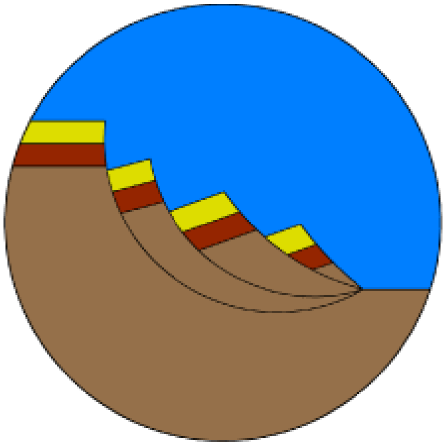
GEOTECHNICAL INVESTIGATION

150 Felker Street
Santa Cruz, Santa Cruz County, California

Submitted to:

AEST Realty
4100 Moorpark Avenue, Suite 205
San Jose, California 95117

ATTN: Arthur Lin



Prepared by:

CMAG ENGINEERING, INC.
Project No. 21-116-SC
September 13, 2021

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September 13, 2021
Project No. 21-116-SC

AEST Realty
4100 Moorpark Avenue, Suite 205
San Jose, California 95117

ATTN: Arthur Lin

SUBJECT: **GEOTECHNICAL INVESTIGATION**
Proposed Apartment Building
150 Felker Street, Santa Cruz, Santa Cruz County, California
APN 008-181-23

Dear Mr. Lin:

In accordance with your authorization, we have completed a geotechnical investigation for the subject project. This report summarizes the findings, conclusions, and recommendations from our field exploration, laboratory testing, and engineering analysis. It is a pleasure being associated with you on this project. If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office.

Sincerely,

CMAG ENGINEERING, INC.

Reviewed by:

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1.0 INTRODUCTION

This report presents the results of our geotechnical investigation for the proposed apartment building and associated improvements located at 150 Felker Street in Santa Cruz, Santa Cruz County, California.

The purpose of our investigation was to provide information regarding the surface and subsurface soil and bedrock conditions, and based on our findings, provide geotechnical recommendations for the design and construction of the proposed project. Conclusions and recommendations related to geotechnical hazards, site grading, drainage, foundations, and driveway areas are presented herein.

1.1 Terms of Reference

CMAG Engineering, Inc.'s (CMAG) scope of work for this phase of the project included site reconnaissance, subsurface exploration, soil and bedrock sampling, laboratory testing, engineering analyses, and preparation of this report.

The work was undertaken in accordance with CMAG's *Proposal for Geotechnical Services* dated April 9, 2021.

The recommendations contained in this report are subject to the limitations presented in Section 8.0 of this report.

1.2 Site Location

The project site is located on the north side of Felker Street just west of its intersection with Ocean Street in Santa Cruz, Santa Cruz County, California. The site location is shown on the Site Location Map, Figure A-1, in Appendix A.

1.3 Surface Conditions

The parcel is approximately 0.4 acres, relatively flat, and occupied by a commercial building and attendant parking lot. The property is bounded by the Highway 1 right-of-way to the north, a residential property to the east, and an undeveloped area to the west which slopes gently to the San Lorenzo River. A moderately steep ascending slope, approximately 16 feet tall, is situated between the northern property line and Highway 1. The property is landscaped with some mature trees and shrubs.

2.0 PROJECT DESCRIPTION

Based on our review of the preliminary plans (William C. Kempf Architects, 2021), it is our understanding that the project consists of the demolition of the existing commercial building, and the construction of a new four story apartment building and associated improvements. The ground floor will consist of parking and the upper three stories living space. Anticipated construction consists of wood/steel frame walls, floors, and roof with a concrete slab-on-grade ground floor.

3.0 FIELD EXPLORATION AND LABORATORY TESTING PROGRAMS

Our field exploration program included drilling, logging, and interval sampling of 4 borings on June 24, 2021. The borings were advanced to depths between 30.5± feet and 36± feet below the existing grades. Details of the field exploration program, including the Boring Logs, Figures A-4.0 through A-7.1, are presented in Appendix A.

Representative samples obtained during the field investigation were taken to the laboratory for testing to determine physical and engineering properties. Details of the laboratory testing program are presented in Appendix B. Test results are presented on the Boring Logs and in Appendix B.

4.0 SUBSURFACE CONDITIONS AND EARTH MATERIALS

4.1 General

The geologic map of Santa Cruz County (Brabb, 1989) depicts the subject property as underlain by Alluvial Deposits (Qal; Holocene) described as consisting of unconsolidated, heterogenous, moderately sorted silt and sand containing discontinuous lenses of clay and silty clay. Santa Margarita Sandstone (Tsm, Upper Miocene) described as consisting of very thick bedded to massive and thickly crossbedded yellowish gray to white, friable, granular, medium to fine grained arkosic sandstone is depicted to the north and east of the site.

Four borings were advanced in the area of the proposed apartment building. The subsurface profile encountered in our field exploration consisted of alluvial deposits overlying Santa Margarita Sandstone within the depths explored. A thin veneer of artificial fill was also encountered in Boring B-2 overlying the alluvium. Complete subsurface profiles are presented on the Boring Logs, Figures A-4.0 through A-7.1, in Appendix A. The boring locations are shown on the Boring Location Plan, Figure A-2.

4.2 Artificial Fill - af

Artificial fill was encountered in Boring B-2 from the surface to a depth of 1.5± feet below the existing grade. The fill generally consisted of moist, slightly plastic sandy silt.

4.3 Alluvial Deposits - Qal

Alluvial deposits were encountered from the surface in Borings B-1, B-3, and B-4 and underlying the artificial fill in Boring B-2 to depths between 23± and 28± feet below the existing grades. The near-surface deposits within the upper 5± to 8± feet generally consisted of soft to very stiff, moist, slightly plastic sandy silt. The surficial material was underlain by stiff to hard, moist, plastic sandy lean clay (Borings B-1 through B-3) and very stiff to hard, moist, slightly plastic sandy silt (Boring B-4) to depths between 8± and 12± feet below the existing grades. The clay and silt was underlain by medium dense to very dense, moist to wet, non plastic silty sand, silty sand with gravel, and well graded sand with silt and gravel. Intermittent gravel and cobble layers were encountered during drilling within the alluvium at depths greater than 12± feet below the existing grades. Based on our field exploration and laboratory testing, the near-surface sandy silt is considered moderately to highly compressible and has a low expansion potential.

4.4 Santa Margarita Sandstone - Tsm

Santa Margarita Sandstone was encountered underlying the alluvial deposits in all four borings at depths between 23± and 28± feet below the existing grades. The bedrock generally consisted of very dense, wet, weakly cemented sandstone.

4.5 Groundwater

Groundwater was encountered in Borings B-1 through B-3 at a depth of 17± feet below the existing grades, and in Boring B-4 at a depth of 24± feet below the existing grade, during our field exploration. It should be noted that groundwater conditions, perched or regional, may vary with location and may fluctuate with variations in rainfall, runoff, irrigation, and other changes to the conditions existing at the time our field investigation was performed.

5.0 GEOTECHNICAL HAZARDS

5.1 General

In our opinion, the geotechnical hazards that could potentially affect the proposed project are:

- Seismic shaking
- Collateral seismic hazards

5.2 Seismic Shaking

The hazard due to seismic shaking in California is high in many areas, indicative of the number of large earthquakes that have occurred historically. Intense seismic shaking may occur at the site during the design lifetime of the proposed structure from an earthquake along one of the local fault systems. Generally, the intensity of shaking will increase the closer the site is to the epicenter of an earthquake, however, seismic shaking is a complex phenomenon and may be modified by local topography and soil conditions. The transmission of earthquake vibrations from the ground into the structure may cause structural damage.

The City of Santa Cruz has adopted the seismic provisions set forth in the 2019 California Building Code (2019 CBC) to address seismic shaking. The seismic provisions in the 2019 CBC are minimum load requirements for the seismic design for the proposed structure. The provisions set forth in the 2019 CBC will not prevent structural and nonstructural damage from direct fault ground surface rupture, coseismic ground cracking, liquefaction and lateral spreading, seismically induced differential compaction, or seismically induced landsliding.

Table 1 has been constructed based on the 2019 CBC requirements for the seismic design of the proposed structure. The Site Class has been determined based on our field investigation and laboratory testing.

Table 1. Seismic Design Parameters - 2019 CBC

S_S	S_1	Site Class	F_a	F_v	S_{MS}	S_{M1}	S_{DS}	S_{D1}	PGA_M
1.667g	0.640g	D	1.0	Null*	1.667g	Null*	1.111g	Null*	0.770g

Note: *Refer to Section 11.4.8 in ASCE 7-16.

5.3 Collateral Seismic Hazards

In addition to seismic shaking, other seismic hazards that may have an adverse affect to the site and/or the structure are: fault ground surface rupture, coseismic ground cracking, seismically induced liquefaction and lateral spreading, seismically induced differential compaction, and seismically induced landsliding. It is our opinion that the potential for collateral seismic hazards to affect the site, and to damage the proposed structure is low with the exception of seismically induced liquefaction. See Subsection 5.3.1 for more information.

5.3.1 Seismically Induced Liquefaction

Seismically induced liquefaction tends to occur in loose, unconsolidated, noncohesive soils beneath the groundwater table. Liquefaction may cause the soil to settle uniformly or differentially. The magnitude of the liquefaction is a function of the severity of the seismic shaking, the relative density of the soil, the elevation of the groundwater table, and the thickness of the liquefiable soils. The alluvial soils which underlie the site potentially meet this criteria and we therefore performed a quantitative liquefaction analysis.

For our analysis, we assumed a groundwater table at 8 feet below the existing grades and the subsurface profiles encountered in Borings B-2 and B-3. The groundwater elevation used in our analysis was based on our experience in the vicinity and subsurface data obtained during the rainy season from nearby parcels. The ground shaking parameter used for our analysis was determined using the *2014 National Seismic Hazard Maps* published by the U.S. Geological Survey (USGS) and *ASCE 7-16 Minimum Design Loads for Buildings and Other Structures* (2016) published by the American Society of Civil Engineers. A Maximum Considered Geometric Mean Peak Ground Acceleration (PGA_M), adjusted for Site Class effects, of 0.770g was determined based on the national maps and Section 11.8.3 of ASCE 7-16. A magnitude of 7.9 on the San Andreas Fault Zone was also used in our analysis.

Particle size analyses and liquid/plastic limit tests were performed on samples considered representative of the potentially liquefiable soils encountered. Results of our particle size analyses and liquid/plastic limit tests are presented in Appendix B.

The results of our laboratory testing indicate that the clayey soils (sandy lean clay) encountered between 4± feet and 8± feet have a Plasticity Index greater than 7. Based on the recommendations as outlined in the Monograph *Soil Liquefaction During Earthquakes* (I.M. Idriss and R.W. Boulanger 2008), the clayey soils encountered in the potentially liquefiable zone are considered to fall outside of the range of soils susceptible to “classic” cyclically induced liquefaction (Plasticity Index $\leq$7).

A quantitative liquefaction analysis was performed using empirical predictions of earthquake-induced liquefaction potential. The analysis is based on a comparison of the in situ cyclic stress ratio (CSR) with that historically present in areas experiencing liquefaction for a given earthquake magnitude and recorded soil grain size distribution and penetration resistance (as expressed by SPT blows\ft). The analysis is based on the method presented by Seed et al. (2003).

Under the conditions anticipated during the design seismic event, our liquefaction analyses determined that a portion of the alluvial soils are potentially liquefiable. Based on the recommended volumetric reconsolidation strains produced by Cetin et. al (2009), a settlement of approximately 1.5 inches should be anticipated beneath the proposed apartment building. Differential settlement of approximately 1 inch should be anticipated across the least dimension of the structure.

6.0 DISCUSSIONS AND CONCLUSIONS

The subsurface profile across the site consists of alluvial deposits overlying Santa Margarita Sandstone within the depths explored. A thin veneer of artificial fill was also encountered in the southeastern corner of the property. The near-surface deposits within the upper 5± to 8± feet generally consisted of soft to very stiff sandy silt. Based on our field exploration and laboratory testing, this material is considered moderately to highly compressible and has a low expansion potential.

Groundwater was encountered in our borings at depths between 17± feet and 24± feet below the existing grades during our field exploration. However, based on our experience in the vicinity, the groundwater elevation is expected to rise significantly during the rainy season.

The results of our liquefaction analysis indicates that a portion of the alluvial deposits have a high potential for seismically induced liquefaction under the conditions anticipated during the design seismic event. Reconsolidation settlements, of approximately 1.5 inches, should be anticipated beneath the proposed apartment building. Differential settlement of approximately 1 inch should be anticipated across the least dimension of the structure.

7.0 RECOMMENDATIONS

7.1 General

Based on the results of our field investigation, laboratory testing, and engineering analysis, it is our opinion, from the geotechnical standpoint, the subject site will be suitable for the proposed development provided the recommendations presented herein are implemented during grading and construction.

We recommend that the proposed apartment building be supported on a mat foundation system founded on a mechanically stabilized engineered fill pad. The recommended foundation system will help prevent damage caused by liquefaction induced differential settlement. Recommendations for the mechanically stabilized engineered fill pad are presented in Subsection 7.2.2. Recommendations for mat foundations including anticipated differential settlements are presented in 7.3.

Due to the poor engineering qualities of the on-site soils, imported, non-expansive granular material will be required for use as engineered fill within the mechanically stabilized engineered fill pad.

It is our understanding that the subject project is in the early planning stages and the structural design of the proposed apartment building has not commenced. When foundation loads become available, it may be feasible to consider a deep foundation system embedded into the underlying sandstone bedrock. Alternative recommendations for a deep foundation system may be supplied upon request.

In order to mitigate the potential for the compressible near-surface soils to adversely affect driveway sections, removal and recompaction of these soils will be required. Refer to Subsection 7.2.2 for details.

The site is relatively flat and site drainage is an important aspect of the project design. Site drainage should be designed to collect and direct surface water away from the proposed apartment building to approved drainage facilities per Subsection 7.2.7.

