



Brunsing Associates, Inc.

GEOTECHNICAL INVESTIGATION

**NEW SHOP BUILDING
15880 KUGLEMAN STREET
LOWER LAKE, CALIFORNIA**

Project Number 13853.01

January 19, 2026

Engineers and Geologists

GEOTECHNICAL INVESTIGATION

NEW SHOP BUILDING
15880 KUGLEMAN STREET
LOWER LAKE, CALIFORNIA

Project Number 13853.01

prepared for

John Lucchesi

prepared by

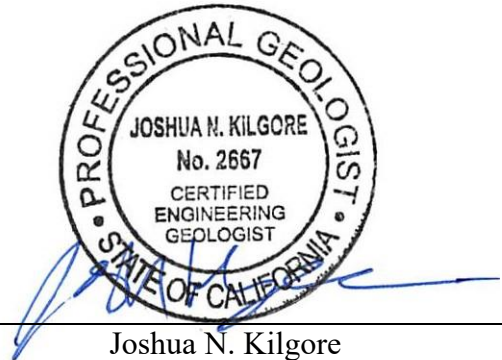
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1.0 INTRODUCTION

This report presents the results of the geotechnical investigation that Brunsing Associates, Inc. (BAI) has performed for the New Shop Building at 15880 Kugelman Street, Lower Lake, California. The site is shown on the Vicinity Map, Plate 1.

It is our understanding that a single-story shop building with associated flat-work is planned to be constructed at the southeast corner of the property. The purpose of our investigation was to evaluate the site soil and geologic conditions in order to provide conclusions and recommendations regarding site grading, support of concrete slab-on-grade, structure foundation support, and associated construction considerations. Our approach to providing geotechnical guidelines for the design of the project utilized our knowledge of the soil and conditions in the site vicinity and experience with similar projects in the area. Field exploration for this investigation was directed toward confirming anticipated soil and geologic conditions in order to provide the basis for our conclusions and recommendations.

As outlined in our Professional Services Agreement, dated September 9, 2025, our scope of services for the geotechnical investigation included subsurface exploration, laboratory testing and engineering and geologic analyses, in order to provide conclusions and recommendations regarding:

- Site preparation and grading, including excavation characteristics, and treatment of existing fill, expansive and porous soils, as appropriate.
- Suitable foundation types, with design criteria and estimated settlement behavior.
- Seismic ground motion values per California Building Code.
- Local geology and site geologic hazards.
- Site drainage and subdrains.
- Anticipated geotechnical construction problems, if appropriate.

2.0 INVESTIGATION AND LABORATORY TESTING

2.1 Research

As part of our investigation, we reviewed published geotechnical literature, including geologic, fault and seismic hazard maps for the site and vicinity. A list of selected published references reviewed for this investigation is presented in Appendix A.

2.2 Field Reconnaissance

BAI's senior engineering geologist performed a reconnaissance of the property on September 17, 2025, to observe site conditions and conduct the field exploration.

2.3 Field Exploration

Our subsurface exploration was conducted on September 17, 2025, and consisted of excavating, logging, and sampling two exploratory test pits: TP-1 and TP-2. The approximate test pit locations



are shown on the Site Map, Plate 2. Test pits were advanced to depths between 4.5 and 5.0 feet below ground surface using a client provide and operated backhoe with an 18-inch-wide bucket.

Our geologist made a descriptive log of each test pit and obtained representative (disturbed) samples of the soil materials encountered for visual classification and laboratory testing. He also performed pocket penetrometer (PP) readings on the soils exposed in the pit walls; PP readings provide a relative indication of soil shear strength.

Graphic logs of the test pits, showing the materials encountered, are presented on Plates 3 and 4. The soils are classified in accordance with the Unified Soil Classification System outlined on Plate 5. The various descriptive properties used to describe the soils are listed on Plate 6.

2.4 Laboratory Testing

Soil samples obtained during our subsurface exploration were transported to our laboratory and examined to confirm field classifications. Laboratory tests were performed on selected samples to estimate their pertinent geotechnical engineering characteristics. Laboratory testing consisted of moisture content, percent passing #200 sieve, and Atterberg Limits testing.

The laboratory test results are presented opposite the samples tested on the boring logs. A key to test data is provided on Plate 5. Atterberg Limits test results are presented on Plate 7.

