and 60%
2. ASTM D4829 *(Classification of Expansive Soil)*
3. ACI-318-14 Table 19.3.1.1 *(Requirement for Concrete Exposed to Sulfate-Containing Solutions)*

Expansion Index and Soluble Sulfate Test Results

(FRM001 Rev.5)

Project No. 16098-01

Project Name: Toll/Nakase

NMG

APPENDIX D

APPENDIX D

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

1.0 General

1.1 Intent: These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 Geotechnical Consultant: Prior to commencement of work, the owner shall employ a geotechnical consultant. The geotechnical consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include natural ground after it has been cleared for receiving fill but before fill is placed, bottoms of all "remedial removal" areas, all key bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to determine the attained level of compaction. The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

1.3 The Earthwork Contractor: The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the plans and specifications.

The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork contemplated for the site prior to commencement of grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified.

2.0 Preparation of Areas to be Filled

2.1 Clearing and Grubbing: Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent of organic matter. Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed

immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

2.2 Processing: Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

2.3 Overexcavation: In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by the Geotechnical Consultant during grading.

2.4 Benching: Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. Please see the Standard Details for a graphic illustration. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for the fill.

2.5 Evaluation/Acceptance of Fill Areas: All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

3.0 Fill Material

3.1 General: Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 Oversize: Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 12 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

3.3 Import: If importing of fill material is required for grading, proposed import material shall meet the requirements of Section 3.1. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

4.0 Fill Placement and Compaction

4.1 Fill Layers: Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 Fill Moisture Conditioning: Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557-91).

4.3 Compaction of Fill: After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557-91). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 Compaction of Fill Slopes: In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557-91.

4.5 Compaction Testing: Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.6 Frequency of Compaction Testing: Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.7 Compaction Test Locations: The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided.

5.0 Subdrain Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and the Standard Details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

6.0 Excavation

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 Trench Backfills

7.1 Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.

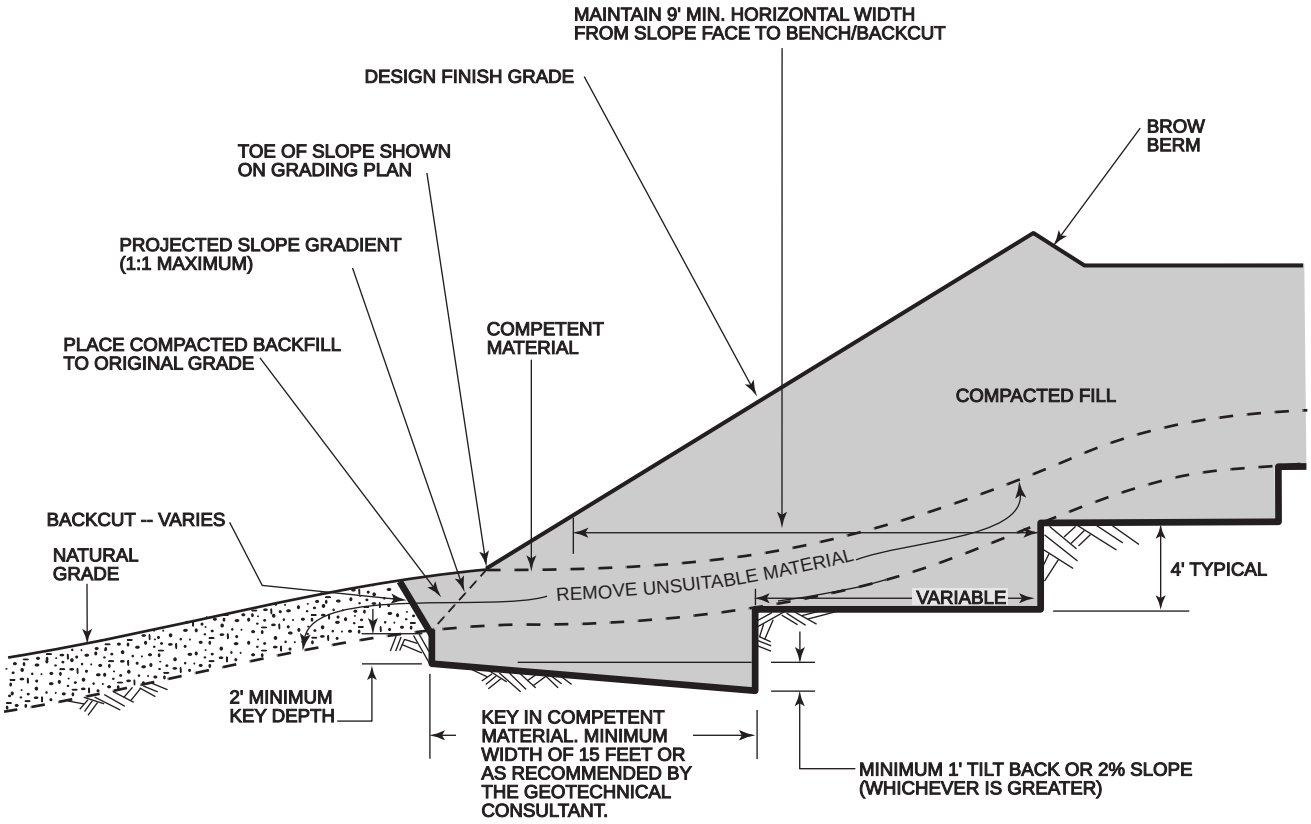
7.2 Bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum 90 percent of maximum from 1 foot above the top of the conduit to the surface, except in traveled ways (see Section 7.6 below).

7.3 Jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

7.4 Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

7.5 Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

7.6 Trench backfill in the upper foot measured from finish grade within existing or future traveled way, shoulder, and other paved areas (or areas to receive pavement) should be placed to a minimum 95 percent relative compaction.