A perimeter subdrain should be constructed to help prevent groundwater migration beneath the proposed apartment building. Subdrain recommendations are presented in Subsection 7.2.8.

7.2 Site Grading

7.2.1 Site Clearing

Prior to grading, the areas to be developed for structures, pavements and other improvements, should be stripped of any vegetation and cleared of any surface or subsurface obstructions, including any existing foundations, utility lines, basements, septic tanks, pavements, stockpiled fills, and miscellaneous debris.

Surface vegetation and organically contaminated topsoil should be removed from areas to be graded. The required depth of stripping will vary with the time of year the work is done and should be observed by the Geotechnical Engineer. It is generally anticipated that the required depth of stripping will be 4 to 8 inches.

Holes resulting from the removal of buried obstructions that extend below finished site grades should be backfilled with compacted engineered fill compacted to the requirements of Subsection 7.2.2.

7.2.2 Preparation of On-Site Soils

Mechanically Stabilized Engineered Fill Pad - Beneath mat foundations, the native soil should be overexcavated a minimum of 4 feet below the lowest foundation elements, or 6 feet below finished exterior grades, whichever is greater. The exposed surface should be scarified, moisture conditioned, and compacted and geogrid consisting of Tensar TriAx TX140 (or approved equivalent) should be placed at the base of the overexcavation. Imported, non-expansive granular material should then be placed as engineered fill compacted to a minimum of 90 percent relative compaction to finished subgrade. Two additional layers of geogrid, (Tensar TriAx TX140 or approved equivalent) should be installed in the engineered fill at 15 inches and 30 inches from the base of the overexcavation. The zone of the mechanically stabilized engineered fill should extend a minimum of 5 feet beyond the building footprint.

The geogrid should be installed per the manufacturer's recommendations. Geogrid should be free of wrinkles and may be temporarily secured in-place with staples, pins, or backfill. Adjacent rolls of geogrid should have a minimum overlap of 18 inches. A minimum fill thickness of 8 inches is required prior to the operation of tracked vehicles over the geogrid. Turning of tracked vehicles should be kept to a minimum to prevent damage. Any geogrid damaged during installation shall be replaced. The manufacturers of the geogrid supply additional installation recommendations not outlined in this report. All manufacturer’s installation recommendations should be adhered to.

Driveway Areas - In driveway areas (including concrete, asphalt, and non-permeable pavers), the native soil should be overexcavated to a minimum of 2 feet below the bottom of the aggregate base course, or 2.5 feet below existing grades, whichever is greater. The exposed surface should be scarified, moisture conditioned, and compacted. The native soil, or imported, non-expansive granular material should then be placed as engineered fill compacted to a minimum of 90 percent relative compaction. The upper 6 inches of subgrade and all aggregate base and subbase in driveway areas shall be compacted to a minimum of 95 percent relative compaction. This zone of reworking should extend laterally a minimum of 3 feet beyond the driveway.

Although the on-site soils are not recommended for use as engineered fill within the mechanically stabilized fill pad, they may be considered within driveway areas. Note: If this work is done during or soon after the rainy season, or in the spring, the soil may require significant drying prior to use as engineered fill. Regardless of the time of year, moisture conditioning the native soils to achieve moisture requirements should be anticipated. Moisture conditioning may include adding water or drying back the soil to achieve the required moisture. It is the contractors responsibility to adequately process the soil to achieve uniform moisture conditions of the material to be used as engineered fill. The soil should be verified by a representative of CMAG in the field during grading operations. All soils, both existing on-site and imported, to be used as fill, should contain less than 3 percent organics and be free of debris and gravel over 2.5 inches in maximum dimension.

Imported fill material should be approved by a representative of CMAG prior to importing. Soils having a significant expansion potential should not be used as imported fill. **The Geotechnical Engineer should be notified not less than 5 working days in advance of placing any fill or base course material proposed for import**. Each proposed source of import material should be sampled, tested, and approved by the Geotechnical Engineer prior to delivery of any soils imported for use on the site.

All fill should be compacted with heavy vibratory equipment. Fill should be compacted by mechanical means in uniform horizontal loose lifts not exceeding 8 inches in thickness. The relative compaction and required moisture content shall be based on the maximum dry density and optimum moisture content obtained in accordance with ASTM D1557. **The Geotechnical Engineer should observe the overexcavations, and placement of engineered fill.**

Any surface or subsurface obstruction, or questionable material encountered during grading, should be brought immediately to the attention of the Geotechnical Engineer for proper processing as required.

7.2.3 Cut and Fill Slopes

Cut and Fill slopes are not anticipated for the project at this time. Cut and fill slopes may affect the stability of the site, and should be analyzed for overall stability and suitability by the Geotechnical Engineer if project requirements change.

7.2.4 Utility Trenches

Bedding material should consist of sand with SE not less than 30 which may then be jetted.

The on-site soils may be utilized for trench backfill outside of the mechanically stabilized engineered fill pad only. See Subsection 7.2.2 for additional information regarding the use of the native soil for engineered fill. Imported fill should be free of organic material and gravel over 2.5 inches in diameter. Backfill of all exterior and interior trenches should be placed in thin lifts and mechanically compacted to achieve a relative compaction of not less than 95 percent in paved areas and 90 percent in other areas per ASTM D1557. Care should be taken not to damage utility lines.

Utility trenches that are parallel to the sides of a building should be placed so that they do not extend below a line sloping down and away at an inclination of 2:1 H:V (horizontal to vertical) from the bottom outside edge of foundation elements.

A 3 foot concrete plug should be placed in each trench where it passes under the exterior footings. Anti-seep collars (trench dams) should also be placed in utility trenches on steep slopes to prevent migration of water and sand.

Trenches should be capped with 1.5± feet of impermeable material. Import material should be approved by the Geotechnical Engineer prior to its use.

Trenches must be shored as required by the local regulatory agency, the State Of California Division of Industrial Safety Construction Safety Orders, and Federal

OSHA requirements.

7.2.5 Vibration During Compaction

The neighboring parcels are within close proximity to the proposed apartment building. The contractor should take all precautionary measures to minimize vibration on the site during grading operations. This may require that the engineered fill be placed in thin lifts using a static roller or hand operated equipment. It is the contractor's responsibility to ensure that the process in which the engineered fill is placed does not adversely affect the neighboring parcels.

7.2.6 Excavating Conditions

We anticipate that excavation of the on-site soils may be accomplished with standard earthmoving and trenching equipment.

If grading commences during, or shortly after the rainy season, difficult construction due to saturated soil conditions should be anticipated. The bottom of excavations may require stabilization measures, in order to construct the graded building pads.

7.2.7 Surface Drainage

Pad drainage should be designed to collect and direct surface water away from structures to approved drainage facilities. A minimum gradient of 2± percent should be maintained and drainage should be directed toward approved swales or drainage facilities. Concentrations of surface water runoff should be handled by providing the necessary structures, paved ditches, catch basins, etc.

All roof eaves should be guttered with the outlets from the downspouts provided with adequate capacity to carry the storm water away from structures to reduce the possibility of soil saturation and erosion.

Drainage patterns approved at the time of construction should be maintained throughout the life of the structure. The building and surface drainage facilities must not be altered nor any grading, filling, or excavation conducted in the area without prior review by the Geotechnical Engineer.

Irrigation activities at the site should be controlled and reasonable. Planter areas should not be sited adjacent to walls without implementing approved measures to contain irrigation water and prevent it from seeping into walls and under foundations and slabs-on-grade.

The finished ground surface should be planted with erosion resistant landscaping and ground cover and continually maintained to minimize surface erosion.

7.2.8 Subsurface Drainage

To help reduce the potential for groundwater to adversely affect the proposed apartment building, we recommend constructing a subdrain. The subdrain should wrap around the perimeter of the building pad and extend a minimum of 1 foot below the lowest foundation elements of the proposed apartment building.

Subdrains should be placed a minimum of 3 feet away from foundations and should not extend below a line sloping down and away at an inclination of 2:1 H:V (horizontal to vertical) from the bottom outside edge of foundations.

Subdrains should consist of 4 inch diameter SDR 35 PVC perforated pipe or equivalent, embedded in Caltrans Class 2 permeable drain rock. The drain should be a minimum of 18 inches in width and should extend to within 8 inches from the surface. The upper 8 inches should be capped with native soils. Mirafi 180N filter fabric or approved equivalent should be placed between the surface cap and the drain rock. The pipe should be 4± inches above the trench bottom; a gradient of 2± percent being provided to the pipe and trench bottom; discharging into suitably protected outlets. Refer to the Typical Subdrain Detail, Figure 1, for recommendations.

Perforations in subdrains are recommended as follows: ½ inch diameter, in 2 rows at the ends of a 120 degree arc, at 5 inch centers in each row, staggered between rows, placed downward.

Subdrains should be observed by the Geotechnical Engineer after placement of bedding and pipe and prior to the placement of clean crushed gravel.

7.3 Foundations

7.3.1 Mat Foundations

Mat foundations should be founded on a mechanically stabilized engineered fill pad per Subsection 7.2.2. The subgrade should be proof-rolled just prior to construction to provide a firm, relatively unyielding surface, especially if the surface has been loosened by the passage of construction traffic.

For mat foundations designed with the flexible method, a unit coefficient of subgrade reaction, k_{V1} = 200 kcf, may be assumed for design purposes. This value is for a 1 foot wide footing and should be reduced for the effective width. For the recommended imported engineered fill soils:

$$k_S = k_{V1} \left((B + 1) / 2B\right)^2$$

where:

k_S = coefficient of subgrade reaction (kcf)
k_{V1}= unit coefficient of subgrade reaction (kcf)

B = effective footing width (feet)

The design values recommended above are based on the assumption that the mat foundations are founded on the recommended mechanically stabilized engineered fill pad consisting of compacted imported, non-expansive granular material. If material other than that recommended in Subsection 7.2.2 is used, the above values will need to be revised.

The subgrade reaction value may be increased by a factor of four for seismic loading.

Mat foundations should be designed to tolerate a differential settlement of 1 inch, across the least dimension of the structure, during the design seismic event. Mat foundations should be combined with flexible utility connections, sleeves, or flexible cushions in order to prevent breakage.

A friction coefficient of 0.35, between the engineered fill and rough concrete may be assumed for design purposes.

The mat foundations should be underlain by a minimum 4 inch thick capillary break of clean crushed rock. It is recommended that neither Class II baserock nor sand be employed as the capillary break material. Where moisture sensitive floor coverings are anticipated or vapor transmission may be a problem, a vapor retarder should be placed between the granular layer and the floor slab in order to reduce moisture condensation under the floor coverings. The vapor retarder should be specified by the slab designer. It should be noted that conventional slab-on-grade construction is not waterproof. Under-slab construction consisting of a capillary break and vapor retarder will not prevent moisture transmission through the slab-on-grade. CMAG does not practice in the field of moisture vapor transmission evaluation or mitigation. Where moisture sensitive floor coverings are to be installed, a waterproofing expert should be consulted for their recommended moisture and vapor protection measures.

The foundation excavations should be observed by the Geotechnical Engineer before steel reinforcement is placed and concrete is poured.

7.3.2 Settlements

Total and differential **static** settlements beneath mat foundations are expected to be within tolerable limits. Vertical movements are not expected to exceed 1 inch. Differential movements are expected to be within the normal range (½ inch) for the anticipated loads and spacings. These preliminary estimates should be reviewed by the Geotechnical Engineer when foundation plans for the proposed structure become available.

7.4 Plan Review

The recommendations presented in this report are based on preliminary design information for the proposed project and on the findings of our geotechnical investigation. When completed, the Grading Plans, Foundation Plans and design loads should be reviewed by CMAG prior to submitting the plans and contract bidding. Additional field exploration and laboratory testing may be required upon review of the final project design plans.

7.5 Observation and Testing

Field observation and testing must be provided by a representative of CMAG to enable them to form an opinion regarding the adequacy of the site preparation, the adequacy of fill materials, and the extent to which the earthwork is performed in accordance with the geotechnical conditions present, the requirements of the regulating agencies, the project specifications, and the recommendations presented in this report. Any earthwork performed in connection with the subject project without the full knowledge of, and not under the direct observation of CMAG will render the recommendations of this report invalid.

CMAG should be notified **at least 5 working days** prior to any site clearing or other earthwork operations on the subject project in order to observe the stripping and disposal of unsuitable materials and to ensure coordination with the grading contractor. During this period, a preconstruction meeting should be held on the site to discuss project specifications, observation and testing requirements and responsibilities, and scheduling.

8.0 LIMITATIONS

The recommendations contained in this report are based on our field explorations, laboratory testing, and our understanding of the proposed construction. The subsurface data used in the preparation of this report was obtained from the borings drilled during our field investigation. Variation in soil, geologic, and groundwater conditions can vary significantly between sample locations. As in most projects, conditions revealed during construction excavation may be at variance with preliminary findings. If this occurs, the changed conditions must be evaluated by the Project Geotechnical Engineer and the Geologist, and revised recommendations be provided as required. In addition, if the scope of the proposed construction changes from the described in this report, our firm should also be notified.

Our investigation was performed in accordance with the usual and current standards of the profession, as they relate to this and similar localities. No other warranty, expressed or implied, is provided as to the conclusions and professional advice presented in this report.

This report is issued with the understanding that it is the responsibility of the Owner, or of his Representative, to ensure that the information and recommendations contained herein are brought to the attention of the Architect and Engineer for the project and incorporated into the plans, and that it is ensured that the Contractor and Subcontractors implement such recommendations in the field. The use of information contained in this report for bidding purposes should be done at the Contractor’s option and risk.

This firm does not practice or consult in the field of safety engineering. We do not direct the Contractor's operations, and we are not responsible for other than our own personnel on the site; therefore, the safety of others is the responsibility of the Contractor. The Contractor should notify the Owner if he considers any of the recommended actions presented herein to be unsafe.

The findings of this report are considered valid as of the present date. However, changes in the conditions of a site can occur with the passage of time, whether they be due to natural events or to human activities on this or adjacent sites. In addition, changes in applicable or appropriate codes and standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, this report may become invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and revision as changed conditions are identified.

