Priority Project

Preliminary Water Quality Management Plan

For:

Apple Bear Retail Site

Prepared for:

Apple Bear Investors, LLC

2950 Airway Avenue, Suite A-9

Costa Mesa, CA 92626

(657) 247-2600 x306

Prepared by:

Tait & Associates

701 N Parkcenter Drive

Santa Ana, CA 92705

(714) 560-8661

Submittal Date: September 12, 2022

Final Approval Date:_____

Project Owner's Certification

This Town of Apple Valley Water Quality Management Plan (WQMP) has been prepared for Wood Investments Companies by Tait & Associates. The WQMP is intended to comply with the requirements of the Town of Apple Valley and the Phase II Small MS4 General Permit for the Mojave River Watershed. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the Phase II Small MS4 Permit and the intent of the Town of Apple Valley's compliance efforts. Once the undersigned transfers its interest in the property, its successors in interest and the Town of Apple Valley shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity.

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors."

Project Data			
Permit/Application Number(s):		Grading Permit Number(s):	
Tract/Parcel Map Number(s):		Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			

Owner's Signature			
Owner Name: Matt Bush			
Title	**Owner**		
Company	Apple Bear Investors, LLC		
Address	2950 Airway Ave., Unit A-9		
Email	matt@woodinvco.com		
Telephone #	657-247-2600 ext. 306		
Signature		Date	

Preparer's Certification

Project Data			
Permit/Application Number(s):		Grading Permit Number(s):	
Tract/Parcel Map Number(s):		Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan were prepared under my oversight and meet the requirements of State of California Water Resources Control Board Order No. 2013-0001-DWQ.

Engineer: Jacob VanderVis		PE Stamp Below
Title	Chief Operating Officer	
Company	Tait & Associates	
Address	701 N Parkcenter Dr.	
Email	jacobv@tait.com	
Telephone #	714-560-8677	
Signature		
Date		

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Forms

APPENDICES:

- **Vicinity Map**
- **Geotechnical Report**
- **Stormwater Runoff Analysis**
- **Preliminary WQMP Map**

Section I – Introduction

This WQMP template has been prepared specifically for the Phase II Small MS4 General Permit in the Mojave River Watershed. This location is within the jurisdiction of the Lahontan Regional Water Quality Control Board (LRWQCB) only. This document should not be confused with the WQMP template for the Santa Ana Phase I area of San Bernardino County.

WQMP preparers must refer to the MS4 Permit for the Mojave Watershed WQMP template and Technical Guidance (TGD) document found at: http://cms.sbcounty.gov/dpw/Land/NPDES.aspx to find pertinent arid region and Mojave River Watershed specific references and requirements.

Section 1 Discretionary Permit(s)

Form 1-1 Project Information					
Project Name	Apple Bear Retail Site				
Project Owner Contact Name:	Matt Bush				
Mailing Address:	2950 Airway Ave., Unit A-9	E-mail Address:	matt@woodinvco.com	Telephone:	657-247-2600 ext. 306
Permit/Application Number(s):		Tract/Parcel Map Number(s):			
Additional Information/ Comments:					
Description of Project:	Development of a retail center with drive-thru restaurants, shops, Drive-thrus, driving lanes				
Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.	N/A. No previous submission.				

Section 2 Project Description

2.1 Project Information

This project proposes the construction of a mixed-use commercial development including retail shopping, drive-thru restaurants, dining, site drive aisles and parking infrastructure. Pollutants of concern are listed hereon based on the Technical Guidance Document (TGD) for Water Quality Management Plans (WQMP).

This project intends to retain all stormwater on site by using underground proprietary infiltration facilities. This study examines the project as though it were one large shed, which is actually composed of 24 sub-sheds that flow into the on-site stormwater drainage system prior to discharging into the underground stormwater facility. The longest path of overland flow was used to determine time of concentration for this site. All water stored by this facility will ultimately infiltrate through the soils into the groundwater.

2.1.1 Project Sizing Categorization

Form 2.1-1 Description of Proposed Project

1 Regulated Development Project Category (Select all that apply):

☒ #1 New development involving the creation of 5,000 ft^2 or more of impervious surface collectively over entire site	☐ #2 Significant re-development involving the addition or replacement of 5,000 ft^2 or more of impervious surface on an already developed site	☐ #3 Road Project – any road, sidewalk, or bicycle lane project that creates greater than 5,000 square feet of contiguous impervious surface	☐ #4 LUPs – linear underground/overhead projects that has a discrete location with 5,000 sq. ft. or more new constructed impervious surface

☐ Site Design Only (Project Total Square Feet > 2,500 but < 5,000 sq.ft) *Will require source control Site Design LID BMPs and other LIP requirements. See section 4. (Please go to Forms 4.1-3 and 4.3-2)*

2 Project Area (ft2):	390,110	**3** Number of Dwelling Units:	0	**4** SIC Code:	

5 Is Project going to be phased? Yes ☐ No ☒ *If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.*

2.2 Property Ownership/Management

The property owner shall provide maintenance for the stormwater drainage and water quality facilities. The Final WQMP shall provide detailed maintenance agreements and covenants.

Form 2.2-1 Property Ownership/Management

Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities:
Property owner to determine long-term maintenance of WQMP stormwater facilities during the construction document development phase.

2.3 Potential Stormwater Pollutants

Expected pollutants of concern were determined based on land uses and site activities, per Table 3-2 in the TGD for WQMP.

Form 2.3-1 Pollutants of Concern

Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	
Nutrients - Phosphorous	E ☒	N ☐	
Nutrients - Nitrogen	E ☒	N ☐	
Noxious Aquatic Plants	E ☒	N ☐	
Sediment	E ☒	N ☐	
Metals	E ☒	N ☐	
Oil and Grease	E ☒	N ☐	
Trash/Debris	E ☒	N ☐	
Pesticides / Herbicides	E ☒	N ☐	
Organic Compounds	E ☒	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

Section 3 Site and Watershed Description

Due to the density of this development and the proximity to public stormwater conveyance systems, the project intends to utilize underground stormwater infiltration devices to infiltrate stormwater runoff into the groundwater. Soils testing was performed and based on the infiltration rate of 1.42 in/hr.; therefore,

retaining water on site is appropriate. See attached Preliminary SQMP Map. See Forms 3-1 through 3-3 for site location, hydrologic features and watershed information.

Form 3-1 Site Location and Hydrologic Features

Site coordinates *take GPS measurement at approximate center of site*	Latitude 34° 28' 12"	Longitude 117° 15' 17"	Thomas Bros Map page
1 San Bernardino County climatic region: ☒ Desert			
2 Does the site have more than one drainage area (DA): Yes☐ No☒ *If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached*			

Conveyance	All water flows view storm drain pipes from catch basins to the underground stormwater facility.
DMA A to Outlet 1	n/a – All water is retained on site.

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1

For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D
1 DMA drainage area (ft^2)	390,110			
2 Existing site impervious area (ft^2)	390,110			
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	AMC I - Dry			
4 Hydrologic soil group *Refer to County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf*	C			
5 Longest flowpath length (ft)	580			
6 Longest flowpath slope (ft/ft)	0.011			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Open Brush			
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating*	Poor			

Form 3-3 Watershed Description for Drainage Area

Receiving waters Refer to CWRCB site: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	Mojave River (Mojave Forks Reservoir outlet to Upper Narrows)
Applicable TMDLs *http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml*	5A
303(d) listed impairments *http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml*	Fluoride
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP*	N/A
Hydromodification Assessment	☒ Yes *Complete Hydromodification Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-9 in submittal* ☐ No

Section 4 Best Management Practices (BMP)

4.1 Source Control and Site Design BMPs

4.1.1 Source Control BMPs

Non-structural and structural source control BMPs are required to be incorporated into all new development and significant redevelopment projects. Form 4.1-1 and 4.1-2 are used to describe specific source control BMPs used in the WQMP or to explain why a certain BMP is not applicable. Table 7-3 of the TGD for WQMP provides a list of applicable source control BMP for projects with specific types of potential pollutant sources or activities. The source control BMP in this table must be implemented for projects with these specific types of potential pollutant sources or activities.

The preparers of this WQMP have reviewed the source control BMP requirements for new development and significant redevelopment projects. The preparers have also reviewed the specific BMP required for project as specified in Forms 4.1-1 and 4.1-2. All applicable non-structural and structural source control BMP shall be implemented in the project.

The identified list of source control BMPs correspond to the CASQA Stormwater BMP Handbook for New Development and Redevelopment.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Landscape Management BMPs	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	Not applicable, per TGD for WQMP.
N6	Local Water Quality Ordinances	☒	☐	
N7	Spill Contingency Plan	☒	☐	
N8	Underground Storage Tank Compliance	☒	☐	
N9	Hazardous Materials Disclosure Compliance	☒	☐	

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N10	Uniform Fire Code Implementation	☒	☐	
N11	Litter/Debris Control Program	☒	☐	
N12	Employee Training	☒	☐	
N13	Housekeeping of Loading Docks	☒	☐	
N14	Catch Basin Inspection Program	☒	☐	
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	Not a public project.
N17	Comply with all other applicable NPDES permits	☒	☐	

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☒	☐	
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	☒	☐	
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☒	☐	
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☒	☐	
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☒	☐	
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☒	☐	
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☒	☐	

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☒	☐	
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	No fueling facilities proposed as part of project.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☒	☐	
S14	Wash water control for food preparation areas	☒	☐	
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☒	☐	

4.1.2 Site Design BMPs

The site is designed to have all stormwater enter the private stormwater drainage system via catch basins. Once stormwater enters the drainage system, the water will flow through CDS units to provide trash capture requirements prior to entering the underground stormwater infiltration facility. See attached WQMP Site Plan and CDS details for location and sizes of the stormwater devices.

Refer to Section 5.2 of the TGD for WQMP for more details.

Form 4.1-3 Site Design Practices Checklist
Site Design Practices *If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets*
Minimize impervious areas: Yes ☒ No ☐ Explanation: Utilize landscaping to create buffers between drive thrus and drive aisles.
Maximize natural infiltration capacity; Including improvement and maintenance of soil: Yes ☒ No ☐ Explanation: Use of Underground infiltration to retain water onsite.
Preserve existing drainage patterns and time of concentration: Yes ☐ No ☒ Explanation: Current site is vacant, untreated and runs off site. Water will now be retained via underground storage system.
Disconnect impervious areas. Including rerouting of rooftop drainage pipes to drain stormwater to storage or infiltration BMPs instead of to storm drain: Yes ☒ No ☐ Explanation:
Use of Porous Pavement: Yes ☐ No ☒ Explanation: Water is to be retained on site using underground infiltration systems.
Protect existing vegetation and sensitive areas: Yes ☐ No ☒ Explanation: N/A
Re-vegetate disturbed areas. Including planting and preservation of drought tolerant vegetation: Yes ☒ No ☐ Explanation:
Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: Compaction to take place on the top of underground storage.
Utilize naturalized/rock-lined drainage swales in place of underground piping or imperviously lined swales: Yes ☐ No ☒ Explanation:
Stake off areas that will be used for landscaping to minimize compaction during construction: Yes ☒ No ☐ Explanation:

Use of Rain Barrels and Cisterns, Including the use of on-site water collection systems: Yes ☐ No ☒ Explanation:
Stream Setbacks. Includes a specified distance from an adjacent steam: Yes ☐ No ☒ Explanation:

Typical landscaping recommendations are found in following local references:

San Bernardino County Special Districts:

Guide to High Desert Landscaping -
http://www.specialdistricts.org/Modules/ShowDocument.aspx?documentid=795

Recommended High-Desert Plants -
http://www.specialdistricts.org/modules/showdocument.aspx?documentid=553

Mojave Water Agency:

Desert Ranch: http://www.mojavewater.org/files/desertranchgardenprototype.pdf

Summertree: http://www.mojavewater.org/files/Summertree-Native-Plant-Brochure.pdf

Thornless Garden: http://www.mojavewater.org/files/thornlessgardenprototype.pdf

Mediterranean Garden: http://www.mojavewater.org/files/mediterraneangardenprototype.pdf

Lush and Efficient Garden: http://www.mojavewater.org/files/lushandefficientgardenprototype.pdf

Alliance for Water Awareness and Conservation (AWAC) outdoor tips – http://hdawac.org/save-outdoors.html

4.2 Treatment BMPs

See forms below for sizing the treatment volume of the underground stormwater infiltration facility. Hydromodification sizing procedures are not utilized for this project. See attached hydrology report sizing the 100-year storm event. This project shall utilize and underground infiltration system capable of retaining the 100-year storm event, so analyzing a lesser event is unnecessary.

4.2.1 Project Specific Hydrology Characterization

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in the Phase II Small MS4 Permit. These targets include runoff volume for water quality control (referred to as LID design capture volume), and runoff volume, time of concentration, and peak runoff for protection from hydromodification.

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), San Bernardino County requires use of the P_6 method (Form 4.2-1) For pre- and post-development hydrologic calculation, San Bernardino County requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi^2), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for hydromodification performance criteria.

<table>
<tr><th colspan="3">Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume
(DA 1)</th></tr>
<tr><td>[1] Project area DA 1 (ft^2):
390,110</td><td>[2] Imperviousness after applying preventative site design practices (Imp%): 85</td><td>[3] Runoff Coefficient (Rc): 0.66
$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$</td></tr>
<tr><td colspan="3">[4] Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.33 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html</td></tr>
<tr><td colspan="3">[5] Compute P_6, Mean 6-hr Precipitation (inches): 0.408
P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Desert = 1.2371)</td></tr>
<tr><td colspan="2">[6] Drawdown Rate
Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.</td><td>24-hrs ☐
48-hrs ☒</td></tr>
<tr><td colspan="3">[7] Compute design capture volume, DCV (ft^3): 17,184
DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)
Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2</td></tr>
</table>

Form 4.2-2 Summary of Hydromodification Assessment (DA 1)

Is the change in post- and pre- condition flows captured on-site? : Yes ☒ No ☐

If "Yes", then complete Hydromodification assessment of site hydrology for 10yr storm event using Forms 4.2-3 through 4.2-5 and insert results below *(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual- Addendum 1)*

If "No," then proceed to Section 4.3 BMP Selection and Sizing

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** 21,780 *Form 4.2-3 Item 12*	**2** 10 *Form 4.2-4 Item 13*	**3** 5.53 *Form 4.2-5 Item 10*
Post-developed	**4** 26,136 *Form 4.2-3 Item 13*	**5** 10 *Form 4.2-4 Item 14*	**6** 7.23 *Form 4.2-5 Item 14*
Difference	**7** *4356* *Item 4 – Item 1*	**8** *0* *Item 2 – Item 5*	**9** *1.70* *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** *20%* *Item 7 / Item 1*	**11** *0%* *Item 8 / Item 2*	**12** *0.31%* *Item 9 / Item 3*

Form 4.2-3 Hydromodification Assessment for Runoff Volume (DA 1)

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1a Land Cover type	Open Brush							
2a Hydrologic Soil Group (HSG)	C							
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*	390,155							
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	74							
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type	Commercial							
2b Hydrologic Soil Group (HSG)	C							
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*	390,155							
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	94							

5 Pre-Developed area-weighted CN: 74	**7** Pre-developed soil storage capacity, S (in): 3.51 *S = (1000 / Item 5) - 10*	**9** Initial abstraction, I_a (in): .70 *I_a = 0.2 * Item 7*
6 Post-Developed area-weighted CN: 94	**8** Post-developed soil storage capacity, S (in): 0.64 *S = (1000 / Item 6) - 10*	**10** Initial abstraction, I_a (in): .13 *I_a = 0.2 * Item 8*

11 Precipitation for 10 yr, 24 hr storm (in): 2.1
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

12 Pre-developed Volume (ft^3): 12,924
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*

13 Post-developed Volume (ft^3): 48,441
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*

14 Volume Reduction needed to meet hydromodification requirement, (ft^3): 35,516
*Vhydro = (Item 13 * 0.95) – Item 12*

4.3.1 Exceptions to Requirements for Bioretention Facilities

Form 4.3-1 Infiltration BMP Feasibility (DA 1)
Feasibility Criterion – Complete evaluation for each DA on the Project Site
[1] Would infiltration BMP pose significant risk for groundwater related concerns? Yes ☐ No ☒ *Refer to Section 5.3.2.1 of the TGD for WQMP*
If Yes, Provide basis: (attach)
[2] Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes ☐ No ☒ (Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert): • The location is less than 50 feet away from slopes steeper than 15 percent • The location is less than ten feet from building foundations or an alternative setback. • A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.
If Yes, Provide basis: (attach)
[3] Would infiltration of runoff on a Project site violate downstream water rights? Yes ☐ No ☒
If Yes, Provide basis: (attach)
[4] Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils? Yes ☐ No ☒
If Yes, Provide basis: (attach)
[5] Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? Yes ☐ No ☒
If Yes, Provide basis: (attach)
[6] Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes ☐ No ☒ *See Section 3.5 of the TGD for WQMP and WAP*
If Yes, Provide basis: (attach)
[7] Any answer from Item 1 through Item 3 is "Yes": Yes ☐ No ☒ *If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Selection and Evaluation of Biotreatment BMP BMP. If no, then proceed to Item 8 below.* [8] Any answer from Item 4 through Item 6 is "Yes": Yes ☐ No ☒ *If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Site Design BMP. If no, then proceed to Item 9, below.* [9] All answers to Item 1 through Item 6 are "No": *Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP. Proceed to Form 4.3-2, Site Design BMPs.*

4.3.2 Site Design BMP

Section E.12.e. of the Small Phase II MS4 Permit emphasizes the use of LID preventative measures; and the use of Site Design BMPs reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable Site Design shall be provided except where they are mutually exclusive with each

other, or with other BMPs. Mutual exclusivity does not apply to this site. See forms below for Site Design BMP data.

Form 4.3-2 Site Design BMPs (DA 1)

1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☒ No ☐ *If yes, complete Items 2-5; If no, proceed to Item 6*	DMA A BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Total impervious area draining to pervious area (ft^2)	331,593		
3 Ratio of pervious area receiving runoff to impervious area	0.15		
4 Retention volume achieved from impervious area dispersion (ft^3) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff*	2,072		
5 Sum of retention volume achieved from impervious area dispersion (ft^3): 1,885 $V_{retention}$ *=Sum of Item 4 for all BMPs*			
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☐ No ☒ *If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
7 Ponding surface area (ft^2)			
8 Ponding depth (ft) (min. 0.5 ft.)			
9 Surface area of amended soil/gravel (ft^2)			
10 Average depth of amended soil/gravel (ft) (min. 1 ft.)			
11 Average porosity of amended soil/gravel			
12 Retention volume achieved from on-lot infiltration (ft^3) $V_{retention}$ *= (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)*			

Form 4.3-2 cont. Site Design BMPs (DA 1)			
13 Runoff volume retention from on-lot infiltration (ft^3): *$V_{retention}$ =Sum of Item 12 for all BMPs*			
14 Implementation of Street Trees: Yes ☐ No ☒ *If yes, complete Items 14-18. If no, proceed to Item 19*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
15 Number of Street Trees			
16 Average canopy cover over impervious area (ft^2)			
17 Runoff volume retention from street trees (ft^3) *$V_{retention}$ = Item 15 * Item 16 * (0.05/12) assume runoff retention of 0.05 inches*			
18 Runoff volume retention from street tree BMPs (ft^3): *$V_{retention}$ = Sum of Item 17 for all BMPs*			
19 Total Retention Volume from Site Design BMPs: 2,072 CF *Sum of Items 5, 13 and 18*			

4.3.3 Infiltration BMPs

See Form 4.3-3 below to see the computations of the on-site retention of runoff from the proposed Underground infiltration BMP.

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Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)

1 Remaining LID DCV not met by site design BMP (ft^3): *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item19*			
BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*	1.42		
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	2		
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	0.71		
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*			
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*			
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*			
8 Infiltrating surface area, SA_{BMP} (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*			
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*			
10 Amended soil porosity			
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*			
12 Gravel porosity			
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*			
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*			
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	96,270		
16 Total Retention Volume from LID Infiltration BMPs: 96,270 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*			
17 Fraction of DCV achieved with infiltration BMP: 100% *Retention% = Item 16 / Form 4.2-1 Item 7*			
18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☒ No ☐ *If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.*			

4.3.4 Biotreatment BMP

Biotreatment BMPs are not utilized as part of this project.

4.3.5 Conformance Summary

See Form 4.3-8 to see the compliance with retention requirements.

Form 4.3-8 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)

1 Total LID DCV for the Project DA-1 (ft^3): 17,184 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design BMP (ft^3): *Copy Item18 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): 96,270 *Copy Item 16 in Form 4.3-3*

4 On-site biotreatment with volume based biotreatment BMP (ft^3): *Copy Item 3 in Form 4.3-4*

5 Flow capacity provided by flow based biotreatment BMP (cfs): *Copy Item 6 in Form 4.3-4*

6 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design or infiltration BMP: Yes ☒ No ☐
  If yes, sum of Items 2, 3, and 4 is greater than Item 1
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☒ No ☐
  If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized
- On-site retention and infiltration is determined to be infeasible; therefore biotreatment BMP provides biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☒
  If yes, Form 4.3-1 Items 7 and 8 were both checked yes

7 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of Site Design, retention and infiltration, , and biotreatment BMPs provide less than full LID DCV capture: ☐
  Checked yes if Form 4.3-4 Item 7is checked yes, Form 4.3-4 Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} *= (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*

- Facilities, or a combination of facilities, of a different design than in Section E.12.e.(ii)(f) may be permitted if all of the following Phase II Small MS4 General Permit 2013-0001-DWQ 55 February 5, 2013 measures of equivalent effectiveness are demonstrated:
  1) Equal or greater amount of runoff infiltrated or evapotranspired; ☒
  2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment; ☒
  3) Equal or greater protection against shock loadings and spills; ☒
  4) Equal or greater accessibility and ease of inspection and maintenance. ☒

4.3.6 Hydromodification Control BMP

Hydromodification was not considered for this project, since the underground infiltration system is sized to retain the 100-year event.

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)			
BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
Underground Infiltration Facility	Owner	To be determined with final WQMP.	
CDS	Owner	To be determined with final WQMP.	

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural Source Control BMP locations
- Site Design Hydrologic Source Control BMP locations
- LID BMP details
- Drainage delineations and flow information
- Drainage connections

6.2 Electronic Data Submittal

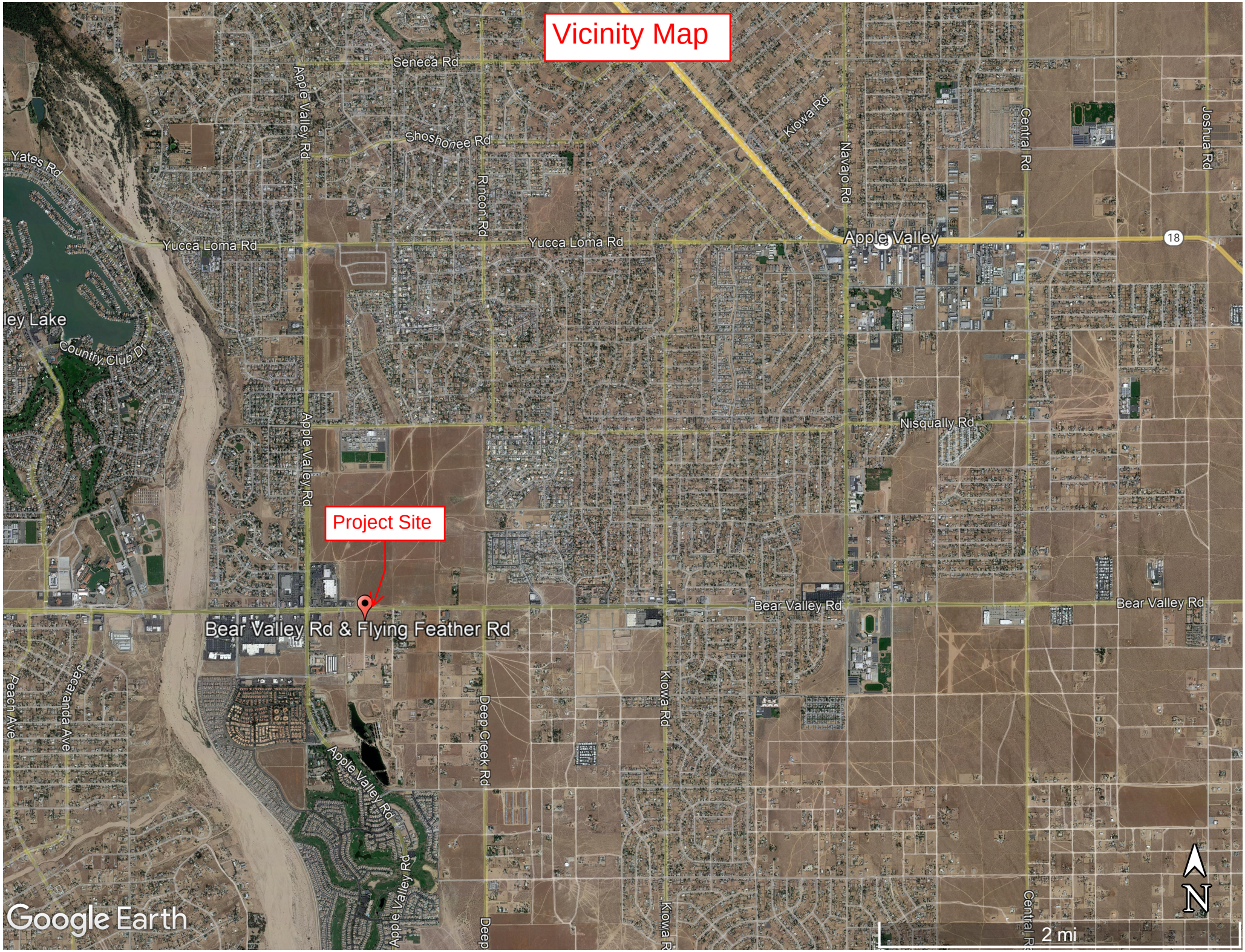
Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their local Local Implementation Plan), this section will describe the contents (e.g., layering, nomenclature, geo-referencing, etc.) of these documents so that they may be interpreted efficiently and accurately.

6.3 Post Construction

Attach all O&M Plans and Maintenance Covenant for BMP to the WQMP. See following page for Maintenance Covenant Template

6.4 Other Supporting Documentation

- BMP Educational Materials
- Activity Restriction-C, C&R's & Lease Agreements


Vicinity Map
Seneca Rd
Apple Valley Rd
Shoshonee Rd
Yates Rd
Rincon Rd
Kiowa Rd
Navajo Rd
Central Rd
Joshua Rd
Yucca Loma Rd
Yucca Loma Rd
Apple Valley
18
ley Lake
Country Club Dr
Apple Valley Rd
Nisqually Rd
Project Site
Bear Valley Rd
Bear Valley Rd
Bear Valley Rd & Flying Feather Rd
Peach Ave
Jacaranda Ave
Deep Creek Rd
Kiowa Rd
Apple Valley Rd
Apple Valley Rd
Deep
Kiowa R
Central R
Google Earth
2 mi
N

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 ************************************************************************
                      SMALL AREA UNIT HYDROGRAPH MODEL
 ========================================================================
          (C) Copyright 1989-2016 Advanced Engineering Software (aes)
              Ver. 23.0  Release Date: 07/01/2016  License ID 1334

                             Analysis prepared by:




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  Problem Descriptions:
   SP8979 - Apple Valley
   EXISTING CONDITION - 2 YEAR ON-SITE HYDROGRAPH
-------------------------------------------------------------------------


     RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
     TOTAL CATCHMENT AREA(ACRES) =    8.96
     SOIL-LOSS RATE, Fm,(INCH/HR) =  0.248
     LOW LOSS FRACTION = 0.450
     TIME OF CONCENTRATION(MIN.) = 10.00
     SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
     USER SPECIFIED RAINFALL VALUES ARE USED
     RETURN FREQUENCY(YEARS) =   2
        5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.11
       30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.27
        1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.33
        3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.54
        6-HOUR   POINT RAINFALL VALUE(INCHES) =  0.74
       24-HOUR   POINT RAINFALL VALUE(INCHES) =  1.30

-------------------------------------------------------------------------

     TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.50
     TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.48

 ************************************************************************
   TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
  (HOURS)    (AF)      (CFS)
-------------------------------------------------------------------------
   0.17      0.0007      0.10  Q         .         .         .         .
   0.33      0.0020      0.10  Q         .         .         .         .
   0.50      0.0034      0.10  Q         .         .         .         .
   0.67      0.0048      0.10  Q         .         .         .         .
   0.83      0.0061      0.10  Q         .         .         .         .
   1.00      0.0075      0.10  Q         .         .         .         .
   1.17      0.0089      0.10  Q         .         .         .         .
   1.33      0.0103      0.10  Q         .         .         .         .
   1.50      0.0117      0.10  Q         .         .         .         .
   1.67      0.0131      0.10  Q         .         .         .         .
   1.83      0.0146      0.10  Q         .         .         .         .
   2.00      0.0160      0.10  Q         .         .         .         .
   2.17      0.0175      0.11  Q         .         .         .         .
   2.33      0.0189      0.11  Q         .         .         .         .
   2.50      0.0204      0.11  Q         .         .         .         .
   2.67      0.0219      0.11  Q         .         .         .         .
   2.83      0.0234      0.11  Q         .         .         .         .
   3.00      0.0249      0.11  Q         .         .         .         .
   3.17      0.0264      0.11  Q         .         .         .         .
   3.33      0.0279      0.11  Q         .         .         .         .
   3.50      0.0295      0.11  Q         .         .         .         .
   3.67      0.0310      0.11  Q         .         .         .         .
   3.83      0.0326      0.11  Q         .         .         .         .
   4.00      0.0342      0.11  Q         .         .         .         .
   4.17      0.0358      0.12  Q         .         .         .         .
   4.33      0.0374      0.12  Q         .         .         .         .
   4.50      0.0390      0.12  Q         .         .         .         .
   4.67      0.0406      0.12  Q         .         .         .         .
   4.83      0.0423      0.12  Q         .         .         .         .
   5.00      0.0439      0.12  Q         .         .         .         .
   5.17      0.0456      0.12  Q         .         .         .         .
   5.33      0.0473      0.12  Q         .         .         .         .
   5.50      0.0490      0.12  Q         .         .         .         .
   5.67      0.0507      0.13  Q         .         .         .         .
   5.83      0.0525      0.13  Q         .         .         .         .
   6.00      0.0542      0.13  Q         .         .         .         .
   6.17      0.0560      0.13  Q         .         .         .         .
   6.33      0.0578      0.13  Q         .         .         .         .
   6.50      0.0596      0.13  Q         .         .         .         .
   6.67      0.0614      0.13  Q         .         .         .         .
   6.83      0.0633      0.13  Q         .         .         .         .
   7.00      0.0651      0.14  Q         .         .         .         .
   7.17      0.0670      0.14  Q         .         .         .         .
   7.33      0.0689      0.14  Q         .         .         .         .
   7.50      0.0708      0.14  Q         .         .         .         .
   7.67      0.0728      0.14  Q         .         .         .         .
   7.83      0.0748      0.14  Q         .         .         .         .
   8.00      0.0768      0.15  Q         .         .         .         .
   8.17      0.0788      0.15  Q         .         .         .         .
   8.33      0.0808      0.15  Q         .         .         .         .
   8.50      0.0829      0.15  Q         .         .         .         .
   8.67      0.0850      0.15  Q         .         .         .         .
   8.83      0.0871      0.16  Q         .         .         .         .
   9.00      0.0893      0.16  Q         .         .         .         .
   9.17      0.0915      0.16  Q         .         .         .         .
   9.33      0.0937      0.16  Q         .         .         .         .
   9.50      0.0959      0.17  Q         .         .         .         .
```

9.67	0.0982	0.17	Q	.	.	.	.
9.83	0.1006	0.17	Q	.	.	.	.
10.00	0.1029	0.17	Q	.	.	.	.
10.17	0.1053	0.18	Q	.	.	.	.
10.33	0.1077	0.18	Q	.	.	.	.
10.50	0.1102	0.18	Q	.	.	.	.
10.67	0.1127	0.18	Q	.	.	.	.
10.83	0.1153	0.19	Q	.	.	.	.
11.00	0.1179	0.19	Q	.	.	.	.
11.17	0.1206	0.20	Q	.	.	.	.
11.33	0.1233	0.20	Q	.	.	.	.
11.50	0.1261	0.20	Q	.	.	.	.
11.67	0.1289	0.21	Q	.	.	.	.
11.83	0.1318	0.21	Q	.	.	.	.
12.00	0.1348	0.22	Q	.	.	.	.
12.17	0.1380	0.25	.Q	.	.	.	.
12.33	0.1415	0.25	.Q	.	.	.	.
12.50	0.1450	0.26	.Q	.	.	.	.
12.67	0.1487	0.27	.Q	.	.	.	.
12.83	0.1524	0.28	.Q	.	.	.	.
13.00	0.1563	0.28	.Q	.	.	.	.
13.17	0.1603	0.29	.Q	.	.	.	.
13.33	0.1644	0.30	.Q	.	.	.	.
13.50	0.1686	0.31	.Q	.	.	.	.
13.67	0.1730	0.32	.Q	.	.	.	.
13.83	0.1775	0.34	.Q	.	.	.	.
14.00	0.1822	0.35	.Q	.	.	.	.
14.17	0.1871	0.36	.Q	.	.	.	.
14.33	0.1922	0.38	.Q	.	.	.	.
14.50	0.1976	0.40	.Q	.	.	.	.
14.67	0.2032	0.42	.Q	.	.	.	.
14.83	0.2093	0.46	.Q	.	.	.	.
15.00	0.2158	0.48	.Q	.	.	.	.
15.17	0.2228	0.54	. Q	.	.	.	.
15.33	0.2305	0.58	. Q	.	.	.	.
15.50	0.2376	0.45	.Q	.	.	.	.
15.67	0.2443	0.52	. Q	.	.	.	.
15.83	0.2570	1.32	. Q	.	.	.	.
16.00	0.2780	1.72	. Q	.	.	.	.
16.17	0.3279	5.53	.	.	. Q	.	.
16.33	0.3703	0.62	. Q	.	.	.	.
16.50	0.3790	0.63	. Q	.	.	.	.
16.67	0.3868	0.51	. Q	.	.	.	.
16.83	0.3933	0.44	.Q	.	.	.	.
17.00	0.3990	0.39	.Q	.	.	.	.
17.17	0.4042	0.36	.Q	.	.	.	.
17.33	0.4089	0.33	.Q	.	.	.	.
17.50	0.4133	0.31	.Q	.	.	.	.
17.67	0.4174	0.29	.Q	.	.	.	.
17.83	0.4212	0.27	.Q	.	.	.	.
18.00	0.4249	0.26	.Q	.	.	.	.
18.17	0.4282	0.22	Q	.	.	.	.
18.33	0.4311	0.21	Q	.	.	.	.
18.50	0.4340	0.20	Q	.	.	.	.
18.67	0.4367	0.19	Q	.	.	.	.
18.83	0.4393	0.19	Q	.	.	.	.
19.00	0.4418	0.18	Q	.	.	.	.
19.17	0.4443	0.17	Q	.	.	.	.
19.33	0.4466	0.17	Q	.	.	.	.
19.50	0.4489	0.16	Q	.	.	.	.
19.67	0.4511	0.16	Q	.	.	.	.
19.83	0.4533	0.15	Q	.	.	.	.
20.00	0.4554	0.15	Q	.	.	.	.
20.17	0.4574	0.15	Q	.	.	.	.
20.33	0.4594	0.14	Q	.	.	.	.
20.50	0.4614	0.14	Q	.	.	.	.
20.67	0.4633	0.14	Q	.	.	.	.
20.83	0.4652	0.13	Q	.	.	.	.
21.00	0.4670	0.13	Q	.	.	.	.
21.17	0.4688	0.13	Q	.	.	.	.
21.33	0.4705	0.13	Q	.	.	.	.
21.50	0.4723	0.12	Q	.	.	.	.
21.67	0.4739	0.12	Q	.	.	.	.
21.83	0.4756	0.12	Q	.	.	.	.
22.00	0.4772	0.12	Q	.	.	.	.
22.17	0.4788	0.12	Q	.	.	.	.
22.33	0.4804	0.11	Q	.	.	.	.
22.50	0.4820	0.11	Q	.	.	.	.
22.67	0.4835	0.11	Q	.	.	.	.
22.83	0.4850	0.11	Q	.	.	.	.
23.00	0.4865	0.11	Q	.	.	.	.
23.17	0.4880	0.11	Q	.	.	.	.
23.33	0.4894	0.10	Q	.	.	.	.
23.50	0.4908	0.10	Q	.	.	.	.
23.67	0.4922	0.10	Q	.	.	.	.
23.83	0.4936	0.10	Q	.	.	.	.
24.00	0.4950	0.10	Q	.	.	.	.
24.17	0.4957	0.00	Q	.	.	.	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1440.0
10%	60.0
20%	30.0
30%	20.0
40%	10.0
50%	10.0
60%	10.0

70%	10.0
80%	10.0
90%	10.0