3.0 SITE CONDITIONS

The site is in a rural area located southeast of ¼ miles west Highway 53 and ¼ mile south of Anderson Marsh State Historic Park in Lower Lake, California. The property is bounded by rural properties to the north, south, east and west which appear to be utilized as grazing land and light industrial/storage areas. At the time of our surface and subsurface investigations, the subject property was occupied by an existing single-story shop and fenced storage yard.

The site is located on and adjacent to nearly level terrain, located southwest of Clear Lake. No standing water or drainage courses were observed at the site during our surface and subsurface investigations. Groundwater was not encountered in our test pits completed on September 17, 2025. Temporarily perched groundwater may occur within one foot of the surface during, and just following, wet weather periods.

4.0 SITE GEOLOGY AND SOILS

According to the geologic maps reviewed of the area, the site is underlain by Quaternary aged alluvial deposits consisting of gravel, sand, silt, and clay. Our subsurface investigation encountered alluvial deposits which extended to the maximum depths explored. The alluvial soils consisted of gray-brown deposits of sandy silt. The deposits were dry to moist, medium stiff to hard and of low plasticity. Locally the alluvial deposits were blanketed by imported gravel fill.

No evidence of fault activity was observed at the property and no generally available published references show faults on, or trending towards, the property. The nearest active fault (i.e.,



movement within the last 11,650 years) is the Konocti Bay Fault Zone, approximately 4.3 miles west of the site.

Future damaging earthquakes could occur on the Konocti Bay Fault Zone or further faults during the lifetime of the proposed project. In general, the intensity of ground shaking at the site will depend on the distance to the causative earthquake epicenter, the magnitude of the shock, and the response characteristics of the underlying earth materials.

5.0 DISCUSSIONS AND CONCLUSIONS

5.1 General

Based upon the results of our investigation, we conclude that the site is suitable for the proposed construction. The main geotechnical considerations affecting the design and construction of the project are weak and porous near surface soils, settlement, strong seismic shaking and potential liquefaction. These constraints are discussed in the following subsections, along with potential settlement.

5.2 Settlement

Assuming foundations are designed and constructed in accordance with our recommendations, we estimate that the maximum post-construction settlement due to foundation loads will be less than ½ inch. We judge that post-construction differential settlement will be less than ¼ inch between adjacent foundations.

5.3 Weak and Porous Near Surface Soils

The near surface deposits including the imported gravel fill are weak and porous and could potentially collapse under the weight of foundations or structural fill. Due to the variable and weak nature of these soils, they are considered unsuitable for the support of foundations and interior and exterior concrete slab-on-grade. These soils should be removed and replaced as properly compacted fill according to the specifications of this report prior to being utilized for structural support.

5.4 Seismicity and Faulting

As is typical of the Lake County area, the site will be subject to strong ground shaking during future, nearby, large magnitude earthquakes. The intensity of ground shaking at the site will depend on the distance to the causative earthquake epicenter, the magnitude of the shock, and the response characteristics of the underlying earth materials. Generally, structures founded in supporting materials and designed in accordance with current building codes are well suited to resist the effects of ground shaking.

No evidence of faulting was observed by BAI or shown in the site vicinity on the published geologic maps that we reviewed for this investigation. Therefore, the potential for fault rupture at the site is considered low.



6.0 RECOMMENDATIONS

6.1 Site Grading

6.1.1 Clearing and Stripping

Areas to be graded should be cleared of existing vegetation and debris. After clearing, surface soils that contain organic matter should be stripped. In general, the depth required stripping will be about 4 to 6 inches; deeper stripping and grubbing may be required to remove isolated concentrations of organic matter or roots. The cleared materials should be removed from the site; however, strippings can be stockpiled for later use in landscape areas.

6.1.2 Structural Area Preparation

Within the building areas weak and porous soils should be removed to an elevation of at least 18-24 inches below ground surface. Removal of these soils should extend for a minimum distance of about 5 feet beyond the perimeter of the building foundations and about 3 feet beyond exterior concrete slabs. BAI should observe the soils exposed by the recommended excavations. The exposed soils should then be scarified to about six inches deep, moisture conditioned to at least optimum moisture content and compacted to at least 90 percent relative compaction as determined by the ASTM D 1557 test procedure, latest edition.