The scope of our services mutually agreed upon did not include any environmental assessment or study for the presence of hazardous to toxic materials in the soil, surface water, or air, on or below or around the site. CMAG is not a mold prevention consultant; none of our services performed in connection with the proposed project are for the purpose of mold prevention. Proper implementation of the recommendations conveyed in our reports will not itself be sufficient to prevent mold from growing in or on the structures involved.

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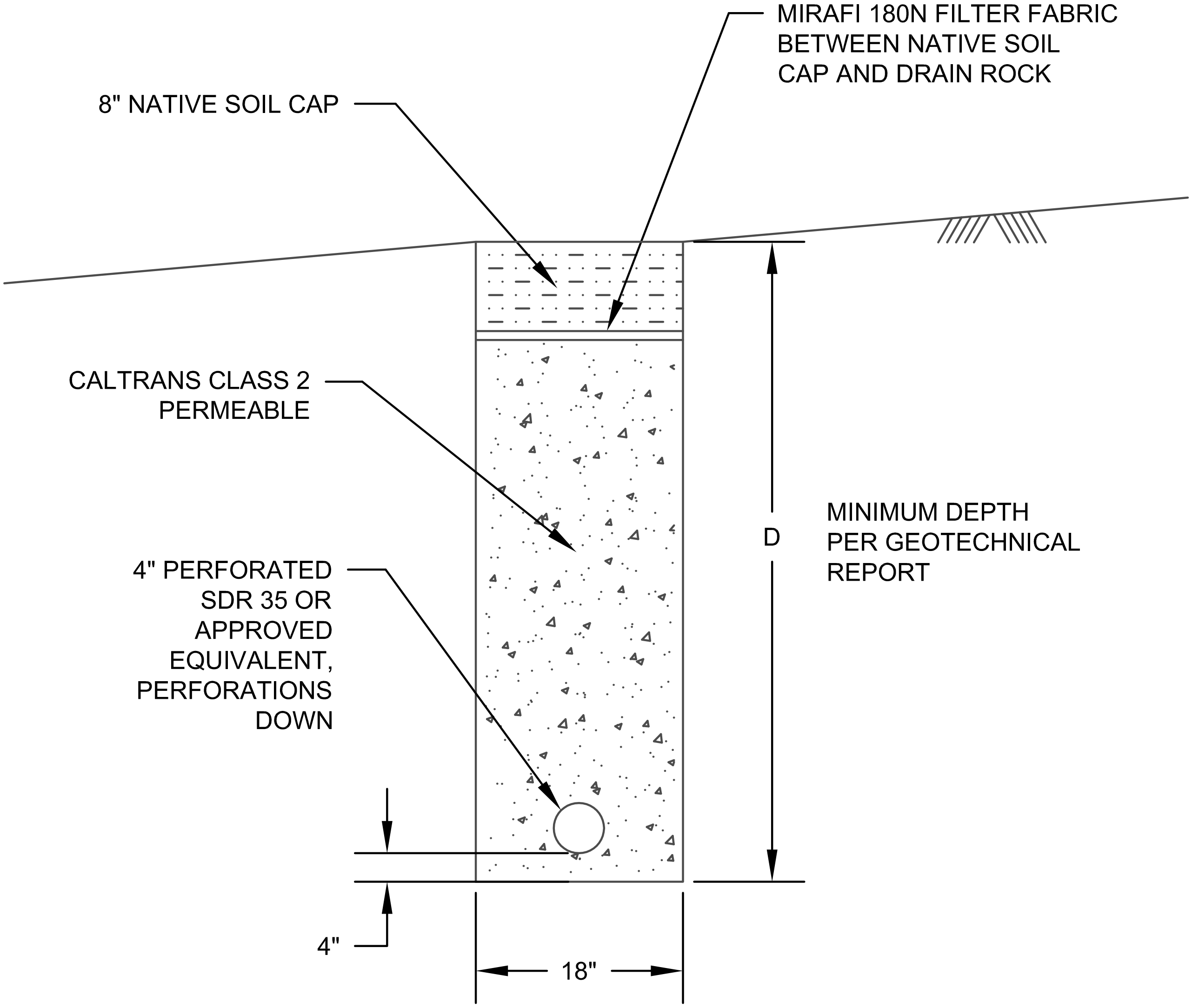


NOTES:

1. DRAWING IS NOT TO SCALE
2. 2± PERCENT TO PIPE AND TRENCH BOTTOM
3. PERFORATED SDR 35 PVC PIPE, OR APPROVED EQUIVALENT, CONNECTED TO CLOSED CONDUITS THAT DISCHARGE TO AN APPROVED LOCATION
4. INSTALL CLEAN OUTS AT APPROVED LOCATIONS

CMAG ENGINEERING

TYPICAL SUBDRAIN DETAIL

FIGURE

1

APPENDIX A

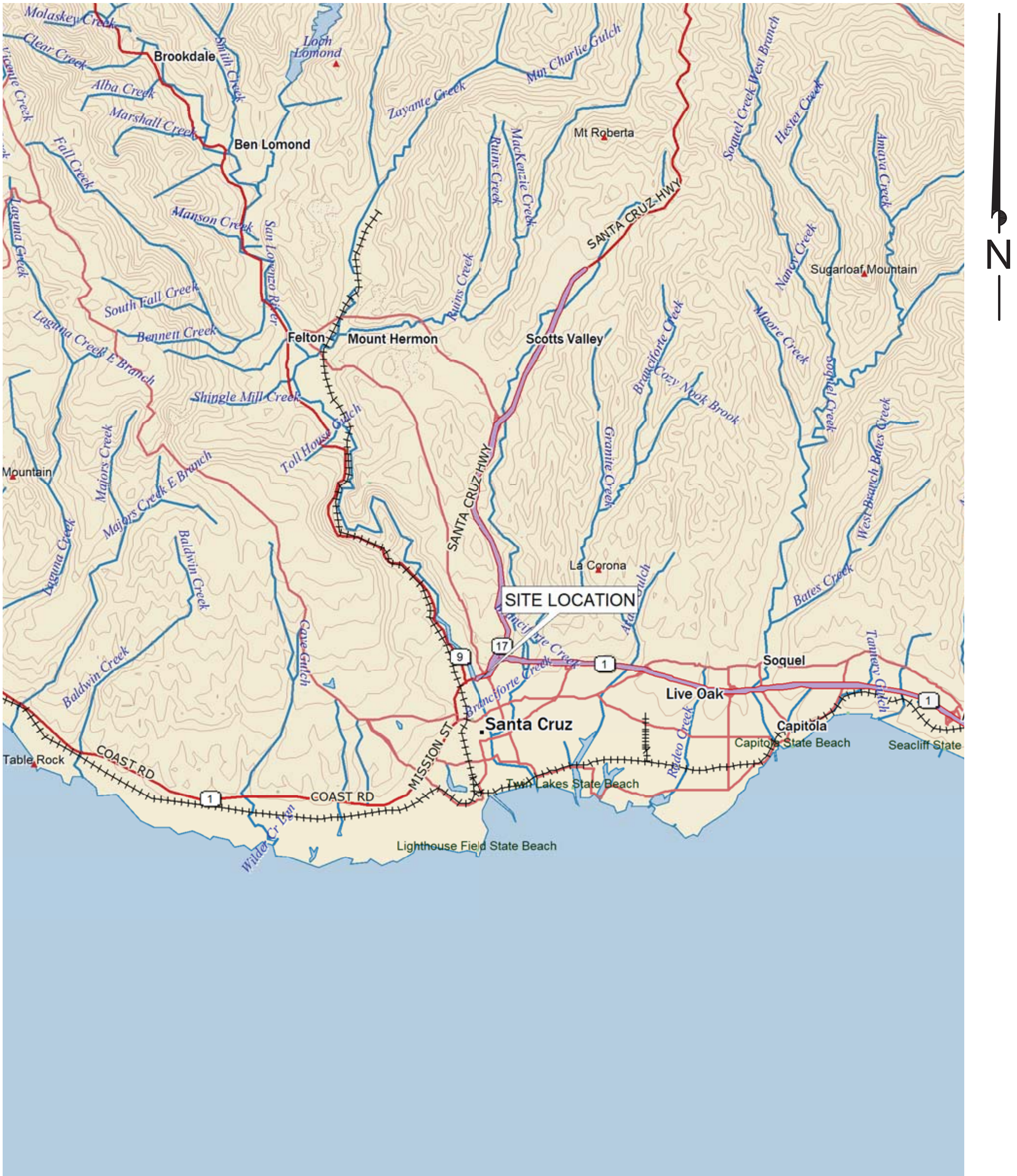
FIELD EXPLORATION PROGRAM

FIELD EXPLORATION PROCEDURES

Subsurface conditions were explored by drilling 4 borings to depths between 30.5± and 36± feet below the existing grades. Boring B-1 was drilled with a track mounted drill rig using mud rotary with a 4 inch diameter bit. Borings B-2 through B-4 were drilled with a track mounted drill rig equipped with 6 inch diameter solid stem augers. The Key to The Logs and the Logs of the Borings are included in Appendix A, Figures A-3 through A-7.1. The approximate locations of the borings are shown on the Boring Location Plan, Figure A-2.

The earth materials encountered in the borings were continuously logged in the field by a representative of CMAG. Bulk and relatively undisturbed samples were obtained for identification and laboratory testing. The samples were classified based on field observations and the laboratory test results. Classification was performed in accordance with the Unified Soil Classification System (Figure A-3).

Representative samples were obtained by means of a drive sampler, the hammer weight and drop being 140 lb and 30 inches, respectively. These samples were recovered using a 3 inch outside diameter Modified California Sampler or a 2 inch outside diameter Terzaghi Sampler. The number of blows required to drive the samplers 12 inches are indicated on the Boring Logs. The penetration test data for the Terzaghi driven samples has been presented as N_{60} values. The N_{60} values are also indicated on the Boring Logs.



SCALE: 1:125,000

1 0 1 2 MILE

BASEMAP: DeLorme Topo USA®

CMAG ENGINEERING

SITE LOCATION MAP

150 Felker Street

FIGURE

A-1

BASEMAP: Google Earth

CMAG ENGINEERING	**BORING LOCATION PLAN**	FIGURE
	150 Felker Street	A-2

KEY TO LOGS

UNIFIED SOIL CLASSIFICATION SYSTEM

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS More than half of the material is larger than the No. 200 sieve	GRAVELS More than half of the coarse fraction is larger than the No. 4 sieve	CLEAN GRAVELS (Less than 5% fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines
	SANDS More than half of the coarse fraction is smaller than the No. 4 sieve	CLEAN SANDS (Less than 5% fines)	SW	Well graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands, gravelly sands, little or no fines
		SAND WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines
			SC	Clayey sands, sand-clay mixtures, plastic fines
FINE GRAINED SOILS More than half of the material is smaller than the No. 200 sieve	SILTS AND CLAYS Liquid limit less than 50		ML	Inorganic silts and very fine sands, silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50		MH	Inorganic silts, micaceous or diatomacaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils

GRAIN SIZE LIMITS

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

No. 200 No. 40 No. 10 No. 4 3/4 in. 3 in. 12 in.

US STANDARD SIEVE SIZE

RELATIVE DENSITY	
SAND AND GRAVEL	BLOWS/FT*
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

CONSISTENCY	
SILT AND CLAY	BLOWS/FT*
VERY SOFT	0 - 2
SOFT	2 - 4
FIRM	4 - 8
STIFF	8 - 16
VERY STIFF	16 - 32
HARD	OVER 32

MOISTURE CONDITION
DRY
MOIST
WET

BEDROCK
(GROUP SYMBOL) Brackets Denote Bedrock

* Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1 3/8 inch I.D.) split spoon (ASTM D-1586).

CMAG ENGINEERING

FIGURE
A-3

LOG OF EXPLORATORY BORING

Project No: 21-116-SC
Project: 150 Felker Street
Santa Cruz County, California
Drill Rig: Track Mounted CME 55 Drill Rig, 4in. Mud Rotary, 140lb. Automatic Trip Hammer

Boring: B-1
Date Drilled: June 24, 2021
Logged By: SSC

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
⊠ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
0			4" AC / 3" Baserock					
1			**Qal:**					
2–3.5	ML	⧅	Dark Brown Sandy SILT. Stiff, Moist, Slightly Plastic. Sand - Fine Grained.	19		103.4	13.3	E.I. = 23 Particle Size F.C.= 71.4%
3.5–5	ML	◫	Dark Brown and Gray Sandy SILT. Firm, Moist, Slightly Plastic. Sand - Fine Grained.	6	6		12.1	
7–8.5	CL	⧅	Yellowish Brown and Gray Sandy Lean CLAY. Hard, Moist, Plastic. Sand - Fine Grained.	52		106.1	21.2	
8.5–10	SM	◫	Dark Yellowish Brown Silty SAND. Medium Dense, Moist, Non Plastic. Sand - Fine to Medium Grained. Trace Gravel up to 1 in, Rounded.	20	23		11.5	
15–16.5	SM	◫	Dark Yellowish Brown Silty SAND with Gravel. Very Dense, Wet, Non Plastic. Sand - Fine to Medium Grained. Gravel up to 1 in, Subrounded.	41	50		12.0	
17	▽							
18			Intermittent Gravel and Cobble Layers.					
20–21.5	SW-SM	◫	Dark Yellowish Brown Well Graded SAND with Silt. Dense, Wet, Non Plastic. Sand - Fine to Coarse Grained. Some Gravel up to 1 in, Subrounded.	24	30		17.9	Particle Size F.C.= 9.7%
23			Intermittent Gravel and Cobble Layers.					