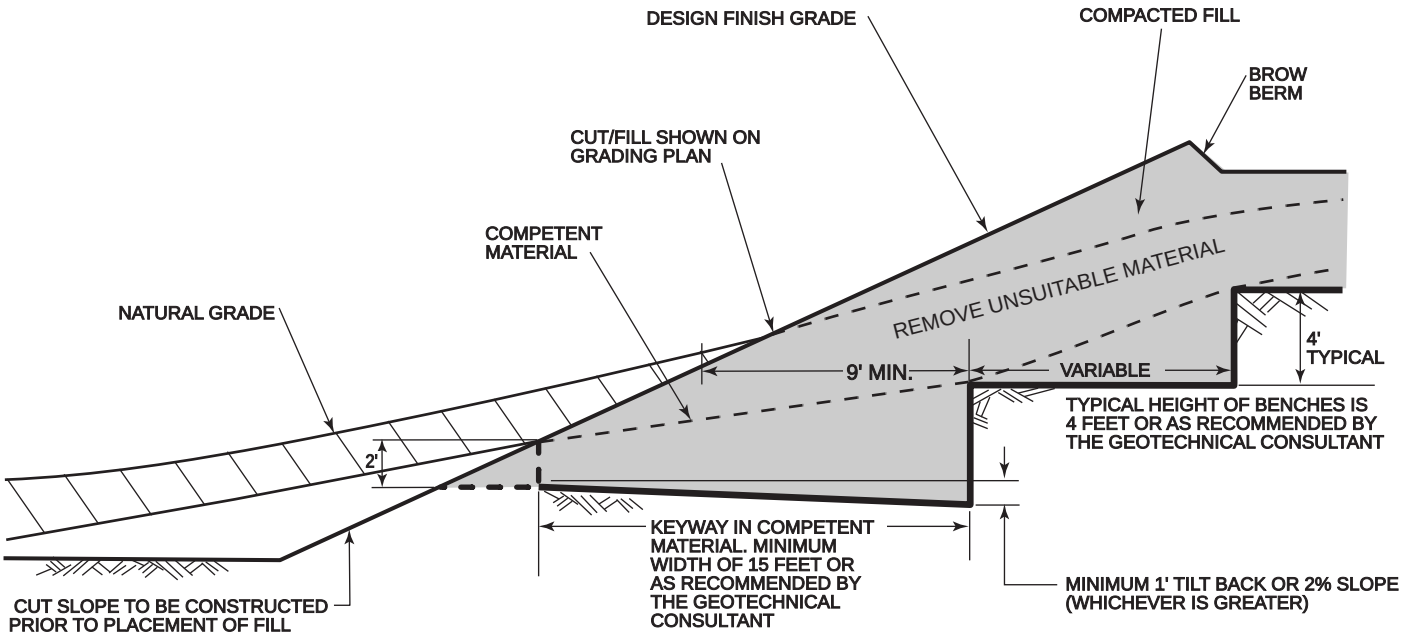


NOTE: BENCHING SHALL BE REQUIRED WHEN NATURAL SLOPES ARE EQUAL TO OR STEEPER THAN 5:1 OR WHEN RECOMMENDED BY THE SOIL ENGINEER. WHERE THE NATURAL SLOPE APPROACHES OR EXCEEDS THE DESIGN SLOPE RATIO, SPECIAL RECOMMENDATIONS WILL BE PROVIDED BY THE GEOTECHNICAL ENGINEER.

FIGURE 1

TYPICAL FILL KEY ABOVE NATURAL SLOPE MINIMUM STANDARD GRADING DETAILS

NMG Geotechnical, Inc.