Fill material, either imported or on-site, should be free of perishable matter and rocks greater than six inches in largest dimension, have an expansion index of less than 40, and should be approved by BAI before being used on site as structural fill.

Fill should be placed in thin lifts (six to eight inches depending on compaction equipment), conditioned to near optimum moisture content and compacted to at least 90 percent relative compaction as determined by the ASTM D 1557 test procedure, latest edition, to achieve planned grades.

6.1.3 Finish Grading

Finished pad surfaces should be graded to drain away from the foundations. A minimum surface drainage gradient of five percent is recommended.

Subgrade soil should be finished true to line and grade to present a smooth, firm, and unyielding surface. Finished surfaces should be maintained moist and free of shrinkage cracks until covered by permanent construction. Pad surfaces allowed to dry out and crack should be re-moisture conditioned to near optimum moisture content and re-compacted prior to foundation and concrete slab-on-grade installation.



6.2 Foundation Support

The proposed structure can be supported on reinforced concrete footings founded in compacted fill, placed in accordance with our recommendations or in supporting soils. Footings can be designed using an allowable bearing pressure of 2,500 pounds per square foot for dead plus live loads. A 33 percent increase in bearing pressure is allowable for total loads, including wind or seismic loads.

Footing elements should be founded at least 12 inches below lowest adjacent finish grade or 18 inches for two story construction. Wall footings should be no less than 18 inches wide. Where weak and porous soils are not removed; footing excavations should extend at least 12 inches into supporting soils, resulting in footing excavations that are about 30 to 36 inches deep below existing grade. No subsurface structures (such as subsurface walls, tanks, or other foundations) should extend below the footings, or within a zone defined by a 45-degree angle projected downward from the outside, bottom edges of the footings. Completed foundation excavations should be observed by BAI prior to the placement of reinforcing steel.

Resistance to lateral loads can be obtained using passive earth pressure against the face of the foundations. An allowable passive pressure of 200 pounds per square foot of depth below subgrade and frictional resistance of 0.30 times net vertical dead load are appropriate for footing elements poured neat against supporting approved materials, if required. Passive pressure should be neglected within the upper six inches of subgrade unless slabs or parameters confine the surface.

6.3 Seismic Design Criteria

The structures should be designed and/or constructed to resist the effects of strong ground shaking (on the order of Modified Mercalli Intensity IX) in accordance with current building codes. The California Building Code (CBC) 2022 edition indicates that the site classification for the property is Site Class D. Accordingly, CBC indicates that the following seismic design parameters are appropriate for the site:

Table 1: Seismic Design Parameters

Site Class	=	D
Mapped Spectral Response Acceleration at 0.2 sec	$S_s =$	1.50g
Mapped Spectral Response Acceleration at 1.0 sec	$S_1 =$	0.52g
Modified Spectral Response Acceleration at 0.2 sec	$S_{MS} =$	1.62g
Modified Spectral Response Acceleration at 1.0 sec	$S_{M1} =$	1.31g
Design Spectral Response Acceleration at 0.2 sec	$S_{DS} =$	1.08g
Design Spectral Response Acceleration at 1.0 sec	$S_{D1} =$	0.87g
Long Period Transition	$T_L =$	8
Seismic Design Category	=	D

6.4 Concrete Slab Support

If a structural-supported concrete slab (i.e., the slab is supported by and able to span between interconnecting foundation elements without gaining support from underlying soil) is used, then



over-excavation of the near-surface weak and porous soil zone is not required. However, soils containing organics should be removed beneath the planned slab (as much as four to six inches in depth below existing ground surface).

Concrete slab-on-grade not supported by foundations elements should be supported on properly compacted fill soils placed in accordance with our recommendations previously presented in section 6.1 Site Grading. Regardless of means of support, interior concrete slab floors should be underlain by at least four inches of clean free draining $\frac{3}{4}$ inch crushed rock to act as a capillary moisture break. An underslab drain should be constructed as shown on the attached Plate 8. Shrinkage cracks within the subgrade soils should be closed by wetting before gravel or rock placement.