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FIGURE
A-4.0

LOG OF EXPLORATORY BORING

Project No: 21-116-SC
Boring: B-1 (continued)
Project: 150 Felker Street
Santa Cruz County, California
Date Drilled: June 24, 2021
Logged By: SSC
Drill Rig: Track Mounted CME 55 Drill Rig, 4in. Mud Rotary, 140lb. Automatic Trip Hammer

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
☒ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
25 26	SM	◫	Dark Yellowish Brown Silty SAND. Dense, Wet, Non Plastic. Sand - Fine to Coarse Grained. Some Gravel up to 1 in, Subrounded.	29	38		15.4	
27 28 29			**Tsm:**					
30 31 32 33 34	(SM)	◫	Gray and Light Yellowish Brown SANDSTONE. Very Dense, Wet, Weakly Cemented. (Silty Sand). Sand - Fine Grained.	100+			24.1	
35	(SM)	◫	Gray SANDSTONE. Very Dense, Wet, Weakly Cemented. (Silty Sand). Sand - Fine Grained.	100+			25.3	Particle Size F.C.= 15.0%
36 37 38 39 40 41 42 43 44 45 46 47 48			Boring Terminated at 36± ft. Groundwater Encountered at 17± ft. Boring Backfilled with Cuttings and Concrete Cap.					

CMAG ENGINEERING

FIGURE
A-4.1

LOG OF EXPLORATORY BORING

Project No: 21-116-SC
Boring: B-2
Project: 150 Felker Street
Santa Cruz County, California
Date Drilled: June 24, 2021
Logged By: SSC
Drill Rig: Track Mounted CME 55 Drill Rig, 6in. Solid Stem Auger, 140lb. Automatic Trip Hammer

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
⊠ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			4" AC / 4" Baserock					
1	ML		**af:** Dark Brown Sandy SILT. Moist, Slightly Plastic. Sand - Fine Grained.					
2	ML	⧅	**Qal:** Dark Brown Sandy SILT. Soft, Moist, Slightly Plastic. Sand - Fine Grained.	6		100.3	17.3	Direct Shear Φ' = 27° c' = 100 psf
3	ML	◫	Dark Brown Sandy SILT. Stiff, Moist, Slightly Plastic. Sand - Fine Grained.	7	8		18.9	Particle Size F.C.= 69.5% Sulfate
4								
5								
6	CL	⧅	Yellowish Brown and Gray Sandy Lean CLAY. Very Stiff, Moist, Plastic. Sand - Fine Grained.	26		97.0	26.4	Particle Size F.C.= 77.8% q_u= 4606 psf
7	CL	◫	Yellowish Brown and Gray Sandy Lean CLAY. Stiff, Moist, Plastic. Sand - Fine Grained.	11	13		25.7	LL = 47 PL = 21 PI = 26
8								
9								
10								
11	SM	◫	Dark Yellowish Brown and Gray Silty SAND. Loose, Wet, Non Plastic. Sand - Fine Grained.	7	9		24.4	Particle Size F.C.= 27.8%
12								
13			Intermittent Gravel and Cobble Layers.					
14								
15								
16	SM	◫	Dark Yellowish Brown Silty SAND with Gravel. Dense, Wet, Non Plastic. Sand - Fine to Coarse Grained. Gravel > 1.5 in, Subrounded to Rounded.	36	47		9.6	
17	▽							
18			Intermittent Gravel and Cobble Layers.					
19								
20								
21	SW-SM	◫	Dark Yellowish Brown Well Graded SAND with Gravel. Dense, Wet, Non Plastic. Sand - Fine to Coarse Grained. Gravel > 1.5 in, Subrounded.	34	45		14.4	Particle Size F.C.= 11.8%
22								
23								
24								

LOG OF EXPLORATORY BORING

Project No: 21-116-SC
Project: 150 Felker Street
Santa Cruz County, California
Drill Rig: Track Mounted CME 55 Drill Rig, 6in. Solid Stem Auger, 140lb. Automatic Trip Hammer

Boring: B-2 (continued)
Date Drilled: June 24, 2021
Logged By: SSC

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
⊠ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
25		◫						
26	SM	◫	Dark Yellowish Brown Silty SAND. Dense, Wet, Non Plastic. Sand - Fine to Coarse Grained. Some Gravel > 1.5 in, Subrounded.	32	43		13.0	
27								
28			**Tsm:**					
29								
30		◫						
31	(SM)	◫	Yellowish Brown and Gray SANDSTONE. Very Dense, Wet, Weakly Cemented. (Silty Sand). Sand - Fine Grained.	95	131		24.9	
32			Boring Terminated at 31.5± ft. Groundwater Encountered at 17± ft. Boring Backfilled with Cuttings and Concrete Cap.					
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								

LOG OF EXPLORATORY BORING

Project No: 21-116-SC
Project: 150 Felker Street
Santa Cruz County, California
Drill Rig: Track Mounted CME 55 Drill Rig, 6in. Solid Stem Auger, 140lb. Automatic Trip Hammer

Boring: B-3
Date Drilled: June 24, 2021
Logged By: SSC

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
⊠ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			Qal:					
1								
2								
3	ML	◫	Dark Brown and Gray Sandy SILT. Stiff, Moist, Slightly Plastic. Sand - Fine Grained.	11	12		9.4	Sulfate
4								
5								
6	CL	⧅	Yellowish Brown and Gray Sandy Lean CLAY. Stiff, Moist, Plastic. Sand - Fine Grained.	32		99.5	17.5	Particle Size F.C.= 87.7% q_u= 2245 psf
7								
8								
9								
10								
11	SM	◫	Yellowish Brown Silty SAND. Medium Dense, Moist, Non Plastic. Sand - Fine to Medium Grained.	18	22		7.0	
12								
13			Intermittent Gravel and Cobble Layers.					
14								
15								
16	SM	◫	Dark Yellowish Brown Silty SAND with Gravel. Medium Dense, Wet, Non Plastic. Sand - Fine to Coarse Grained. Gravel > 1.5 in, Subrounded to Rounded.	20	26		13.3	Particle Size F.C.= 13.7%
17	▽							
18			Intermittent Gravel and Cobble Layers.					
19								
20								
21	SM	◫	Dark Yellowish Brown Silty SAND with Gravel. Very Dense, Wet, Non Plastic. Sand - Fine to Coarse Grained. Gravel > 1.5 in, Subrounded. Schist Cobble in Shoe.	100+			13.9	
22								
23			Intermittent Gravel and Cobble Layers.					
24			**Tsm:** Yellowish Brown and Gray SANDSTONE. Wet, Weakly Cemented. (Silty Sand). Sand - Fine Grained.					

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FIGURE
A-6.0

LOG OF EXPLORATORY BORING

Project No: 21-116-SC
Project: 150 Felker Street
Santa Cruz County, California
Boring: B-3 (continued)
Date Drilled: June 24, 2021
Logged By: SSC
Drill Rig: Track Mounted CME 55 Drill Rig, 6in. Solid Stem Auger, 140lb. Automatic Trip Hammer

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
⊠ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			Tsm:					
25	(SM)	◫	Yellowish Brown and Gray SANDSTONE. Very Dense, Wet, Weakly Cemented. (Silty Sand). Sand - Fine Grained.					
26				100+			27.8	
27								
28								
29								
30	(SM)	◫	Light Gray SANDSTONE. Very Dense, Wet, Weakly Cemented. (Silty Sand). Sand - Fine Grained.	100+			25.8	
31								
32			Boring Terminated at 31± ft. Groundwater Encountered at 17± ft. Boring Backfilled with Cuttings.					
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								

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FIGURE
A-6.1

LOG OF EXPLORATORY BORING

Project No: 21-116-SC
Project: 150 Felker Street
Santa Cruz County, California
Drill Rig: Track Mounted CME 55 Drill Rig, 6in. Solid Stem Auger, 140lb. Automatic Trip Hammer

Boring: B-4
Date Drilled: June 24, 2021
Logged By: SSC

◫	Terzaghi Split Spoon Sample
⧄	2" Ring Sample
⧅	2.5" Ring Sample
S	3" Shelby Tube
⊠	Bulk Sample
▽	Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			4" AC / 3" Baserock					
1			**Qal:**					
2	ML	⧅	Dark Brown Sandy SILT. Firm, Moist, Slightly Plastic. Sand - Fine Grained.	10		85.4	9.0	Particle Size F.C.= 70.9% Sulfate
3	ML	◫	Dark Yellowish Brown Sandy SILT. Firm, Moist, Slightly Plastic. Sand - Fine Grained.	6	7		8.3	
4								
5								
6	ML	⧅	Grayish Brown Sandy SILT. Stiff, Moist, Slightly Plastic. Sand -Fine Grained.	25		101.9	9.1	
7	ML	◫	Yellowish Brown Sandy SILT. Very Stiff, Moist, Slightly Plastic. Sand - Fine Grained.	21	25		9.3	
8								
9								
10								
11	ML	◫	Yellowish Brown Sandy SILT. Hard, Moist, Slightly Plastic. Sand - Fine Grained.	40	49		8.7	
12								
13								
14								
15								
16	SM	◫	Yellowish Brown Silty SAND with Gravel. Dense, Moist, Non Plastic. Sand - Fine to Coarse Grained. Gravel > 1.5 in, Subangular to Subrounded.	30	39		9.9	
17								
18			Intermittent Gravel and Cobble Layers.					
19								
20	SM	◫	Yellowish Brown Silty SAND with Gravel. Very Dense, Moist, Non Plastic. Sand - Fine to Coarse Grained. Gravel > 1.5 in, Subangular to Subrounded. Schist Cobble in Shoe.	100+			7.4	
21								
22								
23			**Tsm:**					
24	▽		Yellowish Brown and Gray SANDSTONE. Wet, Weakly Cemented. (Silty Sand). Sand - Fine Grained.					

CMAG ENGINEERING

FIGURE
A-7.0

LOG OF EXPLORATORY BORING

Project No: 21-116-SC
Project: 150 Felker Street
Santa Cruz County, California
Drill Rig: Track Mounted CME 55 Drill Rig, 6in. Solid Stem Auger, 140lb. Automatic Trip Hammer

Boring: B-4 (continued)
Date Drilled: June 24, 2021
Logged By: SSC

- ▯ Terzaghi Split Spoon Sample
- ⧄ 2" Ring Sample
- ⧅ 2.5" Ring Sample
- S 3" Shelby Tube
- ⊠ Bulk Sample
- ▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
25 26	(SM)	▯	Yellowish Brown and Gray SANDSTONE. Very Dense, Wet, Weakly Cemented. (Silty Sand). Sand - Fine Grained.	100+			26.4	
27								
28								
29								
30	(SM)	▯	Gray SANDSTONE. Very Dense, Wet, Weakly Cemented. (Silty Sand). Sand - Fine Grained.	100+			26.1	

Boring Terminated at 30.5± ft.
Groundwater Encountered at 24± ft.
Boring Backfilled with Cuttings.

APPENDIX B

LABORATORY TESTING PROGRAM

LABORATORY TESTING PROCEDURES

Classification

Earth materials were classified according to the Unified Soil Classification System in accordance with ASTM D 2487 and D 2488. See Figure A-3. Moisture content and dry density determinations were made for representative, relatively undisturbed samples in accordance with ASTM D 2216. Results of the moisture-density determinations, together with classifications, are shown on the Boring Logs in Appendix A.

Direct Shear

A consolidated drained direct shear test was performed in accordance with ASTM D 3080 on a representative, relatively undisturbed sample of the on-site soils. To simulate possible adverse field conditions the sample was saturated prior to shearing. A saturating device was used which permitted the sample to absorb moisture while preventing volume change. The direct shear test results are presented on the Boring Logs and Figure B-1.

Unconfined Compression

Unconfined compression tests were performed on representative samples of the on-site soils in accordance with ASTM D 2166. The test results are presented on the Boring Logs and Figures B-2 and B-3.

Particle Size Distribution

Particle size distribution tests were performed on representative samples of the on-site soils and bedrock in accordance with ASTM D 422. The test results are presented on the Boring Logs and Figures B-4 through B-13.

Liquid Limit, Plastic Limit and Plasticity Index

A liquid limit and plastic limit test was performed on a representative sample of the on-site soils in accordance with ASTM D 4318. The test results are presented on the Boring Logs and Figure B-14.

Expansion

An expansion index test was performed on a representative remolded sample of the on-site soils in accordance with the ASTM D 4829. The test results are presented on the Boring Logs and in Table B-1.

Table B-1. Expansion Index Test Results

Boring	Depth (ft)	Soil Type	Expansion Index	Expansion Potential
B-1	2	ML	23	Low

Soluble Sulfates

The soluble sulfate content was determined for samples considered representative of the on-site soils in accordance with Caltrans 417. The test results are presented in Table B-2.