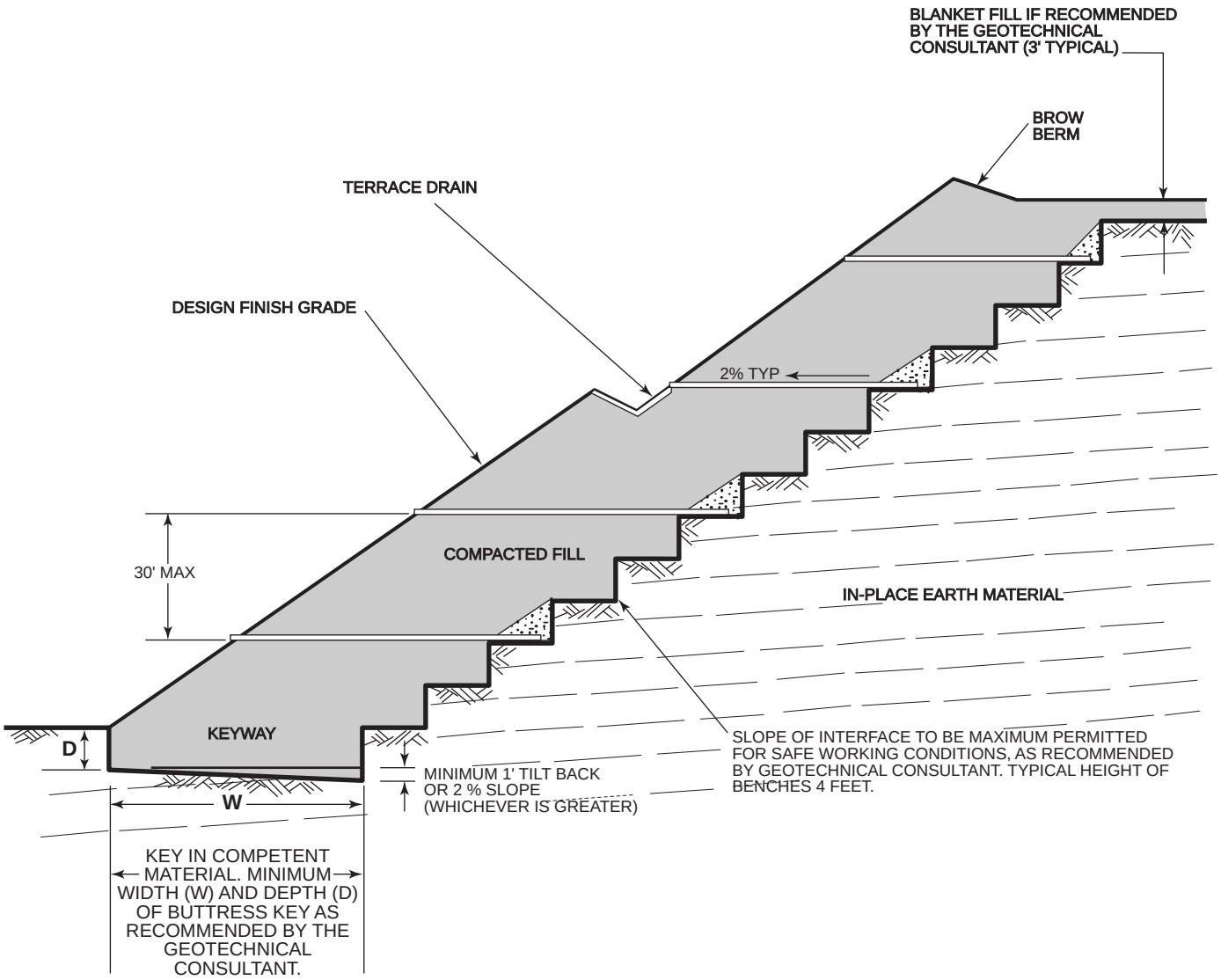


NOTE: THE FILL PORTION OF THE SLOPE SHALL BE COMPACTED AS STATED IN THE PROJECT SPECIFICATIONS.

FIGURE 2

TYPICAL FILL ABOVE CUT SLOPE
MINIMUM STANDARD GRADING DETAILS

NMG Geotechnical, Inc.



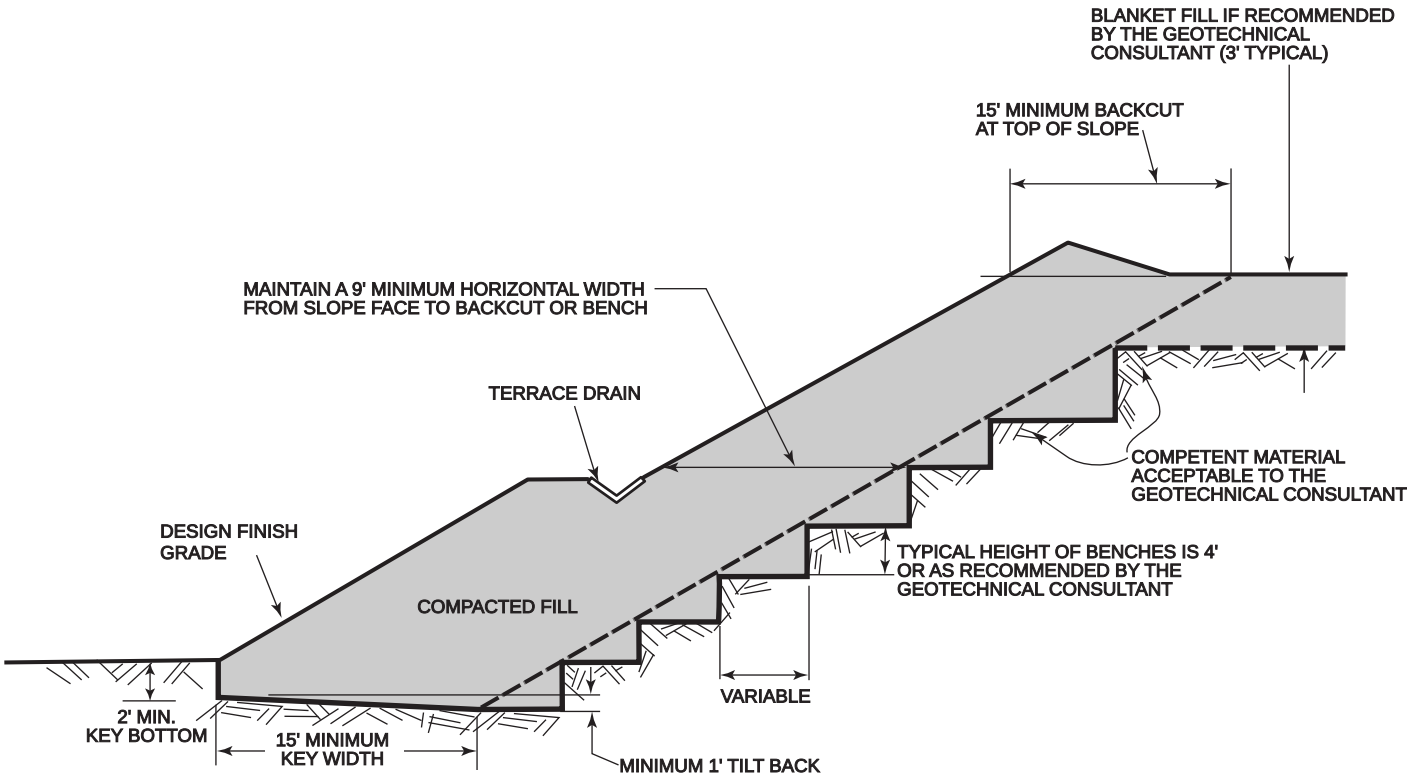
NOTE: SUBDRAIN DETAILS, SEE FIGURE 5.

FIGURE 3

TYPICAL BUTTRESS FILL
MINIMUM STANDARD GRADING DETAILS

NMG Geotechnical, Inc.