Where migration of moisture through the floor slab would be detrimental to its intended use, the installation of a vapor barrier membrane should be considered. The moisture/vapor barrier geomembrane, placed upon the gravel layer, should be at least 15 mils thick (i.e., Stego ® Wrap Vapor Barrier, or equivalent), installed in accordance with the manufacturer's specifications to prevent moisture migration through the seams. With a 15-mil minimum thickness membrane, the 2 inches of wetted sand typically placed upon the membrane may be omitted. Construction of moisture/vapor barrier does not guarantee the prevention of moisture moving through the floor slab. However, this provision should substantially reduce the potential for moisture-vapor problems on the floors and/or future mold and mildew problems.

6.5 Site Drainage

Because surface and/or subsurface water is often the cause of foundation or slope stability problems, care should be taken to intercept and divert concentrated surface flows and subsurface seepage away from the building foundations. Drainage across the lot should be by sheet-flow. Surface grades should maintain a recommended five percent gradient away from building foundations.

7.0 ADDITIONAL SERVICES

Prior to construction, BAI should review the final grading and foundation plans, and geotechnical related specifications for conformance with our recommendations.

During construction, BAI should be retained to provide periodic observations, together with field and laboratory testing, during site preparation, placement, and compaction of fills, if required, and foundation construction. Foundation excavations should be reviewed by BAI while the excavation operations are being performed. Our reviews and tests would allow us to verify conformance of the work to project guidelines, determine that soil conditions are as anticipated, and to modify our recommendations, if necessary.

8.0 LIMITATIONS

This geotechnical investigation was performed in accordance with the usual and current standards of the profession, as they relate to this and similar localities. No other warranty, expressed or



implied, is provided as to the conclusions and professional advice presented in this report. Our conclusions are based upon reasonable geological and engineering interpretation of available data.

The samples taken and tested, and the observations made, are representative of the site; however, soil and geologic conditions may vary significantly between test pits and across the site. As in most projects, conditions revealed during construction excavation may be at variance with preliminary findings. If this occurs, the changed conditions must be evaluated by BAI, and revised recommendations be provided as required.

This report is issued with the understanding that it is the responsibility of the Owner, or his/her representative, to ensure that the information and recommendations contained herein are brought to the attention of all other design professionals for the project, and incorporated into the plans, and that the Contractor and Subcontractors implement such recommendations in the field. The safety of others is the responsibility of the Contractor. The Contractor should notify the owner and BAI if he/she considers any of the recommended actions presented herein to be unsafe or otherwise impractical.

