# Geotechnical Investigation Report

## Proposed Life Plan Humboldt New Community, Hiller Road, McKinleyville, Humboldt County, California; APNs 508-251-060 and 510-133-013

**Prepared for:**

Life Plan Humboldt

**April 2025**

**024007.200**

**Phone:** (707) 441-8855 **Email:** info@shn-engr.com
**Web:** shn-engr.com • 812 W. Wabash Avenue, Eureka, CA 95501-2138

Phone: (707) 441-8855 Email: info@shn-engr.com Web: shn-engr.com
812 W. Wabash Avenue, Eureka, CA 95501-2138

Reference: 024007.200

April 18, 2025

Ann Lindsay, Board Chair
Life Plan Humboldt
1585 Heartwood Drive, Suite B
McKinleyville, CA 95519

**Subject: Geotechnical Investigation Report, Proposed Life Plan Humboldt New Community, Hiller Road, McKinleyville, Humboldt County, California; APNs 508-251-060 and 510-133-013**

Dear Ann Lindsay:

In accordance with your authorization of our agreement dated November 2024, we have performed a geotechnical investigation for the proposed Life Plan Humboldt New Community located on Hiller Road in McKinleyville, California. The accompanying report presents the findings of our study, and our conclusions and recommendations pertaining to the geotechnical aspects of the proposed development's design and construction. Based on the results of our investigation, it is our opinion that the site can be developed as is currently planned, provided the recommendations in this report are followed and implemented during all phases of work.

We appreciate this opportunity to work with you and Life Plan Humboldt on this project. If you have any questions regarding this report, or if we may be of further service, please contact the undersigned.

Sincerely,

SHN

Giovanni A. Vadurro, CEG
Engineering Geologist
(707) 441-8855

John H. Dailey, PE, GE
Senior Geotechnical Engineer
(707) 459-4518

GAV:JHD:lam
Enclosure: Report

\\eureka\projects\2024\024007-LifePlanHumboldt\200-Geotech\PUBS\rpts\20250418-LPHGeotechnicalRpt.docx

# Geotechnical Investigation Report

## Proposed Life Plan Humboldt New Community, Hiller Road, McKinleyville, Humboldt County, California; APNs 508-251-060 and 510-133-013

Prepared for:

**Life Plan Humboldt**


Giovanni A. Vadurro, CEG
Engineering Geologist
signed 4-18-2025

John H. Dailey, PE, GE
Senior Geotechnical Engineer
signed 4-18-2025


Prepared by:


812 W. Wabash Ave.
Eureka, CA 95501-2138
(707) 441-8855


April 2025

QA/QC: JHD__JHD

Reference: 024007.200

# Table of Contents

# List of Illustrations

# Abbreviations and Acronyms

## Units of Measure

| Unit | Definition |
|---|---|
| bpf | blows/ft |
| H | Height |
| lbs/ft | pounds per foot |
| mm | millimeters |
| ohms-cm | ohms-centimeter |
| pcf | pounds per cubic foot |
| pci | pounds per cubic inch |
| ppm | parts per million |
| psf | pounds per square foot |
| psi | pounds per square inch |
| SF | square feet |
| µm | micrometers |

## Additional Terms

| Term | Definition |
|---|---|
| ABS | acrylonitrile butadiene styrene |
| ACI | American Concrete Institute |
| ASCE | American Society of Civil Engineers |
| ASTM | ASTM International |
| BGS | below ground surface |
| Caltrans | California State Transportation Agency, Department of Transportation. |
| CBC | California Building Code |
| CBSC | California Building Standards Commission |
| CDMG | California Department of Conservation, Division of Mines and Geology |
| CGS | California Geological Surve |
| CSZ | Cascadia Subduction Zone |
| $F_{PGA}$ | Site Coefficient |
| GEOR | Geotechnical Engineer-of-Record |
| H:V | horizontal to vertical |
| k | subgrade reaction modulus |
| $MCE_G$ | maximum considered geometric mean |
| MCER | risk-targeted maximum considered earthquake |
| $M_W$ | maximum moment magnitude |
| ML | soft silt with sand |
| NR | no reference |
| OSHA | Occupational Health and Safety Administration |
| p | magnitude of the footing load |
| PGA | Peak Ground Acceleration |
| PVC | polyvinyl chloride |
| R4 | the radius from the location on the wall where $\Delta$p is, measured to the footing load on the surface |
| SC | clayey sand |
| SDR | standard dimension ratio |
| SE | sand equivalent |
| SEI | Structural Engineering Institute |
| SM | silty sand |
| SP | poorly graded sand |
| SPT | standard penetration test |
| USGS | United States Geological Survey |
| X | centerline distance from the footing load to the wall |
| Z | depth below surface |
| $\Delta$ph | the lateral stress on the wall at depth z |

# 1.0 Purpose and Scope

This report presents the results of a geotechnical investigation for the proposed Life Plan Humboldt New Community development located at the east end of Hiller Road near the intersection with Central Avenue in McKinleyville, California (Figure 1). An aerial view of the project site boundary and existing site conditions in relation to adjacent developments and roadways is as shown in Figure 2. A boundary and topographic survey of the site prepared by Spencer Engineering and dated July 24, 2001, is provided in Appendix 1. Select detail sheets from the preliminary conceptual design set including the site layout and grading plan prepared by Perkins Eastman and dated January 21, 2025, are provided in Appendix 2 for reference.

The purpose of the investigation was to evaluate the soil and geologic conditions at the site and, based on conditions encountered, to provide recommendations pertaining to the geotechnical aspects of design and construction.