1/04 TYP BUTTRESS FILL.ai



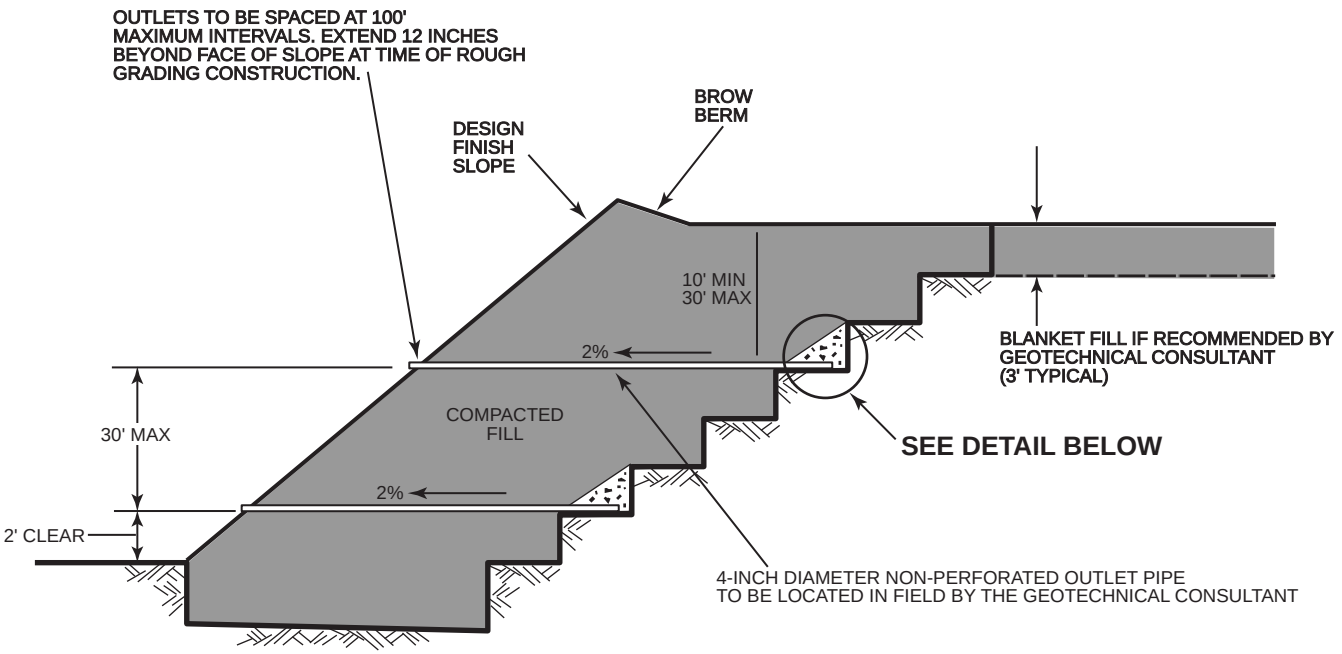
NOTE:
SEE FIGURE 5 FOR TYPICAL SUBDRAIN DETAILS FOR STABILIZATION FILLS

FIGURE 4

TYPICAL STABILIZATION FILL
MINIMUM STANDARD GRADING DETAILS

NMG Geotechnical, Inc.

9/96 STABILIZATION FILL.ai



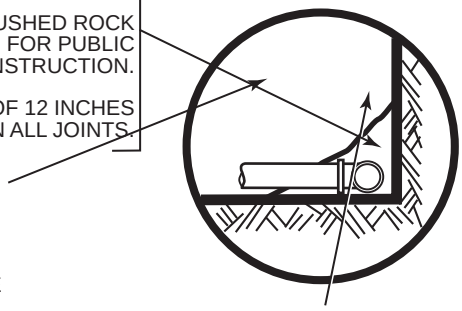
FILTER MATERIAL - MINIMUM OF THREE CUBIC FEET PER FOOT OF PIPE. SEE FILTER MATERIAL SPECIFICATION.

ALTERNATE: IN LIEU OF FILTER MATERIAL, THREE CUBIC FEET OF GRAVEL PER FOOT OF SUBDRAIN (WITHOUT PIPE) MAY BE ENCASED IN FILTER FABRIC. SEE GRAVEL SPECIFICATION, AND FIGURE 6 FOR FILTER FABRIC SPECIFICATION

"GRAVEL" TO CONSIST OF 1/2" TO 1" CRUSHED ROCK PER STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION.

FILTER FABRIC SHALL BE LAPPED A MINIMUM OF 12 INCHES ON ALL JOINTS.

DETAIL



OUTLET PIPE TO BE CONNECTED TO SUBDRAIN PIPE WITH TEE OR ELBOW

"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT.