```
                    SMALL AREA UNIT HYDROGRAPH MODEL
          (C) Copyright 1989-2016 Advanced Engineering Software (aes)
              Ver. 23.0  Release Date: 07/01/2016  License ID 1334

                              Analysis prepared by:
```

 Problem Descriptions:
  SP8979 - Apple Valley
  PROPOSED CONDITION - 2 YEAR ON-SITE HYDROGRAPH

```
    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    8.96
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.038
    LOW LOSS FRACTION = 0.380
    TIME OF CONCENTRATION(MIN.) = 10.00
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.11
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.27
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.33
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.54
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  0.74
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  1.30

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.60
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.37
```

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	2.5	5.0	7.5	10.0
0.17	0.0008	0.11	Q	.	.	.	.
0.33	0.0023	0.11	Q	.	.	.	.
0.50	0.0038	0.11	Q	.	.	.	.
0.67	0.0054	0.11	Q	.	.	.	.
0.83	0.0069	0.11	Q	.	.	.	.
1.00	0.0085	0.11	Q	.	.	.	.
1.17	0.0100	0.11	Q	.	.	.	.
1.33	0.0116	0.12	Q	.	.	.	.
1.50	0.0132	0.12	Q	.	.	.	.
1.67	0.0148	0.12	Q	.	.	.	.
1.83	0.0164	0.12	Q	.	.	.	.
2.00	0.0181	0.12	Q	.	.	.	.
2.17	0.0197	0.12	Q	.	.	.	.
2.33	0.0213	0.12	Q	.	.	.	.
2.50	0.0230	0.12	Q	.	.	.	.
2.67	0.0247	0.12	Q	.	.	.	.
2.83	0.0264	0.12	Q	.	.	.	.
3.00	0.0281	0.12	Q	.	.	.	.
3.17	0.0298	0.12	Q	.	.	.	.
3.33	0.0315	0.13	Q	.	.	.	.
3.50	0.0332	0.13	Q	.	.	.	.
3.67	0.0350	0.13	Q	.	.	.	.
3.83	0.0368	0.13	Q	.	.	.	.
4.00	0.0385	0.13	Q	.	.	.	.
4.17	0.0403	0.13	Q	.	.	.	.
4.33	0.0421	0.13	Q	.	.	.	.
4.50	0.0440	0.13	Q	.	.	.	.
4.67	0.0458	0.13	Q	.	.	.	.
4.83	0.0477	0.14	Q	.	.	.	.
5.00	0.0495	0.14	Q	.	.	.	.
5.17	0.0514	0.14	Q	.	.	.	.
5.33	0.0533	0.14	Q	.	.	.	.
5.50	0.0552	0.14	Q	.	.	.	.
5.67	0.0572	0.14	Q	.	.	.	.
5.83	0.0591	0.14	Q	.	.	.	.
6.00	0.0611	0.14	Q	.	.	.	.
6.17	0.0631	0.15	Q	.	.	.	.
6.33	0.0651	0.15	Q	.	.	.	.
6.50	0.0672	0.15	Q	.	.	.	.
6.67	0.0692	0.15	Q	.	.	.	.
6.83	0.0713	0.15	Q	.	.	.	.
7.00	0.0734	0.15	Q	.	.	.	.
7.17	0.0755	0.16	Q	.	.	.	.
7.33	0.0777	0.16	Q	.	.	.	.
7.50	0.0799	0.16	Q	.	.	.	.
7.67	0.0821	0.16	Q	.	.	.	.
7.83	0.0843	0.16	Q	.	.	.	.
8.00	0.0865	0.16	Q	.	.	.	.
8.17	0.0888	0.17	Q	.	.	.	.
8.33	0.0911	0.17	Q	.	.	.	.
8.50	0.0935	0.17	Q	.	.	.	.
8.67	0.0958	0.17	Q	.	.	.	.
8.83	0.0982	0.18	Q	.	.	.	.
9.00	0.1007	0.18	Q	.	.	.	.
9.17	0.1031	0.18	Q	.	.	.	.
9.33	0.1056	0.18	Q	.	.	.	.
9.50	0.1082	0.19	Q	.	.	.	.

9.67	0.1107	0.19	Q	.	.	.	.
9.83	0.1133	0.19	Q	.	.	.	.
10.00	0.1160	0.19	Q	.	.	.	.
10.17	0.1187	0.20	Q	.	.	.	.
10.33	0.1214	0.20	Q	.	.	.	.
10.50	0.1242	0.21	Q	.	.	.	.
10.67	0.1271	0.21	Q	.	.	.	.
10.83	0.1300	0.21	Q	.	.	.	.
11.00	0.1329	0.22	Q	.	.	.	.
11.17	0.1359	0.22	Q	.	.	.	.
11.33	0.1390	0.22	Q	.	.	.	.
11.50	0.1421	0.23	Q	.	.	.	.
11.67	0.1453	0.23	Q	.	.	.	.
11.83	0.1486	0.24	Q	.	.	.	.
12.00	0.1519	0.24	Q	.	.	.	.
12.17	0.1556	0.28	.Q	.	.	.	.
12.33	0.1595	0.29	.Q	.	.	.	.
12.50	0.1635	0.30	.Q	.	.	.	.
12.67	0.1676	0.30	.Q	.	.	.	.
12.83	0.1718	0.31	.Q	.	.	.	.
13.00	0.1762	0.32	.Q	.	.	.	.
13.17	0.1807	0.33	.Q	.	.	.	.
13.33	0.1853	0.34	.Q	.	.	.	.
13.50	0.1900	0.35	.Q	.	.	.	.
13.67	0.1950	0.36	.Q	.	.	.	.
13.83	0.2001	0.38	.Q	.	.	.	.
14.00	0.2054	0.39	.Q	.	.	.	.
14.17	0.2109	0.41	.Q	.	.	.	.
14.33	0.2167	0.42	.Q	.	.	.	.
14.50	0.2227	0.45	.Q	.	.	.	.
14.67	0.2291	0.47	.Q	.	.	.	.
14.83	0.2360	0.53	. Q	.	.	.	.
15.00	0.2435	0.57	. Q	.	.	.	.
15.17	0.2521	0.68	. Q	.	.	.	.
15.33	0.2620	0.75	. Q	.	.	.	.
15.50	0.2707	0.51	. Q	.	.	.	.
15.67	0.2786	0.64	. Q	.	.	.	.
15.83	0.2975	2.10	.	Q	.	.	.
16.00	0.3313	2.82	.	.Q	.	.	.
16.17	0.4006	7.23	.	.	.	Q	.
16.33	0.4560	0.83	. Q	.	.	.	.
16.50	0.4675	0.84	. Q	.	.	.	.
16.67	0.4775	0.62	. Q	.	.	.	.
16.83	0.4852	0.49	.Q	.	.	.	.
17.00	0.4916	0.44	.Q	.	.	.	.
17.17	0.4974	0.40	.Q	.	.	.	.
17.33	0.5027	0.37	.Q	.	.	.	.
17.50	0.5077	0.35	.Q	.	.	.	.
17.67	0.5123	0.32	.Q	.	.	.	.
17.83	0.5166	0.31	.Q	.	.	.	.
18.00	0.5207	0.29	.Q	.	.	.	.
18.17	0.5245	0.25	Q	.	.	.	.
18.33	0.5278	0.24	Q	.	.	.	.
18.50	0.5310	0.23	Q	.	.	.	.
18.67	0.5341	0.22	Q	.	.	.	.
18.83	0.5370	0.21	Q	.	.	.	.
19.00	0.5399	0.20	Q	.	.	.	.
19.17	0.5426	0.20	Q	.	.	.	.
19.33	0.5453	0.19	Q	.	.	.	.
19.50	0.5478	0.18	Q	.	.	.	.
19.67	0.5503	0.18	Q	.	.	.	.
19.83	0.5528	0.17	Q	.	.	.	.
20.00	0.5551	0.17	Q	.	.	.	.
20.17	0.5575	0.17	Q	.	.	.	.
20.33	0.5597	0.16	Q	.	.	.	.
20.50	0.5619	0.16	Q	.	.	.	.
20.67	0.5641	0.15	Q	.	.	.	.
20.83	0.5662	0.15	Q	.	.	.	.
21.00	0.5682	0.15	Q	.	.	.	.
21.17	0.5702	0.15	Q	.	.	.	.
21.33	0.5722	0.14	Q	.	.	.	.
21.50	0.5742	0.14	Q	.	.	.	.
21.67	0.5761	0.14	Q	.	.	.	.
21.83	0.5779	0.13	Q	.	.	.	.
22.00	0.5798	0.13	Q	.	.	.	.
22.17	0.5816	0.13	Q	.	.	.	.
22.33	0.5834	0.13	Q	.	.	.	.
22.50	0.5851	0.13	Q	.	.	.	.
22.67	0.5868	0.12	Q	.	.	.	.
22.83	0.5885	0.12	Q	.	.	.	.
23.00	0.5902	0.12	Q	.	.	.	.
23.17	0.5919	0.12	Q	.	.	.	.
23.33	0.5935	0.12	Q	.	.	.	.
23.50	0.5951	0.12	Q	.	.	.	.
23.67	0.5967	0.11	Q	.	.	.	.
23.83	0.5982	0.11	Q	.	.	.	.
24.00	0.5998	0.11	Q	.	.	.	.
24.17	0.6005	0.00	Q	.	.	.	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1440.0
10%	60.0
20%	30.0
30%	20.0
40%	10.0
50%	10.0
60%	10.0

70%	10.0
80%	10.0
90%	10.0

GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED APPLE BEAR RETAIL CENTER
19439 BEAR VALLEY ROAD
APPLE VALLEY, CALIFORNIA

PROJECT NO. 112-21076
SEPTEMBER 9, 2021

Prepared for:

MR. MATTHEW BUSH
WOOD INVESTMENTS COMPANIES
2950 AIRWAY AVENUE, UNIT A-9
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PREPARED BY:

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Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

September 9, 2021

KA Project No. 112-21076

Mr. Matthew Bush
Wood Investments Companies
2950 Airway Avenue, Unit A-9
Costa Mesa, California 92626

RE: Geotechnical Engineering Investigation
Proposed Apple Bear Retail Center
19439 Bear Valley Road
Apple Valley, California

Dear Mr. Bush:

In accordance with your request, we have completed a Geotechnical Engineering Investigation for the above-referenced site. The results of our investigation are presented in the attached report.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (951) 273-1011.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

David R. Jarosz, II
Managing Engineer
RGE No. 2698 RCE No. 60185

DRJ:ht

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GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED APPLE BEAR RETAIL CENTER
19439 BEAR VALLEY ROAD
APPLE VALLEY, CALIFORNIA

INTRODUCTION

This report presents the results of our Geotechnical Engineering Investigation for the proposed Apple Bear Retail Center, to be located at 19439 Bear Valley Road in Apple Valley, California. Discussions regarding site conditions are presented herein, together with conclusions and recommendations pertaining to site preparation, Engineered Fill, utility trench backfill, drainage and landscaping, foundations, concrete floor slabs and exterior flatwork, retaining walls, excavation stability, soil cement reactivity, and pavement design.

A site plan showing the approximate boring locations is presented following the text of this report. A description of the field investigation, boring logs, and the boring log legend are presented in Appendix A. Appendix A contains a description of the laboratory testing phase of this study along with the laboratory test results. Appendices B and C contain guides to earthwork and pavement specifications. When conflicts in the text of the report occur with the general specifications in the appendices, the recommendations in the text of the report have precedence.

PURPOSE AND SCOPE

This investigation was conducted to evaluate the soil and groundwater conditions at the site, to make geotechnical engineering recommendations for use in design of specific construction elements, and to provide criteria for site preparation and Engineered Fill construction.

Our scope of services was outlined in our proposal dated July 14, 2021 (KA Proposal No. G21094CAC) and included the following:

- A site reconnaissance by a member of our engineering staff to evaluate the surface conditions at the project site.
- A field investigation consisting of drilling 24 borings to depths ranging from approximately 10 to 50 feet and conducting 4 percolation tests at depths of 6 to 8 feet for evaluation of the subsurface conditions at the project site.
- Performing laboratory tests on representative soil samples obtained from the borings to evaluate the physical and index properties of the subsurface soils.

- Evaluation of the data obtained from the investigation and an engineering analysis to provide recommendations for use in the project design and preparation of construction specifications.

- Preparation of this report summarizing the results, conclusions, recommendations, and findings of our investigation.

PROPOSED CONSTRUCTION

We understand that design of the proposed development is currently underway; structural load information and other final details pertaining to the structures are unavailable. On a preliminary basis, it is understood the development will include the construction of a new retail center. The development is understood to include eight (8) retail building pads intended for single story retail buildings. The proposed structures are anticipated to be single-story, wood or metal framed buildings supported on shallow foundation systems. Underground utility connections, flexible and rigid asphalt pavements, trash enclosures and localized landscaped areas are anticipated as part of the proposed development.

In the event these structural or grading details are inconsistent with the final design criteria, the Soils Engineer should be notified so that we may update this writing as applicable.

SITE LOCATION, SITE HISTORY AND SITE DESCRIPTION

The property site is rectangular in shape and encompasses approximately 10.32 acres. The project site is located on the south side of Bear Valley Road, approximately 0.2 miles east of Apple Valley Road in Apple Valley, California. The site is surrounded by vacant land, commercial developments, and rural residences.

Presently, the site consists of a rural residence and vacant land. The house and associated structures are located in the northwest corner of the site. An unpaved access road and overhead electrical line and power poles trend north-south through the middle of the site. The site is surrounded by vacant land to the west, south and east, and a commercial development and vacant land to the north. The site is bordered by Bear Valley Road and overhead electrical lines to the north, and Flying Feather Road to the east. Buried utility lines associated with the existing and surrounding developments may be located within and along the edges of the project site. The surface soils have a loose consistency. The site is relatively level with no major changes in grade.

GEOLOGIC SETTING

The subject site is located in Victor Valley, which is situated in the southwestern portion of the Mojave Desert Geomorphic Province. The Mojave Desert is bound by the Tehachapi Mountains of the Sierra Nevada Geomorphic Province to the northwest and the San Gabriel and San Bernardino Mountains of the Transverse Range Geomorphic Province to the south and southwest. A major portion of the Mojave Desert is underlain by Mesozoic granitic rocks. Quaternary alluvium covers a majority of the Victor Valley floor.

Groundwater is reported to occur at an elevation of approximately 80 to 100 feet below existing ground surface. No known regional groundwater impairments were reported within the subject site vicinity.

Both the Tehachapi and the San Gabriel mountain ranges are geologically young mountain ranges and possess active and potentially active fault zones. Numerous moderate to large earthquakes have affected the area of the subject site within historic time. Based on the proximity of several dominant active faults and seismogenic structures, as well as the historic seismic record, the area of the subject site is considered subject to relatively high seismicity. The site under consideration is located in a seismically active area of Southern California. The nearest significant active fault is the North Frontal Fault Zone, which is approximately 8.5 miles southwest of the project site. The Helendale – So Lockhart and San Andreas Fault Zones are located approximately 17.8 and 29.5 miles from the site, respectively. The area in consideration shows no mapped faults on-site according to maps prepared by the California Geologic Survey and published by the International Conference of Building Officials (ICBO). No evidence of surface faulting was observed on the property during our reconnaissance. The project site is not located within an Earthquake Fault Zone.

FAULT RUPTURE HAZARD ZONES