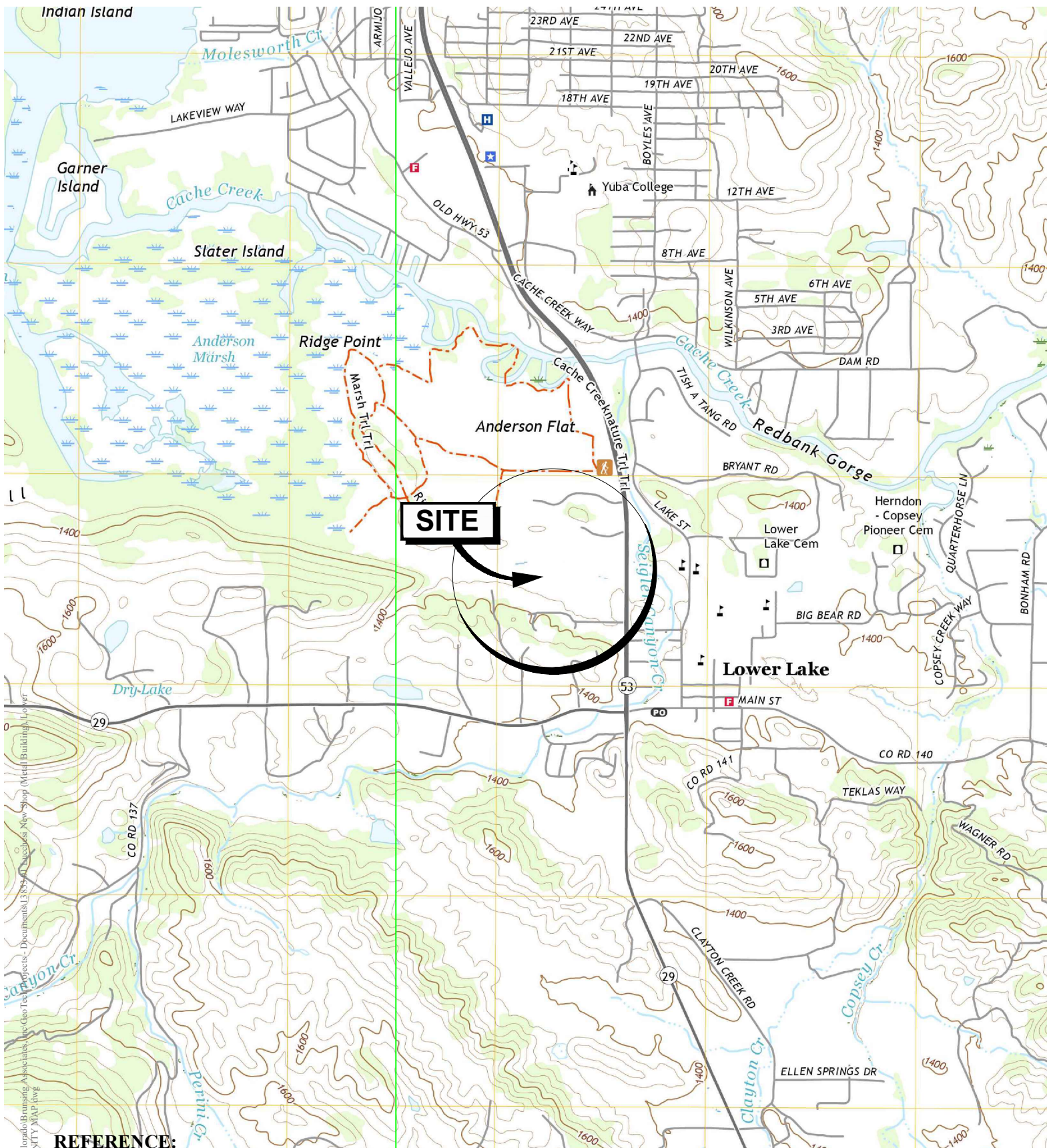
Changes in the condition of a site can occur with the passage of time, whether they are due to natural events or to human activities on this, or adjacent sites. In addition, changes in applicable or appropriate codes and standards may occur, whether they result from legislation or the broadening of knowledge.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

The recommendations contained in this report are based on certain specific project information regarding the type of construction and current structure locations which have been made available to us. If conceptual changes are undertaken during final project design, we should be allowed to review them in light of this report to determine if our recommendations are still applicable.



PLATES





REFERENCE:

US TOPO

Clearlake Highlands and Lower Lake Quadrangles
7.5-Minute Series, USGS, 2021

Latitude: 38.916040

Longitude: -122.616410



APPROXIMATE SCALE (FEET)



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Date: 01/19/26

VICINITY MAP
NEW SHOP BUILDING
15880 Kugleman Street
Lower Lake, California

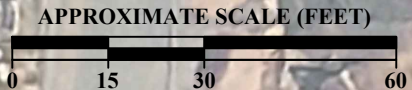
PLATE

1

LEGEND

Test Pit location and number

Approximate property line



REFERENCE:
 Google Earth and Plot Plan prepared
 by VanDerWall Engineering dated
 June 2025



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SITE MAP
 NEW SHOP BUILDING
 15880 Kugleman Street
 Lower Lake, California

PLATE
2

TEST PIT 1 PER PAGE: 13853.01 GINT.GPJ, 1/20/26

Laboratory Tests

63% Passing #200
LL=26, PI=7

Pocket
Penetrometer (psf)

9000

9000

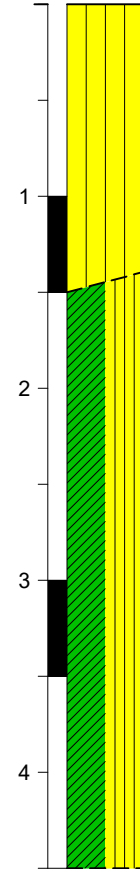
Log of Test Pit TP-1

Equipment: Bachkhoe with 18-inch bucket

Date: 9/17/25 **Logged By:** JNK

Elevation: 1348 feet * **Latitude:** 38.915866 **Longitude:** -122.616296

Depth (ft.)
Sample



LIGHT BROWN SANDY SILT (ML)
hard, dry
porous with roots,

GRAY-BROWN SANDY SILTY CLAY (CL-ML)
stiff to hard, dry to moist

Notes:
1. Near practical excavating refusal at 4.5 feet.
2. No free water encountered.