SIEVE SIZE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

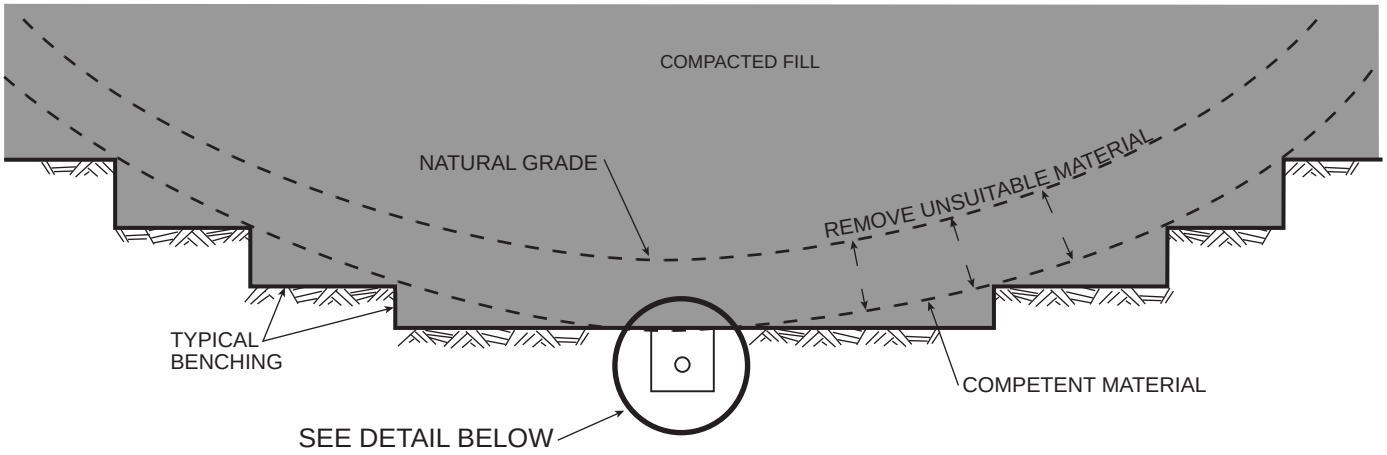
MINIMUM 4-INCH DIAMETER SCHEDULE 40 ASTM D1527 OR D1785 OR SDR 35 ASTM D2751 OR D 3034. FOR FILL DEPTH OF 90 FEET OR GREATER, USE ONLY SCHEDULE 40 OR EQUIVALENT. THERE SHALL BE A MINIMUM OF 8 UNIFORMLY SPACED PERFORATIONS PER FOOT OF PIPE INSTALLED WITH PERFORATIONS ON BOTTOM OF PIPE. PROVIDE CAP AT UPSTREAM END OF PIPE. SLOPE AT 2 PERCENT TO OUTLET PIPE.

NOTE:
TRENCH FOR OUTLET PIPES TO BE BACKFILLED WITH ON-SITE SOIL.

FIGURE 5

TYPICAL STABILIZATION AND BUTTRESS FILL SUBDRAINS MINIMUM STANDARD GRADING DETAILS

NMG Geotechnical, Inc.



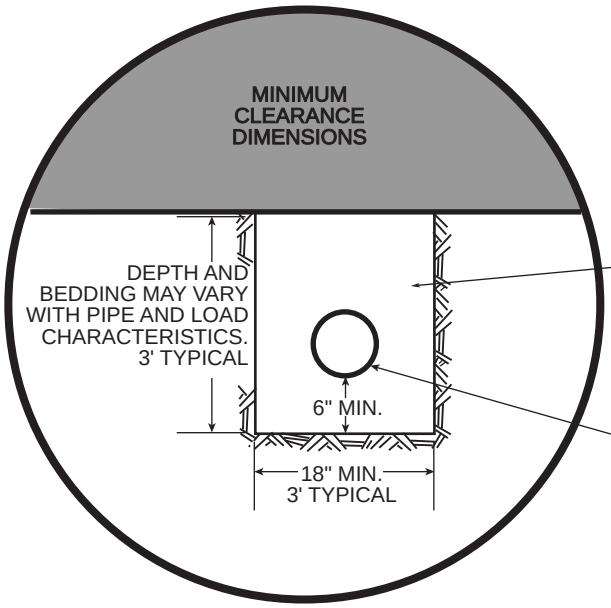
FILTER FABRICS SHALL BE PERMEABLE NON-WOVEN POLYESTER, NYLON, OR POLYPROPYLENE MATERIAL CONFORMING TO THE FOLLOWING:

1) GRAB TENSILE STRENGTH. POUNDS, MIN. ASTM D 4632.....90
2) ELONGATION, AT PEAK LOAD, PERCENT, MIN. ASTM D 4632.....50
3) PUNCTURE STRENGTH, LBS., MIN. ASTM D 3787.....45
4) COEFFICIENT OF WATER PERMITTIVITY, 1/SEC. ASTM D 4491.....>0.7
5) BURST STRENGTH, P.S.I., MIN. ASTM D 3786.....180

NOTES: DOWNSTREAM 20' OF PIPE AT OUTLET SHALL BE NON-PERFORATED AND BACKFILLED WITH FINE-GRAINED MATERIAL

PIPE SHALL BE A MINIMUM OF 4-INCH DIAMETER. FOR RUNS OF 500 FEET OR MORE, USE 6-INCH DIAMETER PIPE, OR AS RECOMMENDED BY THE GEOTECHNICAL CONSULTANT

DETAIL



FILTER MATERIAL - MINIMUM OF NINE CUBIC FEET PER FOOT OF PIPE. SEE FIGURE 5 FOR FILTER MATERIAL SPECIFICATIONS.