The Alquist-Priolo Geologic Hazards Zones Act went into effect in March, 1973. Since that time, the Act has been amended 11 times (Hart, 2007). The purpose of the Act, as provided in California Geologic Survey (CGS) Special Publication 42 (SP 42), is to prohibit the location of most structures for human occupancy across the traces of active faults and to mitigate thereby the hazard of fault-rupture." The Act was renamed the Alquist-Priolo Earthquake Fault Zoning Act in 1994, and at that time, the originally designated "Special Studies Zones" was renamed the "Earthquake Fault Zones."

The subject site is located in the State of California, Earthquake Fault Zones Map for the Apple Valley South Quadrangle dated March 1, 1988. The site is not located in a Fault Zone area. The nearest zoned fault is North Frontal Fault Zone, located approximately 8.5 miles from the subject site.

SEISMIC HAZARDS ZONES

In 1990, the California State Legislature passed the Seismic Hazard Mapping Act to protect public safety from the effects of strong shaking, liquefaction, landslides, or other ground failure, and other hazards caused by earthquakes. The Act requires that the State Geologist delineate various seismic hazards zones on Seismic Hazards Zones Maps. Specifically, the maps identify areas where soil liquefaction and earthquake-induced landslides are most likely to occur. A site-specific geotechnical evaluation is required prior to permitting most urban developments within the mapped zones. The Act also requires sellers of real property within the zones to disclose this fact to potential buyers. The subject site is located in the State of California, Earthquake Fault Zones Map for the Apple Valley South Quadrangle dated March 1, 1988. The area of the subject is not located in an area designated as a seismic hazard zone. According to the San Bernardino County Geologic Hazard Overlay Map FH07C dated May 30, 2007, the site is not located in an area of liquefaction susceptibility.

OTHER HAZARDS

Rockfall, Landslide, Slope Instability, Debris Flow: The subject site is relatively flat and level. It is our understanding that there are no significant slopes proposed as part of the proposed development. Provided the recommendations presented in this report are implemented into the design and construction of the anticipated development, rockfalls, landslides, slope instability, and debris flows are not anticipated to pose a hazard to the subject site.

Seiches: Seiches are large waves generated within enclosed bodies of water. The site is not located in close proximity to any lakes or reservoirs. As such, seiches are not anticipated to pose a hazard to the subject site.

Hydroconsolidation: The near surface soils encountered at the subject site were found to be medium dense to very dense. Provided remedial grading recommendations presented in this report are incorporated in the design and construction, hydroconsolidation is not anticipated to be a significant concern for the subject site.

FIELD AND LABORATORY INVESTIGATIONS

Subsurface soil conditions were explored by drilling 24 borings to depths ranging from approximately 10 to 50 feet below existing site grade, using a truck-mounted drill rig. In addition, a bulk subgrade sample was obtained from the site for laboratory R-value testing. In addition, 4 percolation tests were performed within the site at depths of 5 to 8 feet to evaluate the soils absorption characteristics. The approximate boring, bulk sample, and percolation locations are shown on the site plan. During drilling operations, penetration tests were performed at regular intervals to evaluate the soil consistency and to obtain information regarding the engineering properties of the subsoils. Soil samples were retained for laboratory testing. The soils encountered were continuously examined and visually classified in accordance with the Unified Soil Classification System. A more detailed description of the field investigation is presented in Appendix A.

Laboratory tests were performed on selected soil samples to evaluate their physical characteristics and engineering properties. The laboratory testing program was formulated with emphasis on the evaluation of natural moisture, density, gradation, shear strength, consolidation potential, R-value, and moisture-density relationships of the materials encountered. In addition, chemical tests were performed to evaluate the soil-cement reactivity. Details of the laboratory test program and results of the laboratory tests are summarized in Appendix A. This information, along with the field observations, was used to prepare the final boring logs in Appendix A.

SOIL PROFILE AND SUBSURFACE CONDITIONS

Based on our findings, the subsurface conditions encountered appear typical of those found in the geologic region of the site. In general, the upper soils predominately consisted of approximately 6 to 12 inches of very loose silty sand or sand. These soils are disturbed, have moderate strength characteristics, and are slightly compressible when saturated.

Beneath the loose surface soils, approximately 3 to 4 feet of medium dense to very dense silty sand or sand was encountered. Field and laboratory tests suggest that these soils are moderately strong and moderately compressible. Penetration resistance ranged from 25 blows per foot to over 50 blows per 6 inches. Dry densities ranged from 103 to 116 pcf. Representative soil samples consolidated approximately 5 to 8½ percent under a 2 ksf load when saturated. Representative soil samples had angles of internal friction of 31 and 33 degrees.

Below 4 to 5 feet, predominately medium dense to very dense silty sand, silty sand/sand, sand and sandy silt were encountered. Penetration resistance ranged from 10 blows per foot to greater than 50 blows per 6 inches. Dry densities ranged from 90 to 117 pcf. These soils had slightly stronger strength characteristics than the upper soils and extended to the termination depth of our boring.

For additional information about the soils encountered, please refer to the boring log in Appendix A.

PERCOLATION TESTING

As requested, four percolation tests were performed within the site to evaluate the soils absorption characteristics. The percolation tests were performed at a depth of 6 to 8 feet below existing site grade. The tests were conducted in general accordance with the criteria set in the "Manual of Septic Tank Practice" published by the Department of Health, Education, and Welfare. The test results were converted to infiltration rate utilizing the Porchet Method. Results of the tests are as follows:

Test No.	Depth (feet)	Infiltration Rate (in/hr)	Soil Type
1	8	1.42	Silty Sand (SM)
2	8	1.20	Silty Sand (SM)
3	6	1.33	Silty Sand (SM)
4	6	1.73	Silty Sand (SM)

The test results indicate that the soils tested at depths of 6 to 8 feet have fair absorption characteristics. The test results do not include a factor of safety.

GROUNDWATER

Test boring locations were checked for the presence of groundwater during and immediately following the drilling operations. Groundwater was not encountered in any of the borings drilled as part of our subsurface investigation. Information obtained from the Department of Water Resources indicated that water wells had historic groundwater elevations as shallow as 12 feet below existing site grade within the project site vicinity.

It should be recognized that water table elevations may fluctuate with time, being dependent upon seasonal precipitation, irrigation, land use, and climatic conditions, as well as other factors. Therefore, water level observations at the time of the field investigation may vary from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

SEISMIC CONSIDERATIONS

Although ground rupture is not considered to be a major concern at the subject site, the site will likely be subject to at least one moderate to severe earthquake and associated seismic shaking during its lifetime, as well as periodic slight to moderate earthquakes. Some degree of structural damage due to stronger seismic shaking should be expected at the site, but the risk can be reduced through adherence to seismic design codes.

SOIL LIQUEFACTION

Seismicity is a general term relating to the abrupt release of accumulated strain energy in the rock materials of the earth's crust in a given geographical area. The recurrence of accumulation and subsequent release of strain have resulted in faults and fault systems. Fault patterns and density reflect relative degrees of regional stress through time, but do not necessarily indicate recent seismic activity; therefore, the degree of seismic risk must be determined or estimated by the seismic record in any given region.

Soil liquefaction is a state of soil particle suspension caused by a complete loss of strength when the effective stress drops to zero. Liquefaction normally occurs under saturated conditions in soils such as sand in which the strength is purely frictional. However, liquefaction has occurred in soils other than clean sand. Liquefaction usually occurs under vibratory conditions such as those induced by seismic events. To evaluate the liquefaction potential of the site, the following items were evaluated:

1) Soil type

2) Groundwater depth

3) Relative density

4) Initial confining pressure

5) Intensity and duration of ground shaking

The soil beneath the site consists of medium to very dense silty sands, silty sands/sands, and sands. Groundwater was not encountered at any of the boring locations during the site visit. However, historic groundwater elevations as shallow as 12 feet below existing site grade within the project site vicinity.

The potential for soil liquefaction during a seismic event was evaluated using the LIQUEFYPRO computer program (version 5.9d) developed by CivilTech Software. For the analysis, a maximum earthquake magnitude of 7.9 was used. A peak horizontal ground surface acceleration of 0.573g was considered conservative and appropriate for the liquefaction analysis. An estimated high groundwater depth of 12 feet was used for our analysis. The computer analysis indicates that soils above a depth of 12 feet are non-liquefiable due to the absence of groundwater. The soils below a depth of 12 feet have a slight to moderate potential for liquefaction under seismic shaking.

The analysis indicates that the estimated total seismic induced settlement is less than ¼ inch. Differential settlement caused by a seismic event is estimated to be less than ¼ inch. The anticipated differential settlement is estimated over a horizontal distance of 100 feet.

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of our field and laboratory investigations, along with previous geotechnical experience in the project area, the following is a summary of our evaluations, conclusions, and recommendations.

Administrative Summary

In brief, the subject site and soil conditions, with the exception of the loose surface soils, and existing and surrounding developments, appear to be conducive to the development of the project. The surface soils have a loose consistency. These soils are disturbed, have low strength characteristics and are highly compressible when saturated. Accordingly, it is recommended that the surface soils be recompacted. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation.

Fill material was not encountered in our borings. However, fill may be located between or beyond our borings. It is anticipated fill soils will consist of silty sands and sands. The thickness and extent of fill material was determined based on limited test borings and visual observation. Verification of the extent of fill should be determined during site grading. It is recommended that fill soils that have not been properly compacted and certified be excavated and recompacted. Prior to backfilling, the bottom of the excavation should be observed by Krazan & Associates, Inc. to verify no additional removal is required.

Trees are located within the project site vicinity. Tree or root removal operations should include roots greater than 1 inch in diameter. The resulting excavations should be backfilled with Engineered Fill compacted to a minimum of 95 percent of maximum density based on ASTM Test Method D1557.

Presently, the site consists of a rural residence, vacant land, and power poles with overhead electrical lines. Associated with these developments may be buried structures, such as utility lines and irrigation lines that may extend into the project site. Demolition activities should include proper removal of any buried structures or loosely backfilled excavations encountered. The resulting excavations should be backfilled with Engineered Fill. It is suspected that demolition activities of the existing structures will disturb the upper soils. After demolition activities, it is recommended that these disturbed soils be removed and/or recompacted. This compaction effort should stabilize the upper soils and locate any unsuitable or pliant areas not found during our field investigation.