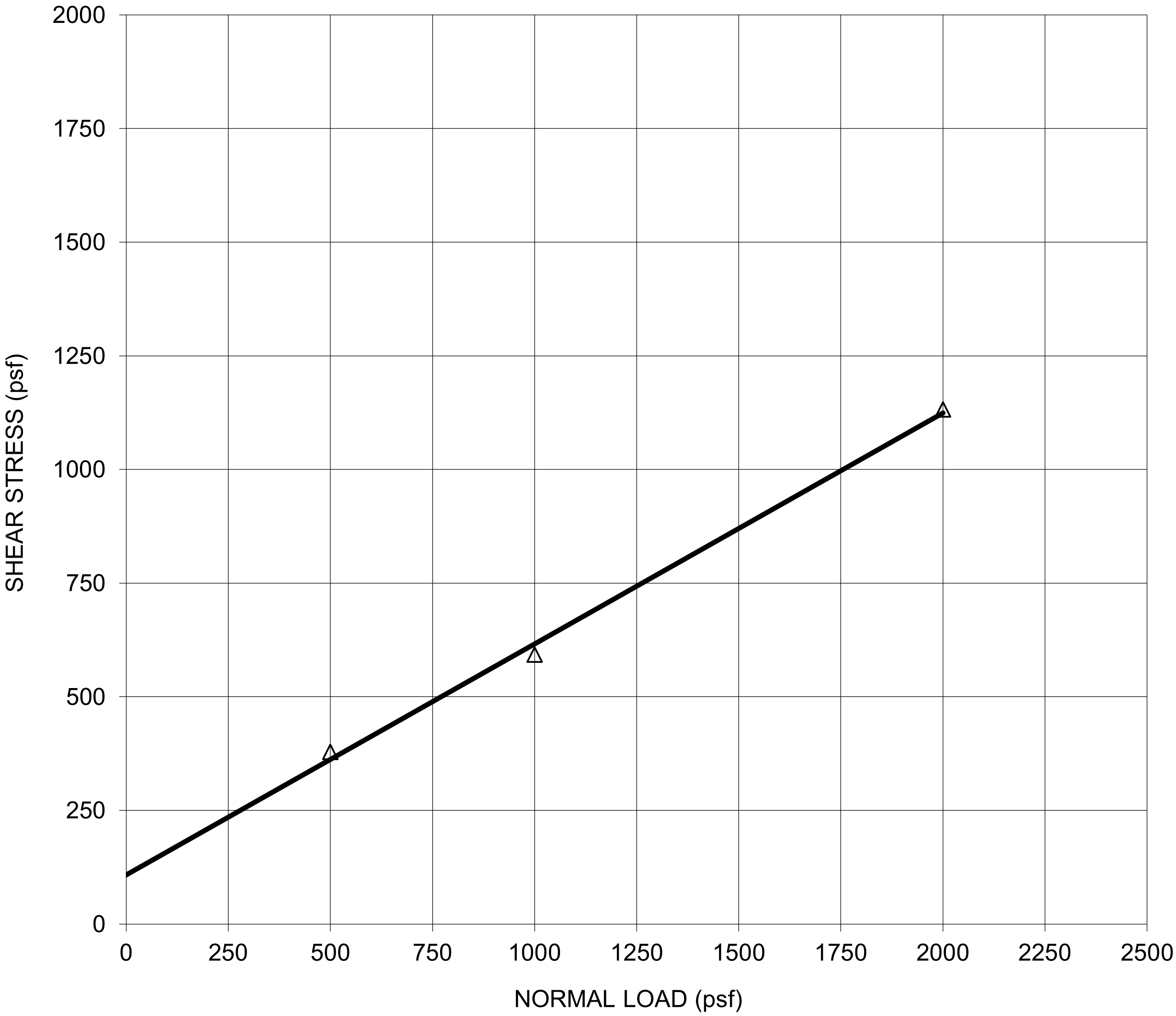
Table B-2. Sulfate Test Results

Boring	Depth (ft)	Soil Type	Sulfates (ppm)	Exposure
B-2	2.5	ML	19	Negligible
B-3	2	ML	10	Negligible
B-4	1	ML	89	Negligible

			COHESION (psf)	FRICTION ANGLE
BORING:	B-2			
DEPTH (ft):	2			
SOIL TYPE (USCS):	ML	▬▬▬ PEAK	100	27
		▬ ▬ ▬ FULLY SOFTENED		

MOISTURE: **SATURATED**

TEST TYPE: **CONSOLIDATED - DRAINED**



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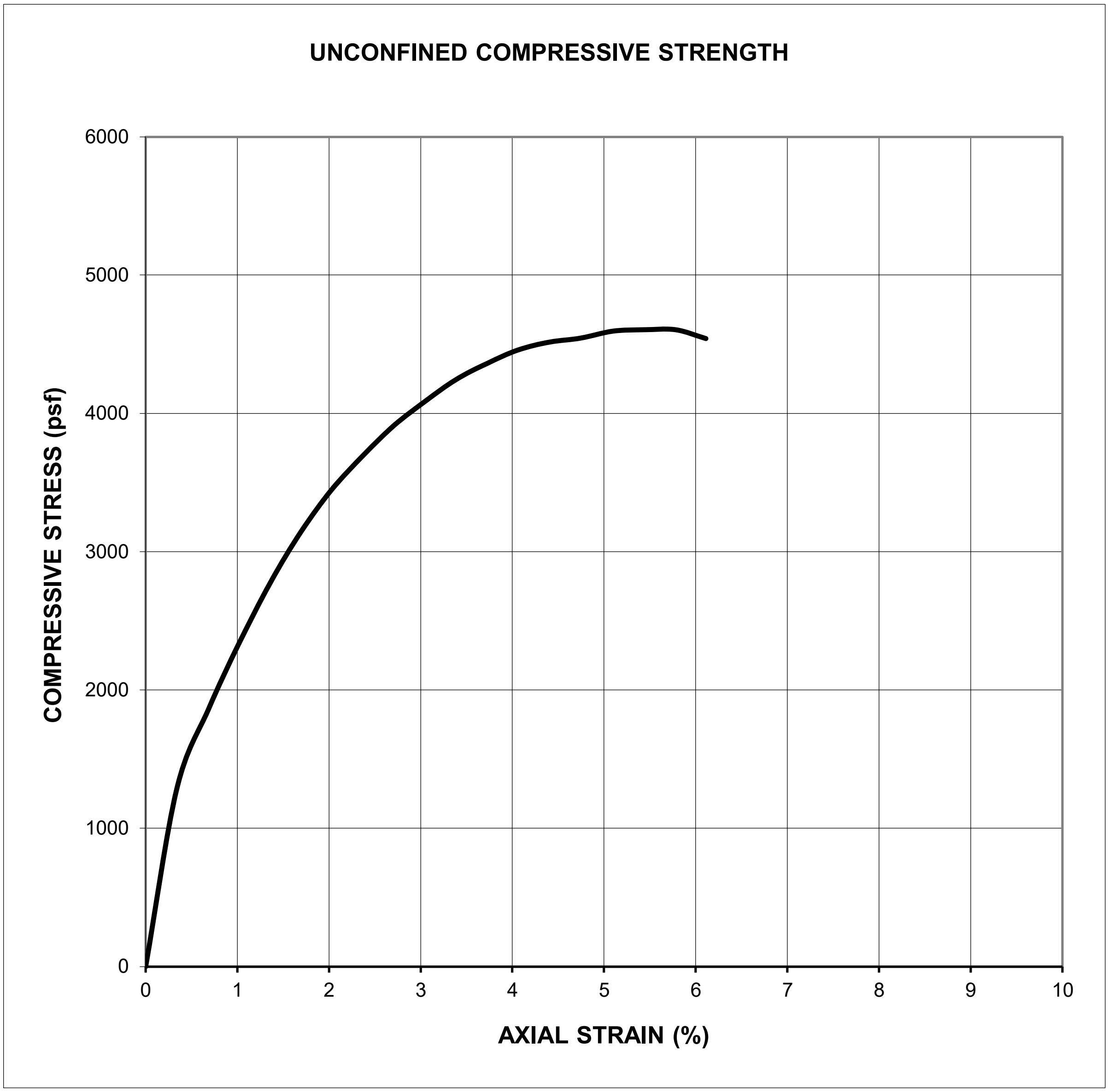
DIRECT SHEAR TEST RESULTS

150 Felker Street

FIGURE

B-1

BORING:	B-2	UNCONFINED COMPRESSIVE STRENGTH (psf) 4,606
DEPTH (ft):	6	SAMPLE TYPE: UNDISTURBED
SOIL TYPE (USCS):	CL	MOISTURE: INSITU - SATURATED



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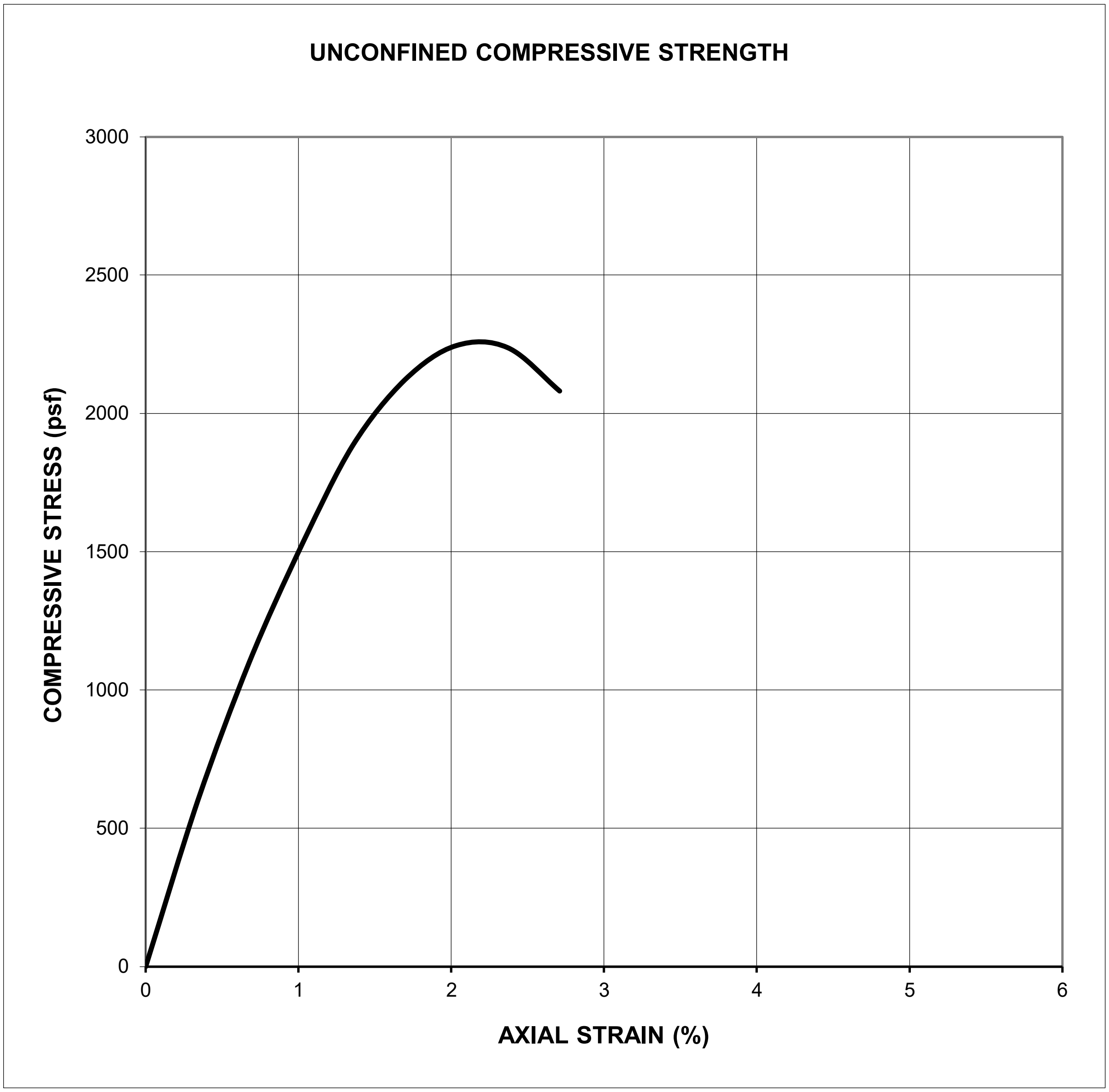
UNCONFINED COMPRESSIVE STRENGTH RESULTS

150 Felker Street

FIGURE B-2

BORING:	B-3	UNCONFINED COMPRESSIVE STRENGTH (psf)	2,245
DEPTH (ft):	6	SAMPLE TYPE: UNDISTURBED	
SOIL TYPE (USCS):	CL	MOISTURE: INSITU - SATURATED	



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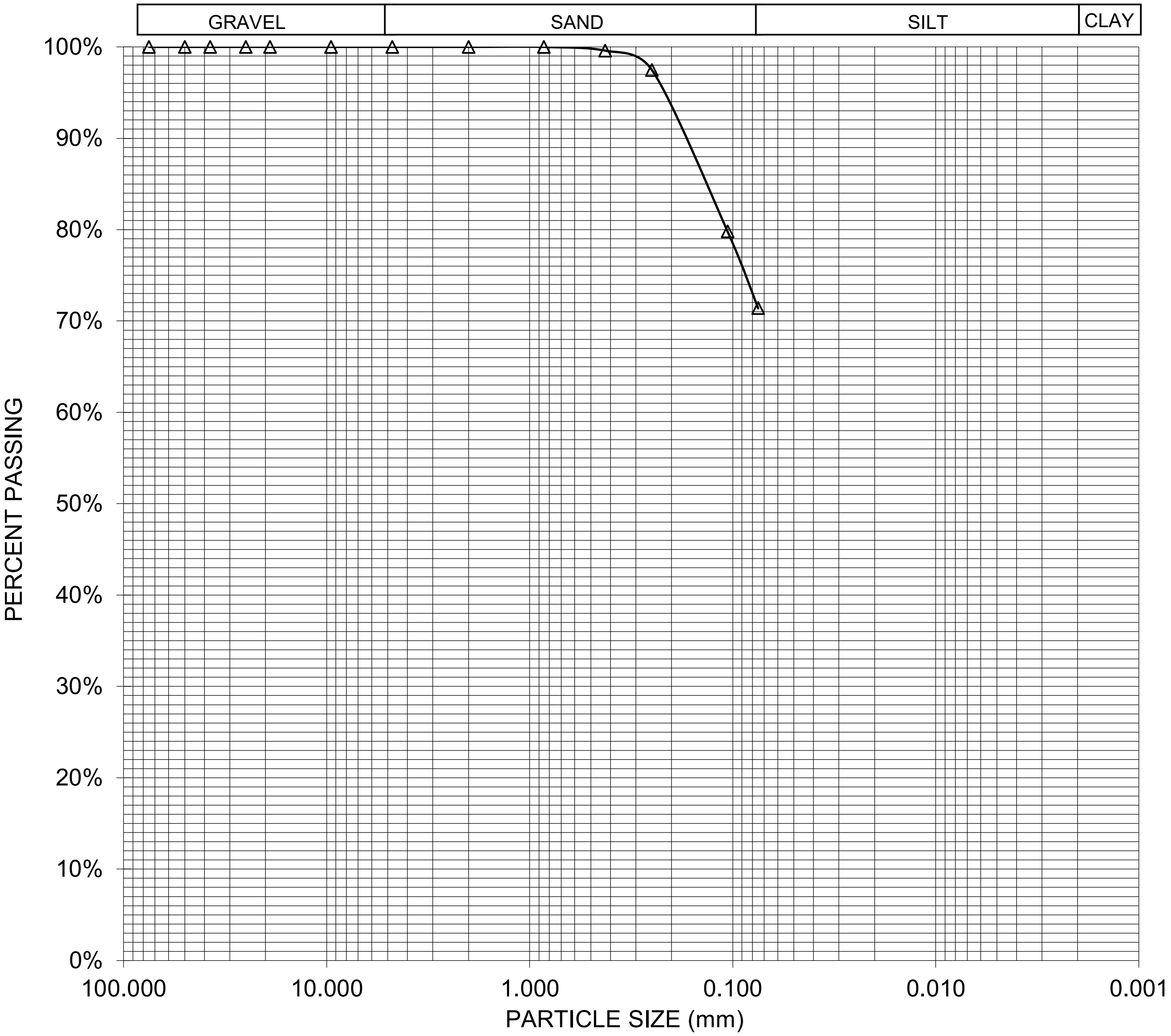
UNCONFINED COMPRESSIVE STRENGTH RESULTS