Latitude/Longitude estimated from Google Earth
* Elevations interpolated from Pacific Veg Map.

Scale: 1" = 1'



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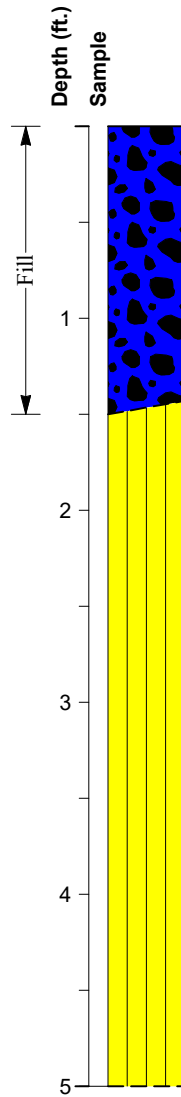
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LOG OF TEST PIT TP-1
NEW SHOP BUILDING
15880 Kugleman Street
Lower Lake, California

PLATE
3

Pocket
Penetrometer (psf)

9000



BROWN GRAVEL (GW)
hard, dry

GRAY-BROWN SANDY SILT (ML)
stiff, dry to moist

Log of Test Pit TP-2

Equipment: Bachkhoe with 18-inch bucket

Date: 9/17/25

Logged By: JNK

Elevation: 1348 feet * Latitude: 38.915967 Longitude: -122.615995

Latitude/Longitude estimated from Google Earth
* Elevations interpolated from Pacific Veg Map.

Scale: 1" = 1'



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LOG OF TEST PIT TP-2
NEW SHOP BUILDING
15880 Kugleman Street
Lower Lake, California

PLATE

4

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)	MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS		
				GRAPHIC	LETTER			
	COARSE-GRAINED SOILS	GRAVELS AND GRAVELLY SOILS	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 (Greater than 12% fines)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES		
					GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES		
		SAND AND SANDY SOILS	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		
			50% OR MORE OF COARSE FRACTION PASSING THROUGH NO. 4 SIEVE		SANDS WITH FINES (Greater than 12% fines)	SM	SILTY SANDS, SAND-SILT MIXTURES	
						SC	CLAYEY SANDS, SAND-CLAY MIXTURES	
	FINE-GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY		
					CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS		
					OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY		
		SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILT, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS		
					CH	INORGANIC CLAYS OF HIGH PLASTICITY		
					OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS		
					HIGHLY ORGANIC SOILS		PT	PEAT, HUMOUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

KEY TO TEST DATA

LL - Liquid Limit

Consol - Consolidation

Shear Strength, psf

Confining Pressure, psf

PI - Plasticity Index

EI - Expansion Index

Tx 1564 (1440) - Unconsolidated Undrained Triaxial

■ Sample Retained

SA - Sieve Analysis

TxCU 1564 (1440) - Consolidated Undrained Triaxial

▨ Sample Recovered, Not Retained

DS 2020 (1440) - Consolidated Drained Direct Shear

☒ Bulk Sample

FVS 520 - Field Vane Shear

☐ Sample Not Recovered

UC 1500 - Unconfined Compression

CA - California Modified Split Barrel Sampler 3.0-inch O.D.

PP 1500 - Field Pocket Penetrometer

CM - California Modified Split Barrel Sampler 2.5-inch O.D.

Sat - Sample saturated prior to test

SPT - California Split Barrel Sampler 2.0-inch O.D.