In order to provide uniform foundation support, it is recommended that following stripping, fill removal operations and demolition activities, the upper four (4) feet of native soil below existing site grade or two (2) foot below the bottom of proposed foundations, whichever is deeper, should be excavated, moisture-conditioned to near optimum moisture content, and recompacted to a minimum of 95 percent of the maximum dry density based on ASTM Test Method D1557. Fill soils should be moisture conditions to at least optimum moisture content prior to compaction. Excavation should extend to a

minimum of 5 feet beyond structural elements. The on-site, native soils will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension. Prior to backfilling, the bottom of the excavation should be proof-rolled and observed by Krazan and Associates, Inc. to verify stability. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation. The bottom of the of the excavation as well as all fill material should be moisture conditioned to at least optimum moisture content and compacted to a minimum of 95 percent of maximum density based on ASTM Test Method D1557.

Relatively clean sands were encountered at various locations throughout the site. The possibility exists that site grading operations could expose these soils in areas of proposed buildings, pavements, and/or retaining walls. The Contractor should note that these soils lack the cohesion necessary to stand vertically, even in shallow excavations such as footing trenches. If these conditions are encountered, it will be necessary to over-excavate the affected area(s) to a minimum of 12 inches below the proposed bearing surface. These areas may be backfilled using a mix of the silty sand and sand soils that contains at least 20 percent fines and meeting the requirements for Engineered Fill. This material may be obtained from elsewhere at the site, imported to the site from an approved off-site source, or manufactured through blending of the excavated clean sand with other suitable material containing a higher percentage of fines to result in material meeting the requirements for Engineered Fill.

In pavement and exterior flatwork areas, the upper 12 inches of native soils should be excavated, moisture-conditioned to near optimum moisture content, and recompacted to a minimum of 95 percent of the maximum dry density based on ASTM Test Method D1557. Excavation should extend to a minimum of 3 feet beyond the edge of pavements or back of curbs. The on-site native soils will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension. Prior to backfilling, the bottom of the excavation should be proof-rolled and observed by Krazan and Associates, Inc. to verify stability. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation. Fill material should be compacted to a minimum of 95 percent of maximum dry density based on ASTM Test Method D1557.

Sandy soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavation. Shoring or sloping back trench sidewalls may be required within these sandy soils.

After completion of the recommended site preparation, the site should be suitable for shallow footing support. The proposed structure footings may be designed utilizing an allowable bearing pressure of 2,600 psf for dead-plus-live loads. Footings should have a minimum embedment of 12 inches.

Groundwater Influence on Structures/Construction

Based on our findings and historical records, it is not anticipated that groundwater will rise within the zone of structural influence or affect the construction of foundations and pavements for the project. Groundwater was not encountered in any of the borings drilled as part of our subsurface investigation.

However, information obtained from the Department of Water Resources indicated that water wells had historic groundwater elevations as shallow as 12 feet below existing site grade within the project site vicinity.

If earthwork is performed during or soon after periods of precipitation, the subgrade soils may become saturated, "pump," or not respond to densification techniques. Typical remedial measures include: discing and aerating the soil during dry weather; mixing the soil with dryer materials; removing and replacing the soil with an approved fill material; or mixing the soil with an approved lime or cement product. Our firm should be consulted prior to implementing remedial measures to observe the unstable subgrade conditions and provide appropriate recommendations.

Site Preparation

General site clearing should include removal of concrete; vegetation and existing utilities; and structures; including foundations; basement walls and floors; existing stockpiled soil; trees and associated root systems; rubble; rubbish; and any loose and/or saturated materials. Site stripping should extend to a minimum depth of 2 to 4 inches, or until all organics in excess of 3 percent by volume are removed. Deeper stripping may be required in localized areas. These materials will not be suitable for reuse as Engineered Fill. However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas.

Fill material was not encountered in our borings. However, fill may be located between or beyond our borings. It is anticipated fill soils will consist of silty sands and sands. The thickness and extent of fill material was determined based on limited test borings and visual observation. Verification of the extent of fill should be determined during site grading. It is recommended that fill soils that have not been properly compacted and certified be excavated and recompacted. Prior to backfilling, the bottom of the excavation should be observed by Krazan & Associates, Inc. to verify no additional removal is required.

Presently, the site consists of a rural residence, vacant land, and power poles with overhead electrical lines. Associated with these developments may be buried structures, such as utility lines, irrigation lines, septic systems, and water wells. Demolition activities should include proper removal of any buried structures. Any buried structures or loosely backfilled excavations encountered during construction should be properly removed and the resulting excavations backfilled. Excavations, depressions, or soft and pliant areas extending below planned finish subgrade level should be cleaned to firm undisturbed soil, and backfilled with Engineered Fill. In general, any septic tanks, debris pits, cesspools, or similar structures should be entirely removed. Concrete footings should be removed to an equivalent depth of at least 3 feet below proposed footing elevations or as recommended by the Soils Engineer. Water wells should be abandoned in accordance with county standards. Any other buried structures should be removed in accordance with the recommendations of the Soils Engineer. Resulting excavations should be backfilled with Engineered Fill.

Trees are located within the project site vicinity. Tree or root removal operations should include roots greater than 1 inch in diameter. The resulting excavations should be backfilled with Engineered Fill compacted to a minimum of 95 percent of maximum density based on ASTM Test Method D1557.

In order to provide uniform foundation support, it is recommended that following stripping, fill removal operations and demolition activities, the upper four (4) feet of native soil below existing site grade or two (2) foot below the bottom of proposed foundations, whichever is deeper, should be excavated, moisture-conditioned to near optimum moisture content, and recompacted to a minimum of 95 percent of the maximum dry density based on ASTM Test Method D1557. Fill soils should be moisture conditions to at least optimum moisture content prior to compaction. Excavation should extend to a minimum of 5 feet beyond structural elements. The on-site native soils will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension. Prior to backfilling, the bottom of the excavation should be proof-rolled and observed by Krazan and Associates, Inc. to verify stability. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation. The bottom of the of the excavation as well as all fill material should be moisture conditioned to at least optimum moisture content and compacted to a minimum of 95 percent of maximum density based on ASTM Test Method D1557.

In pavement and exterior flatwork areas, the upper 12 inches of native soils should be excavated, moisture-conditioned to near optimum moisture content, and recompacted to a minimum of 95 percent of the maximum dry density based on ASTM Test Method D1557. Excavation should extend to a minimum of 3 feet beyond the edge of pavements or back of curbs. The on-site native soils will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension. Prior to backfilling, the bottom of the excavation should be proof-rolled and observed by Krazan and Associates, Inc. to verify stability. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation. Fill material should be compacted to a minimum of 95 percent of maximum dry density based on ASTM Test Method D1557.

The upper soils, during wet winter months, become very moist due to the absorptive characteristics of the soil. Earthwork operations performed during winter months may encounter very moist unstable soils, which may require removal to grade a stable building foundation. Project site winterization consisting of placement of aggregate base and protecting exposed soils during the construction phase should be performed.

A representative of our firm should be present during all site clearing and grading operations to test and observe earthwork construction. This testing and observation is an integral part of our service as acceptance of earthwork construction is dependent upon compaction of the material and the stability of the material. The Soils Engineer may reject any material that does not meet compaction and stability requirements. Further recommendations of this report are predicated upon the assumption that earthwork construction will conform to recommendations set forth in this section and the Engineered Fill section.

Engineered Fill

The on-site, native soils are predominately silty sands, silty sands/sands, and sands. These soils will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension.

Relatively clean sands were encountered at various locations throughout the site. The possibility exists that site grading operations could expose these soils in areas of proposed buildings, pavements, and/or retaining walls. The Contractor should note that these soils lack the cohesion necessary to stand vertically, even in shallow excavations such as footing trenches. If these conditions are encountered, it will be necessary to over-excavate the affected area(s) to a minimum of 12 inches below the proposed bearing surface. These areas may be backfilled using a mix of the silty sand and sand soils that contains at least 20 percent fines and meeting the requirements for Engineered Fill. This material may be obtained from elsewhere at the site, imported to the site from an approved off-site source, or manufactured through blending of the excavated clean sand with other suitable material containing a higher percentage of fines to result in material meeting the requirements for Engineered Fill.

The preferred materials specified for Engineered Fill are suitable for most applications with the exception of exposure to erosion. Project site winterization and protection of exposed soils during the construction phase should be the sole responsibility of the Contractor, since he has complete control of the project site at that time.

Imported Fill material should be predominately granular material with between 20 and 50 percent passing the No. 200 sieve, a plasticity index less than 10 and an expansion index less than 15. Imported Fill should be free from rocks and clods greater than 4 inches in diameter. All Imported Fill material should be submitted to the Soils Engineer for approval at least 48 hours prior to delivery at the site.

Fill soils should be placed in lifts approximately 6 inches thick, moisture-conditioned as necessary, and compacted to achieve at least 95 percent maximum density as based on ASTM Test Method D1557. Additional lifts should not be placed if the previous lift did not meet the required dry density or if soil conditions are not stable.

Drainage and Landscaping

The ground surface should slope away from building pad and pavement areas toward appropriate drop inlets or other surface drainage devices. In accordance with Section 1804 of the 2019 California Building Code, it is recommended that the ground surface adjacent to foundations be sloped a minimum of 5 percent for a minimum distance of 10 feet away from structures, or to an approved alternative means of drainage conveyance. Swales used for conveyance of drainage and located within 10 feet of foundations should be sloped a minimum of 2 percent. Impervious surfaces, such as pavement and exterior concrete flatwork, within 10 feet of building foundations should be sloped a minimum of 1 percent away from the structure. Drainage gradients should be maintained to carry all surface water to collection facilities and off-site. These grades should be maintained for the life of the project.