150 Felker Street

FIGURE

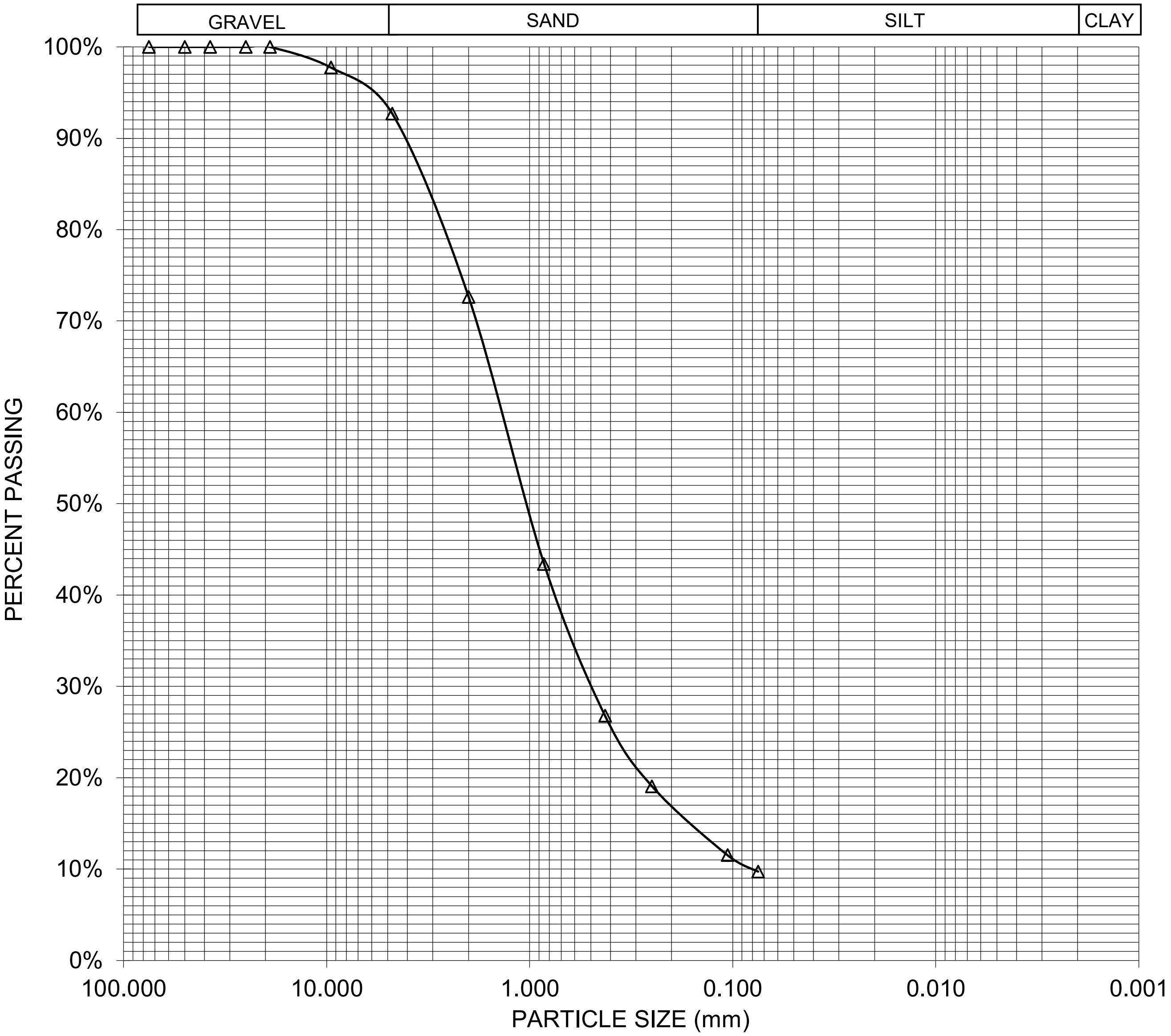
B-3

BORING:	B-1	PERCENT PASSING No. 4	PERCENT PASSING No. 200
DEPTH (ft):	2		
SOIL TYPE (USCS):	ML	100.0%	71.4%



CMAG ENGINEERING	**PARTICLE SIZE DISTRIBUTION**	FIGURE
	150 Felker Street	B-4

BORING:	B-1	PERCENT PASSING No. 4	PERCENT PASSING No. 200
DEPTH (ft):	20		
SOIL TYPE (USCS):	SW-SM	92.7%	9.7%



CMAG ENGINEERING

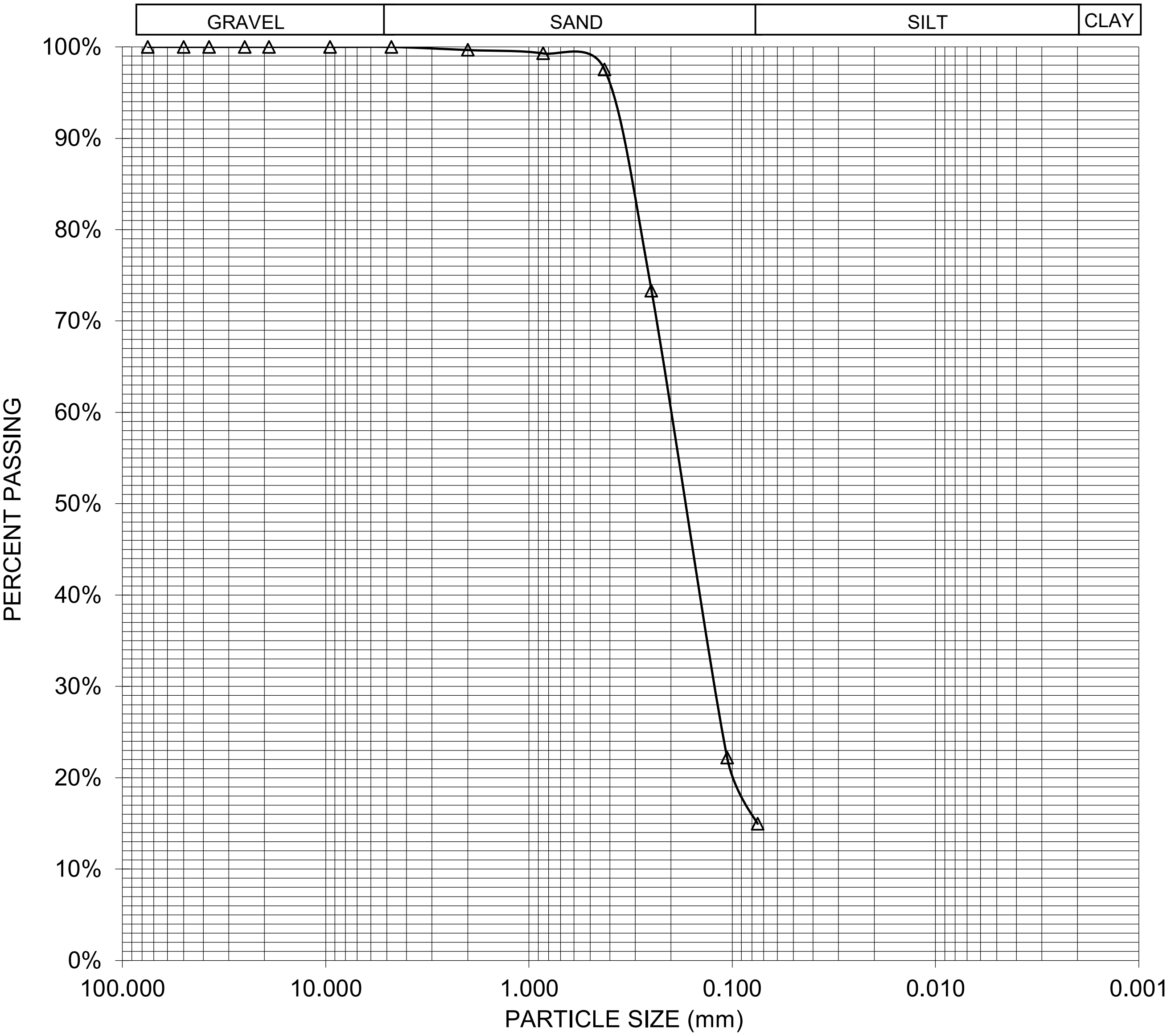
PARTICLE SIZE DISTRIBUTION

150 Felker Street

FIGURE

B-5

BORING:	B-1	PERCENT	PERCENT
DEPTH (ft):	35	PASSING No. 4	PASSING No. 200
SOIL TYPE (USCS):	(SM)	100.0%	15.0%



CMAG ENGINEERING

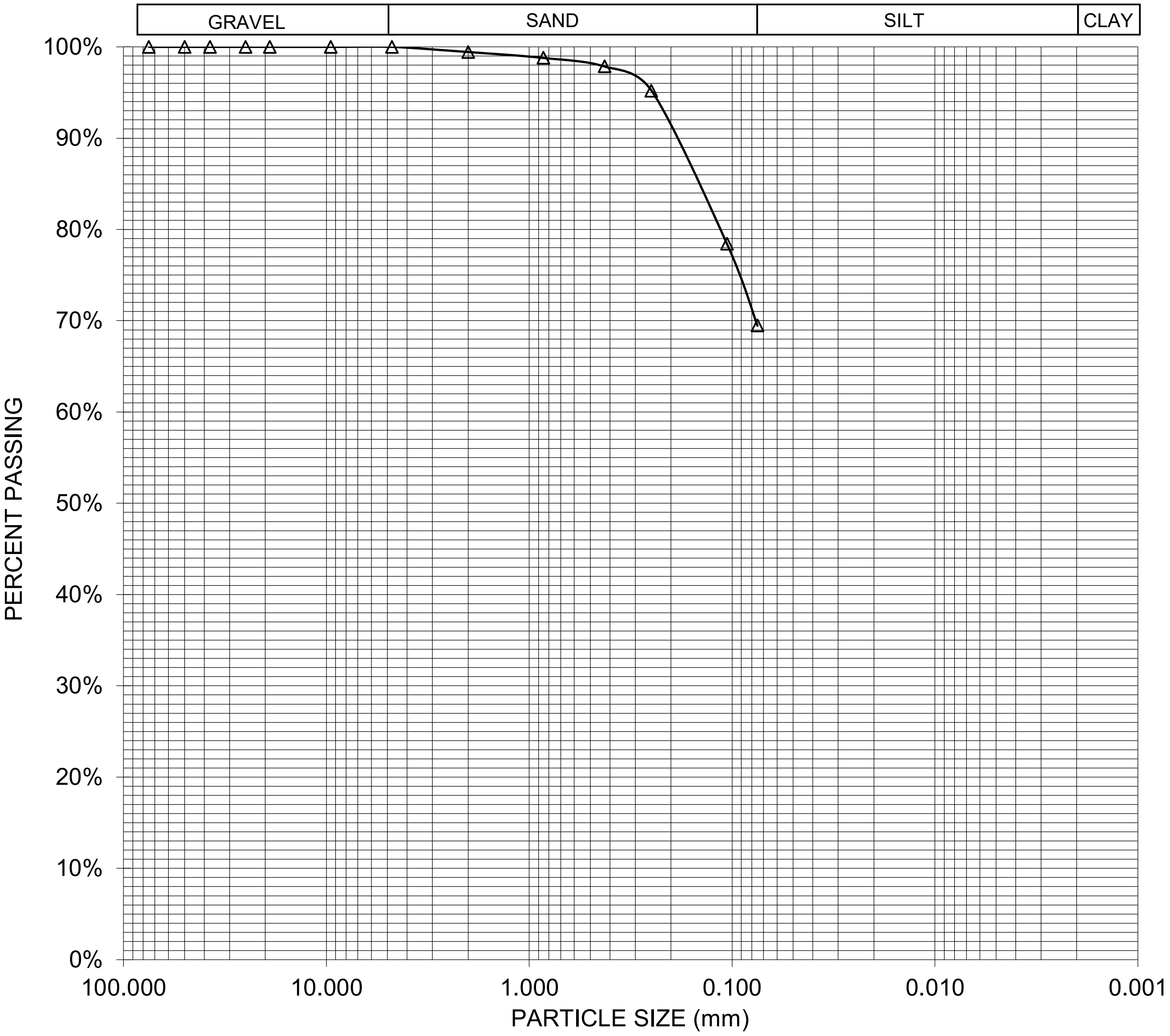
PARTICLE SIZE DISTRIBUTION

150 Felker Street

FIGURE

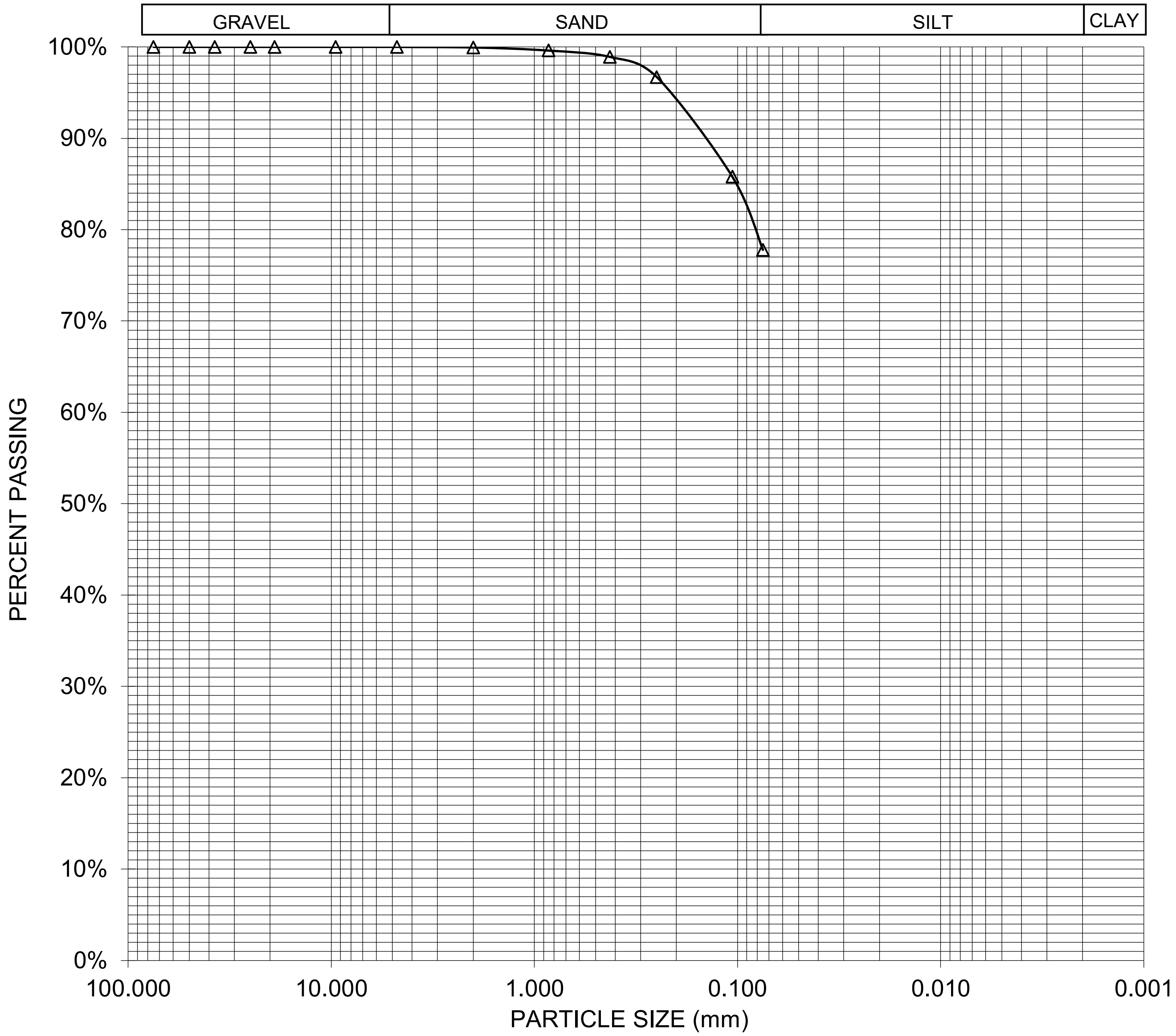
B-6

BORING:	B-2	PERCENT	PERCENT
DEPTH (ft):	2	PASSING No. 4	PASSING No. 200