SH - Shelby Tube

▽ Initial Groundwater Level Reading

RC - Rock Coring

▼ Second Groundwater Level Reading

Recovery - Percent Core Recovered

RQD - Rock Quality Designation (length of core pieces >= 4-inches / core length)



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SOIL CLASSIFICATION CHART & KEY TO TEST DATA

NEW SHOP BUILDING
15880 Kugleman Street
Lower Lake, California

PLATE

5

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	Standard Penetration Test Blow Count (blows per foot)
Very loose	4 or less
Loose	5 to 10
Medium dense	11 to 30
Dense	31 to 50
Very dense	More than 50

CONSISTENCY OF FINE-GRAINED SOILS

Consistency	Identification Procedure	Approximate Shear Strength (psf)
Very soft	Easily penetrated several inches with fist	Less than 250
Soft	Easily penetrated several inches with thumb	250 to 500
Medium stiff	Penetrated several inches by thumb with moderate effort	500 to 1000
Stiff	Readily indented by thumb, but penetrated only with great effort	1000 to 2000
Very stiff	Readily indented by thumb nail	2000 to 4000
Hard	Indented with difficulty by thumb nail	More than 4000

NATURAL MOISTURE CONTENT

Dry	No noticeable moisture content. Requires considerable moisture to obtain optimum moisture content* for compaction.
Damp	Contains some moisture, but is on the dry side of optimum.
Moist	Near optimum moisture content for compaction.
Wet	Requires drying to obtain optimum moisture content for compaction.
Saturated	Near or below the water table, from capillarity, or from perched or ponded water. All void spaces filled with water.

* Optimum moisture content as determined in accordance with ASTM Test Method D1557, latest edition.

Where laboratory test data are not available, the above field classifications provide a general indication of material properties; the classifications may require modification based upon laboratory tests.



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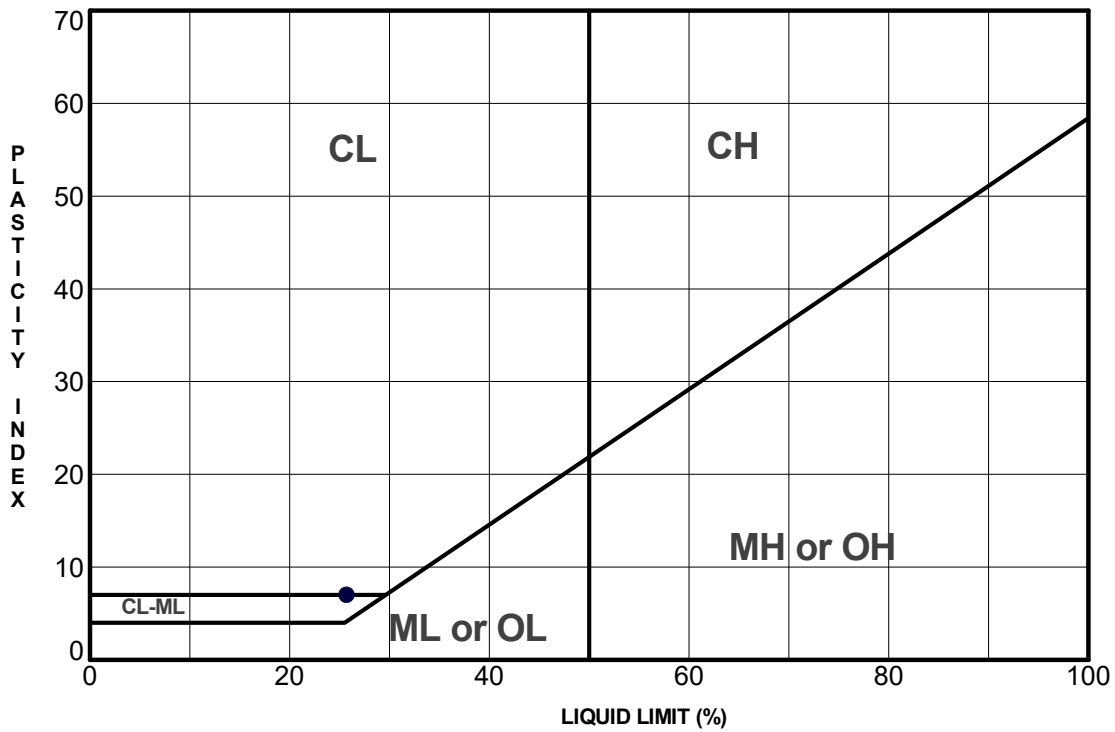
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SOIL DESCRIPTIVE PROPERTIES