Utility Trench Backfill

Utility trenches should be excavated according to accepted engineering practices following OSHA (Occupational Safety and Health Administration) standards by a Contractor experienced in such work. The responsibility for the safety of open trenches should be borne by the Contractor. Traffic and vibration adjacent to trench walls should be reduced and cyclic wetting and drying of excavation side slopes should be avoided. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced, especially during or shortly following periods of precipitation.

Sandy soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavation. Shoring or sloping back trench sidewalls may be required within these sandy soils.

Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 95 percent of maximum density based on ASTM Test Method D1557. Utility trench backfill placed in pavement areas should be compacted to at least 95 percent of maximum density based on ASTM Test Method D1557. Pipe bedding should be in accordance with pipe manufacturer's recommendations.

The Contractor is responsible for removing all water sensitive soil from the trench regardless of the backfill location and compaction requirements. The Contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

Foundations

After completion of the recommended site preparation, the site should be suitable for shallow footing support. The proposed structures may be supported on a shallow foundation system bearing on a minimum of 2 feet of Engineered Fill. Spread and continuous footings can be designed for the following maximum allowable soil bearing pressures:

Load	Allowable Loading
Dead Load Only	1,950 psf
Dead-Plus-Live Load	2,600 psf
Total Load, including wind or seismic loads	3,450 psf

The footings should have a minimum depth of 12 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Footings should have a minimum width of 12 inches, regardless of load.

The total settlement is not expected to exceed 1 inch. Differential settlement should be less than ½ inch across 30 feet. Most of the settlement is expected to occur during construction as the loads are applied. However, additional post-construction soil movement may occur if the foundation soils are flooded or

saturated. Based on the soil liquefaction analysis performed within the site, the estimated total seismic-induced settlement is less than ¼ inch. Differential settlement caused by a seismic event is estimated to be less than ¼ inch. The anticipated differential settlement is estimated over a horizontal distance of 100 feet.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.4 acting between the base of foundations and the supporting subgrade. Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 325 pounds per cubic foot acting against the appropriate vertical footing faces. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. A ⅓ increase in the above value may be used for short duration, wind, or seismic loads.

Floor Slabs and Exterior Flatwork

In areas where moisture-sensitive floor coverings will be included or where moisture-sensitive materials will be stored, concrete slab-on-grade floors should be underlain by a water vapor retarder. The water vapor retarder should be installed in accordance with accepted engineering practice.

The exterior floors should be poured separately in order to act independently of the walls and foundation system. All fills required to bring the building pads to grade should be Engineered Fills.

Moisture within the structure may be derived from water vapors, which were transformed from the moisture within the soils. This moisture vapor can travel through the vapor membrane and penetrate the slab-on-grade. This moisture vapor penetration can affect floor coverings and produce mold and mildew in the structure. To reduce moisture vapor intrusion, it is recommended that a vapor retarder be installed. It is recommended that the utility trenches within the structure be compacted, as specified in our report, to reduce the transmission of moisture through the utility trench backfill. Special attention to the immediate drainage and irrigation around the building is recommended. Positive drainage should be established away from the structure and should be maintained throughout the life of the structure. Ponding of water should not be allowed adjacent to the structure. Over-irrigation within landscaped areas adjacent to the structure should not be performed. In addition, ventilation of the structure (i.e. ventilation fans) is recommended to reduce the accumulation of interior moisture.

Lateral Earth Pressures and Retaining Walls

Walls retaining horizontal backfill and capable of deflecting a minimum of 0.1 percent of its height at the top may be designed using an equivalent fluid active pressure of 31 pounds per square foot per foot of depth. Walls that are incapable of this deflection or are fully constrained against deflection may be designed for an equivalent fluid at-rest pressure of 52 pounds per square foot per foot of depth. Expansive soils should not be used for backfill against walls. The wedge of non-expansive backfill material should extend from the bottom of each retaining wall outward and upward at a slope of 2:1 (horizontal to vertical) or flatter. The stated lateral earth pressures do not include the effects of hydrostatic water pressures generated by infiltrating surface water that may accumulate behind the retaining walls; or loads imposed by construction equipment, foundations, or roadways.

Retaining and/or below grade walls should be drained with either perforated pipe encased in free-draining gravel or a prefabricated drainage system. The gravel zone should have a minimum width of 12 inches and should extend upward to within 12 inches of the top of the wall. The upper 12 inches of backfill should consist of native soils, concrete, asphaltic concrete, or other suitable backfill to reduce surface drainage into the wall drain system. The aggregate should conform to Class 2 permeable materials graded in accordance with CalTrans Standard Specifications (2018). Prefabricated drainage systems, such as Miradrain®, Enkadrain®, or an equivalent substitute, are acceptable alternatives in lieu of gravel provided they are installed in accordance with the manufacturer's recommendations. If a prefabricated drainage system is proposed, our firm should review the system for final acceptance prior to installation.

Drainage pipes should be placed with perforations down and should discharge in a non-erosive manner away from foundations and other improvements. The pipes should be placed no higher than 6 inches above the heel of the wall, in the center line of the drainage blanket and should have a minimum diameter of four inches. Collector pipes may be either slotted or perforated. Slots should be no wider than ⅛ inch in diameter, while perforations should be no more than ¼ inch in diameter. If retaining walls are less than 6 feet in height, the perforated pipe may be omitted in lieu of weep holes on 4 feet maximum spacing. The weep holes should consist of 4-inch diameter holes (concrete walls) or unmortared head joints (masonry walls) and not be higher than 18 inches above the lowest adjacent grade. Two 8-inch square overlapping patches of geotextile fabric (conforming to CalTrans Standard Specifications for "edge drains") should be affixed to the rear wall opening of each weep hole to retard soil piping.

During grading and backfill operations adjacent to any walls, heavy equipment should not be allowed to operate within a lateral distance of 5 feet from the wall, or within a lateral distance equal to the wall height, whichever is greater, to avoid developing excessive lateral pressures. Within this zone, only hand-operated equipment ("whackers," vibratory plates, or pneumatic compactors) should be used to compact the backfill soils.

Seismic Parameters – 2019 California Building Code

The Site Class per Section 1613 of the 2019 California Building Code (2019 CBC) and ASCE 7-16, Chapter 20 is based upon the site soil conditions. It is our opinion that a Site Class D is most consistent with the subject site soil conditions. For seismic design of the structures based on the seismic provisions of the 2019 CBC, we recommend the following parameters:

Seismic Item	Value*	CBC Reference
Site Class	D	Section 1613.2.2
Site Coefficient F_a	1.015	Table 1613.2.3 (1)
S_s	1.213	Section 1613.2.1
S_{MS}	1.231	Section 1613.2.3
S_{DS}	0.821	Section 1613.2.4
Site Coefficient F_v	1.836	Table 1613.2.3 (2)

S_1	0.464	Section 1613.2.1
S_{M1}	0.852	Section 1613.2.3
S_{D1}	0.568	Section 1613.2.4
T_S	0.692	Section 1613.2

* Based on Equivalent Lateral Force (ELF) Design Procedure being used.

Soil Cement Reactivity

Excessive sulfate in either the soil or native water may result in an adverse reaction between the cement in concrete (or stucco) and the soil. HUD/FHA and CBC have developed criteria for evaluation of sulfate levels and how they relate to cement reactivity with soil and/or water.

Soil samples were obtained from the site and tested in accordance with State of California Materials Manual Test Designation 417. The sulfate concentrations detected from these soil samples were greater than 1000 ppm (2,057 ppm) and are greater than the maximum allowable values established by HUD/FHA and CBC. Therefore, it is recommended that a Type V cement be used within the concrete to compensate for sulfate reactivity with the cement.

Compacted Material Acceptance

Compaction specifications are not the only criteria for acceptance of the site grading or other such activities. However, the compaction test is the most universally recognized test method for assessing the performance of the Grading Contractor. The numerical test results from the compaction test cannot be used to predict the engineering performance of the compacted material. Therefore, the acceptance of compacted materials will also be dependent on the stability of that material. The Soils Engineer has the option of rejecting any compacted material regardless of the degree of compaction if that material is considered to be unstable or if future instability is suspected. A specific example of rejection of fill material passing the required percent compaction is a fill which has been compacted with an in-situ moisture content significantly less than optimum moisture. This type of dry fill (brittle fill) is susceptible to future settlement if it becomes saturated or flooded.

Testing and Inspection

A representative of Krazan & Associates, Inc. should be present at the site during the earthwork activities to confirm that actual subsurface conditions are consistent with the exploratory fieldwork. This activity is an integral part of our service, as acceptance of earthwork construction is dependent upon compaction testing and stability of the material. This representative can also verify that the intent of these recommendations is incorporated into the project design and construction. Krazan & Associates, Inc. will not be responsible for grades or staking, since this is the responsibility of the Prime Contractor.

LIMITATIONS

Soils Engineering is one of the newest divisions of Civil Engineering. This branch of Civil Engineering is constantly improving as new technologies and understanding of earth sciences advance. Although your site was analyzed using the most appropriate and most current techniques and methods, undoubtedly there will be substantial future improvements in this branch of engineering. In addition to advancements in the field of Soils Engineering, physical changes in the site, either due to excavation or fill placement, new agency regulations, or possible changes in the proposed structure after the soils report is completed may require the soils report to be professionally reviewed. In light of this, the Owner should be aware that there is a practical limit to the usefulness of this report without critical review. Although the time limit for this review is strictly arbitrary, it is suggested that 2 years be considered a reasonable time for the usefulness of this report.

Foundation and earthwork construction is characterized by the presence of a calculated risk that soil and groundwater conditions have been fully revealed by the original foundation investigation. This risk is derived from the practical necessity of basing interpretations and design conclusions on limited sampling of the earth. The recommendations made in this report are based on the assumption that soil conditions do not vary significantly from those disclosed during our field investigation. If any variations or undesirable conditions are encountered during construction, the Soils Engineer should be notified so that supplemental recommendations may be made.