SOIL TYPE (USCS):	ML	100.0%	69.5%



CMAG ENGINEERING	**PARTICLE SIZE DISTRIBUTION**	FIGURE
	150 Felker Street	B-7

		PERCENT PASSING No. 4	PERCENT PASSING No. 200
BORING:	B-2		
DEPTH (ft):	6		
SOIL TYPE (USCS):	CL	100.0%	77.8%



CMAG ENGINEERING

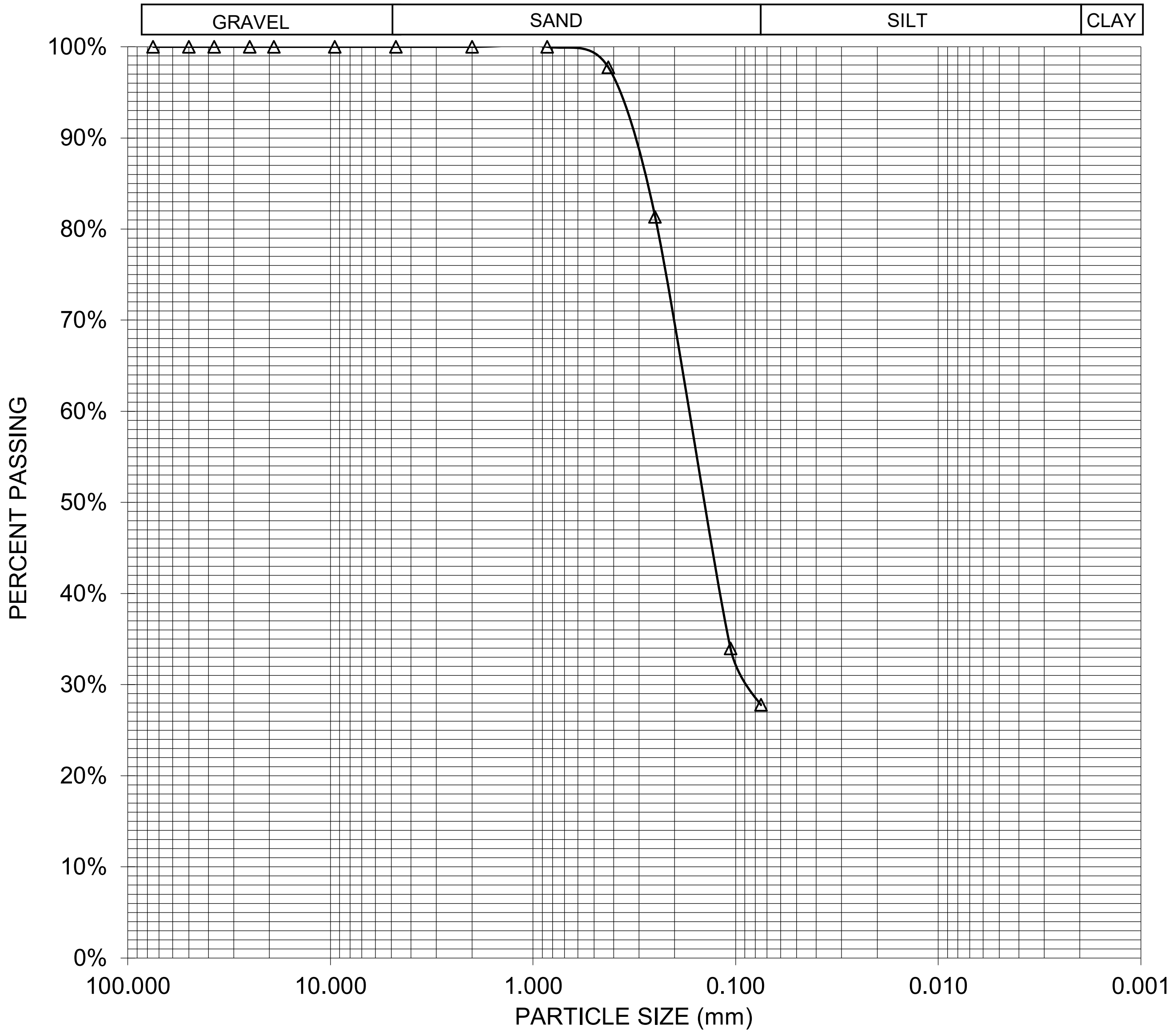
PARTICLE SIZE DISTRIBUTION

150 Felker Street

FIGURE

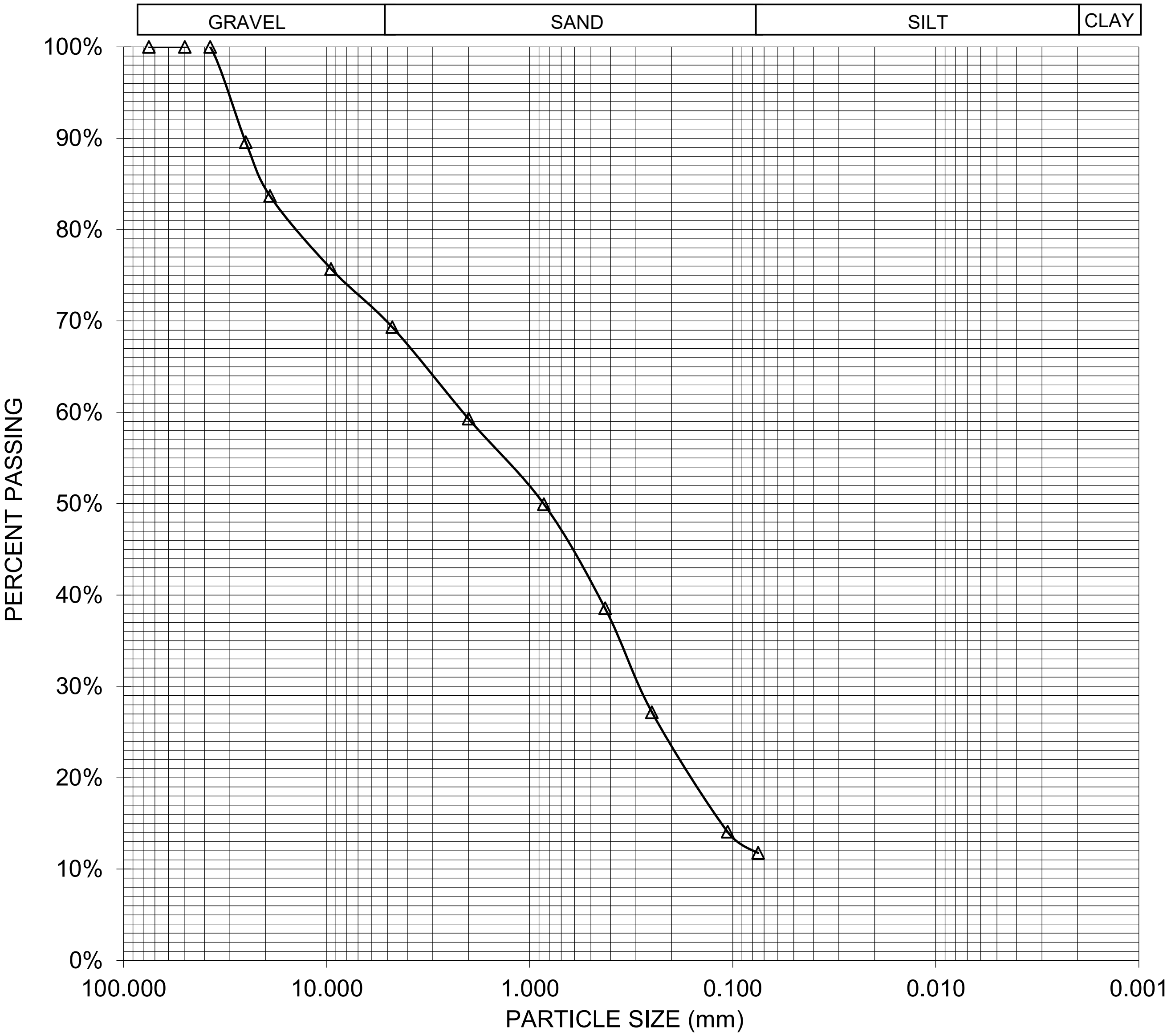
B-8

		PERCENT PASSING No. 4	PERCENT PASSING No. 200
BORING:	B-2		
DEPTH (ft):	10		
SOIL TYPE (USCS):	SM	100.0%	27.8%



CMAG ENGINEERING	**PARTICLE SIZE DISTRIBUTION**	FIGURE
	150 Felker Street	B-9

BORING:	B-2	PERCENT	PERCENT
DEPTH (ft):	20	PASSING No. 4	PASSING No. 200
SOIL TYPE (USCS):	SW-SM	69.3%	11.8%



CMAG ENGINEERING

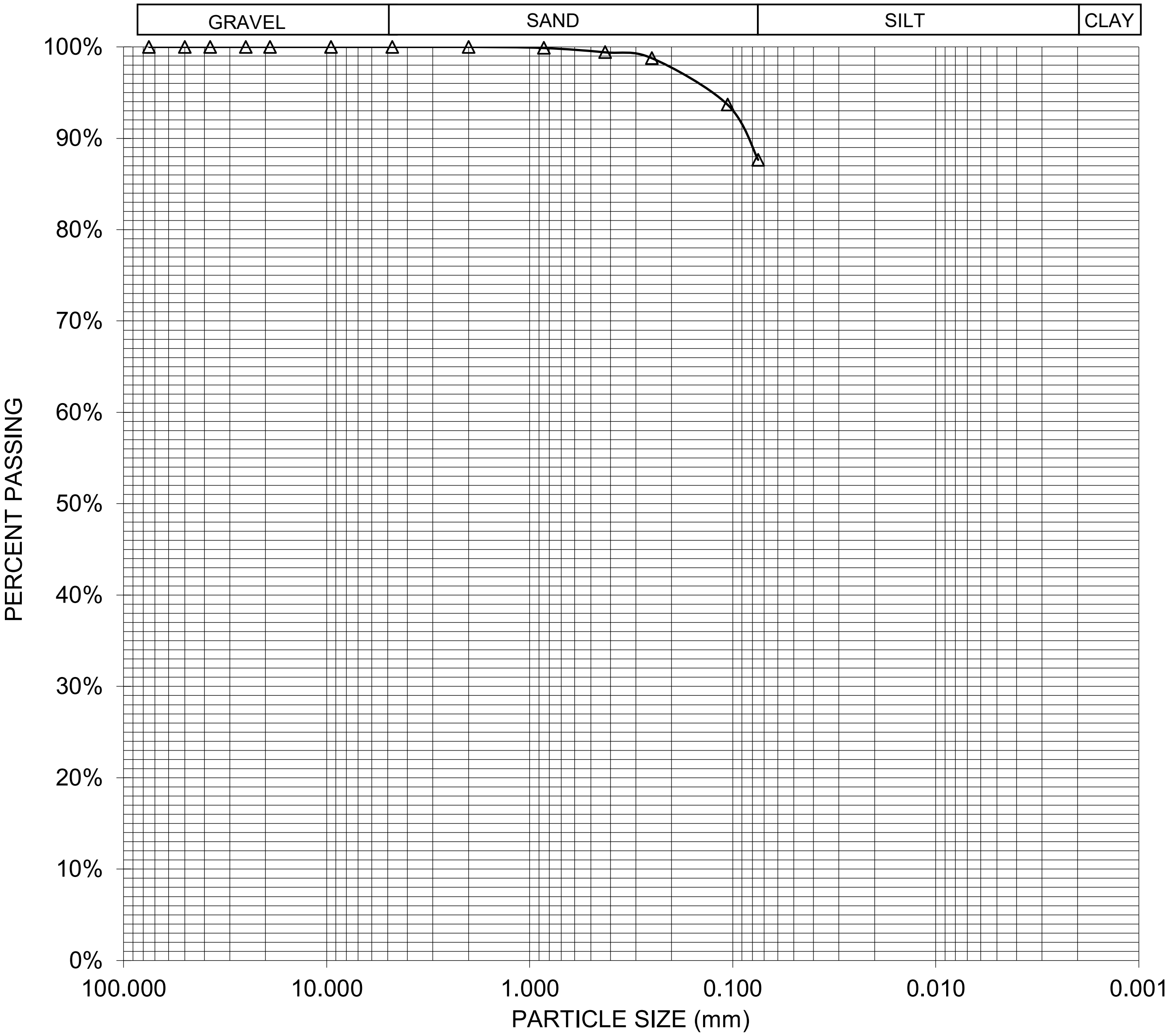
PARTICLE SIZE DISTRIBUTION

150 Felker Street

FIGURE