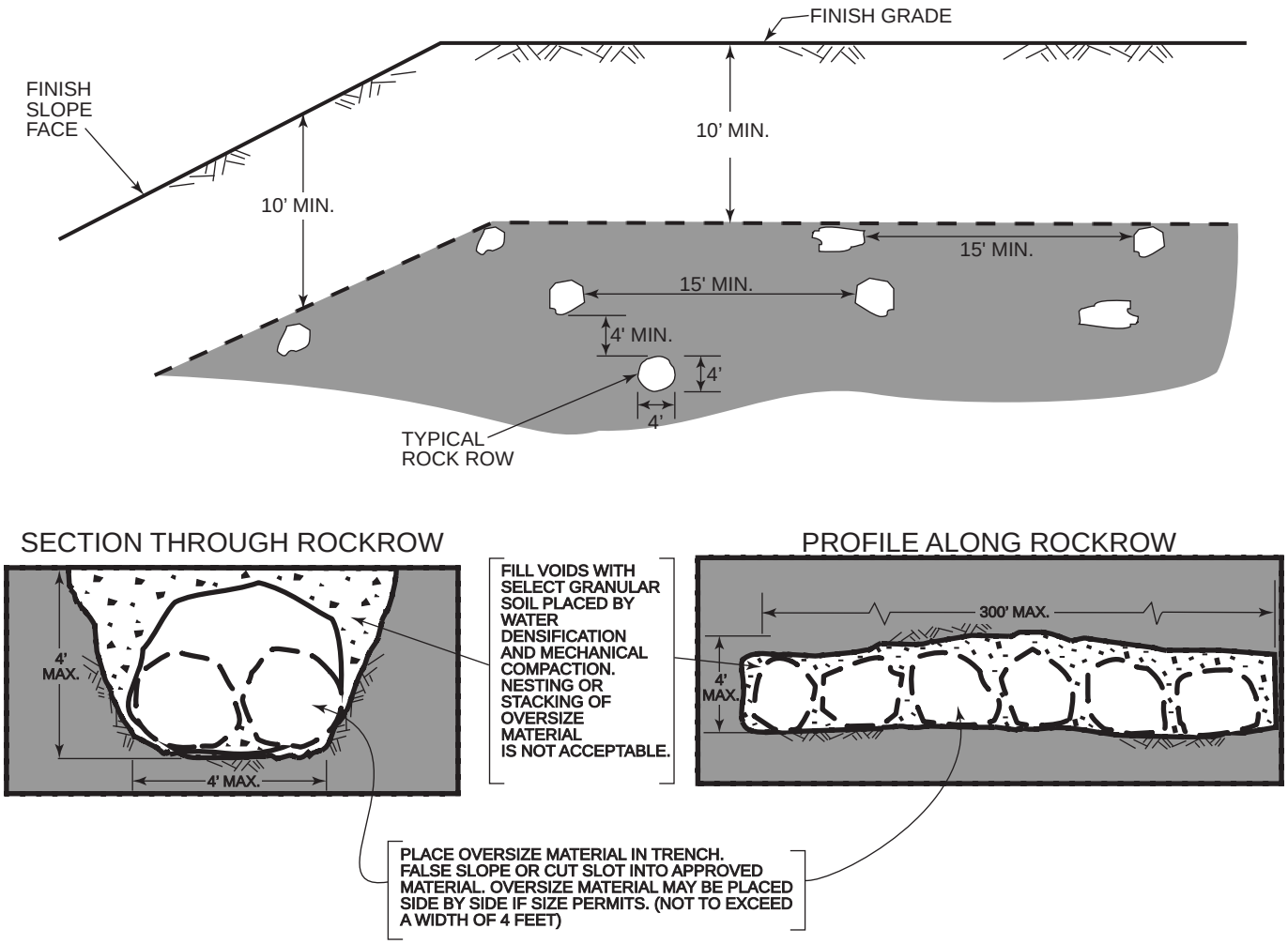
ALTERNATE: IN LIEU OF FILTER MATERIAL, NINE CUBIC FEET OF GRAVEL PER FOOT OF SUBDRAIN (WITHOUT PIPE) MAY BE ENCASED IN FILTER FABRIC. SEE FIGURE 5 TO GRAVEL SPECIFICATION. SEE ABOVE FOR FILTER FABRIC SPECIFICATION. FILTER FABRIC SHALL BE LAPPED MINIMUM OF 12 INCHES ON ALL JOINTS.

MINIMUM 4 INCH DIAMETER SCHEDULE 40 ASTM D 1527, OR D 1785, OR SDR 35 ASTM 2751 OR D 3034. FOR FILL DEPTH OF 90 FEET OR GREATER, USE ONLY SCHEDULE 40 OR APPROVED EQUIVALENT. THERE SHALL BE A MINIMUM OF 8 UNIFORMLY SPACED PERFORATIONS PER FOOT OF PIPE INSTALLED WITH PERFORATIONS ON BOTTOM OF PIPE.

FIGURE 6

TYPICAL CANYON SUBDRAIN MINIMUM STANDARD GRADING DETAILS

NMG Geotechnical, Inc.



NOTES:

A) OVERSIZED ROCK IS DEFINED AS LARGER THAN 12" IN SIZE (IN GREATEST DIMENSION).

B) SPACE BETWEEN ROCKROWS SHOULD BE ONE EQUIPMENT WIDTH OR A MINIMUM OF 15 FEET.

C) THE WIDTH AND HEIGHT OF THE ROCKROW SHALL BE LIMITED TO FOUR FEET AND THE LENGTH LIMITED TO 300 FEET UNLESS APPROVED OTHERWISE BY THE GEOTECHNICAL CONSULTANT. OVERSIZE SHOULD BE PLACED WITH FLATEST SIDE ON THE BOTTOM.

D) OVERSIZE MATERIAL EXCEEDING FOUR FEET MAY BE PLACED ON AN INDIVIDUAL BASIS IF APPROVED BY THE GEOTECHNICAL CONSULTANT.

E) FILLING OF VOIDS WILL REQUIRE SELECT GRANULAR SOIL (SE > 20, OR LESS THAN 20 PERCENT FINES) AS APPROVED BY THE GEOTECHNICAL CONSULTANT. VOIDS IN THE ROCKROW TO BE FILLED BY WATER DENSIFYING GRANULAR SOIL INTO PLACE ALONG WITH MECHANICAL COMPACTION EFFORT.

F) IF APPROVED BY THE GEOTECHNICAL CONSULTANT, ROCKROWS MAY BE PLACED DIRECTLY ON COMPETENT MATERIALS OR BEDROCK, PROVIDED ADEQUATE SPACE IS AVAILABLE FOR COMPACTION.

G) THE FIRST LIFT OF MATERIAL ABOVE THE ROCKROW SHALL CONSIST OF GRANULAR MATERIAL AND SHALL BE PROOF-ROLLED WITH A D-8 OR LARGER DOZER OR EQUIVALENT.