NEW SHOP BUILDING
15880 Kugleman Street
Lower Lake, California

PLATE

6



SYMBOL	CLASSIFICATION AND SOURCE	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX	% PASSING No. 200 SIEVE
●	GRAY-BROWN SANDY SILTY CLAY (CL-ML) TP-1 @ 3.0 feet	26	19	7	63

ASTM D4318



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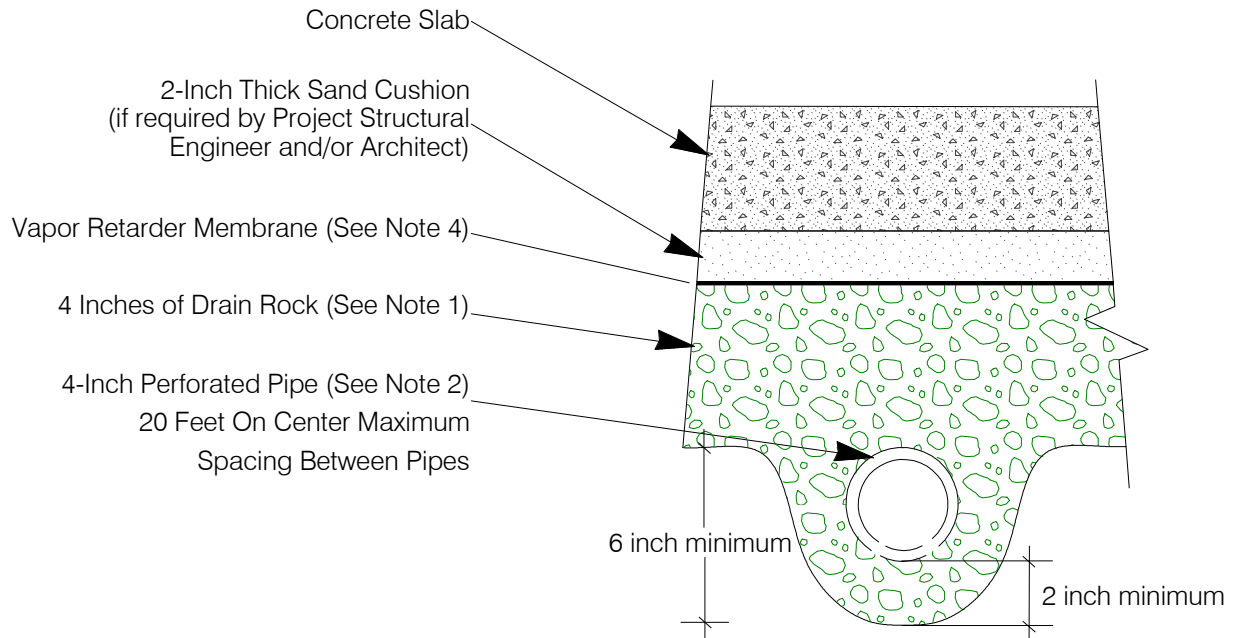
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ATTERBERG LIMITS TEST RESULTS

NEW SHOP BUILDING
15880 Kugleman Street
Lower Lake, California

PLATE

7



NOT TO SCALE

NOTES:

1. Drain rock should be clean, free-draining 3/4-inch crushed rock. Drain rock should be vibated in place to ensure a tight inter-locking of the rocks.
2. Pipe should be SDR 35 or equivalent, perforations placed down, sloped at least 1 percent to gravity outlet.
3. A clean-out pipe with cap should be installed at the up-slope end of perforated pipe.
4. Vapor retarder should be at least 15-mils thick and installed in accordance with the manufacturer's specifications.



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UNDERSLAB DRAINAGE DETAILS
NEW SHOP BUILDING
15880 Kugleman Street
Lower Lake, California

PLATE
8

APPENDIX A

References

- California, Division of Mines and Geology, 1953, Geologic of the Lower Lake Quadrangle, California.
- California, Division of Mines and Geology, 1990, Landslide Hazards in the Eastern Clear Lake Area, Lake County California: Landslide Hazard Identification Map No. 16.
- California Department of Conservation Division of Mines and Geology, 1982, Geologic Map of the Santa Rosa Quadrangle.
- Metropolitan Transportation Commission/Association of Bay Area Governments, last updated March 2020, Hazard Viewer Map.
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