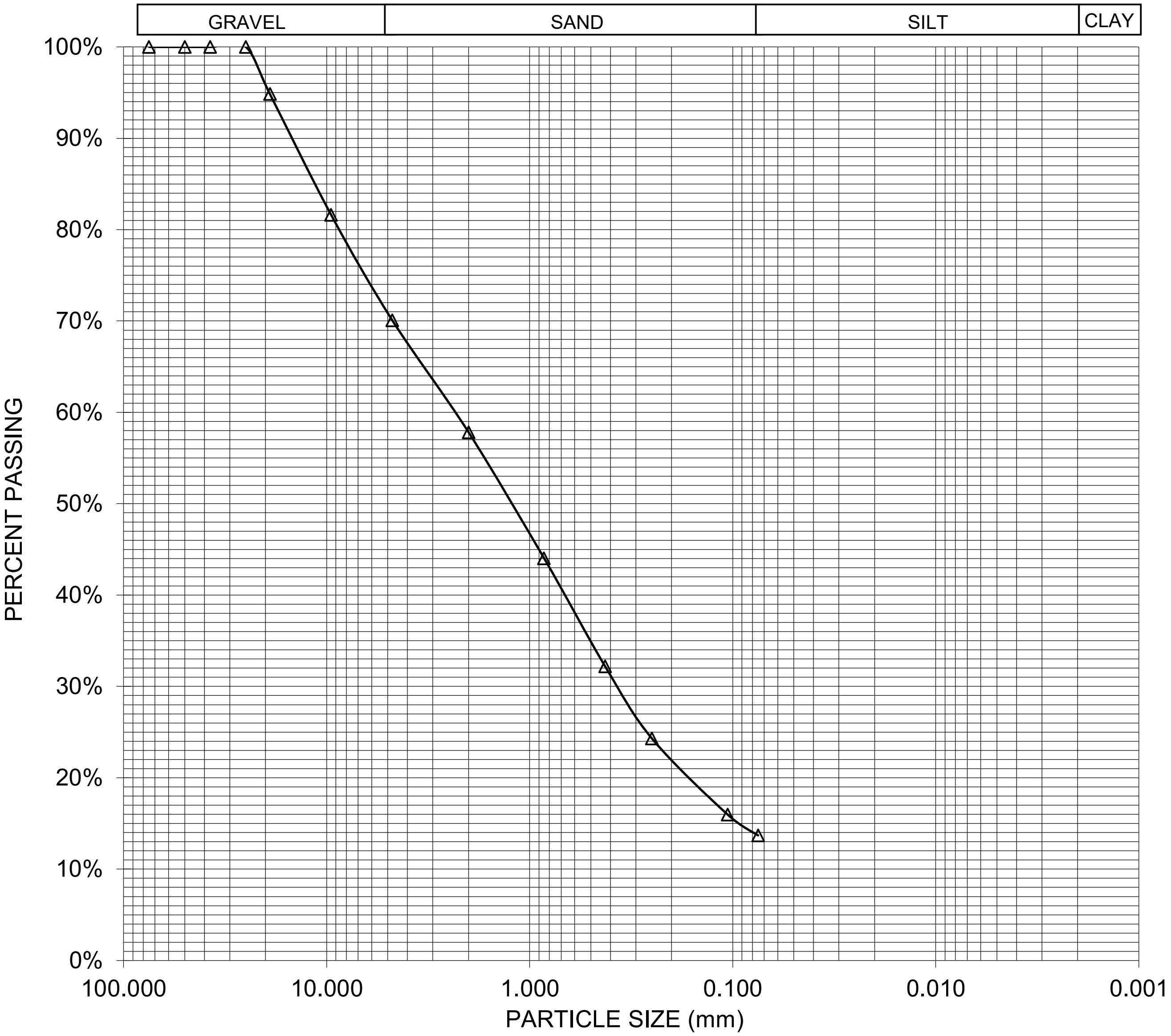
B-10

BORING:	B-3	PERCENT PASSING No. 4	PERCENT PASSING No. 200
DEPTH (ft):	6		
SOIL TYPE (USCS):	CL	100.0%	87.7%



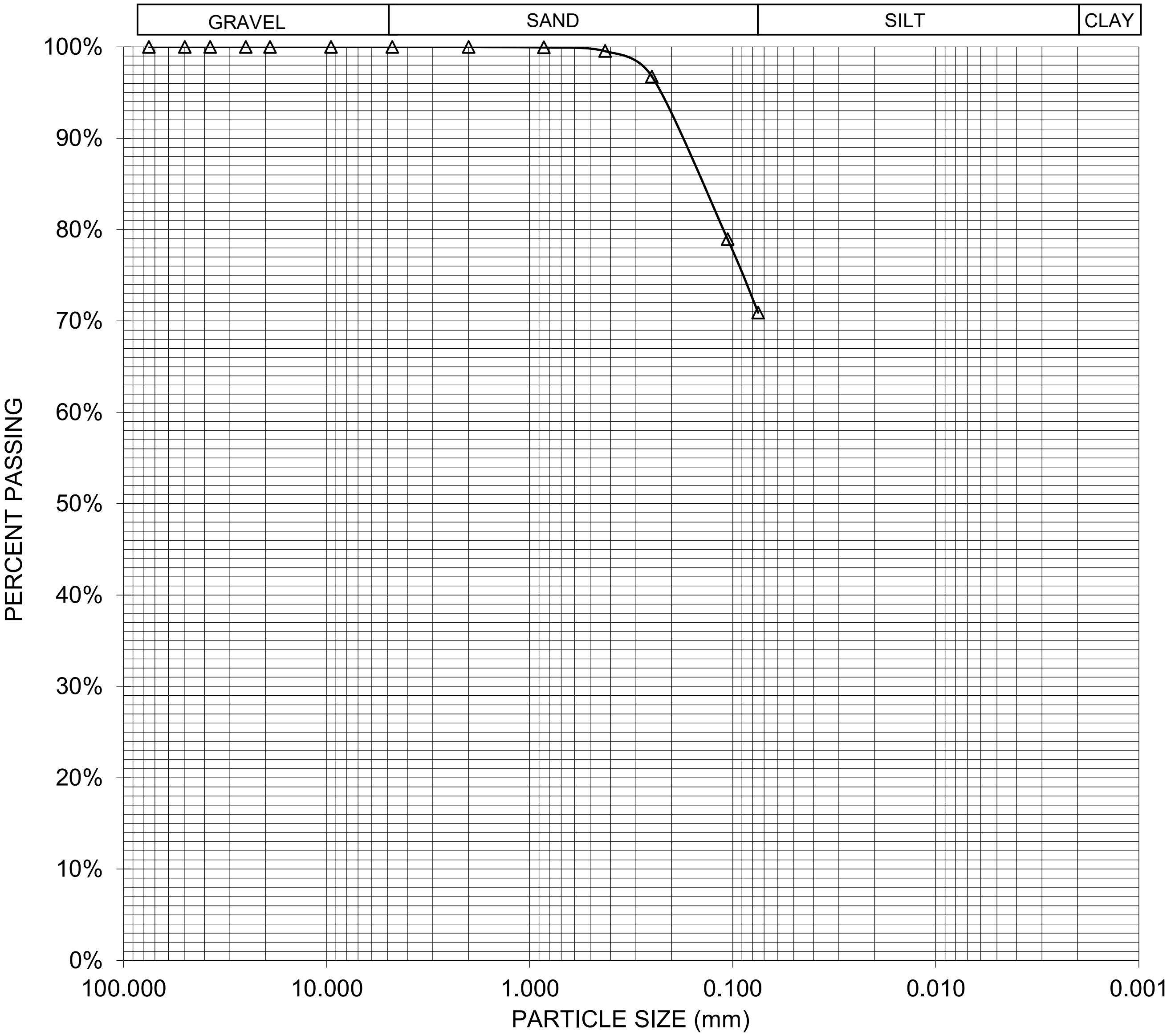
CMAG ENGINEERING	**PARTICLE SIZE DISTRIBUTION** 150 Felker Street	FIGURE B-11

BORING:	B-3	PERCENT	PERCENT
DEPTH (ft):	15	PASSING No. 4	PASSING No. 200
SOIL TYPE (USCS):	SM	70.1%	13.7%



CMAG ENGINEERING	**PARTICLE SIZE DISTRIBUTION**	FIGURE
	150 Felker Street	B-12

BORING:	B-4	PERCENT	PERCENT
DEPTH (ft):	1	PASSING No. 4	PASSING No. 200
SOIL TYPE (USCS):	ML	100.0%	70.9%



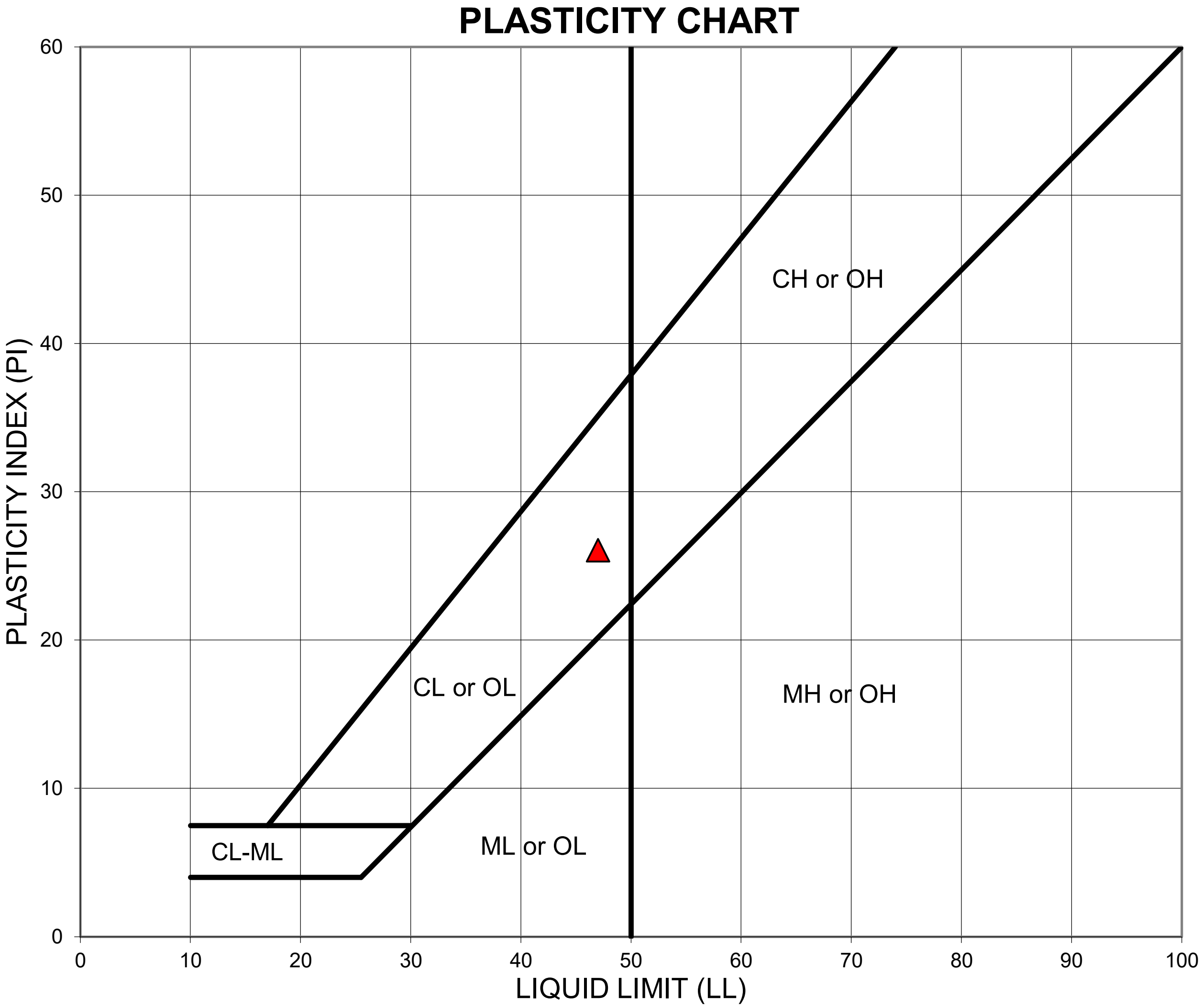
CMAG ENGINEERING

PARTICLE SIZE DISTRIBUTION

150 Felker Street

FIGURE

B-13



KEY

SYMBOL	BORING	DEPTH(FT)	LL	PL	PI
▲	B-2	6.5	47	21	26

CMAG ENGINEERING

LIQUID/PLASTIC LIMIT TEST RESULTS

150 Felker Street

FIGURE

B-14