H) ROCKROWS NEAR SLOPES SHOULD BE ORIENTED PARALLEL TO SLOPE FACE.

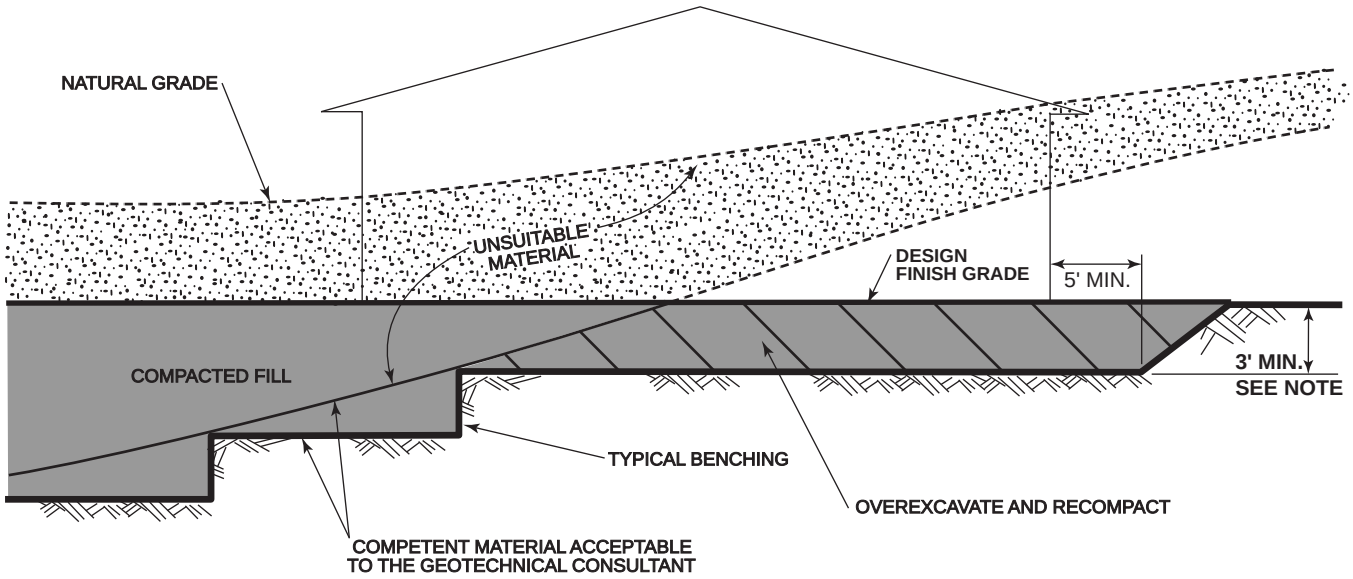
I) NESTING OR STACKING OF ROCKS IS NOT ACCEPTABLE.

FIGURE 7

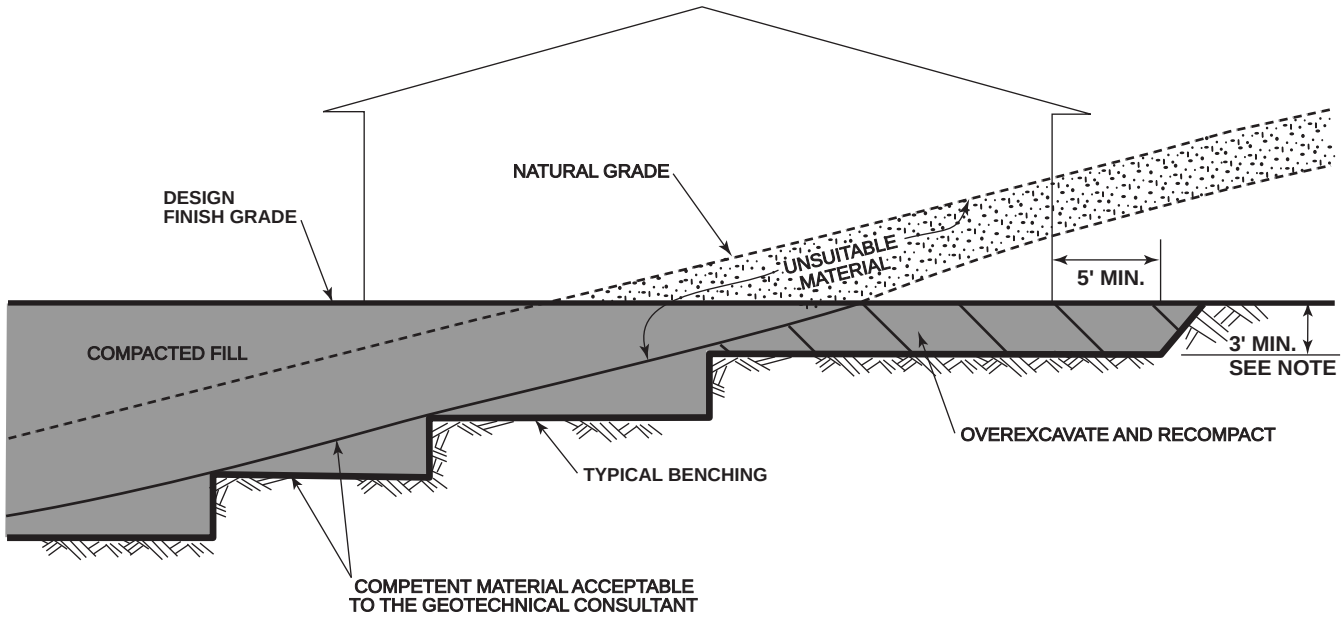
TYPICAL OVERSIZE ROCK PLACEMENT METHOD MINIMUM STANDARD GRADING DETAIL FOR STRUCTURAL FILL

NMG Geotechnical, Inc.