The conclusions of this report are based on the information provided regarding the proposed construction. If the proposed construction is relocated or redesigned, the conclusions in this report may not be valid. The Soils Engineer should be notified of any changes so the recommendations may be reviewed and re-evaluated.

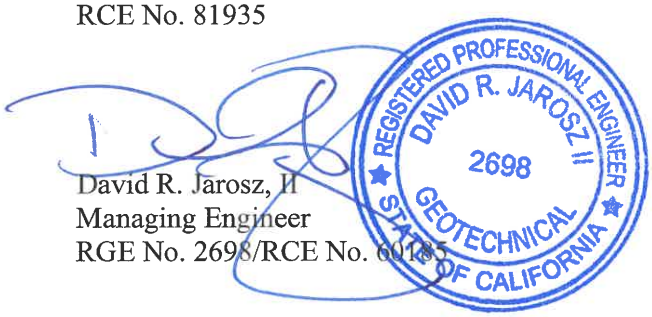
This report is a Geotechnical Engineering Investigation with the purpose of evaluating the soil conditions in terms of foundation design. The scope of our services did not include any Environmental Site Assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater, or atmosphere; or the presence of wetlands. Any statements, or absence of statements, in this report or on any boring log regarding odors, unusual or suspicious items, or conditions observed, are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous and/or toxic assessment.

The geotechnical engineering information presented herein is based upon professional interpretation utilizing standard engineering practices and a degree of conservatism deemed proper for this project. It is not warranted that such information and interpretation cannot be superseded by future geotechnical engineering developments. We emphasize that this report is valid for the project outlined above and should not be used for any other sites.

If you have any questions or if we may be of further assistance, please do not hesitate to contact our office at (951) 273-1011.

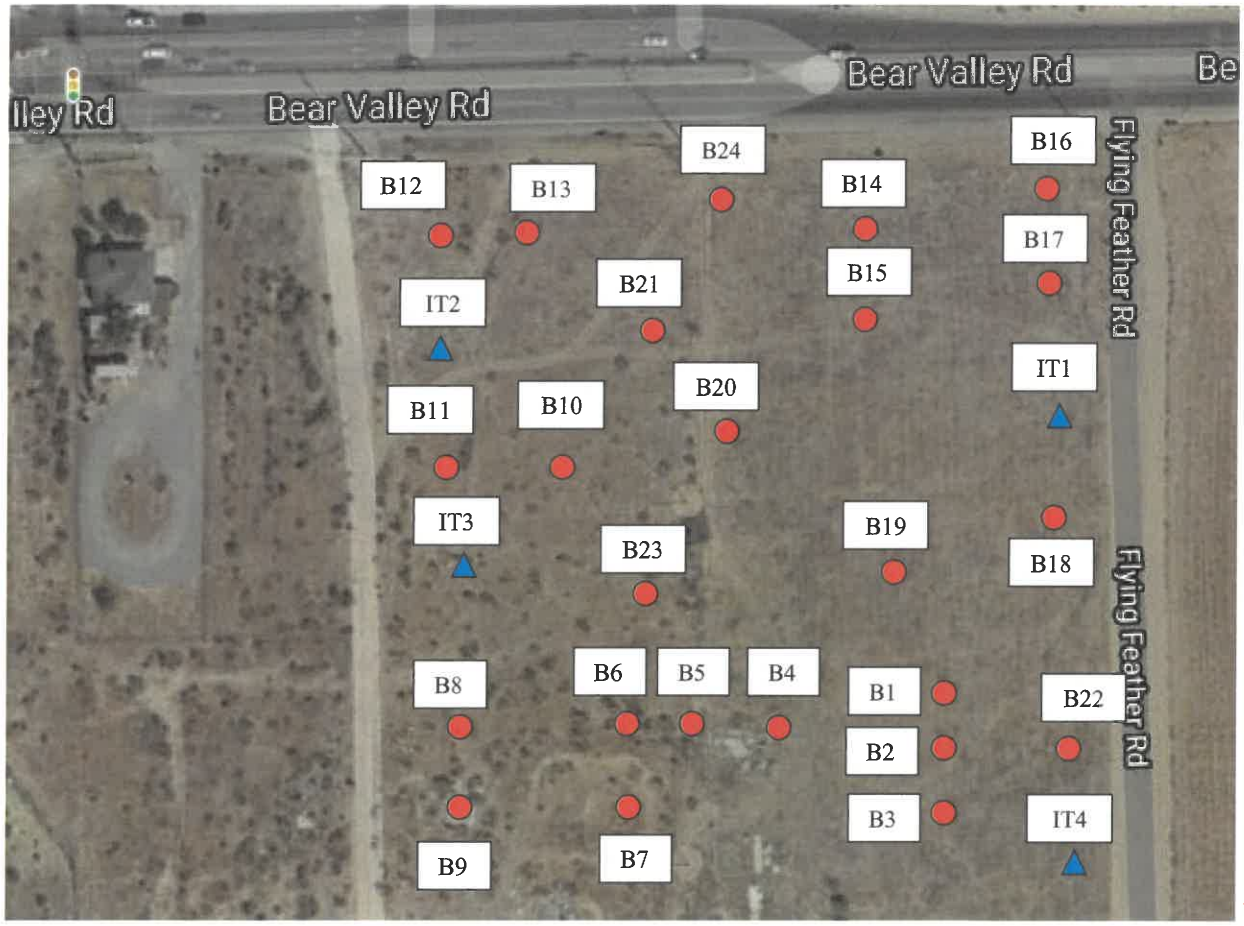
Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

Madison K. Weber, P.E.
Project Engineer
RCE No. 81935



David R. Jarosz, II
Managing Engineer
RGE No. 2698/RCE No. 60185

MKW/DRJ:ht

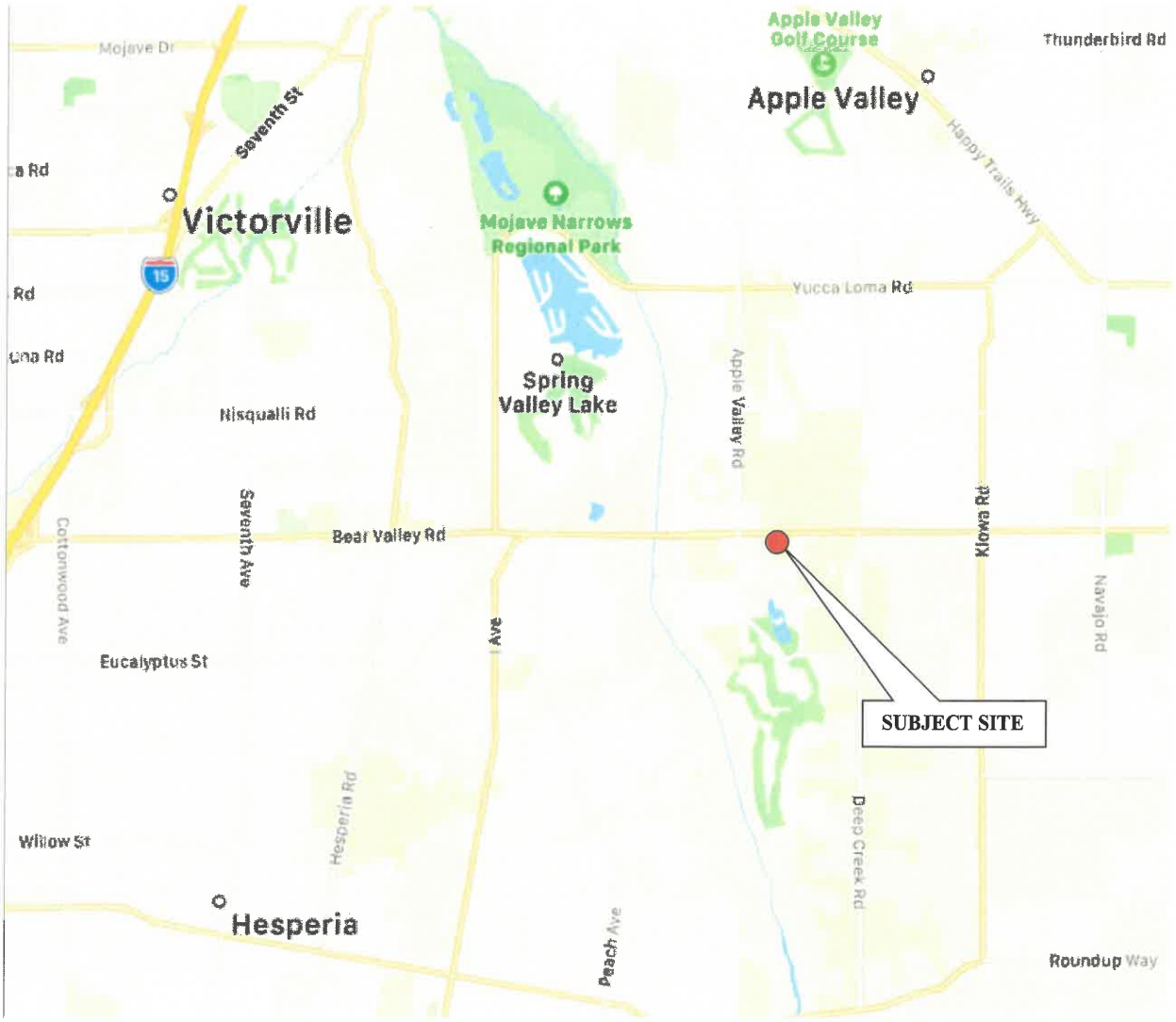


APPROXIMATE BORING LOCATION

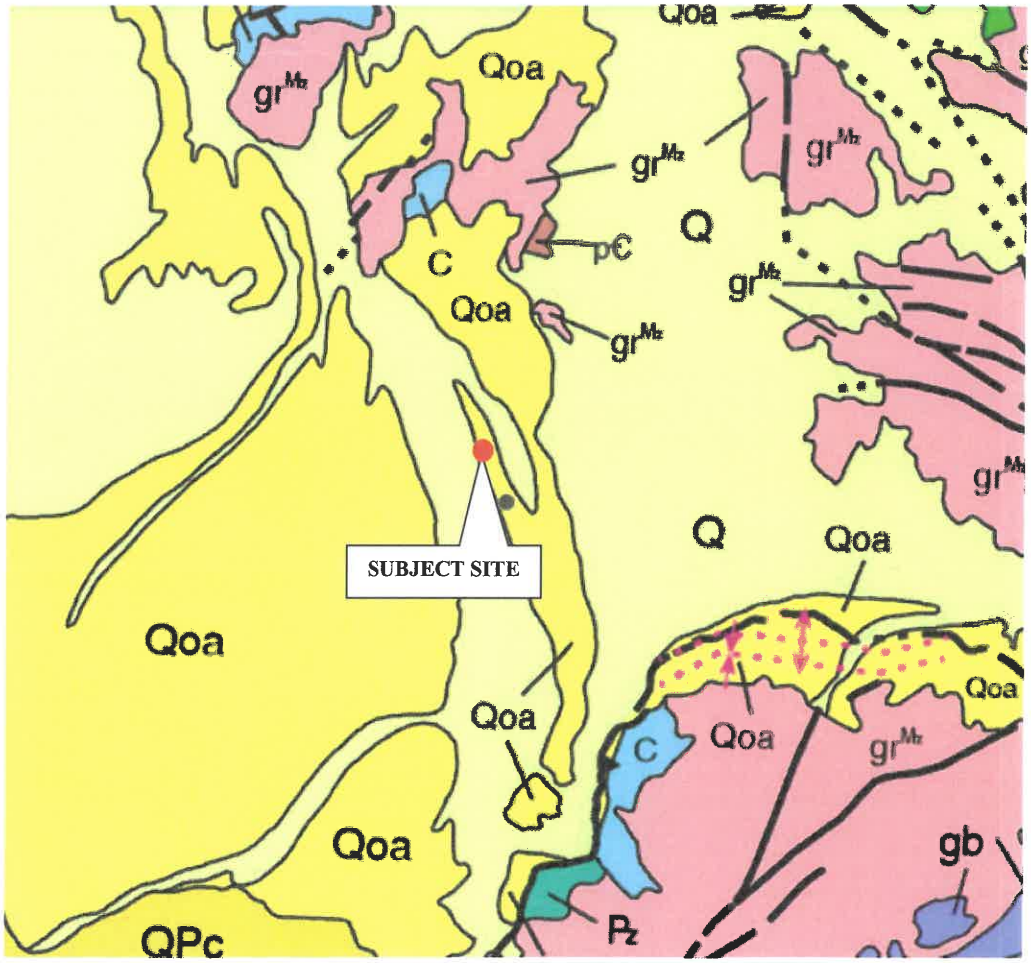
APPROXIMATE PERCOLATION/INFILTRATION TEST LOCATION

N
W
E
S

SITE MAP	Scale: Not to Scale	Date: Sept. 2021	Krazan GEOTECHNICAL ENGINEERING
PROPOSED APPLE BEAR RETAIL CENTER 19439 BEAR VALLEY ROAD APPLE VALLEY, CALIFORNIA	Drawn by: AM	Approved by: MW	
	Project No. 112-21076	Figure No. 2	



VICINITY MAP	**Scale:** Not to Scale	**Date:** Sept. 2021	Krazan GEOTECHNICAL ENGINEERING
PROPOSED APPLE BEAR RETAIL CENTER 19439 BEAR VALLEY ROAD APPLE VALLEY, CALIFORNIA	**Drawn by:** MW	**Approved by:** DJ	
	Project No. 112-21076	**Figure No.** 1	



DESCRIPTION OF MAP UNITS

QUATERNARY DEPOSITS

- Qs — Extensive marine and nonmarine sand deposits, generally near the coast or desert playas
- Q — Alluvium, lake, playa, and terrace deposits; unconsolidated and semi-consolidated
- Qls — Selected large landslides
- Qg — Glacial till and moraines. Found at high elevations mostl in the Sierra Nevada and Klamath Mountains
- Qoa — Older alluvium, lake, playa, and terrace deposits
- QPc — Pleistocene and/or Pliocene sandstone, shale, and gravels deposits; mostly loosely consolidated

QUATERNARY VOLCANIC ROCKS

- Qrv — Recent (Holocene) volcanic flow rocks; minor pyroclastic deposits
- Qrvᵖ — Recent (Holocene) pyroclastic and volcanic mudflow deposits
- Qv — Quaternary volcanic flow rocks; minor pyroclastic deposits
- Qvᵖ — Quaternary pyroclastic and volcanic mudflow deposits

MESOZOIC PLUTONIC ROCKS

- gr^Mz — Mesozoic granite, quartz monzonite, granodiorite, and quartz diorite
- um — Ultramafic rocks, mostly serpentine. Minor peridotite, gabbro, and diabase, chiefly Mesozoic
- gb — Gabbro and dark dioritic rocks, chiefly Mesozoic
- gr — Undated granitic rocks

PALEOZOIC SEDIMENTARY AND METASEDIMENTARY ROCKS

- Pz — Undivided Paleozoic metasedimentary rocks. Includes slate, sandstone, shale, chert, conglomerate, limestone, dolomite, marble, phyllite, schist, hornfels, and quartzite
- Pm — Permian shale, conglomerate, limestone, dolomite, sandstone, slate, hornfels, and quartzite; minor pyroclastic rocks
- C — Carboniferous shale, sandstone, conglomerate, limestone, dolomite, chert, hornfels, marble, and quartzite; in part pyroclastic rocks
- D — Devonian limestone, dolomite, sandstone, and shale; in part tuffaceous
- SO — Silurian to Ordovician sandstone, shale, conglomerate, chert, slate, quartzite, hornfels, marble, dolomite, and phyllite; some greenstone
- C — Cambrian sandstone, shale, limestone, dolomite, chert, quartzite, and phyllite; includes some rocks that are possibly Precambrian

SYMBOL EXPLANATION

Contact between geologic units - approximately located

Fault traces - solid where well located, dashed where approximately located or inferred, dotted where concealed, and queried where continuation or existence is uncertain. Ball and bar on downthrown side (relative or apparent) Arrows indicate direction of lateral movement (relative or apparent)

Thrust fault (barbs on upper plate)

Regional strike and dip of stratified rocks

Regional strike and dip of stratified rocks (overturned)

Anticlinal fold

Synclinal fold

Monoclinal fold

Source: Department of Conservation: Geologic Map of California, 2010

GEOLOGIC MAP	**Scale:** Not to Scale	**Date:** Sept. 2021
PROPOSED APPLE BEAR RETAIL CENTER 19439 BEAR VALLEY ROAD APPLE VALLEY, CALIFORNIA	**Drawn by:** MW	**Approved by:** DJ
	Project No. 112-21076	**Figure No.** 3

Krazan
GEOTECHNICAL ENGINEERING

APPENDIX A

FIELD AND LABORATORY INVESTIGATIONS

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploratory program. Twenty-four 5½-inch diameter exploratory borings were advanced. The boring locations are shown on the site plan.

The soils encountered were logged in the field during the exploration and, with supplementary laboratory test data, are described in accordance with the Unified Soil Classification System.

Modified standard penetration tests and standard penetration tests were performed at selected depths. These tests represent the resistance to driving a 2½-inch and 1½-inch diameter split barrel sampler, respectively. The driving energy was provided by a hammer weighing 140 pounds falling 30 inches. Relatively undisturbed soil samples were obtained while performing this test. Bag samples of the disturbed soil were obtained from the auger cuttings. The modified standard penetration tests are identified in the sample type on the boring logs with a full shaded in block. The standard penetration tests are identified in the sample type on the boring logs with half of the block shaded. All samples were returned to our Clovis laboratory for evaluation.

Laboratory Investigation

The laboratory investigation was programmed to determine the physical and mechanical properties of the foundation soil underlying the site. Test results were used as criteria for determining the engineering suitability of the surface and subsurface materials encountered.

In-situ moisture content, dry density, consolidation, direct shear, and sieve analysis tests were completed for the undisturbed samples representative of the subsurface material. R-value tests were completed for select bag samples obtained from the auger cuttings. These tests, supplemented by visual observation, comprised the basis for our evaluation of the site material.

The logs of the exploratory borings and laboratory determinations are presented in this Appendix.

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	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
	Gravels with fines (More than 12% fines)		
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	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
	Sands with fines (More than 12% fines)		
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)			
SILTS AND CLAYS Liquid limit less than 50%		ML	Inorganic silts and very fine sands, rock flour, silty of 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 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

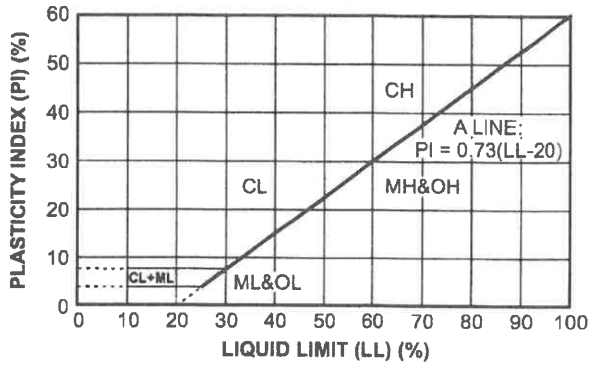
CONSISTENCY CLASSIFICATION

Description	Blows per Foot
Granular Soils	
Very Loose	< 5
Loose	5 – 15
Medium Dense	16 – 40
Dense	41 – 65
Very Dense	> 65
Cohesive Soils	
Very Soft	< 3
Soft	3 – 5
Firm	6 – 10
Stiff	11 – 20
Very Stiff	21 – 40
Hard	> 40

GRAIN SIZE CLASSIFICATION

Grain Type	*Standard Sieve Size*	*Grain Size in Millimeters*
Boulders	Above 12 inches	Above 305
Cobbles	12 to 13 inches	305 to 76.2
Gravel	3 inches to No. 4	76.2 to 4.76
Coarse-grained	3 to ¾ inches	76.2 to 19.1
Fine-grained	¾ inches to No. 4	19.1 to 4.76
Sand	No. 4 to No. 200	4.76 to 0.074
Coarse-grained	No. 4 to No. 10	4.76 to 2.00
Medium-grained	No. 10 to No. 40	2.00 to 0.042
Fine-grained	No. 40 to No. 200	0.042 to 0.074
Silt and Clay	Below No. 200	Below 0.074

PLASTICITY CHART



Log of Boring B1

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

Figure No.: A-1

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0		***SAND (SP)*** Very loose, fine- to medium-grained; brown, damp, drills easily Medium dense below 12 inches				
2			115.9	2.6		39
4						
6		***SILTY SAND (SM)*** Very dense, fine- to medium-grained; brown, damp, drills firmly	106.1	3.7		50+
8						
10		Dense below 10 feet				56
12						
14						
16		***SILTY SAND/SAND (SM/SP)*** Medium dense, fine- to medium-grained; brown, damp, drills easily		2.5		26
18						
20						

Penetration Test blows/ft: 20 40 60

Water Content (%): 10 20 30 40

Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 50 Feet

Log of Boring B1

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

Figure No.: A-1

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
22		***SILTY SAND (SM)*** Medium dense, fine- to medium-grained; brown, damp, drills easily		1.2		28
24						
26				3.9		29
28						
30		***SILTY SAND/SAND (SM/SP)*** Medium dense, fine- to medium-grained; brown, damp, drills easily		2.6		17
32						
34						
36		***SILTY SAND (SM)*** Medium dense, fine- to medium-grained; brown, damp, drills easily		5.4		18
38						
40		Dense and drills firmly below 40 feet				

Penetration Test blows/ft: 20 40 60

Water Content (%): 10 20 30 40

Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 50 Feet

Log of Boring B1

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

Figure No.: A-1

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
				12.6		34
42						
44						
46		***SILTY SAND/SAND (SM/SP)*** Dense, fine- to medium-grained; brown, damp, drills firmly		2.1		30
48						
50		***SILTY SAND (SM)*** Very dense, fine- to medium-grained; brown, damp, drills firmly		5.5		54
		End of Borehole				
52						
54		Water not encountered Boring backfilled with soil cuttings				
56						
58						
60						

Penetration Test blows/ft: 20 40 60

Water Content (%): 10 20 30 40

Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 50 Feet

Log of Boring B2

Project: Retail Center

Project No: 112-21076

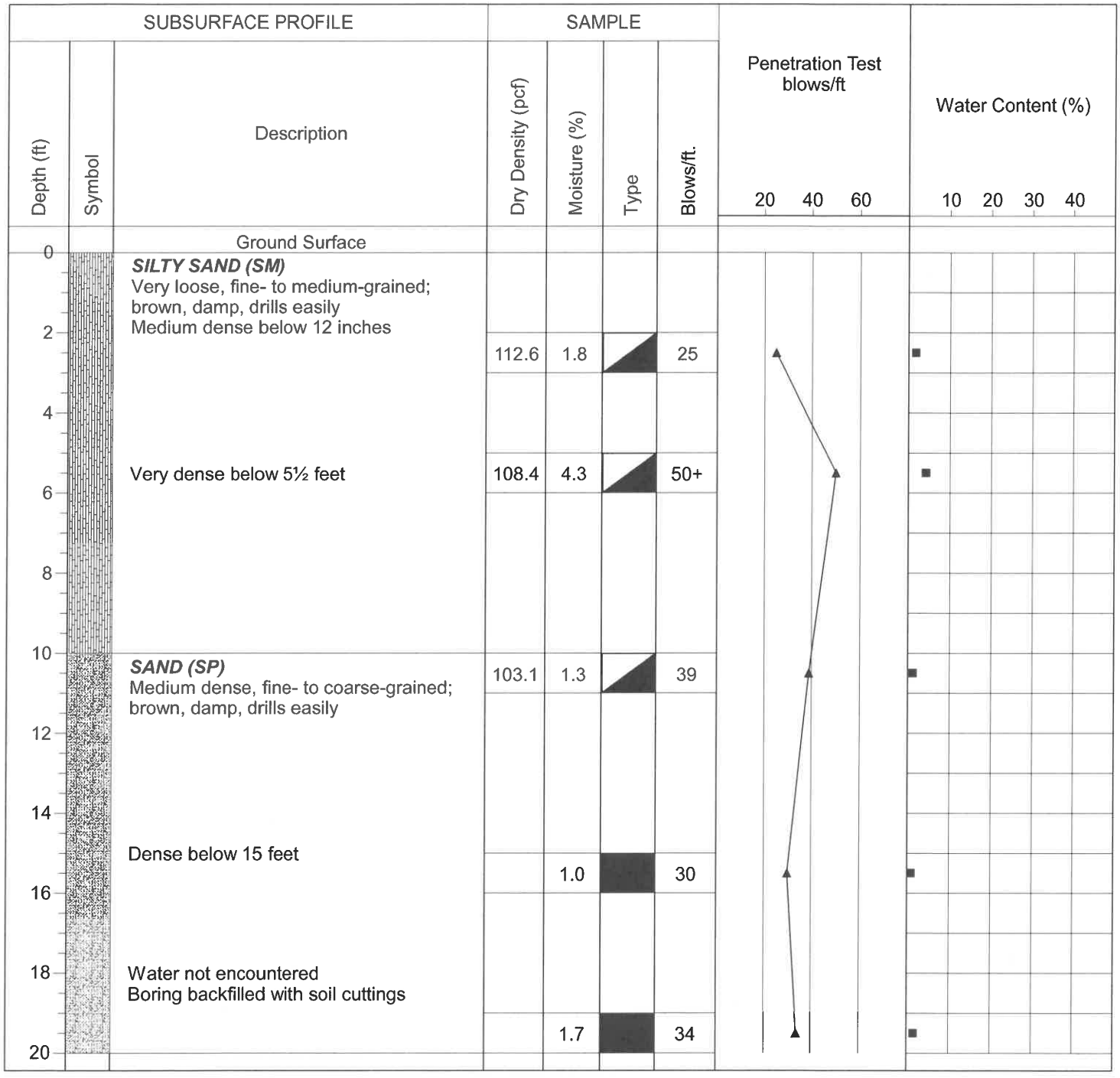
Client: Wood Investments

Figure No.: A-2

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A



Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 20 Feet

Sheet: 1 of 1

Log of Boring B3

Project: Retail Center

Project No: 112-21076

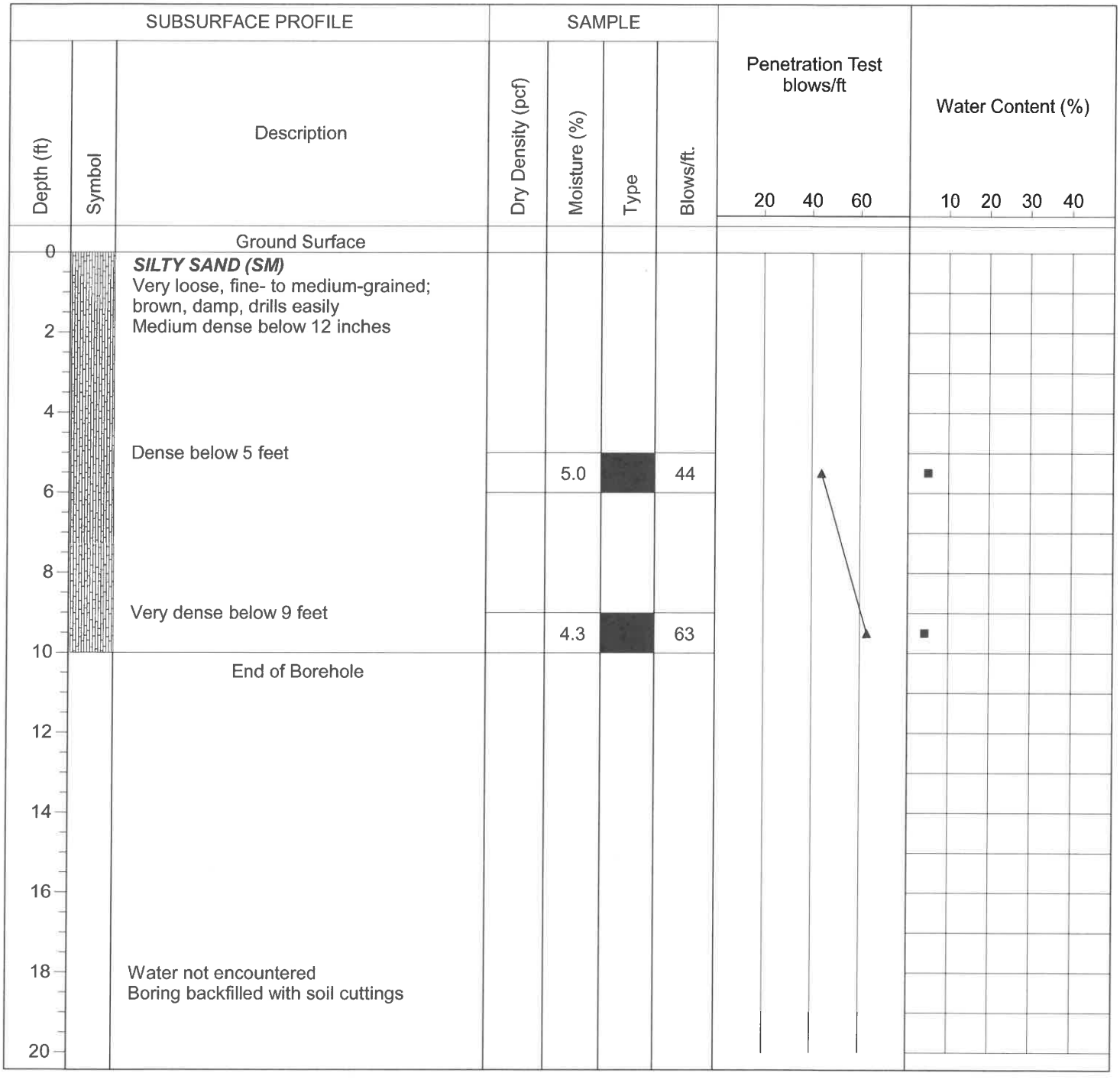
Client: Wood Investments

Figure No.: A-3

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A



Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 10 Feet

Sheet: 1 of 1

Log of Boring B4

Project: Retail Center

Project No: 112-21076

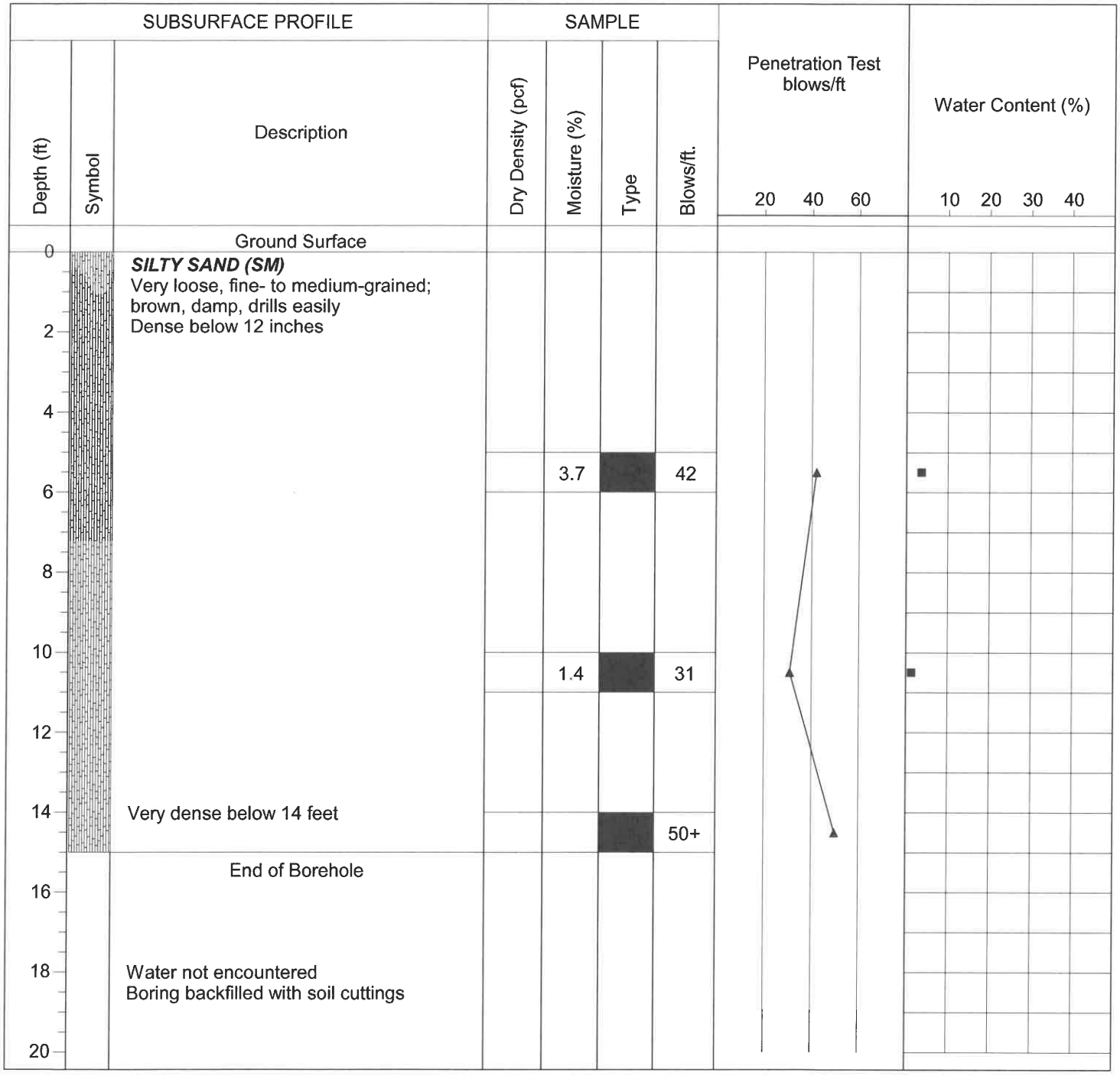
Client: Wood Investments

Figure No.: A-4

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A



Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 15 Feet

Sheet: 1 of 1

Log of Boring B5

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

Figure No.: A-5

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0		***SILTY SAND (SM)*** Very loose, fine- to medium-grained; brown, damp, drills easily Very dense below 12 inches				
2			113.9	6.5		50+
4		Medium dense below 5 feet				
6			109.6	3.3		30
8						
10		Very dense below 10 feet	101.6	2.4		50+
12						
14		Dense below 15 feet		0.9		34
16						
18						
20		Medium dense below 20 feet				

Penetration Test blows/ft: 20 40 60

Water Content (%): 10 20 30 40

Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 25 Feet

Log of Boring B5

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

Figure No.: A-5

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20 40 60	10 20 30 40
				14.3		14		
22								
24				12.6		17		
		End of Borehole						
26								
28								
30								
32								
34								
		Water not encountered Boring backfilled with soil cuttings						
36								
38								
40								

Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 25 Feet

Sheet: 2 of 2

Log of Boring B6

Project: Retail Center

Project No: 112-21076

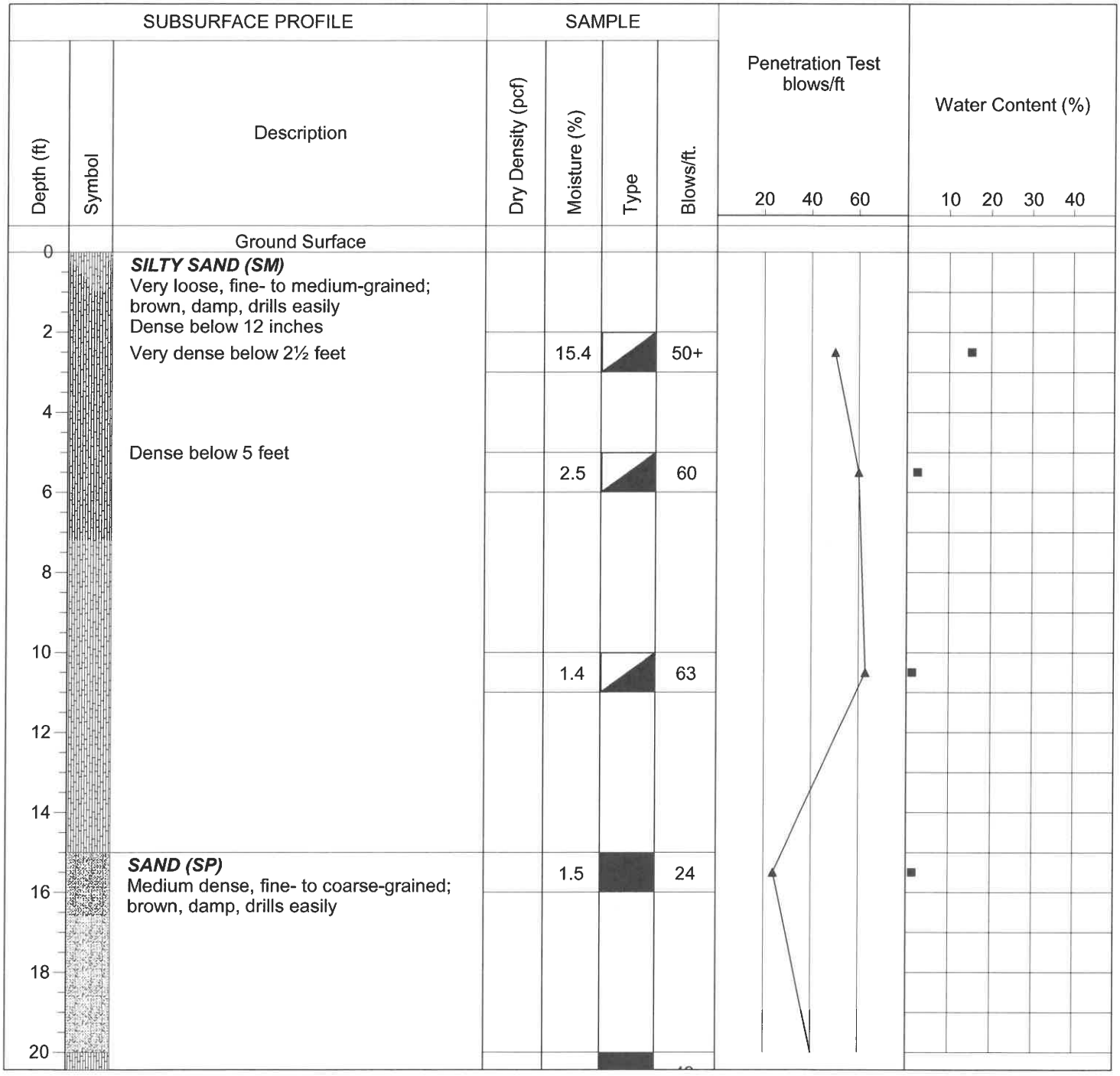
Client: Wood Investments

Figure No.: A-6

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A



Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 25 Feet

Log of Boring B6

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

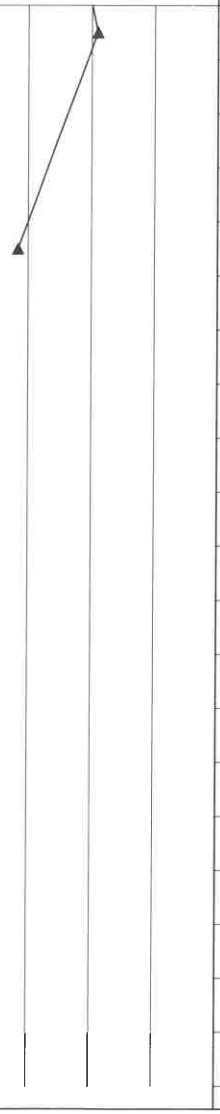
Figure No.: A-6

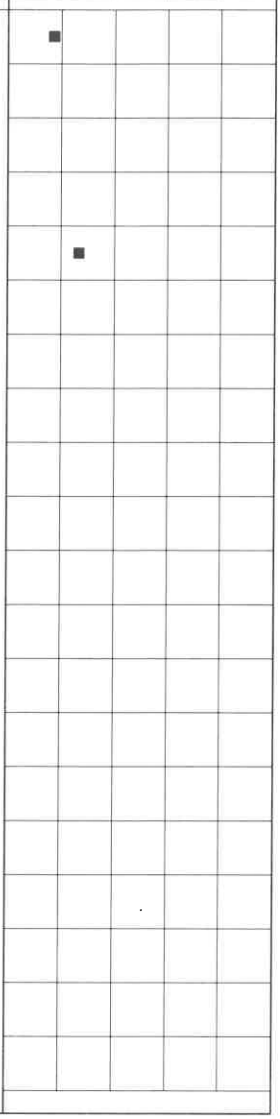
Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
22		***SILTY SAND (SM)*** Dense, fine- to medium-grained; brown, damp, drills firmly		8.7		42
24		Medium dense below 24 feet		13.4		17
26		End of Borehole				
28						
30						
32						
34		Water not encountered Boring backfilled with soil cuttings				
36						
38						
40						





Drill Method: Hollow Stem

Drill Rig: CME 75

Driller: Whitcomb Drilling, Inc.

Krazan and Associates

Drill Date: 7-29-21

Hole Size: 5½ Inches

Elevation: 25 Feet

Log of Boring B7

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

Figure No.: A-7

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0		***SILTY SAND (SM)*** Very loose, fine- to medium-grained; brown, damp, drills easily Medium dense below 12 inches				
4		Dense below 5 feet		3.0		37
8		***SAND (SP)*** Medium dense, fine- to coarse-grained; brown, damp, drills easily		1.0		26
12		***SILTY SAND (SM)*** Medium dense, fine- to medium-grained; brown, damp, drills easily		3.7		23
14		End of Borehole				
16		Water not encountered Boring backfilled with soil cuttings				
18						
20						

Penetration Test blows/ft: 20 40 60

Water Content (%): 10 20 30 40

Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 15 Feet

Sheet: 1 of 1

Log of Boring B8

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

Figure No.: A-8

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20 40 60	10 20 30 40
0		Ground Surface						
0		***SILTY SAND (SM)*** Very loose, fine- to medium-grained; brown, damp, drills easily Dense below 12 inches Very dense below 2 feet						
2			113.9	5.6		50+		
4								
6			117.2	4.9		79		
8								
10						50+		
12								
14								
16				2.0		46		
18								
20								

Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 25 Feet

Log of Boring B8

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

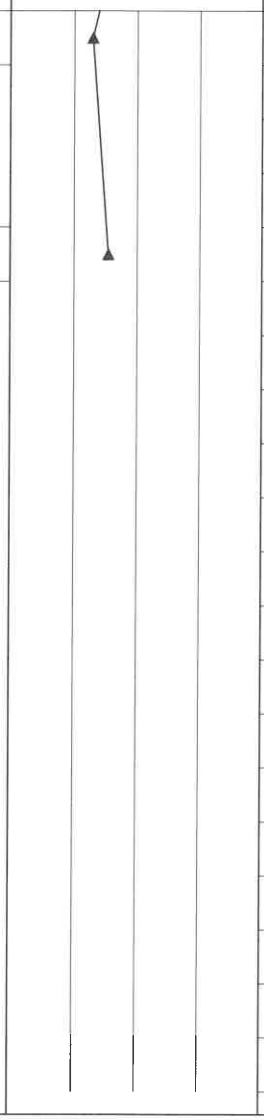
Figure No.: A-8

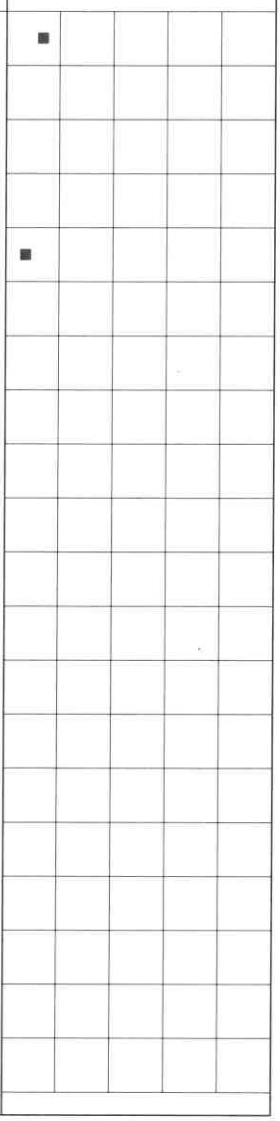
Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
22		***SAND (SP)*** Medium dense, fine- to coarse-grained; brown, damp, drills easily		7.0		26
24		Dense below 24 feet		3.8		31
26		End of Borehole				
28						
30						
32						
34						
36		Water not encountered Boring backfilled with soil cuttings				
38						
40						





Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 25 Feet

Log of Boring B9

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

Figure No.: A-9

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0		***SILTY SAND (SM)*** Very loose, fine- to medium-grained; brown, damp, drills easily Medium dense below 12 inches				
6				8.3		20
10		***SAND (SP)*** Medium dense, fine- to coarse-grained; brown, damp, drills easily		1.5		20
14		Dense below 14 feet		1.0		32
15		End of Borehole				
18		Water not encountered Boring backfilled with soil cuttings				

Penetration Test blows/ft: 20 40 60

Water Content (%): 10 20 30 40

Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 15 Feet

Sheet: 1 of 1

Log of Boring B10

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

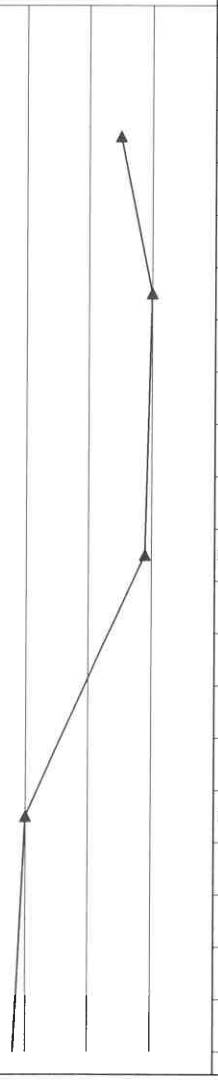
Figure No.: A-10

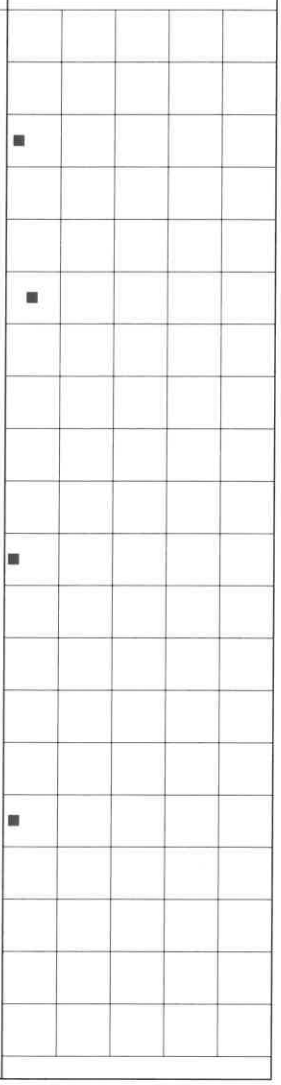
Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
		SUBSURFACE PROFILE / SAMPLE				
0		Ground Surface				
0		***SILTY SAND (SM)*** Very loose, fine- to medium-grained; brown, damp, drills easily				
2		Dense below 12 inches Very dense below 2 feet	110.4	2.3		50+
4		Dense below 5 feet	113.3	4.9		60
6						
8						
10		***SAND (SP)*** Dense, fine- to coarse-grained; brown/light red, damp, drills firmly	100.0	1.7		58
12						
14		Medium dense below 15 feet		2.0		20
16						
18						
20						





Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 25 Feet

Log of Boring B10

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

Figure No.: A-10

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
22		***SILTY SAND (SM)*** Medium dense, fine- to medium-grained; brown, damp, drills easily		15.4		16
24				16.0		10
26		End of Borehole				
28						
30						
32						
34						
36		Water not encountered Boring backfilled with soil cuttings				
38						
40						

Penetration Test blows/ft: 20 40 60

Water Content (%): 10 20 30 40

Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 25 Feet

Log of Boring B11

Project: Retail Center

Project No: 112-21076

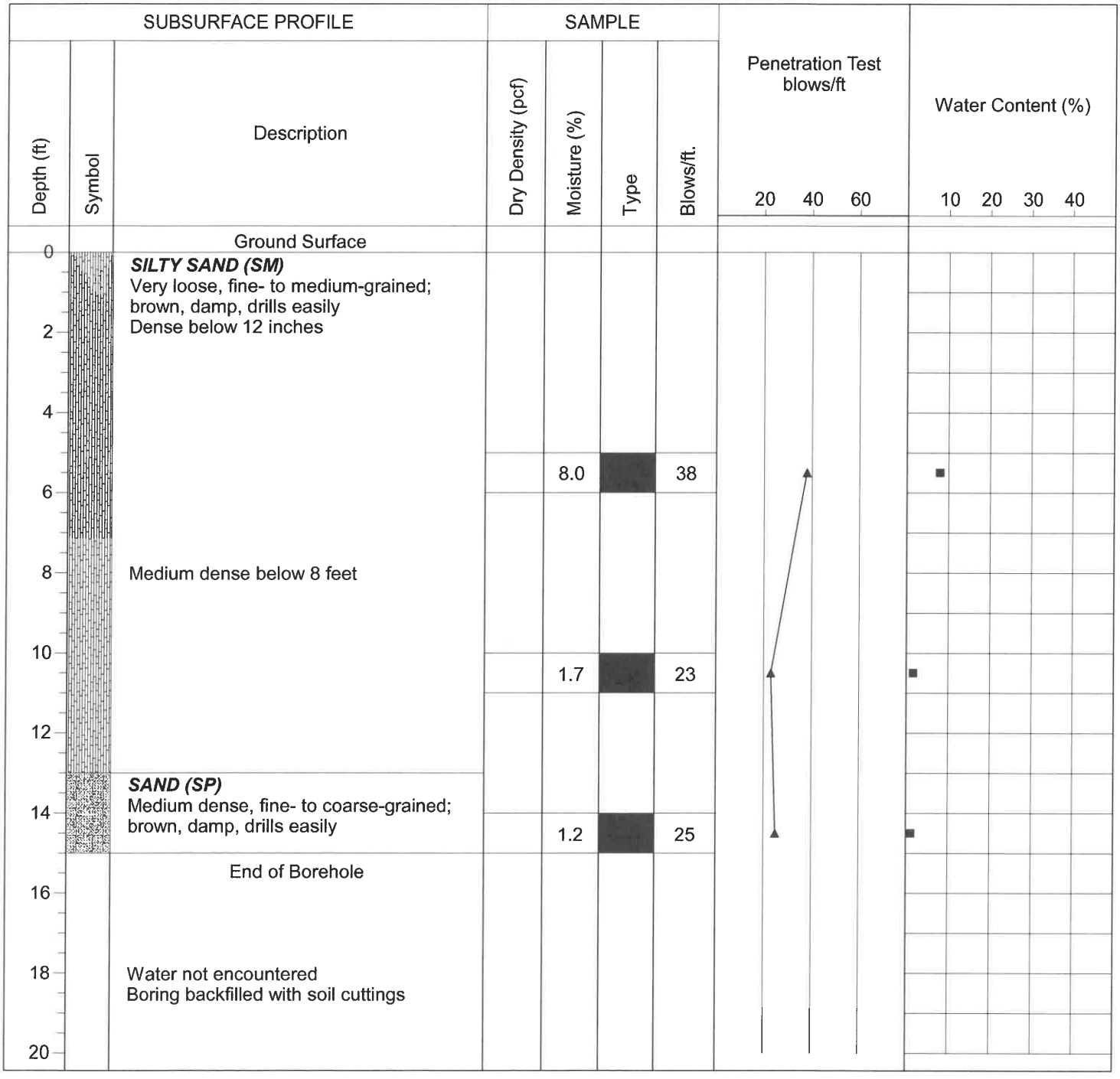
Client: Wood Investments

Figure No.: A-11

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A



Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 15 Feet

Sheet: 1 of 1

Log of Boring B12

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

Figure No.: A-12

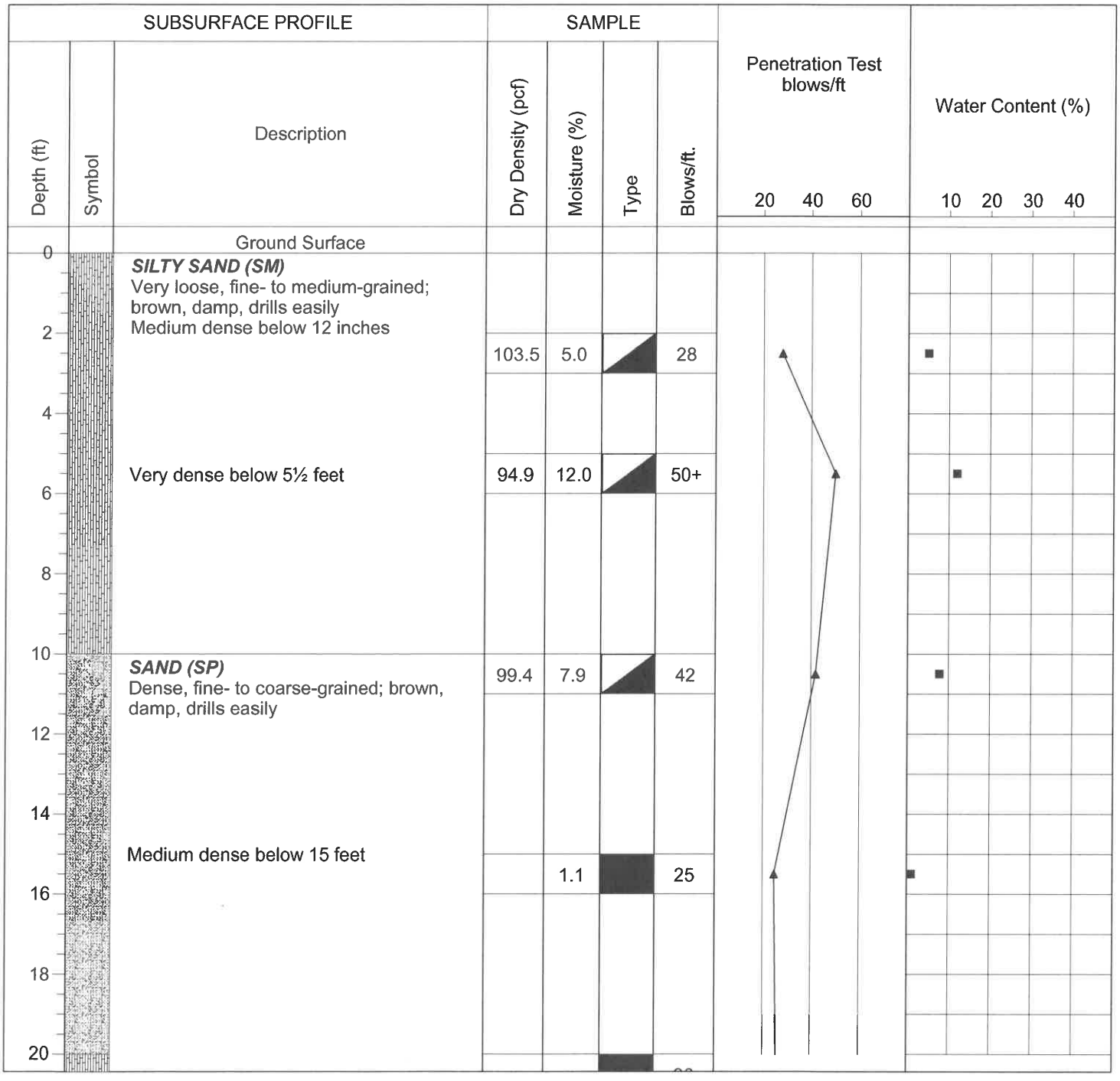
Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered

Initial: N/A

At Completion: N/A



Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 25 Feet

Log of Boring B12

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

Figure No.: A-12

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
22		***SILTY SAND (SM)*** Medium dense, fine- to medium-grained; brown, damp, drills easily		8.5		26
24				17.7		19
26		End of Borehole				
28						
30						
32						
34		Water not encountered Boring backfilled with soil cuttings				
36						
38						
40						

Penetration Test blows/ft: 20, 40, 60

Water Content (%): 10, 20, 30, 40

Drill Method: Hollow Stem

Drill Rig: CME 75

Driller: Whitcomb Drilling, Inc.

Krazan and Associates

Drill Date: 7-29-21

Hole Size: 5½ Inches

Elevation: 25 Feet

Log of Boring B13

Project: Retail Center

Project No: 112-21076

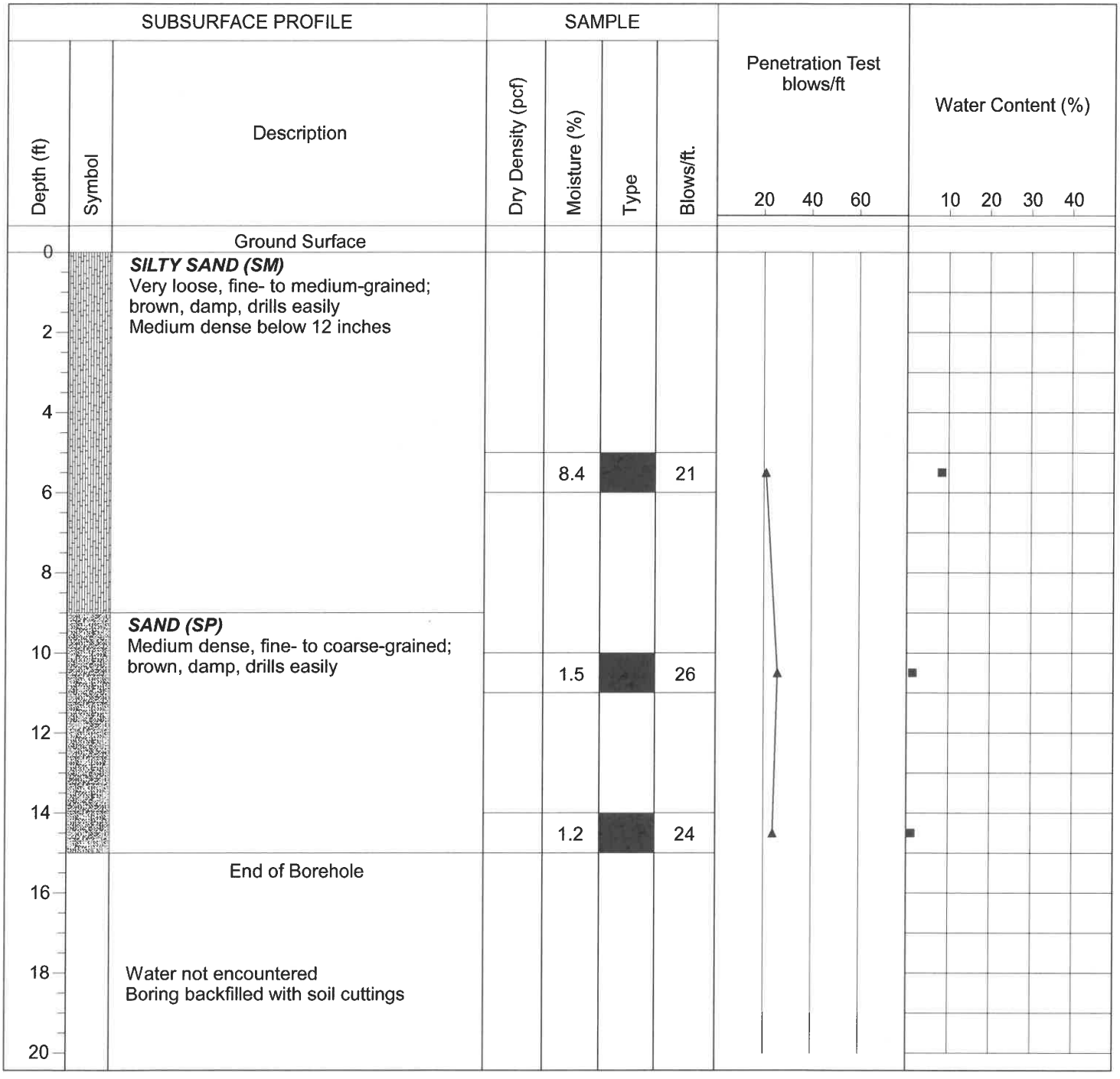
Client: Wood Investments

Figure No.: A-13

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A



Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 15 Feet

Sheet: 1 of 1

Log of Boring B14

Project: Retail Center

Project No: 112-21076

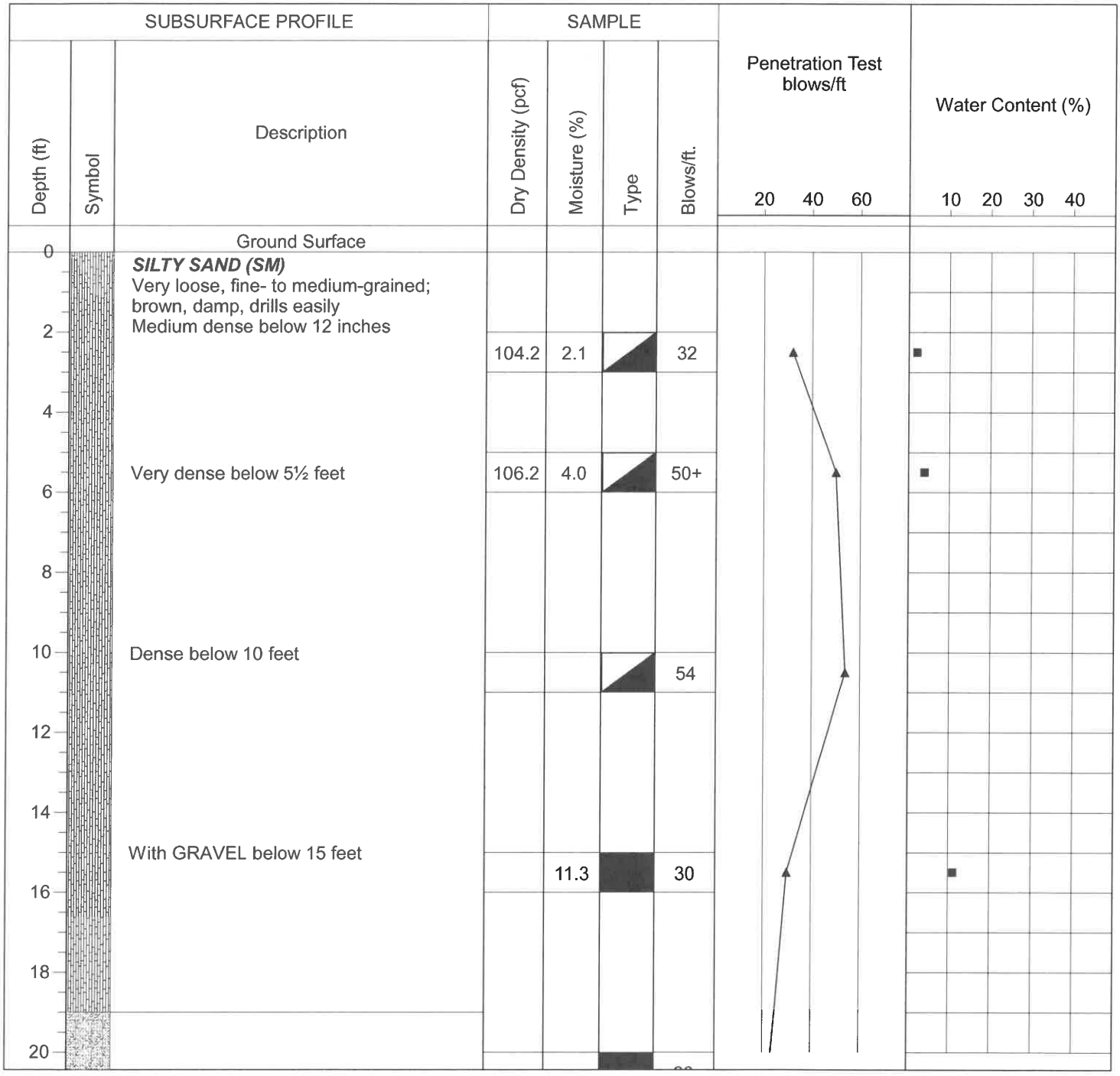
Client: Wood Investments

Figure No.: A-14

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A



Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 25 Feet

Log of Boring B14

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

Figure No.: A-14

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20 40 60	10 20 30 40
22		***SAND (SP)*** Medium dense, fine- to coarse-grained; brown, damp, drills easily		15.7		23		
24		***SILTY SAND (SM)*** Medium dense, fine- to medium-grained; brown, damp, drills easily		3.0		17		
26		End of Borehole						
28								
30								
32								
34								
36		Water not encountered Boring backfilled with soil cuttings						
38								
40								

Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 25 Feet

Log of Boring B15

Project: Retail Center

Project No: 112-21076

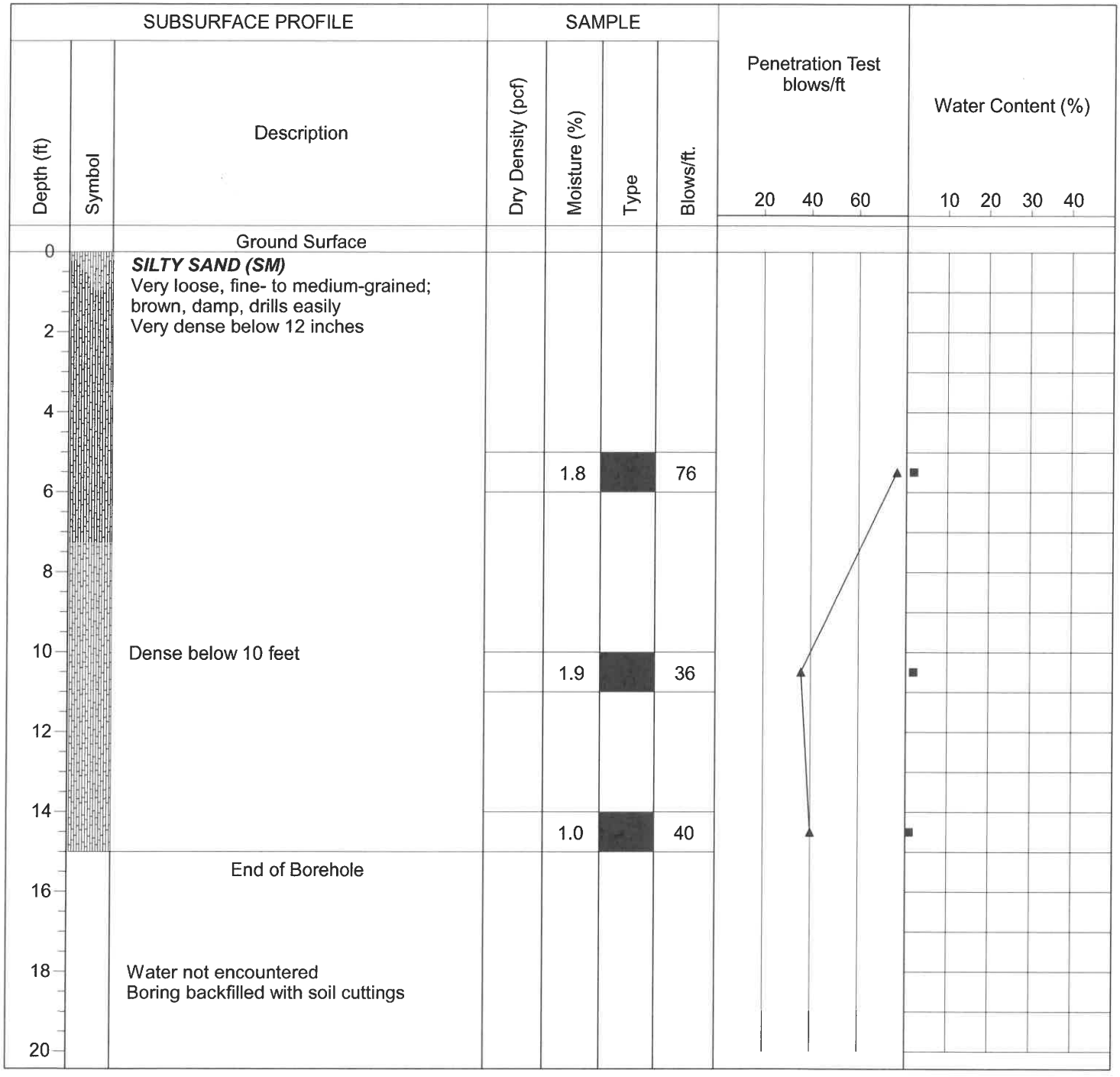
Client: Wood Investments

Figure No.: A-15

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A



Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 15 Feet

Sheet: 1 of 1

Log of Boring B16

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

Figure No.: A-16

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0		***SILTY SAND (SM)*** Very loose, fine- to medium-grained; brown, damp, drills easily Dense below 12 inches				
2			105.1	1.9		46
4						
6		Very dense below 5½ feet	90.7	2.2		50+
8						
10		Dense below 10 feet				48
12						
14						
16		***SANDY SILT (ML)*** Medium dense, fine- to medium-grained; brown, damp, drills easily		18.6		20
18						
20						

Penetration Test blows/ft: 20 40 60

Water Content (%): 10 20 30 40

Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 25 Feet

Log of Boring B16

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

Figure No.: A-16

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
				1.9		15
22						
		SAND (SP) Medium dense, fine- to coarse-grained; brown, damp, drills easily		11.2		17
24						
		End of Borehole				
26						
28						
30						
32						
34						
		Water not encountered Boring backfilled with soil cuttings				
36						
38						
40						

Penetration Test blows/ft: 20, 40, 60

Water Content (%): 10, 20, 30, 40

Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 25 Feet

Log of Boring B17

Project: Retail Center

Project No: 112-21076

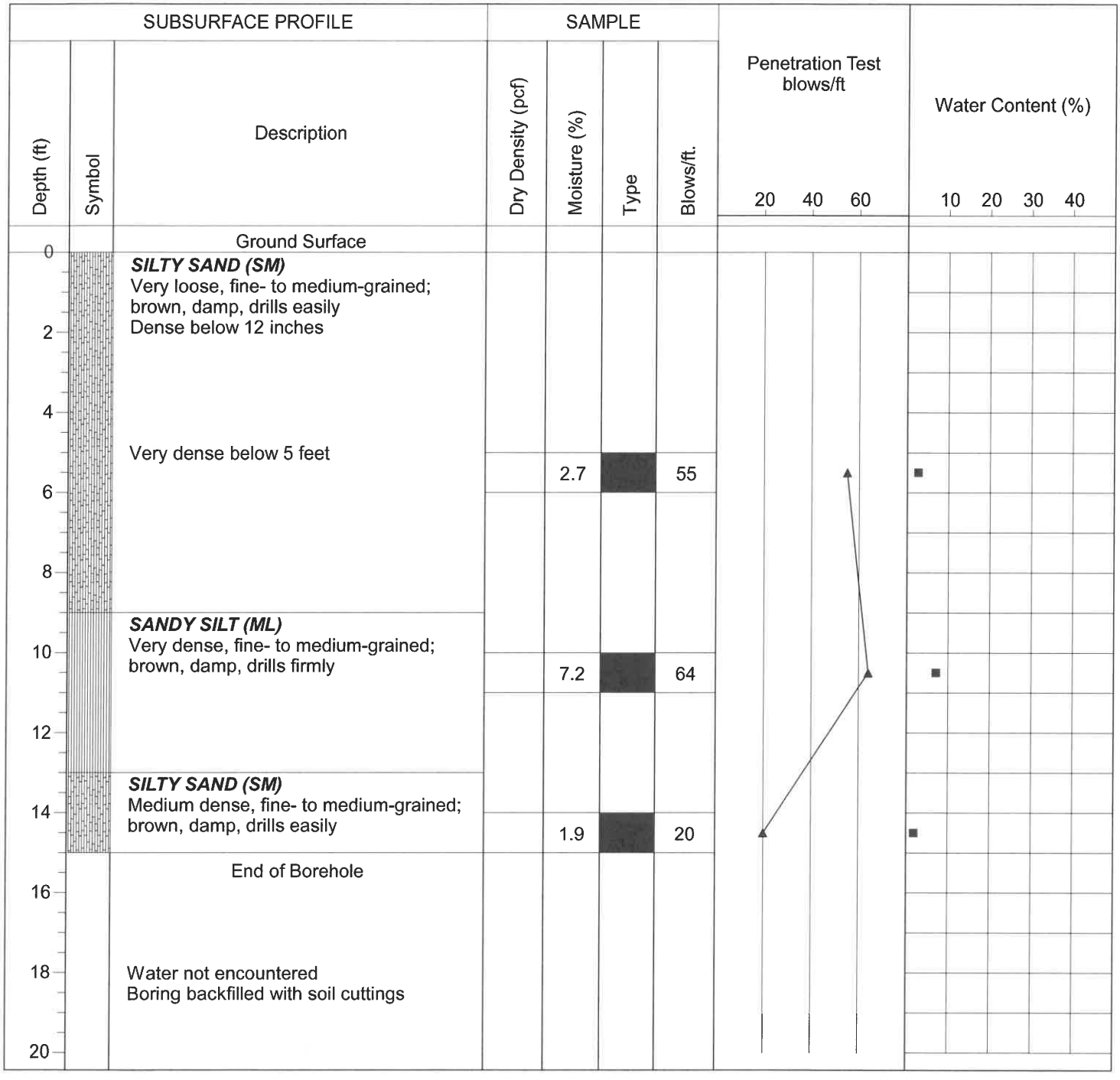
Client: Wood Investments

Figure No.: A-17

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A



Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 15 Feet

Sheet: 1 of 1

Log of Boring B18

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

Figure No.: A-18

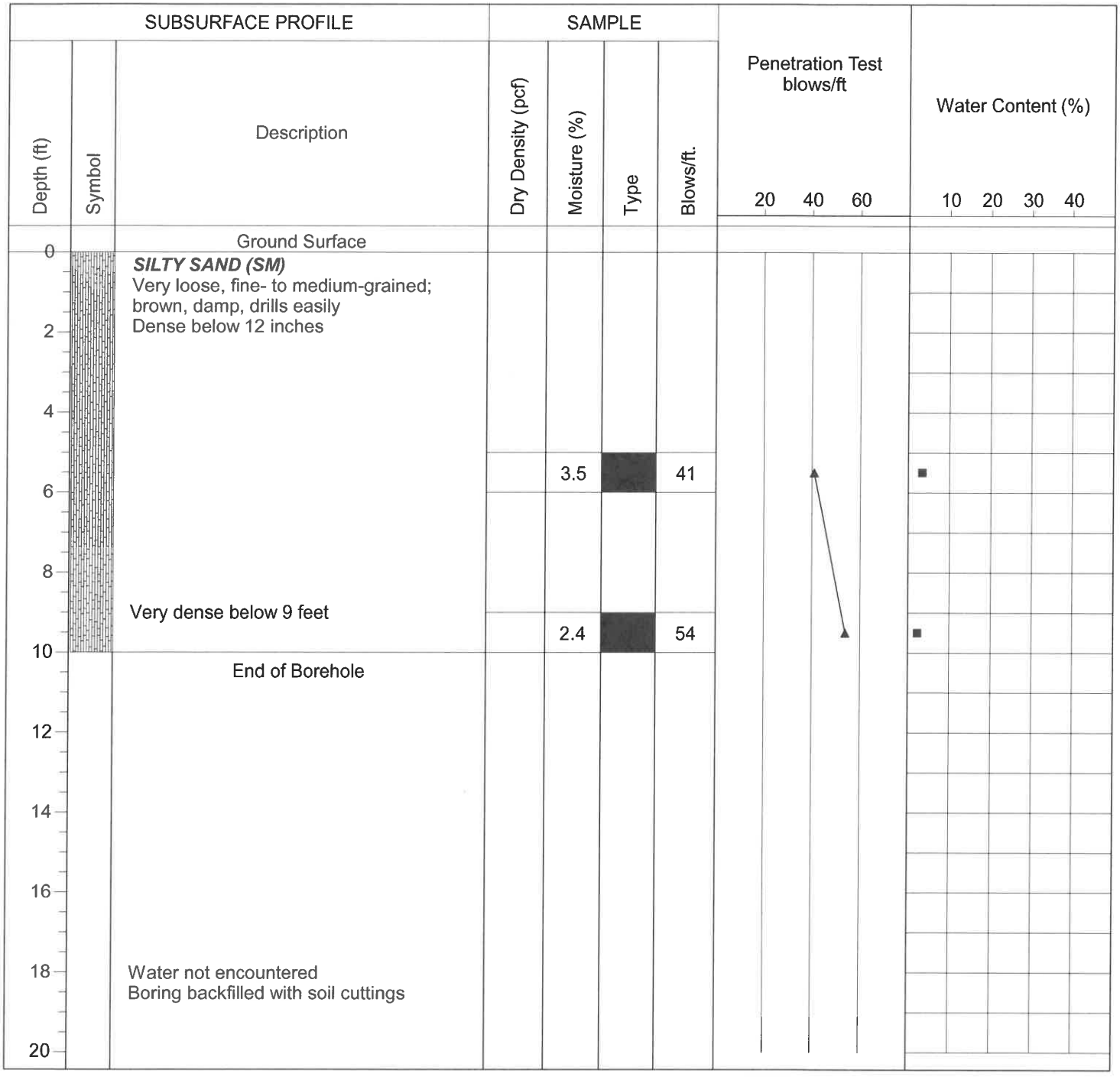
Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered

Initial: N/A

At Completion: N/A



Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 10 Feet

Sheet: 1 of 1

Log of Boring B19

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

Figure No.: A-19

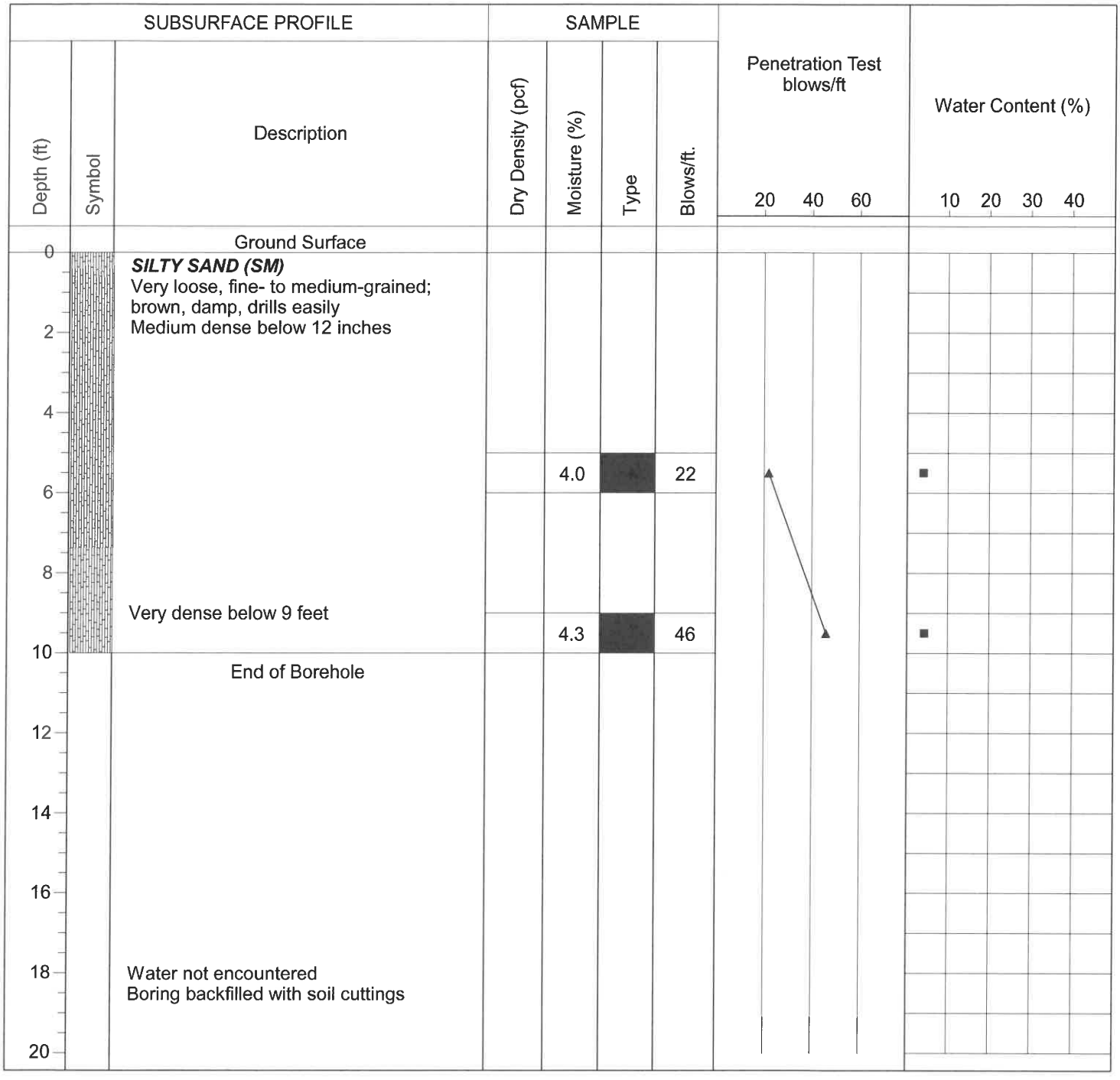
Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered

Initial: N/A

At Completion: N/A



Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 10 Feet

Sheet: 1 of 1

Log of Boring B20

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

Figure No.: A-20

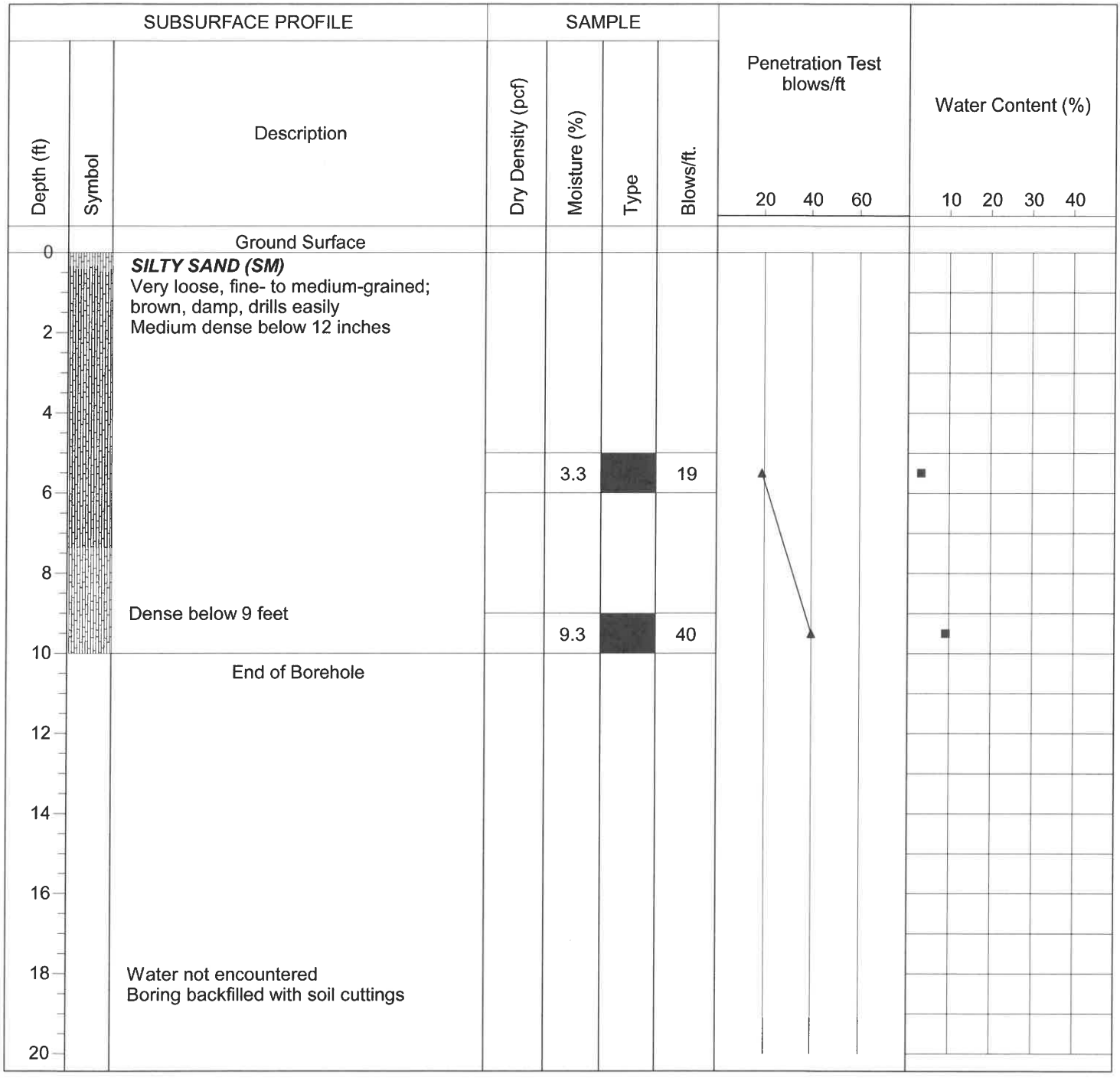
Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered

Initial: N/A

At Completion: N/A



Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 10 Feet

Log of Boring B21

Project: Retail Center

Project No: 112-21076

Client: Wood Investments

Figure No.: A-21

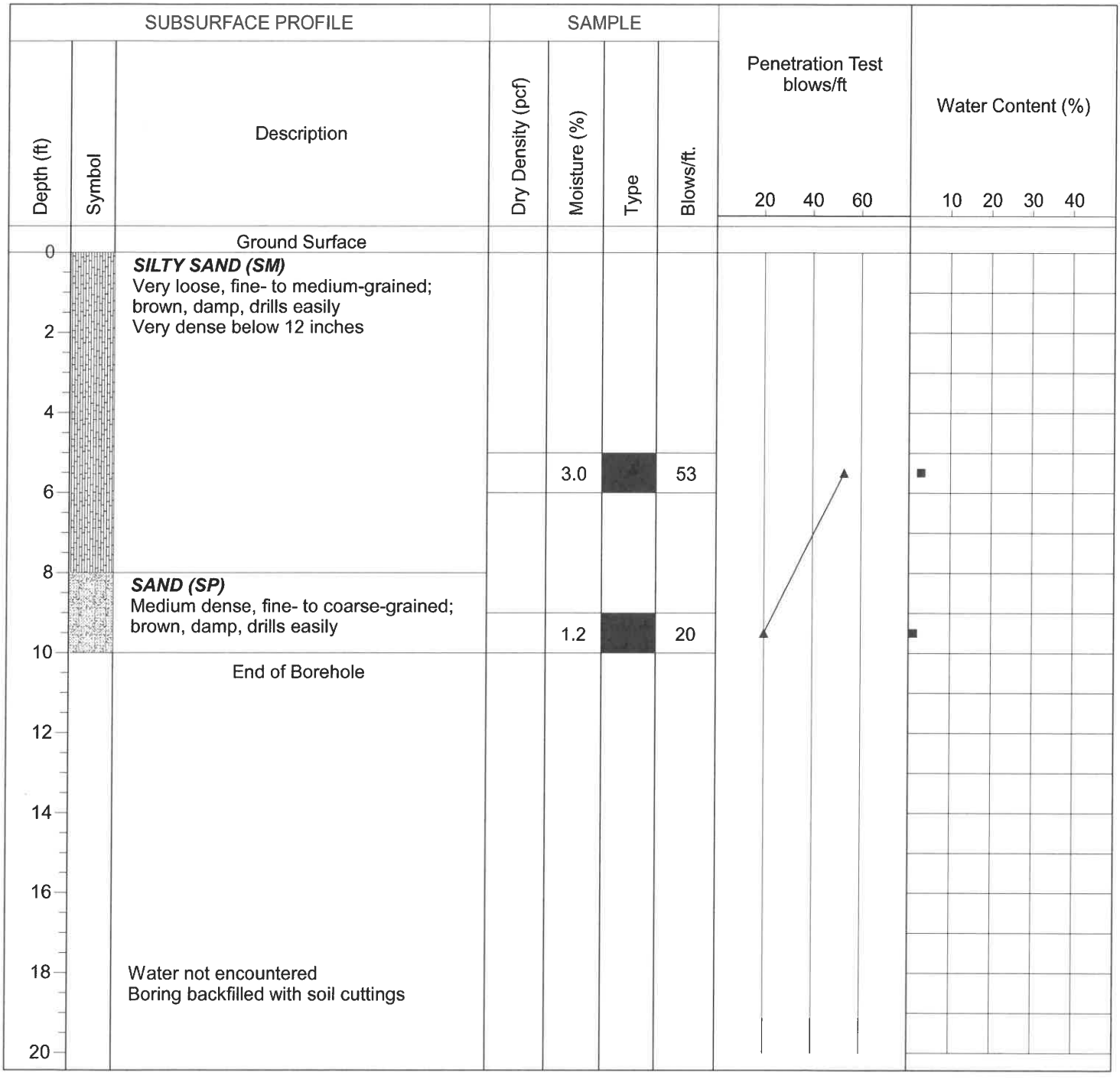
Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered

Initial: N/A

At Completion: N/A



Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 10 Feet

Sheet: 1 of 1

Log of Boring B22

Project: Retail Center

Project No: 112-21076

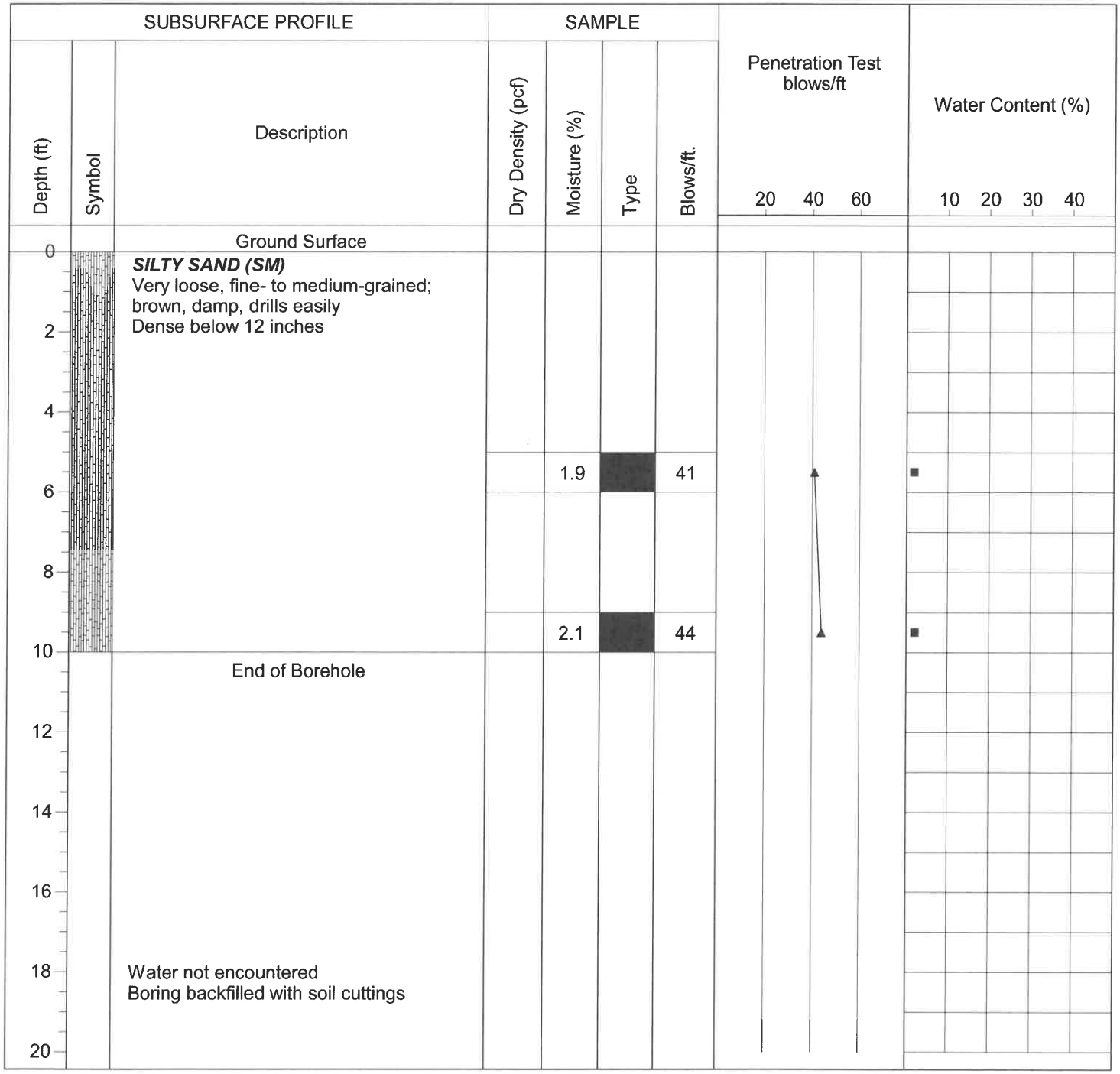
Client: Wood Investments

Figure No.: A-22

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A



Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 10 Feet

Sheet: 1 of 1

Log of Boring B23

Project: Retail Center

Project No: 112-21076

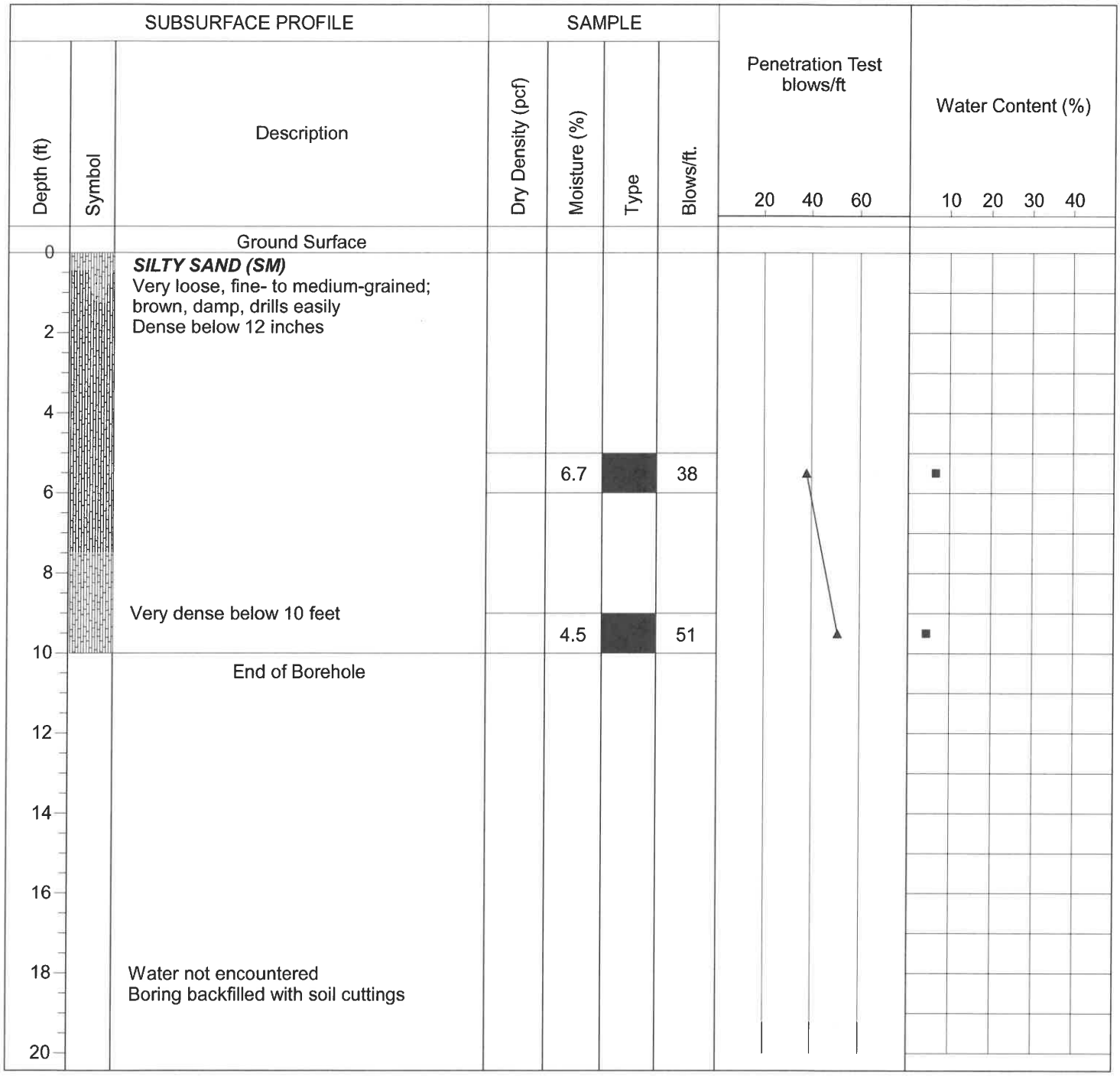
Client: Wood Investments

Figure No.: A-23

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A



Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 10 Feet

Sheet: 1 of 1

Log of Boring B24

Project: Retail Center

Project No: 112-21076

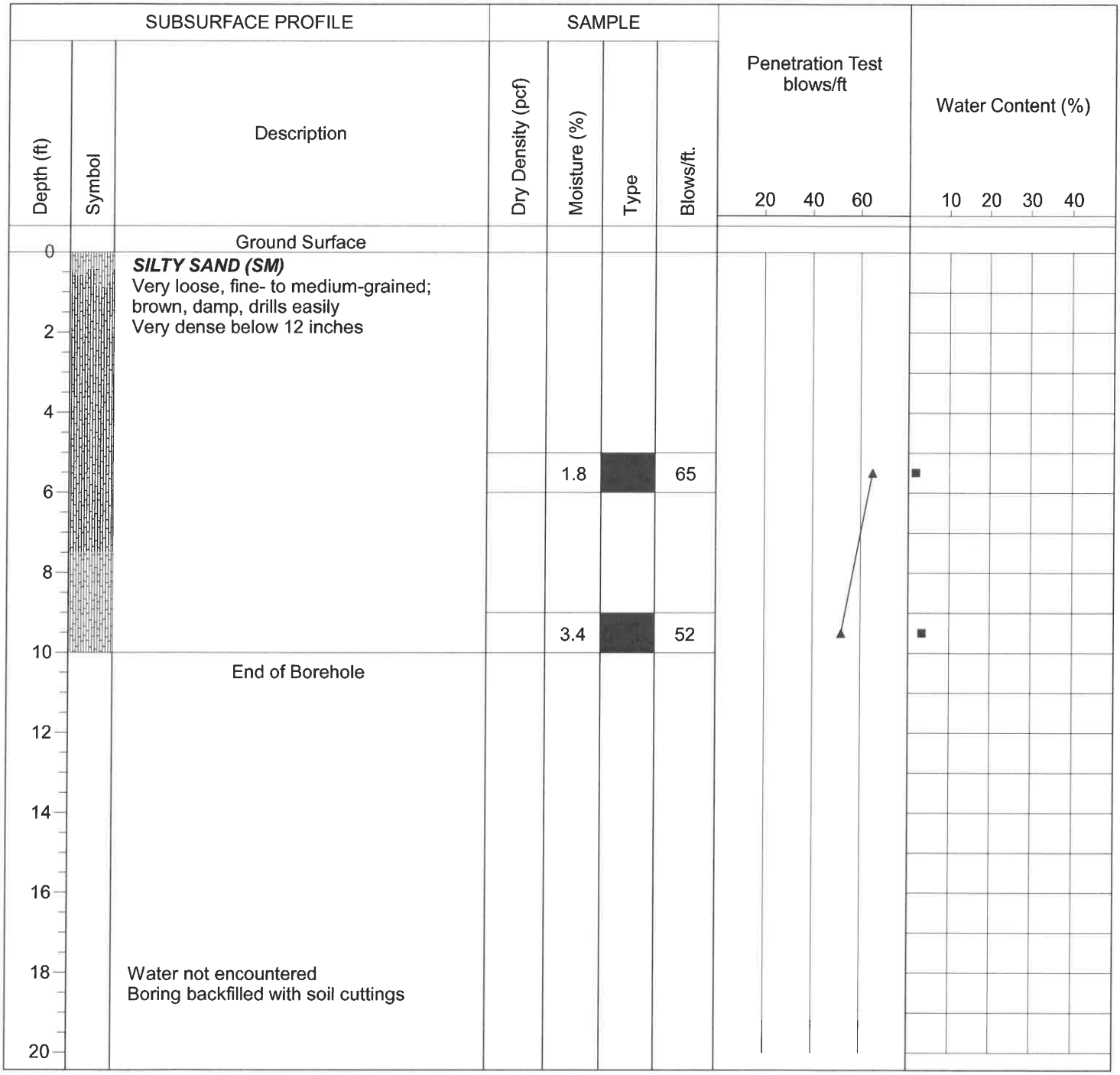
Client: Wood Investments

Figure No.: A-24

Location: 19439 Bear Valley Road, Apple Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A



Drill Method: Hollow Stem

Drill Date: 7-29-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 5½ Inches

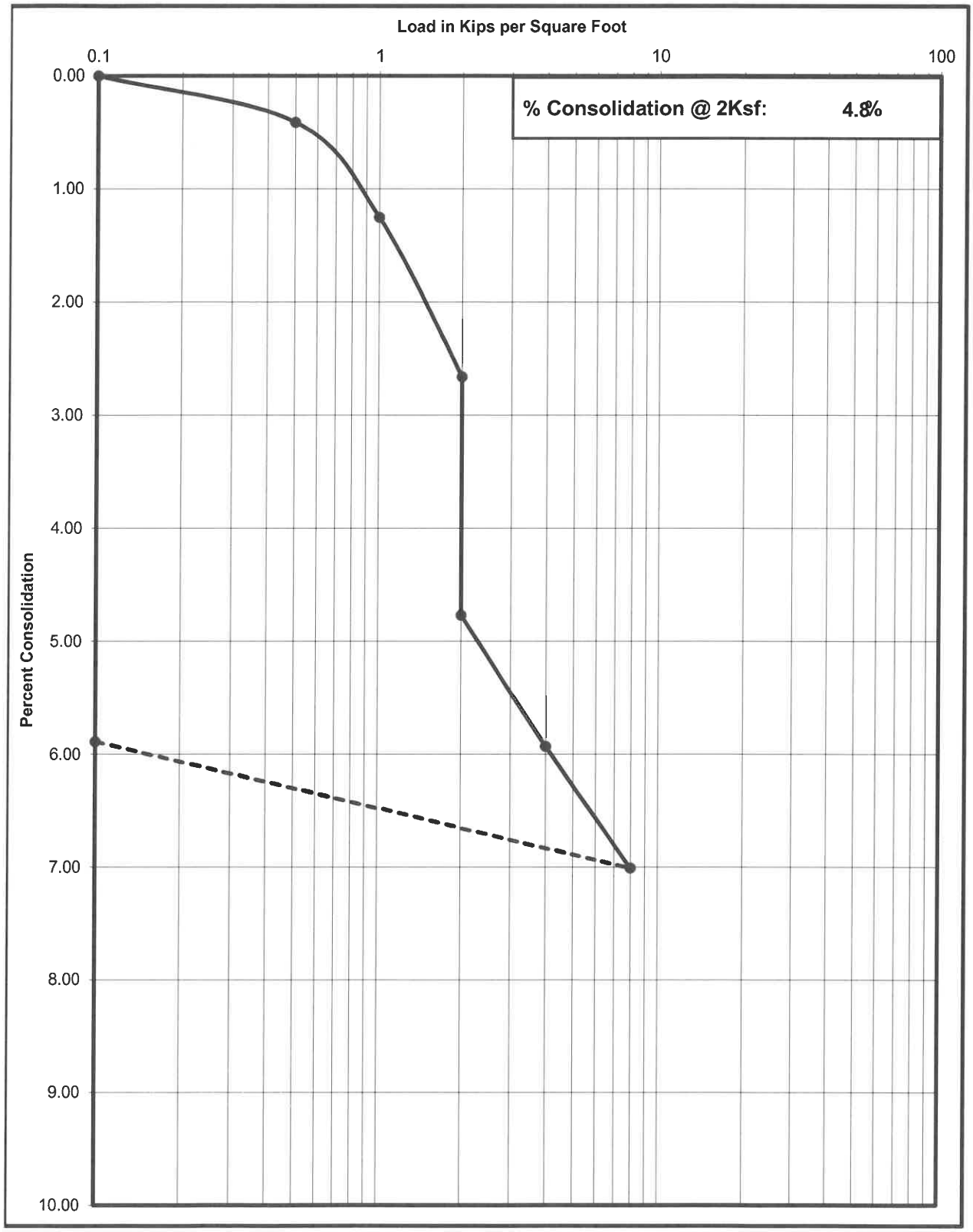
Driller: Whitcomb Drilling, Inc.

Elevation: 10 Feet

Sheet: 1 of 1

Consolidation Test

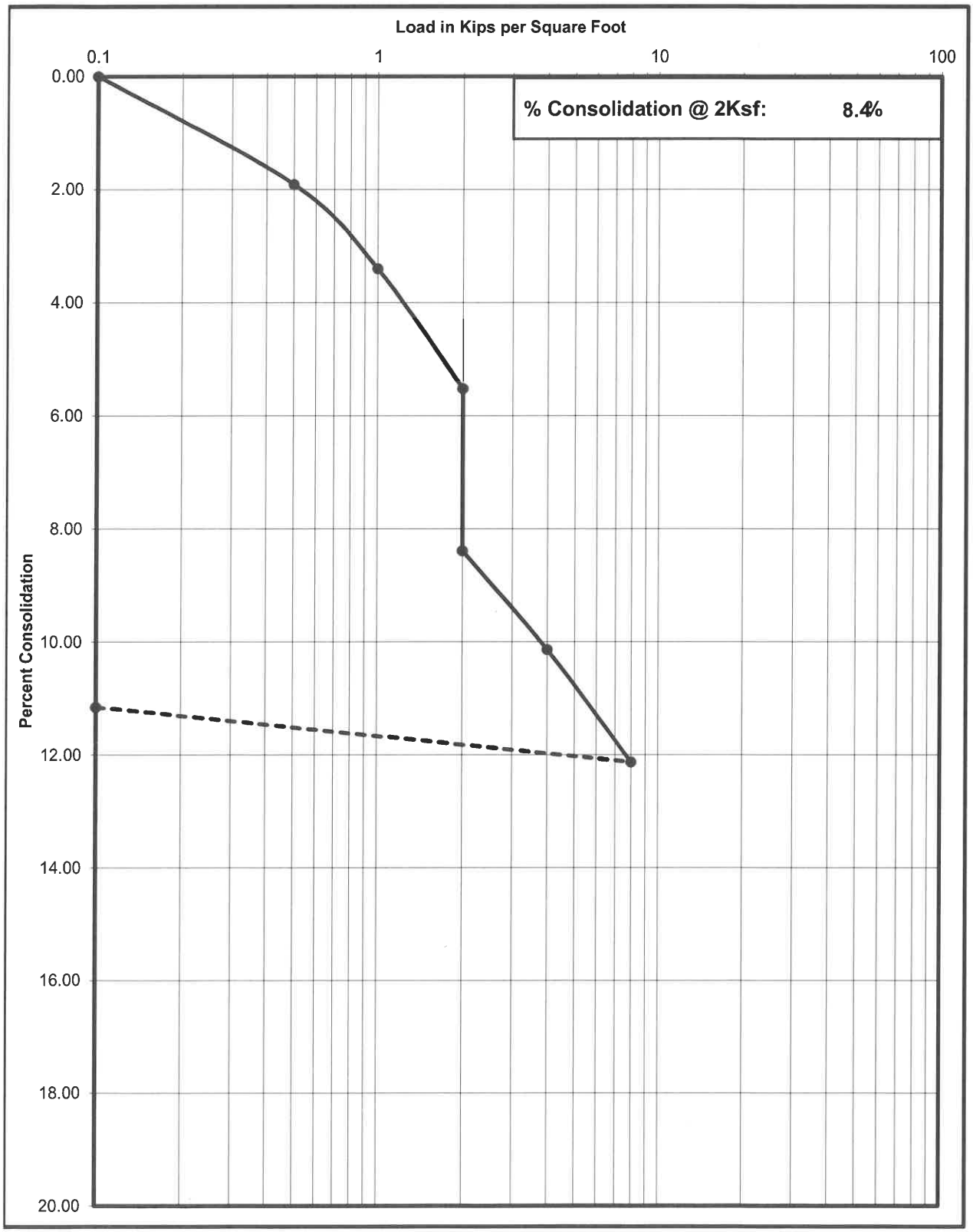
Project No	Boring No. & Depth	Date	Soil Classification
11221076	B-1 @ 2'	8/10/2021	SP



Krazan Testing Laboratory

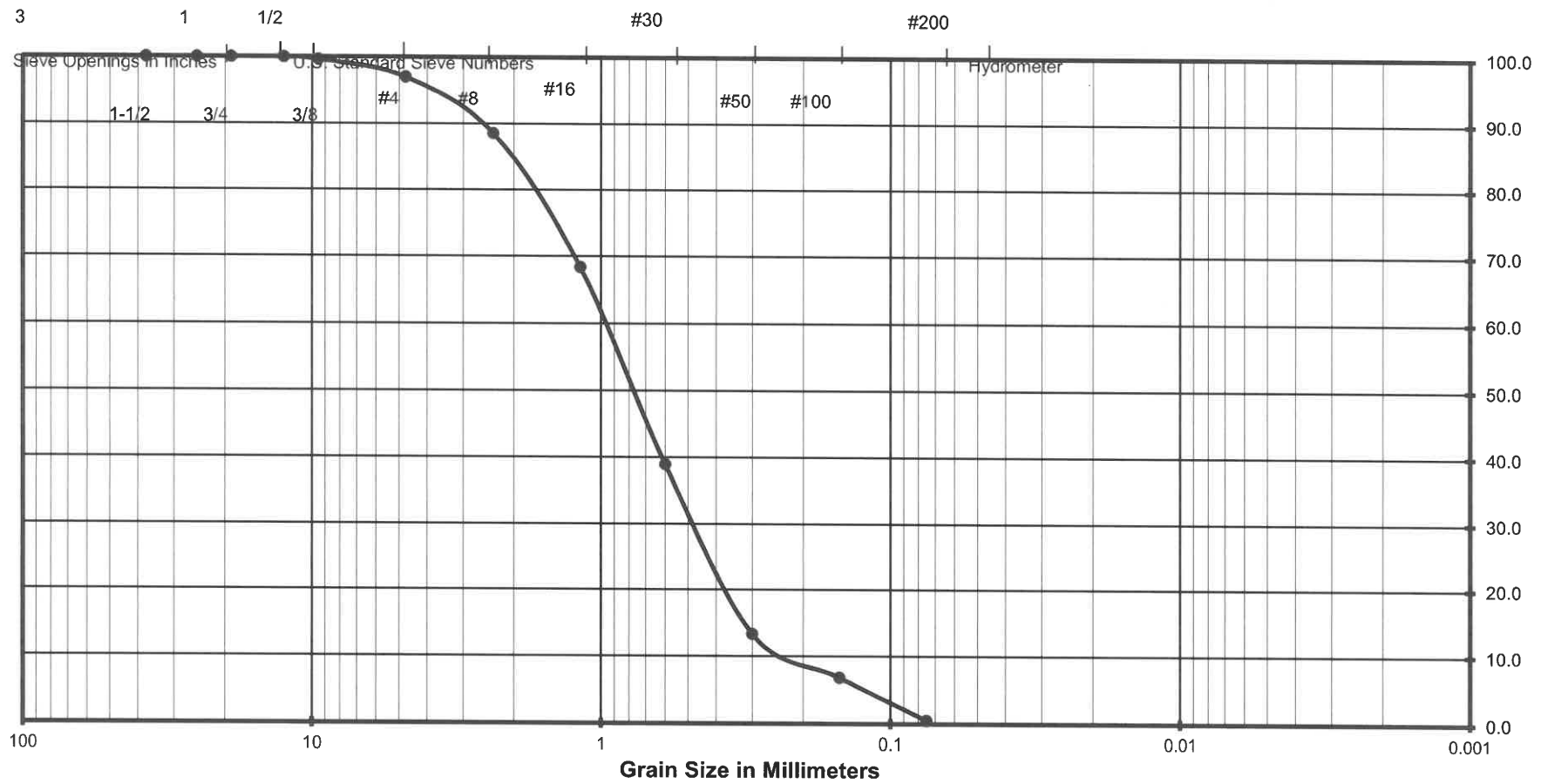
Consolidation Test

Project No	Boring No. & Depth	Date	Soil Classification
11221076	B-16 @ 2'	8/10/2021	SM



Krazan Testing Laboratory

Grain Size Analysis



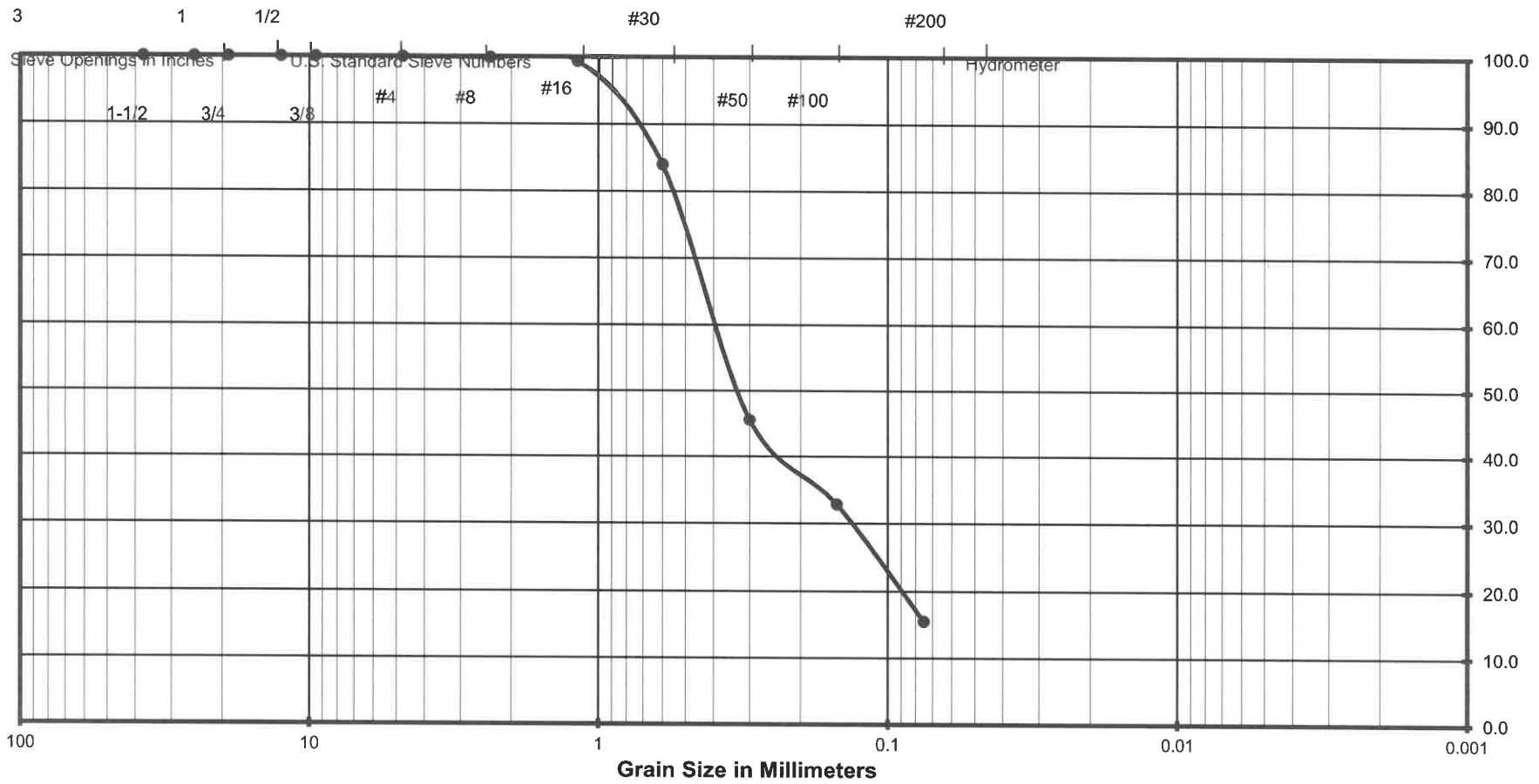
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SP
Sample Number	B-1 @ 2'

Krazan Testing Laboratory

Grain Size Analysis



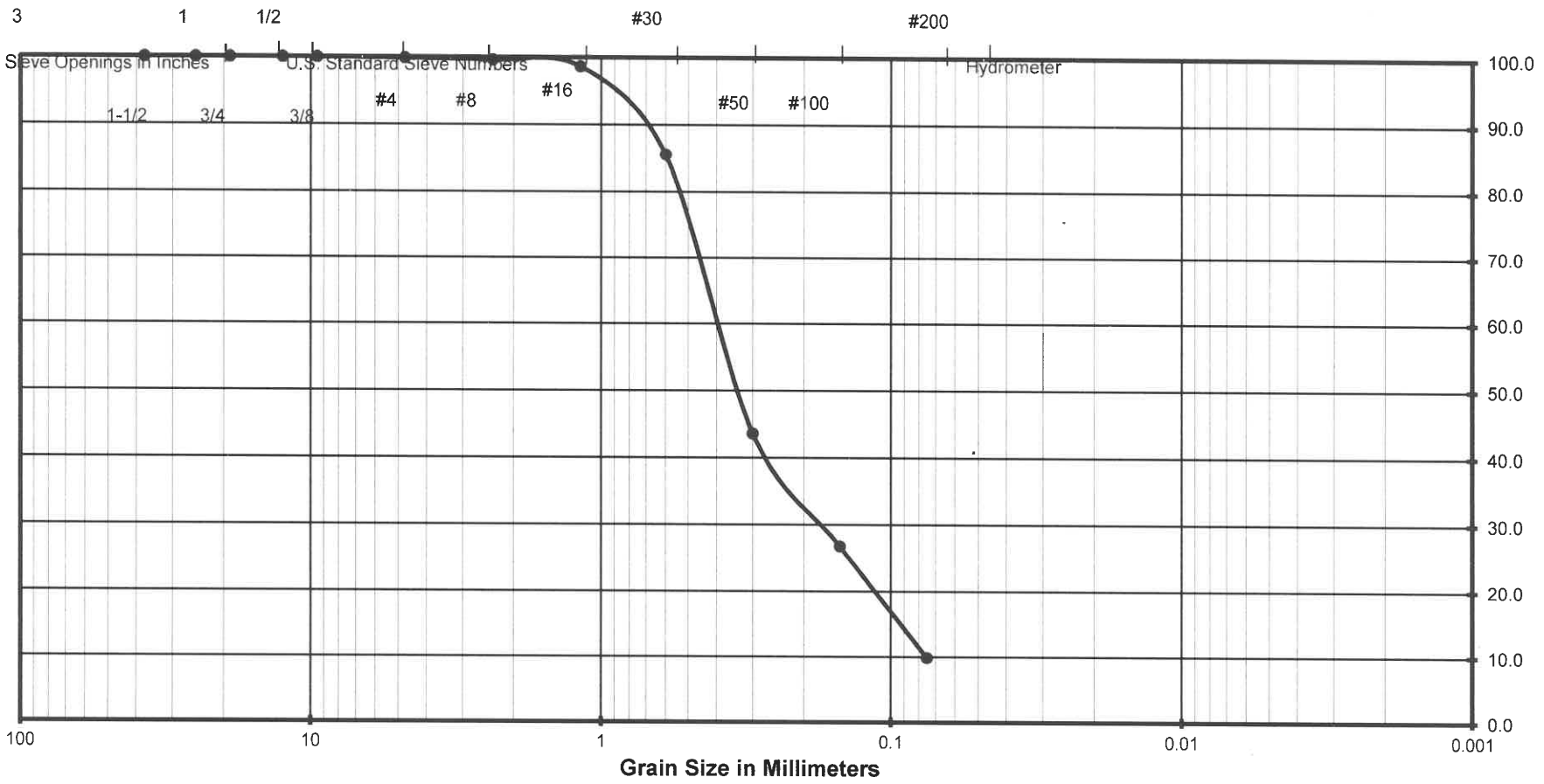
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM
Sample Number	B-1 @ 5'

Krazan Testing Laboratory

Grain Size Analysis



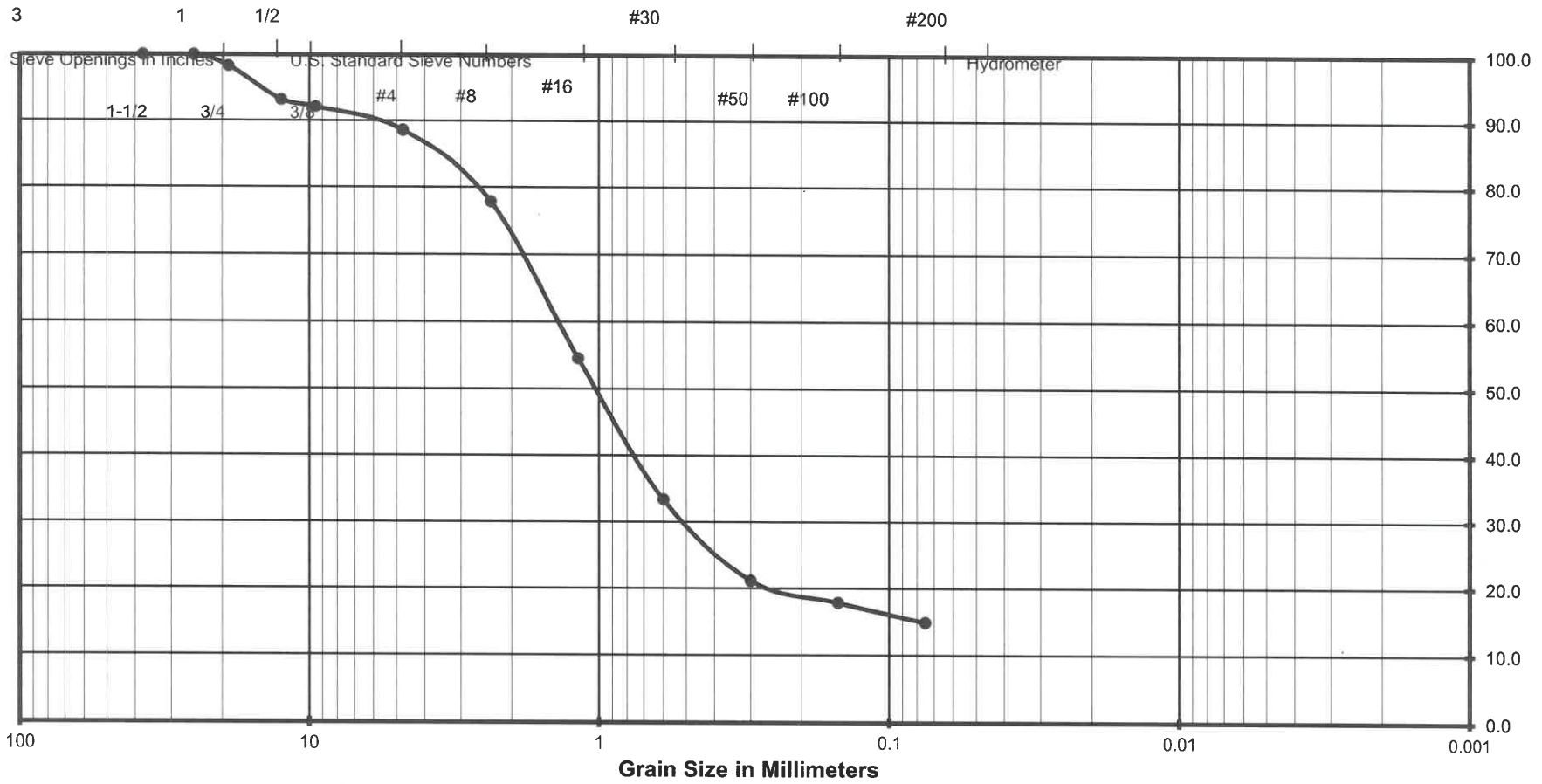
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM-SP
Sample Number	B-1 @ 15'

Krazan Testing Laboratory

Grain Size Analysis



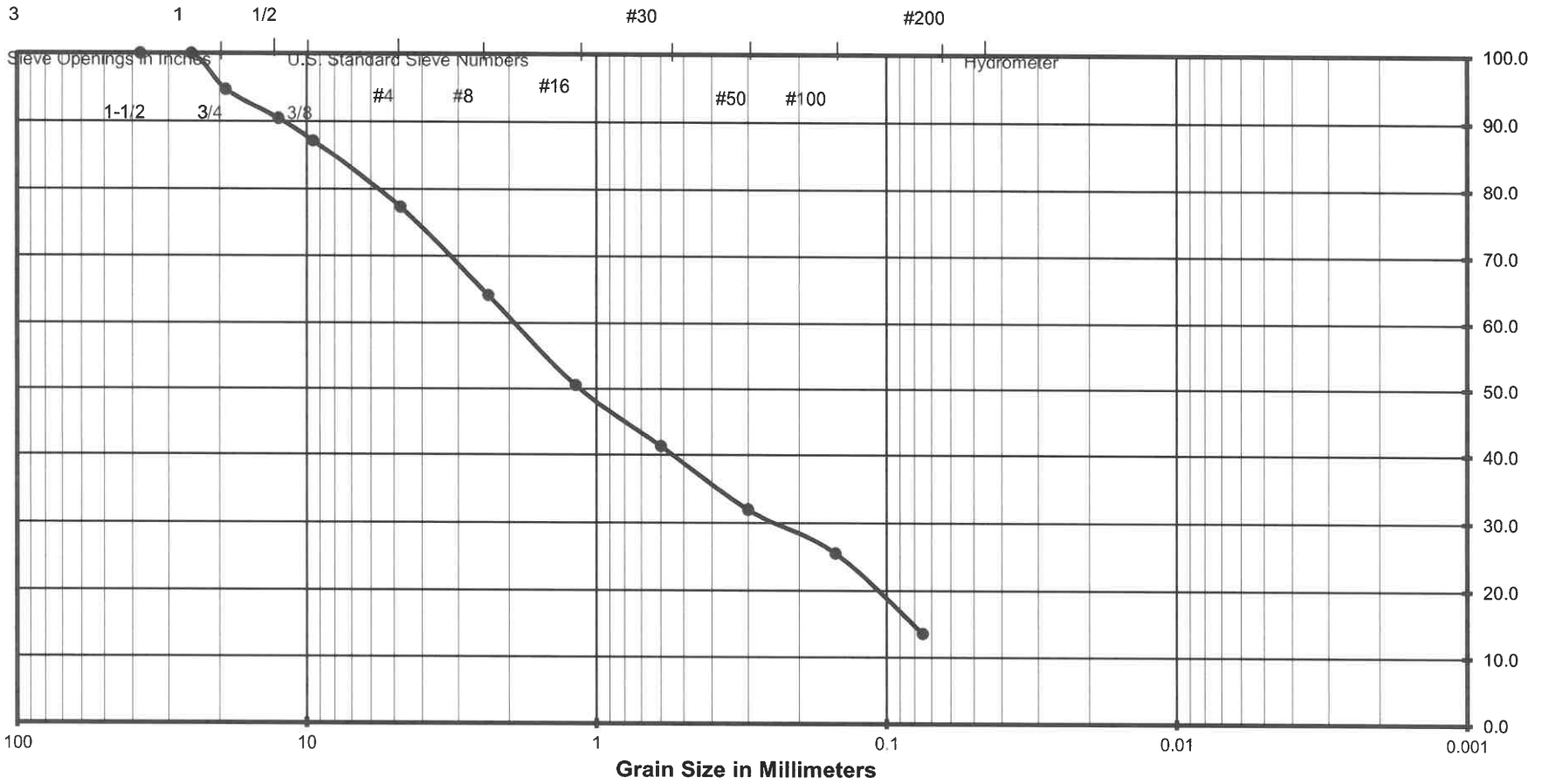
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM
Sample Number	B-1 @ 20'

Krazan Testing Laboratory

Grain Size Analysis



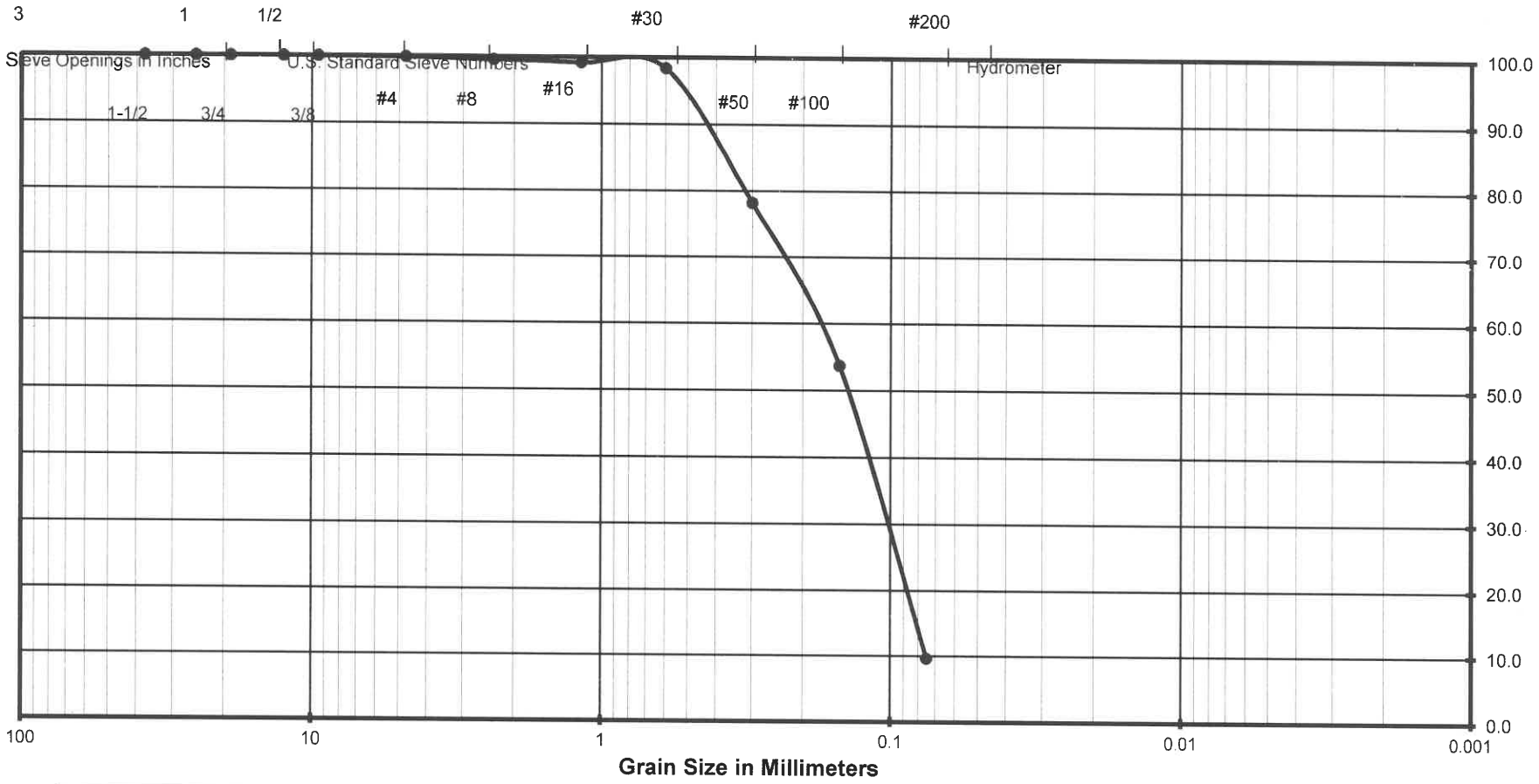
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM
Sample Number	B-1 @ 25'

Krazan Testing Laboratory

Grain Size Analysis



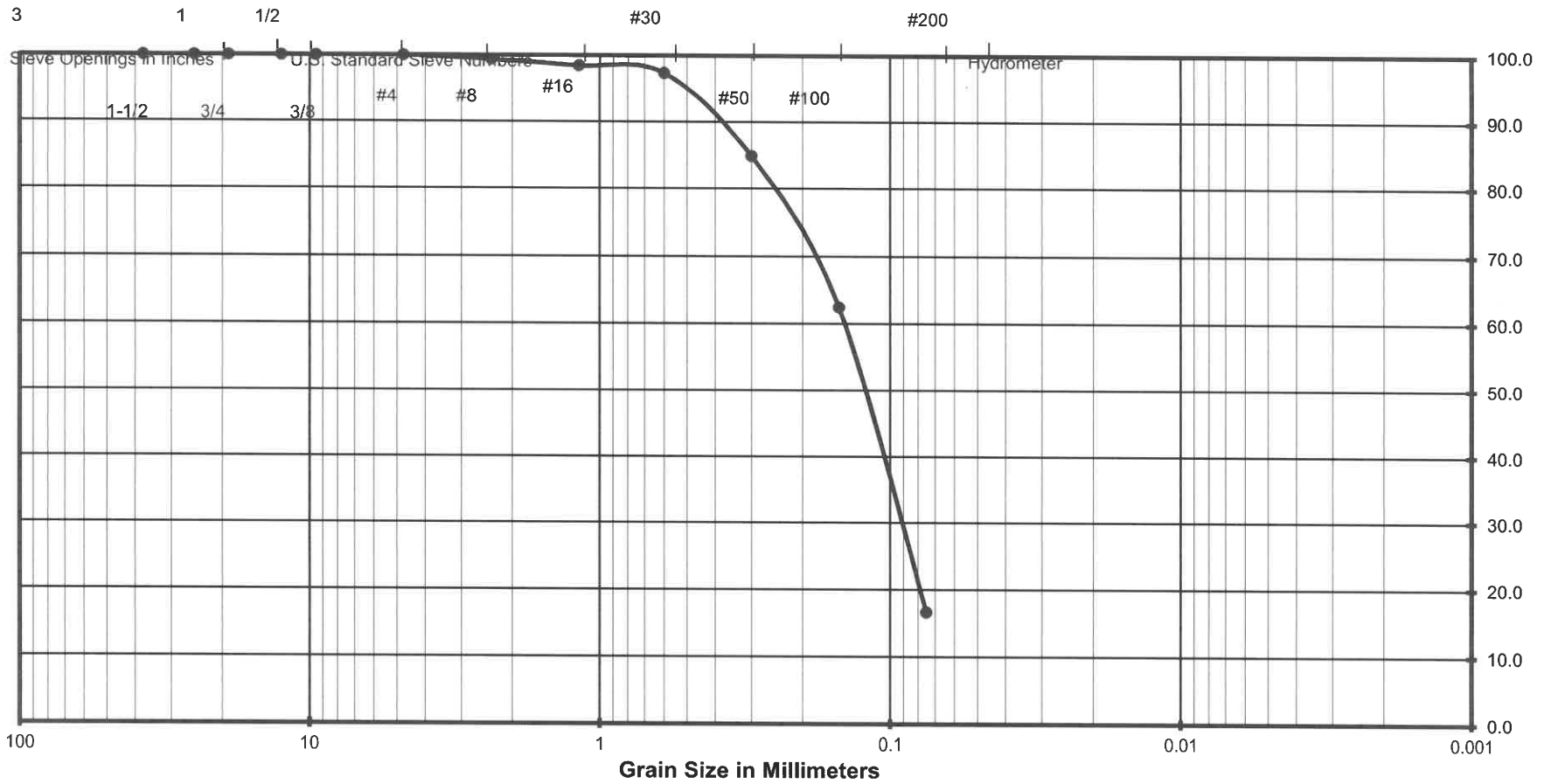
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM-SP
Sample Number	B-1 @ 30'

Krazan Testing Laboratory

Grain Size Analysis



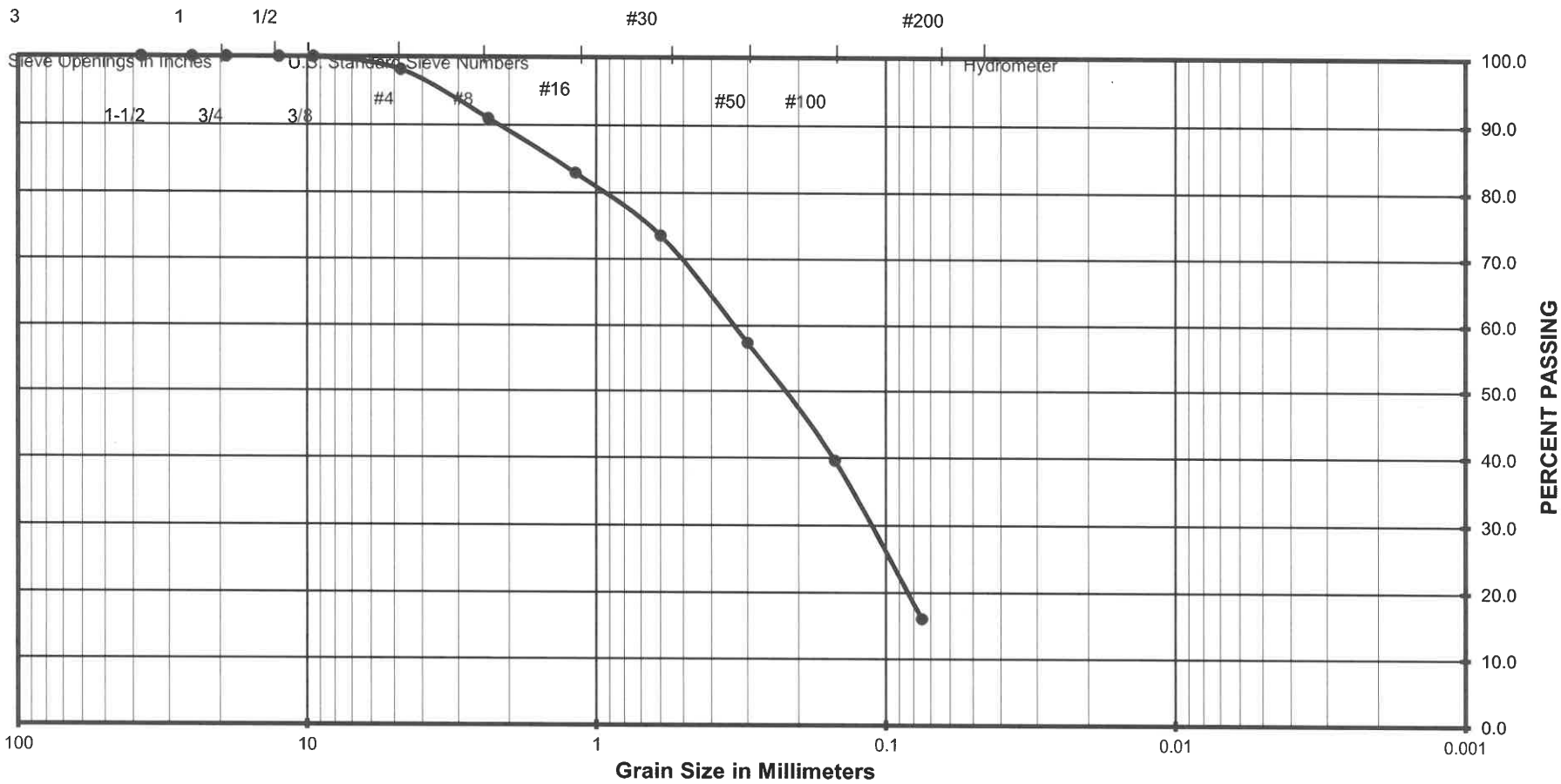
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM
Sample Number	B-1 @ 35'

Krazan Testing Laboratory

Grain Size Analysis

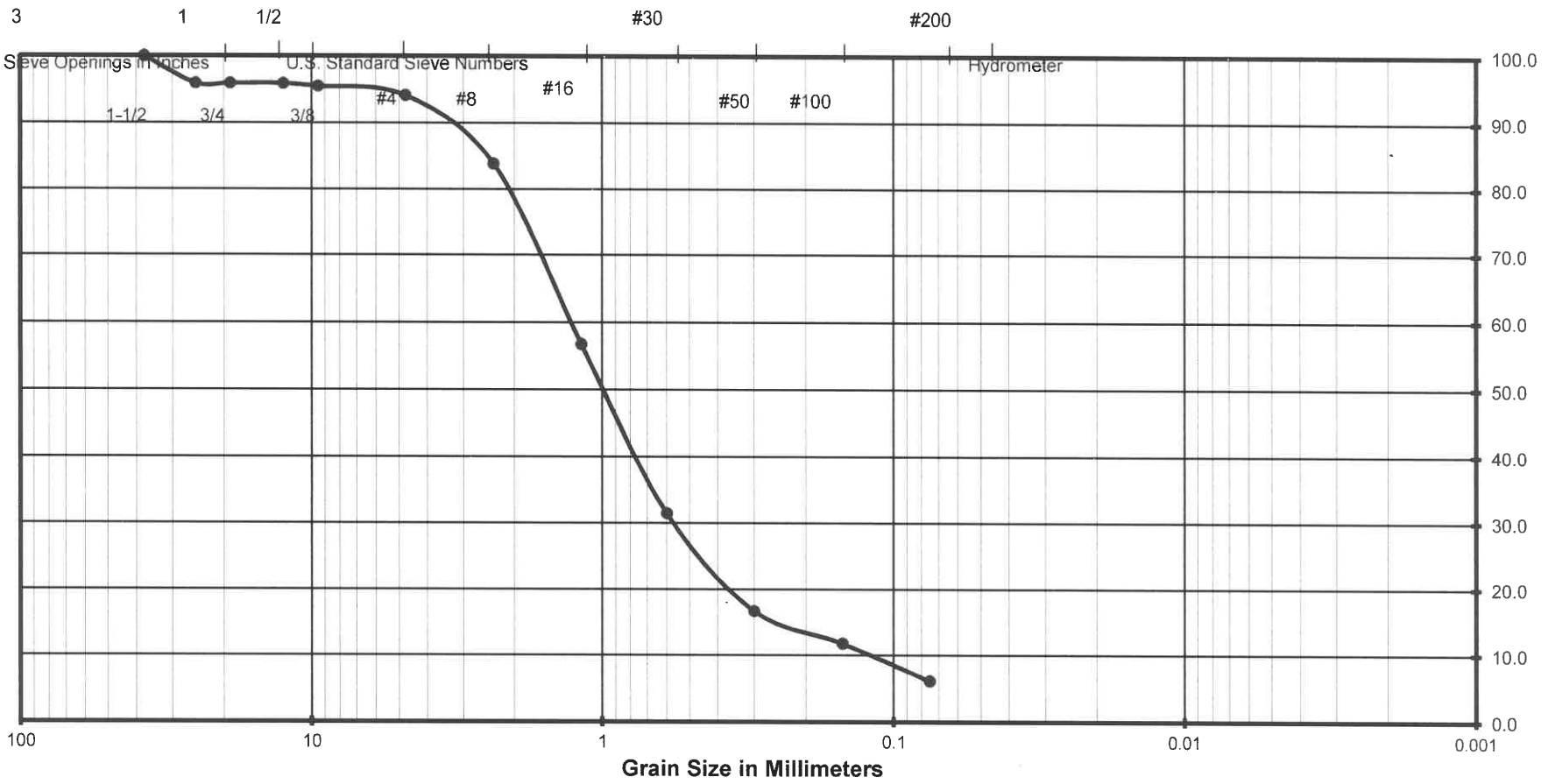


(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM
Sample Number	B-1 @ 40'

Krazan Testing Laboratory

Grain Size Analysis



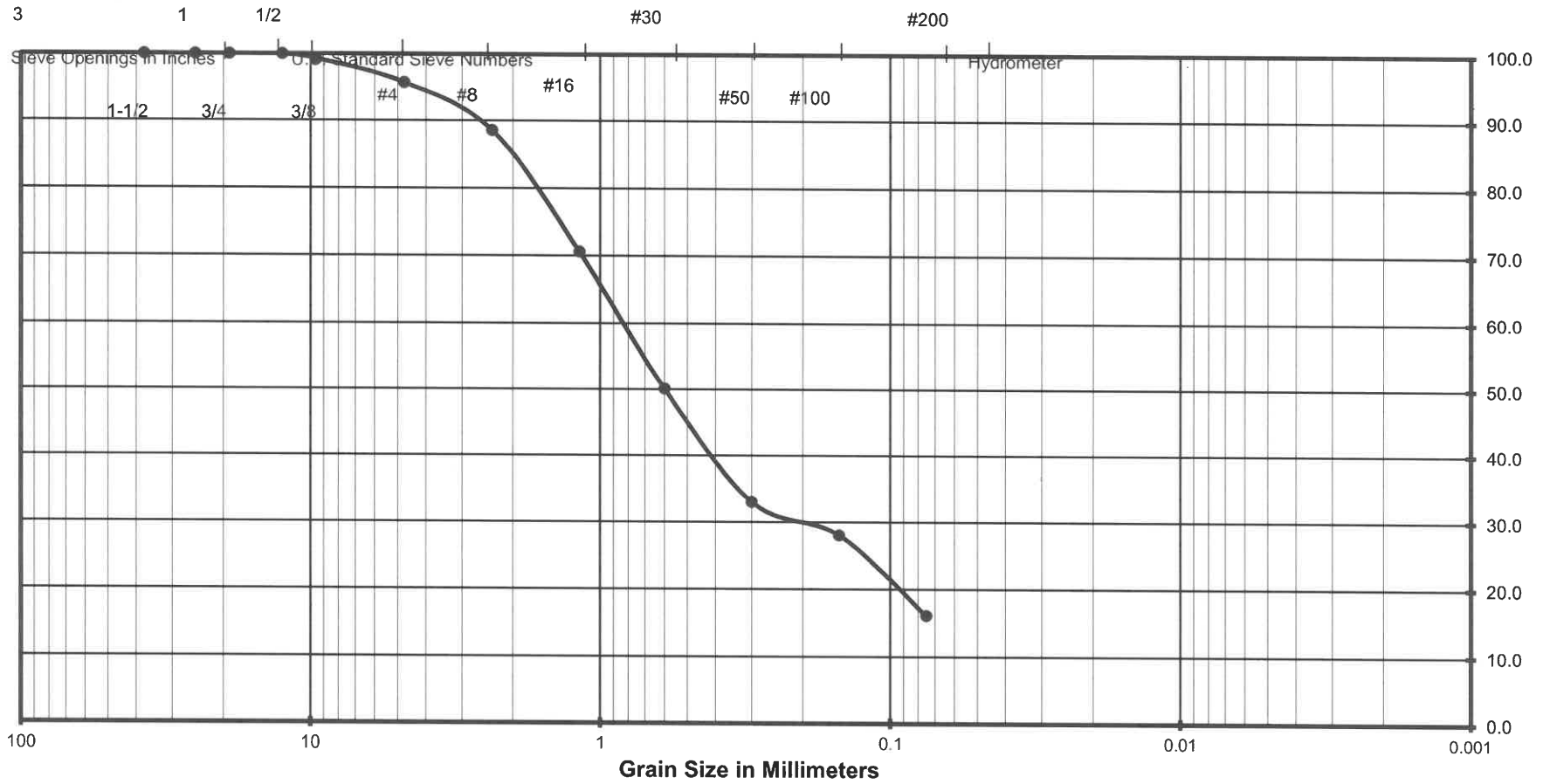
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM-SP
Sample Number	B-1 @ 45'

Krazan Testing Laboratory

Grain Size Analysis



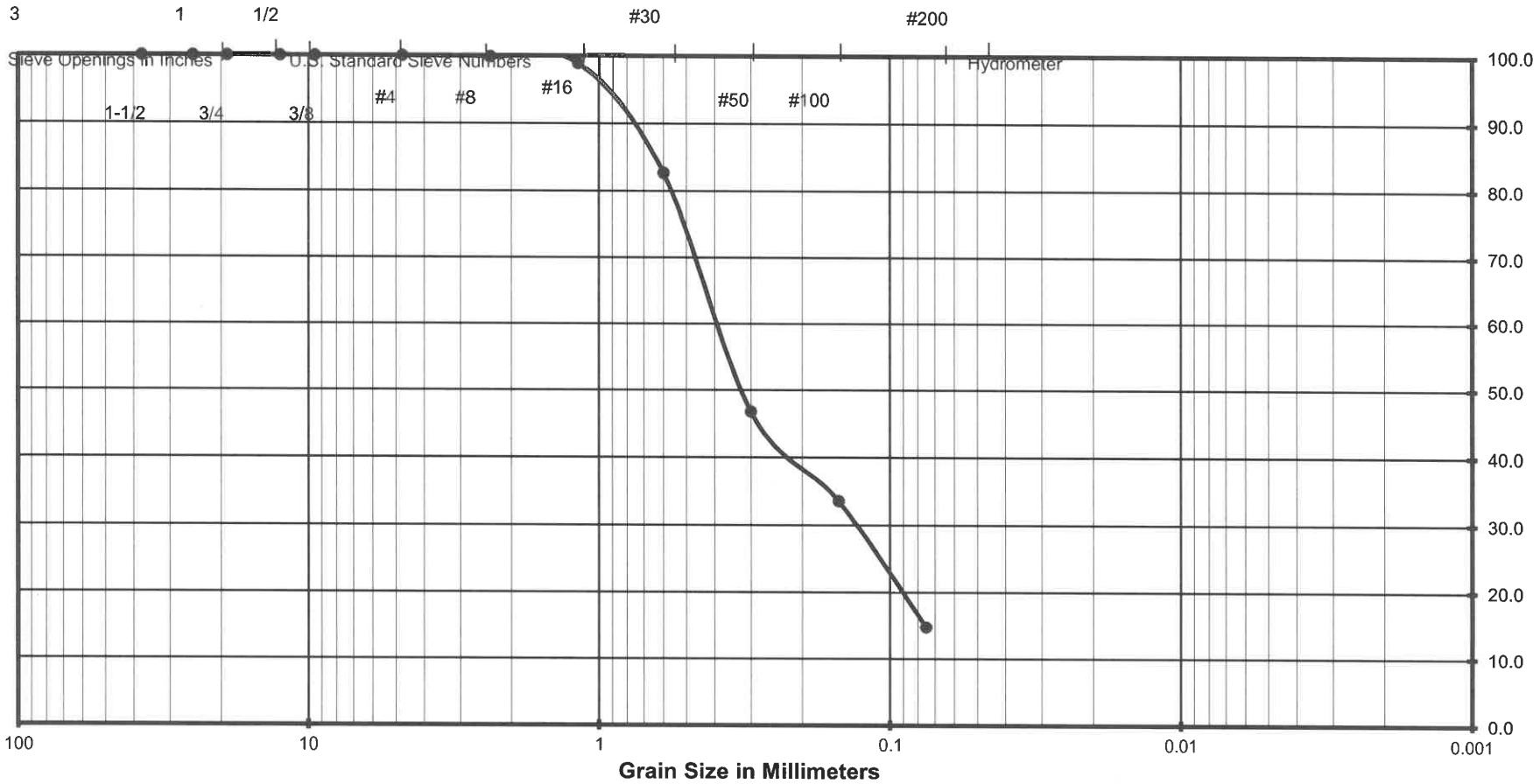
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM
Sample Number	B-1 @ 50'

Krazan Testing Laboratory

Grain Size Analysis



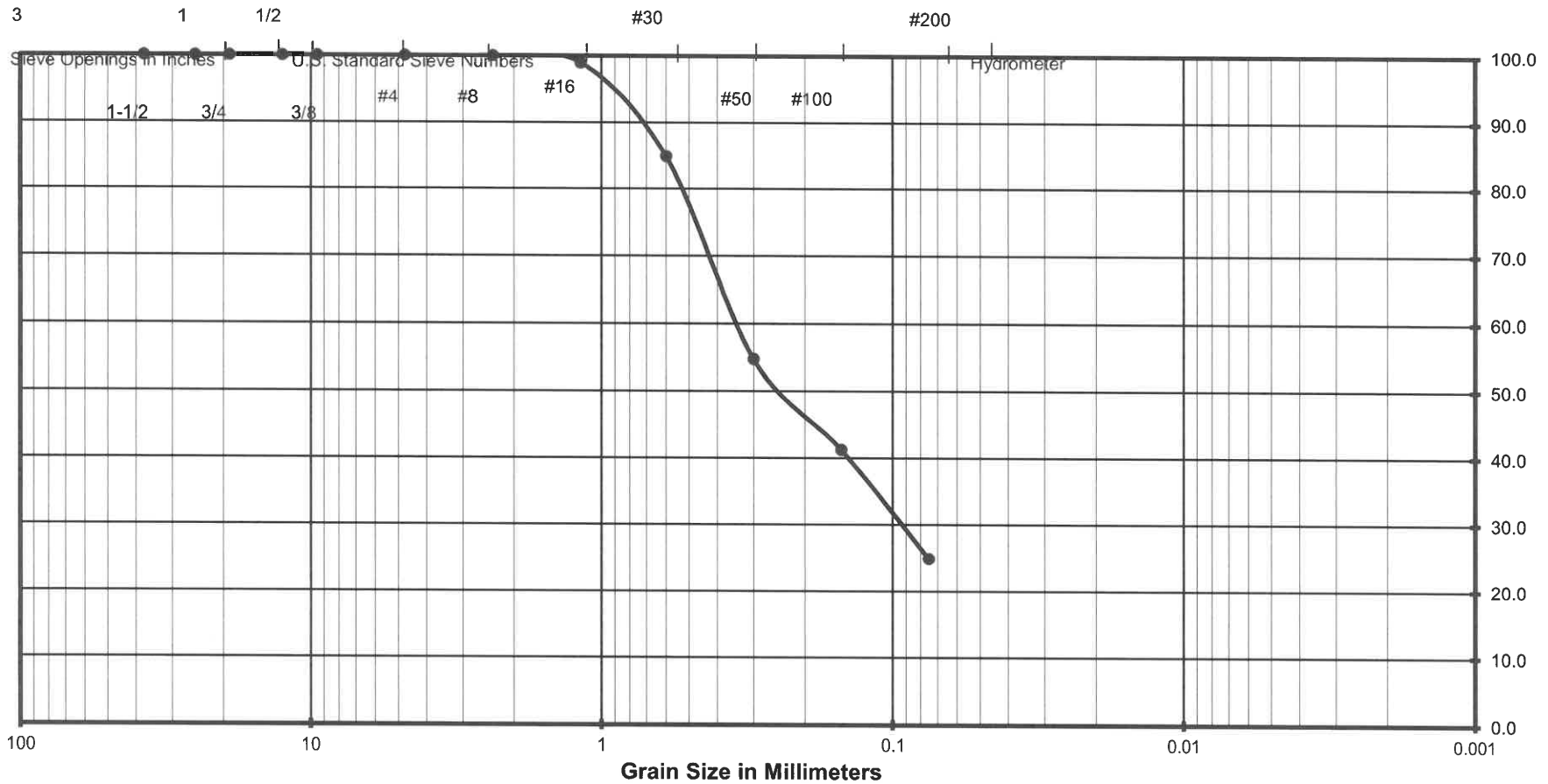
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM
Sample Number	B-4 @ 5'

Krazan Testing Laboratory

Grain Size Analysis



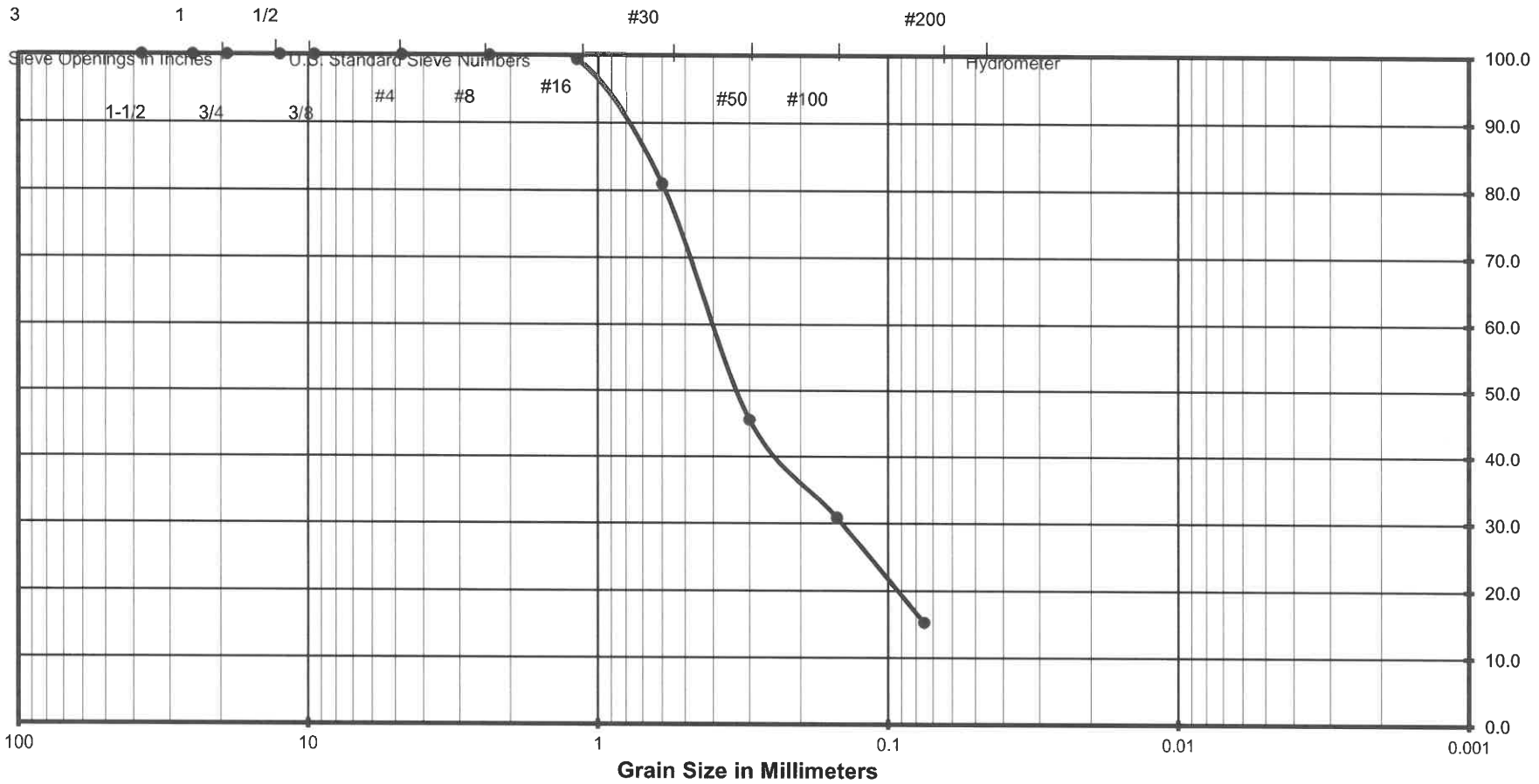
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM
Sample Number	B-4 @ 10'

Krazan Testing Laboratory

Grain Size Analysis



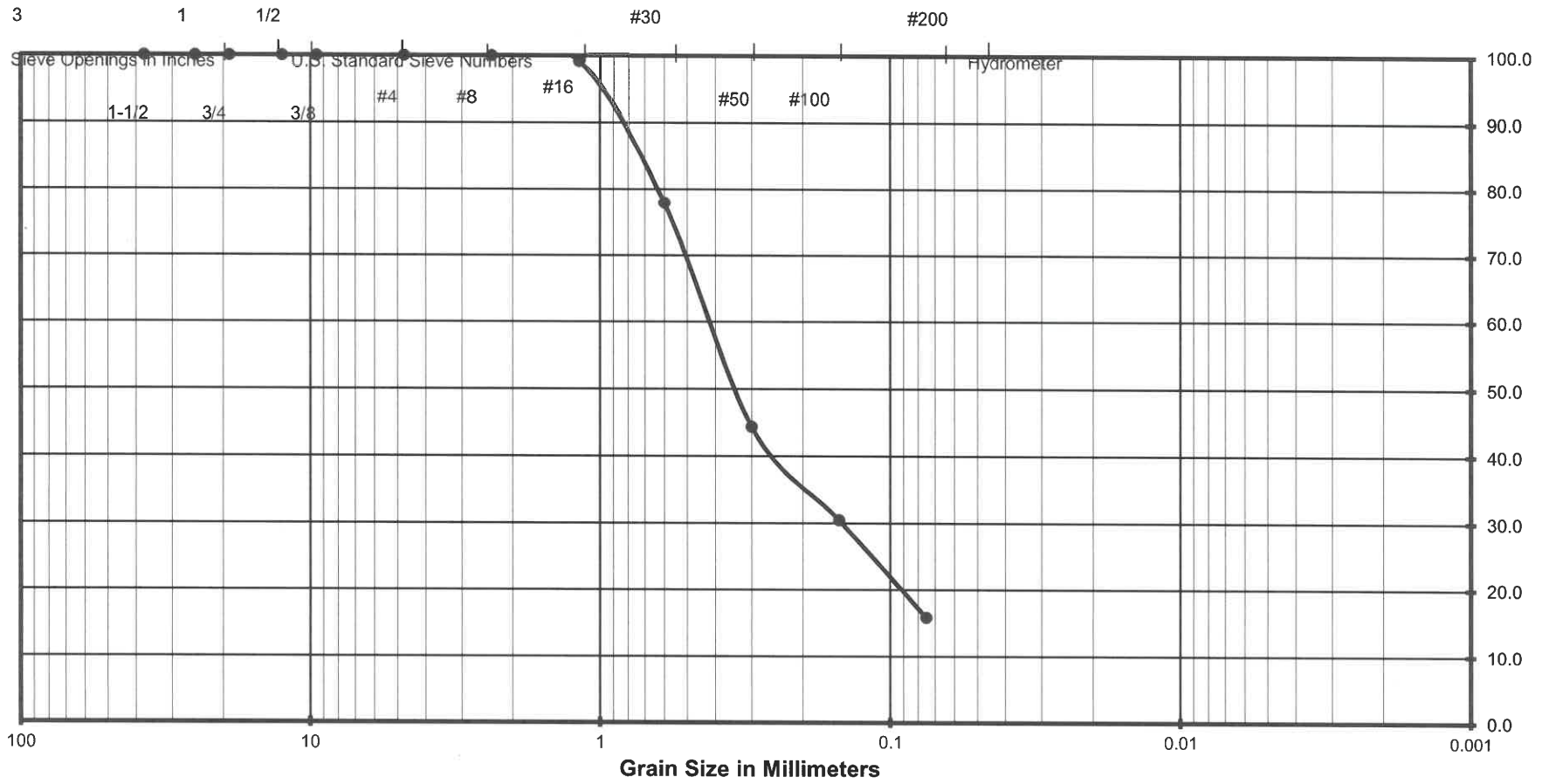
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM
Sample Number	B-8 @ 2'

Krazan Testing Laboratory

Grain Size Analysis



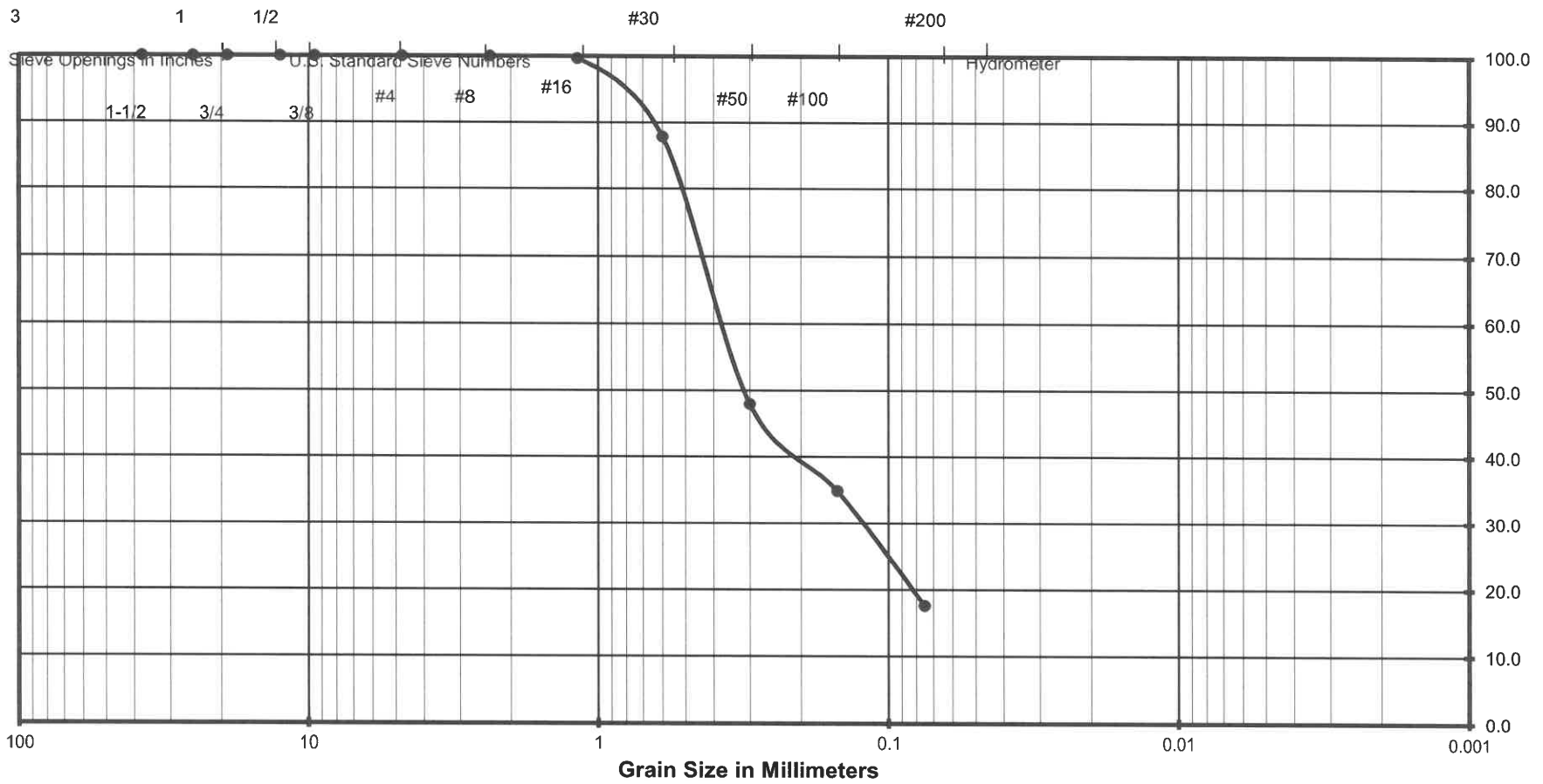
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM
Sample Number	B-8 @ 5'

Krazan Testing Laboratory

Grain Size Analysis



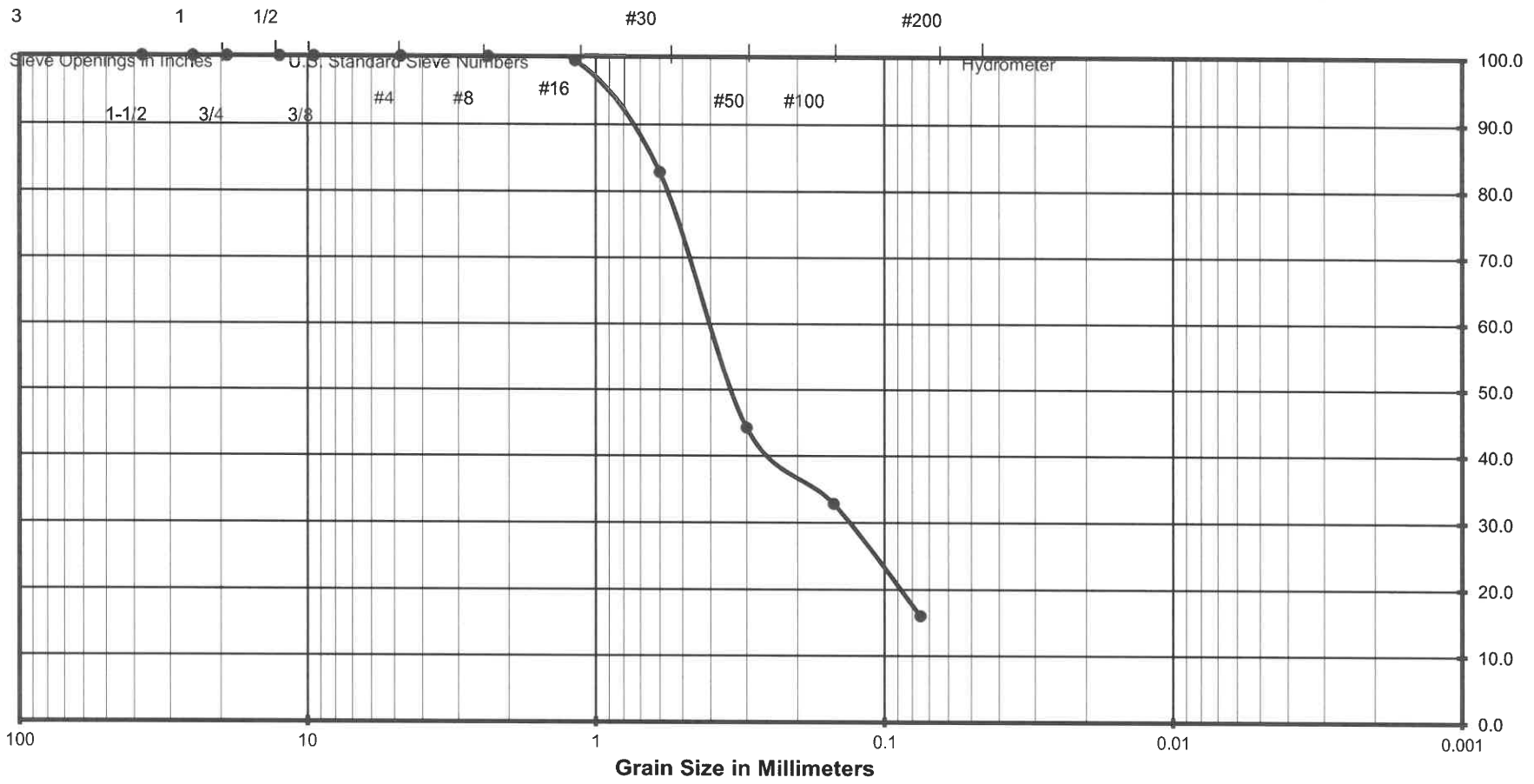
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM
Sample Number	B-10 @ 2'

Krazan Testing Laboratory

Grain Size Analysis



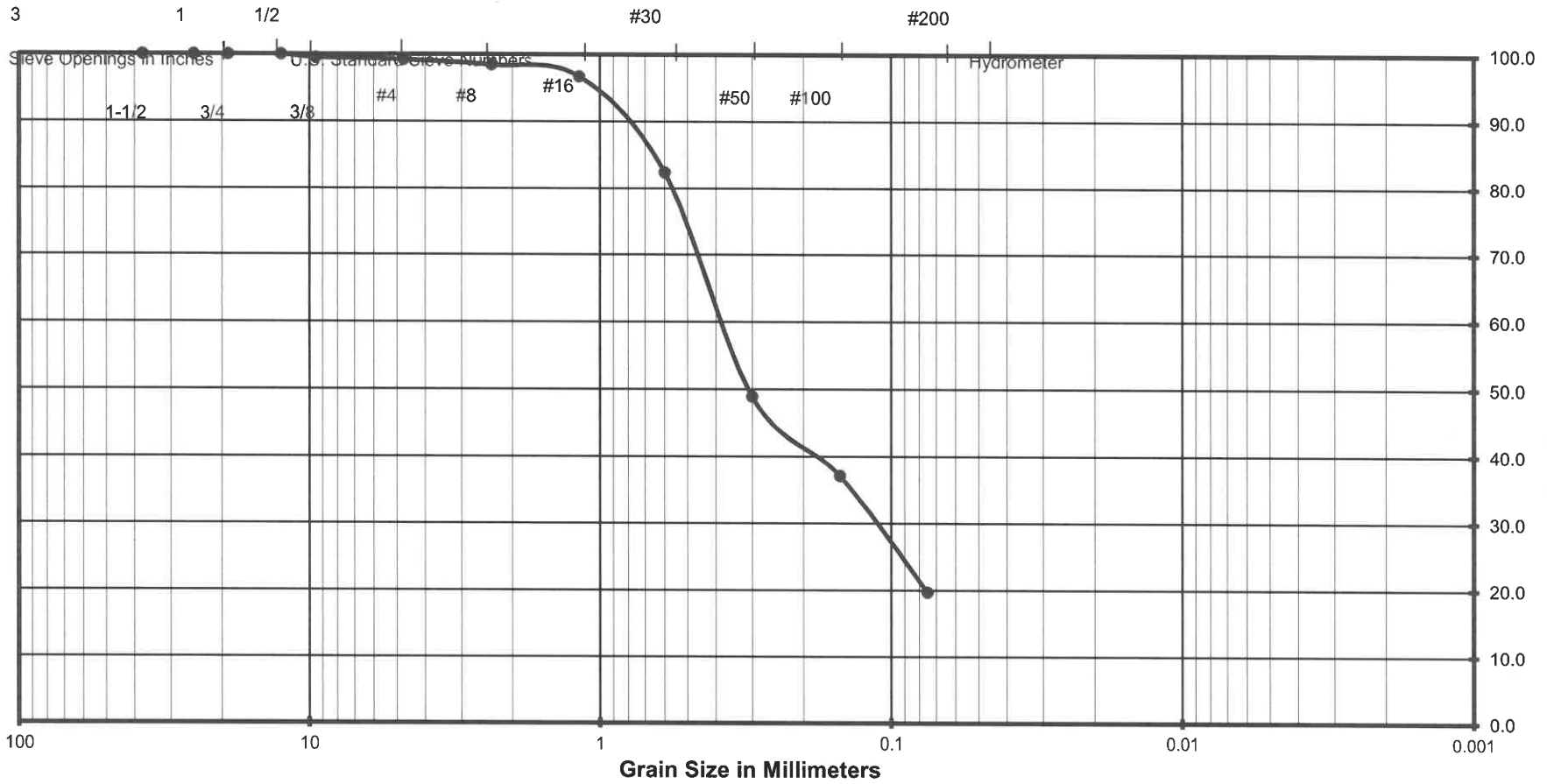
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM
Sample Number	B-10 @ 5'

Krazan Testing Laboratory

Grain Size Analysis



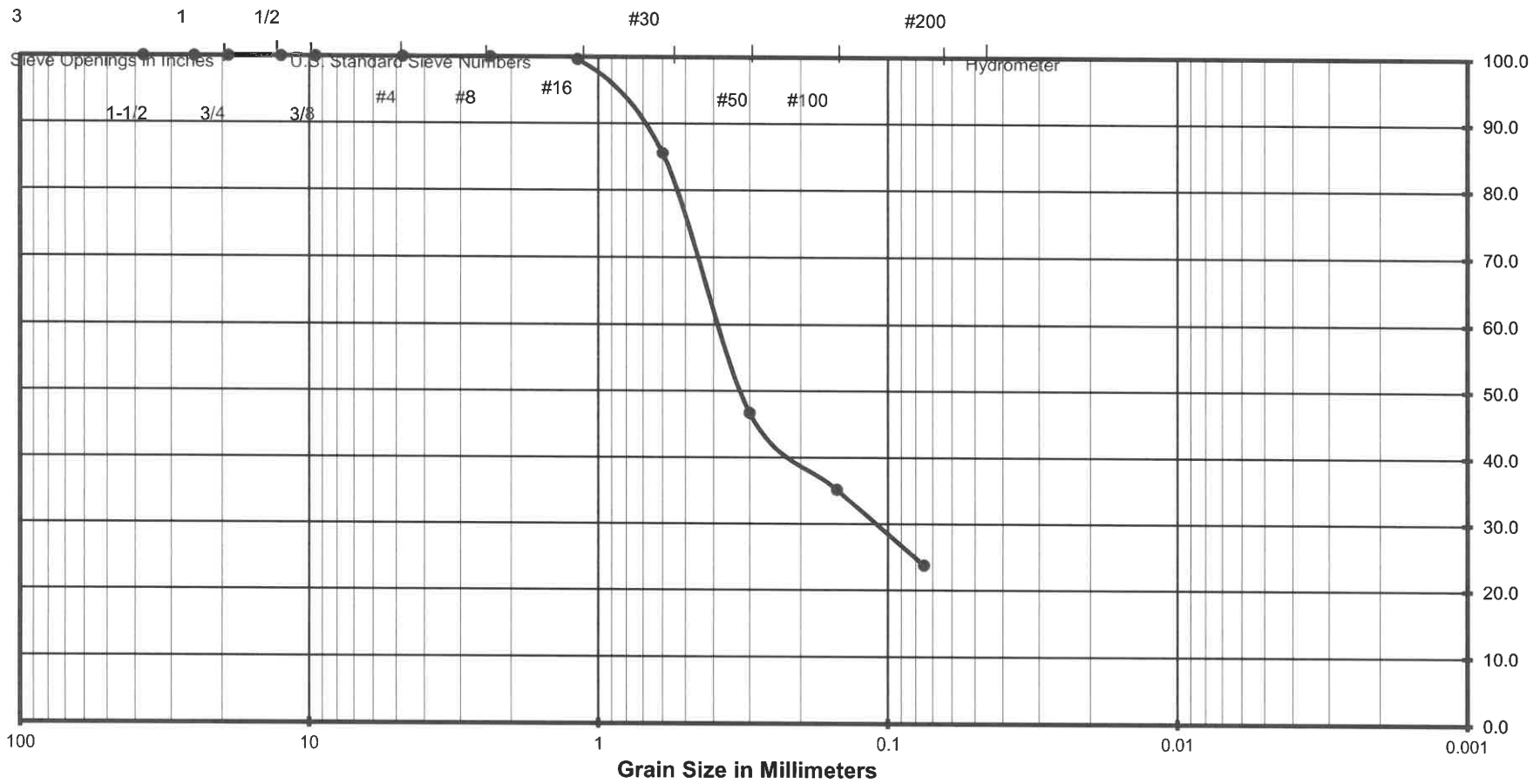
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM
Sample Number	B-16 @ 2'

Krazan Testing Laboratory

Grain Size Analysis



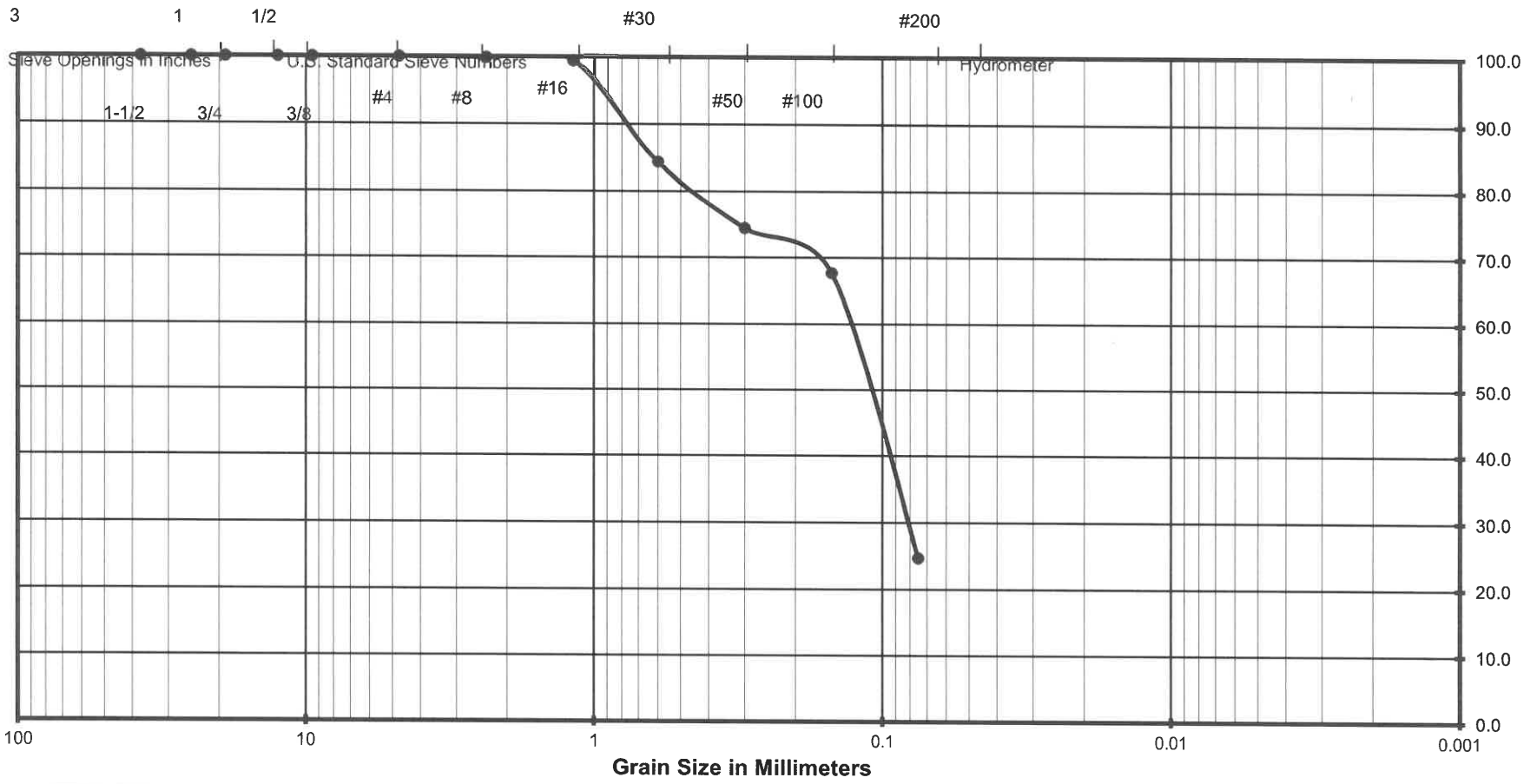
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM
Sample Number	B-16 @ 5'

Krazan Testing Laboratory

Grain Size Analysis



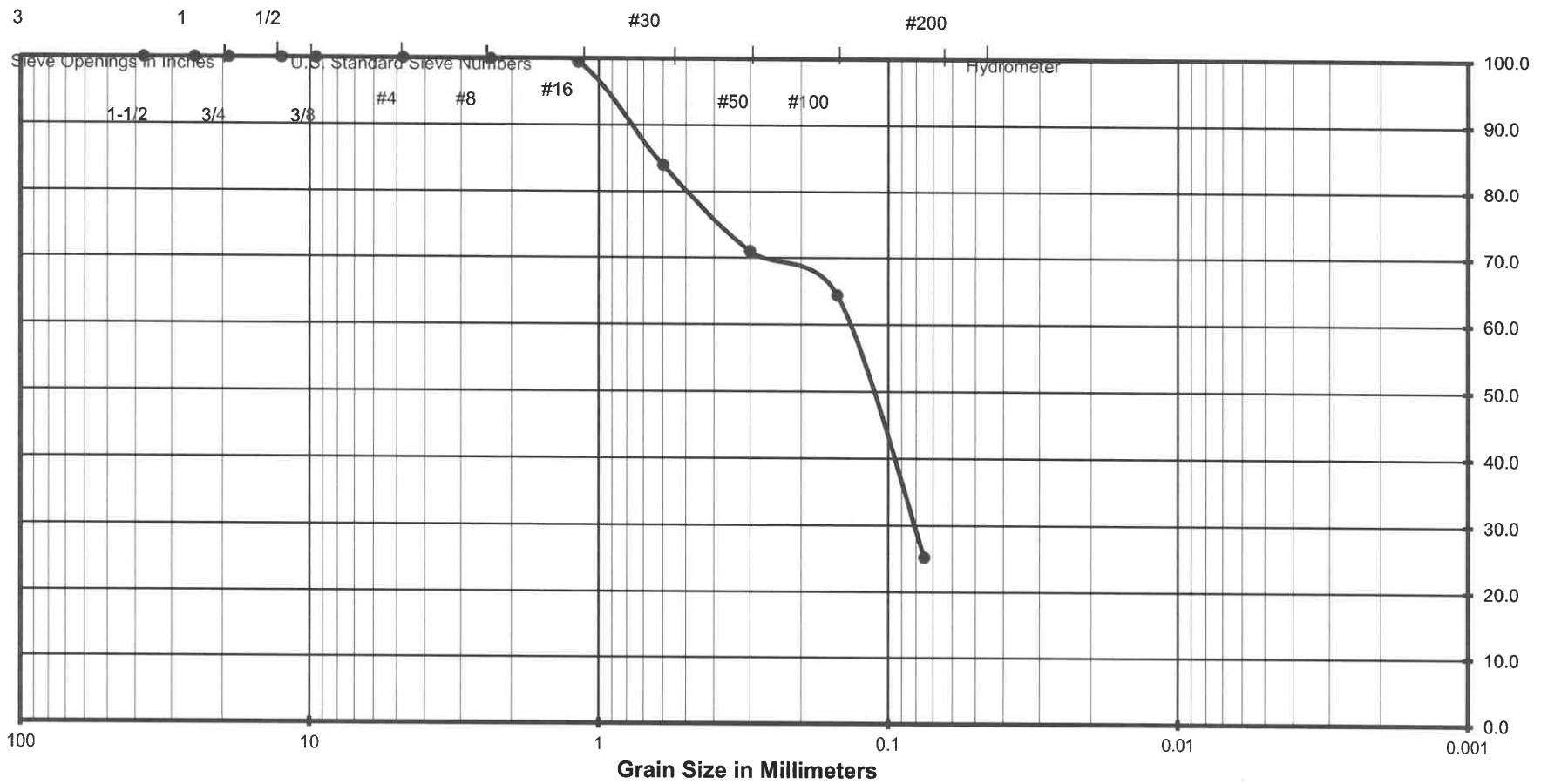
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM
Sample Number	B-24 @ 2'

Krazan Testing Laboratory

Grain Size Analysis



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Apple Bear Retail Center
Project Number	11221076
Soil Classification	SM
Sample Number	B-24 @ 5'

Krazan Testing Laboratory

APPENDIX B

EARTHWORK SPECIFICATIONS

GENERAL

When the text of the report conflicts with the general specifications in this appendix, the recommendations in the report have precedence.

SCOPE OF WORK: These specifications and applicable plans pertain to and include all earthwork associated with the site rough grading, including but not limited to the furnishing of all labor, tools, and equipment necessary for site clearing and grubbing, stripping, preparation of foundation materials for receiving fill, excavation, processing, placement and compaction of fill and backfill materials to the lines and grades shown on the project grading plans, and disposal of excess materials.

PERFORMANCE: The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications. This work shall be inspected and tested by a representative of Krazan and Associates, Inc., hereinafter known as the Soils Engineer and/or Testing Agency. Attainment of design grades when achieved shall be certified by the project Civil Engineer. Both the Soils Engineer and the Civil Engineer are the Owner's representatives. If the Contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory as determined by both the Soils Engineer and the Civil Engineer. No deviation from these specifications shall be made except upon written approval of the Soils Engineer, Civil Engineer or project Architect.

No earthwork shall be performed without the physical presence or approval of the Soils Engineer. The Contractor shall notify the Soils Engineer at least 2 working days prior to the commencement of any aspect of the site earthwork.

The Contractor agrees that he shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the Owner and the Engineers harmless from any and all liability, real or alleged, in connection with the performance of work on this project, except for liability arising from the sole negligence of the Owner or the Engineers.

TECHNICAL REQUIREMENTS: All compacted materials shall be densified to a density not less than 95 percent relative compaction based on ASTM Test Method D1557 or CAL-216, as specified in the technical portion of the Soil Engineer's report. The location and frequency of field density tests shall be as determined by the Soils Engineer. The results of these tests and compliance with these specifications shall be the basis upon which satisfactory completion of work will be judged by the Soils Engineer.

SOILS AND FOUNDATION CONDITIONS: The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the soil report.

The Contractor shall make his own interpretation of the data contained in said report, and the Contractor shall not be relieved of liability under the Contract documents for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

DUST CONTROL: The work includes dust control as required for the alleviation or prevention of any dust nuisance on or about the site or the borrow area, or off-site if caused by the Contractor's operation either during the performance of the earthwork or resulting from the conditions in which the Contractor leaves the site. The Contractor shall assume all liability, including court costs of codefendants, for all claims related to dust or windblown materials attributable to his work.

SITE PREPARATION

Site preparation shall consist of site clearing and grubbing and the preparations of foundation materials for receiving fill.

CLEARING AND GRUBBING: The Contractor shall accept the site in this present condition and shall demolish and/or remove from the area of designated project earthwork all structures, both surface and subsurface, trees, brush, roots, debris, organic matter, and all other matter determined by the Soils Engineer to be deleterious or otherwise unsuitable. Such materials shall become the property of the Contractor and shall be removed from the site.

Tree root systems in proposed building areas should be removed to a minimum depth of 3 feet and to such an extent which would permit removal of all roots larger than 1 inch. Tree roots removed in parking areas may be limited to the upper 1½ feet of the ground surface. Backfill of tree root excavations should not be permitted until all exposed surfaces have been inspected and the Soils Engineer is present for the proper control of backfill placement and compaction. Burning in areas which are to receive fill materials shall not be permitted.

SUBGRADE PREPARATION: Surfaces to receive Engineered Fill, building or slab loads shall be prepared as outlined above, excavated/scarified to a depth of 12 inches, moisture-conditioned as necessary, and compacted to 95 percent relative compaction.

Loose soil areas, areas of uncertified fill, and/or areas of disturbed soils shall be moisture-conditioned as necessary and recompacted to 95 percent relative compaction. All ruts, hummocks, or other uneven surface features shall be removed by surface grading prior to placement of any fill materials. All areas which are to receive fill materials shall be approved by the Soils Engineer prior to the placement of any of the fill material.

EXCAVATION: All excavation shall be accomplished to the tolerance normally defined by the Civil Engineer as shown on the project grading plans. All over-excavation below the grades specified shall be backfilled at the Contractor's expense and shall be compacted in accordance with the applicable technical requirements.

FILL AND BACKFILL MATERIAL: No material shall be moved or compacted without the presence of the Soils Engineer. Material from the required site excavation may be utilized for construction site fills provided prior approval is given by the Soils Engineer. All materials utilized for constructing site fills shall be free from vegetation or other deleterious matter as determined by the Soils Engineer.

PLACEMENT, SPREADING AND COMPACTION: The placement and spreading of approved fill materials and the processing and compaction of approved fill and native materials shall be the responsibility of the Contractor. However, compaction of fill materials by flooding, ponding, or jetting shall not be permitted unless specifically approved by local code, as well as the Soils Engineer.

Both cut and fill areas shall be surface-compacted to the satisfaction of the Soils Engineer prior to final acceptance.

SEASONAL LIMITS: No fill material shall be placed, spread, or rolled while it is frozen or thawing or during unfavorable wet weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until the Soils Engineer indicates that the moisture content and density of previously placed fill are as specified.

APPENDIX C

PAVEMENT SPECIFICATIONS

1. DEFINITIONS - The term "pavement" shall include asphaltic concrete surfacing, untreated aggregate base, and aggregate subbase. The term "subgrade" is that portion of the area on which surfacing, base, or subbase is to be placed.

The term "Standard Specifications": hereinafter referred to is the 2018 Standard Specifications of the State of California, Department of Transportation, and the "Materials Manual" is the Materials Manual of Testing and Control Procedures, State of California, Department of Public Works, Division of Highways. The term "relative compaction" refers to the field density expressed as a percentage of the maximum laboratory density as defined in the applicable tests outlined in the Materials Manual.

2. SCOPE OF WORK - This portion of the work shall include all labor, materials, tools, and equipment necessary for, and reasonably incidental to the completion of the pavement shown on the plans and as herein specified, except work specifically noted as "Work Not Included."

3. PREPARATION OF THE SUBGRADE - The Contractor shall prepare the surface of the various subgrades receiving subsequent pavement courses to the lines, grades, and dimensions given on the plans. The upper 12 inches of the soil subgrade beneath the pavement section shall be compacted to a minimum relative compaction of 95 percent. The finished subgrades shall be tested and approved by the Soils Engineer prior to the placement of additional pavement courses.

4. UNTREATED AGGREGATE BASE - The aggregate base material shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate base material shall conform to the requirements of Section 26 of the Standard Specifications for Class 2 material, 1½ inches maximum size. The aggregate base material shall be spread and compacted in accordance with Section 26 of the Standard Specifications. The aggregate base material shall be spread in layers not exceeding 6 inches and each layer of aggregate material course shall be tested and approved by the Soils Engineer prior to the placement of successive layers. The aggregate base material shall be compacted to a minimum relative compaction of 95 percent.

5. AGGREGATE SUBBASE - The aggregate subbase shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate subbase material shall conform to the requirements of Section 25 of the Standard Specifications for Class 2 material. The aggregate subbase material shall be compacted to a minimum relative compaction of 95 percent, and it shall be spread and compacted in accordance with Section 25 of the Standard Specifications. Each layer of aggregate subbase shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

6. ASPHALTIC CONCRETE SURFACING - Asphaltic concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at a central mixing plant and spread and compacted on a prepared base in conformity with the lines, grades and dimensions shown on the plans. The viscosity grade of the asphalt shall be PG 64-10. The mineral aggregate shall be Type B, ½ inch maximum size, medium grading and shall conform to the requirements set forth in Section 39 of the Standard Specifications. The drying, proportioning and mixing of the materials shall conform to Section 39.

The prime coat, spreading and compacting equipment and spreading and compacting mixture shall conform to the applicable chapters of Section 39, with the exception that no surface course shall be placed when the atmospheric temperature is below 50° F. The surfacing shall be rolled with a combination of steel wheel and pneumatic rollers, as described in Section 39-6. The surface course shall be placed with an approved self-propelled mechanical spreading and finishing machine.

7. FOG SEAL COAT - The fog seal (mixing type asphaltic emulsion) shall conform to and be applied in accordance with the requirements of Section 37.

BEAR VALLEY ROAD

APPLE BEAR ROAD (PRIVATE)

FLYING FEATHER ROAD (PUBLIC)

STORM DRAIN CATCH BASIN

STORM DRAIN MANHOLE

STORM DRAIN INLET

CDS UNIT

DMA-A
AREA (SF)=390,110
AREA (AC)=8.96
IMP%=85%

BMP-A
UNDERGROUND STORMWATER INFILTRATION FACILITY
STORAGE VOLUME=2.21 ACFT

DRIVE THRU

BYPASS LANE

VAN

NO PARKING

EV

CA

SD

N

0 30' 60'
SCALE: 1" = 30'

LEGEND

- XXX — MAJOR CONTOUR
- XXX — MINOR CONTOUR
- PARCEL LINE
- PROPERTY LINE
- OVERALL SHED AREA
- R — RIDGE LINE
- SD — STORM DRAIN LINE
- D — STORM DRAIN MANHOLE (OR CDS, SEE PLAN)
- STORM DRAIN CATCH BASIN
- X.X% — SLOPE ARROW

FOR REVIEW ONLY - NOT FOR CONSTRUCTION

FOR REVIEW ONLY NOT FOR CONSTRUCTION

NO.	DESCRIPTION	REVISIONS	BY	DATE

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PRELIMINARY WQMP MAP

APPLE BEAR RETAIL SITE
WOOD INVESTMENT COMPANIES
2950 AIRWAY AVENUE, SUITE A-9
COSTA MESA, CA 92626

DRAWN: AJC
DATE:
CHECKED:
DATE:
REVISION #:
DATE:
JOB NO: SP8879

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Sep. 12, 2022 - 5:30pm by rhoskin K:\Drawings\SP\SP8879 - Apple Valley\ENG\Preliminary WQMP\SP8879-WQMP.dwg