CUT LOT



CUT FILL LOT (TRANSITION)



NOTE: DEEPER THAN THE 3-FOOT OVEREXCAVATION MAY BE RECOMMENDED BY THE GEOTECHNICAL CONSULTANT IN STEEP TRANSITIONS.

FIGURE 8

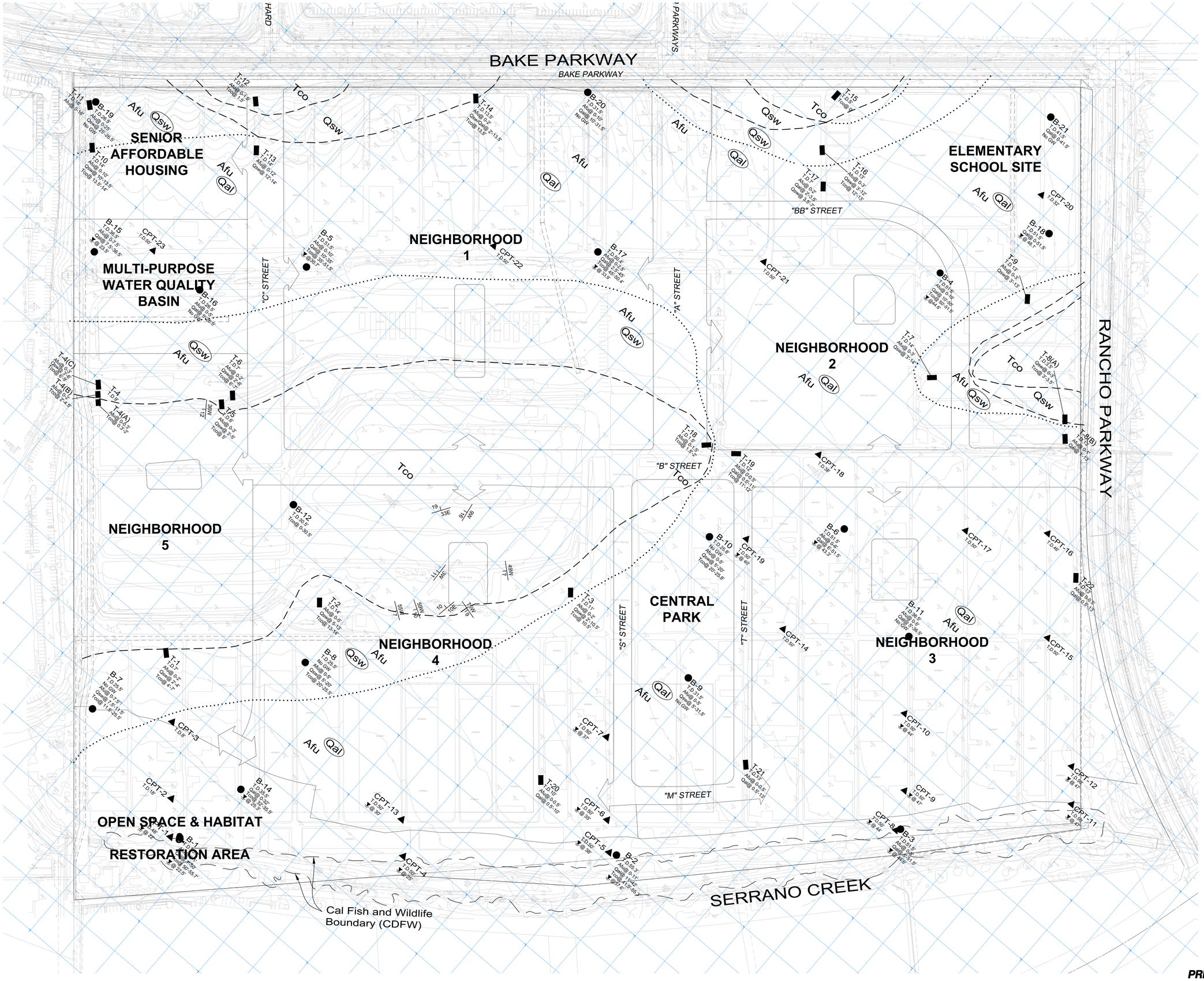
TYPICAL OVEREXCAVATION OF DAYLIGHT LINE MINIMUM STANDARD GRADING DETAILS

NMG Geotechnical, Inc.

GEOTECHNICAL MAP
NAKASE NURSERY
CITY OF LAKE FOREST, CALIFORNIA

Project No.:16098-01 By:TM/WG
Project Name:Toll/Nakase Nursery
Date: 7/13/2018 SCALE: 1"=80'
NMG Geotechnical, Inc.

PLATE 1



LEGEND

EARTH UNITS - CIRCLED WHERE BURIED

Afu	UNDOCUMENTED FILL
Qsw	SLOPE/WASH MATERIAL
Qal	ALLUVIUM
Tco	CAPISTRANO FORMATION, OSO MEMBER

OTHER SYMBOLS - LOCATIONS ARE APPROXIMATE

●B-21 T.D. 41.5' Qal@ 0-41.5' No GW ▼@43.3'	HOLLOW-STEM AUGER BORING, SHOWING TOTAL DEPTH, DEPTH TO EARTH UNIT AND GROUNDWATER
▲CPT-23 T.D. 50'	CONE PENETROMETER TEST, SHOWING TOTAL DEPTH AND DEPTH TO GROUND WATER
■T-22 T.D. 13' Afu@ 0-0.5' Qal@ 0-13'	EXPLORATORY TEST PIT, SHOWING TOTAL DEPTH & DEPTH TO EARTH UNITS
— — —······	GEOLOGIC CONTACT, DOTTED WHERE BURIED
E-W / 30	BEDDING

GRAPHIC SCALE
80 0 40 80 160
(IN FEET)
1 inch = 80 ft.

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