The scope of this investigation included subsurface exploration, laboratory testing, engineering analysis, and the preparation of this report. The site was explored on January 14 and 15, 2025, by drilling and sampling twelve 4-inch diameter geotechnical borings to depths ranging from 11.5 feet and 51.5 feet below the existing ground surface (BGS). The geotechnical borings were advanced using a track-mounted CME-55 rotary-wash drilling rig operated by Taber Drilling, Inc. of West Sacramento, California. The approximate locations of the geotechnical borings in relation to the proposed developments are shown in Figure 3. A detailed discussion of the subsurface investigation, including the final geotechnical boring logs, is provided in Appendix 3.

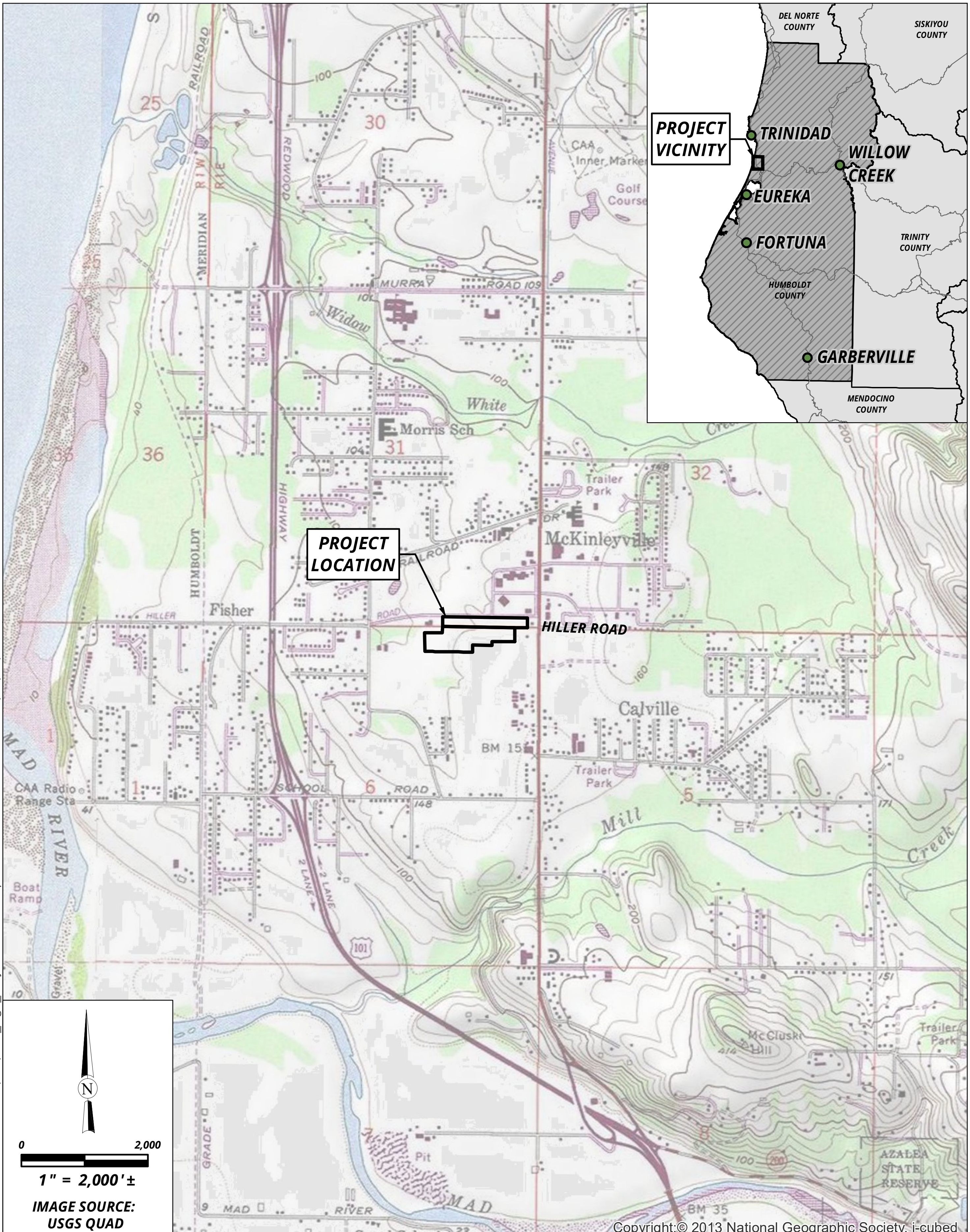
Laboratory tests were performed on selected soil samples obtained during this geotechnical investigation to determine pertinent soil index and strength properties. A summary of the laboratory test results is provided in Appendix 4.

The recommendations presented herein are based on analysis of the data obtained during the investigation and our experience with similar soil and geologic conditions. References reviewed in the preparation of this report are provided in section "10.0: References Cited."

# 2.0 Site and Project Description

The proposed developments are located on the vacant land containing both open pasture and numerous mature, large diameter eucalyptus trees as shown in Figure 2. An existing wetland occupies the northwest corner of the site. The locations of the proposed structures in relation to existing roadways, property lines, and the current topography are shown in Figure 3. The project site borders residential developments to the southwest and commercial developments to the west, east, and south. Hiller Road borders the site to the north and will provide access to the proposed developments during construction and following the full build-out.

Based on the conceptual design set documents prepared by Perkins Eastman, we understand that the proposed developments will be built out in two phases. Phase 1 will consist of 2, 2-story buildings, 35 cottages, and 53 studios. The two buildings, denoted as Buildings A and B in Figure 3, have first floor building footprints of 19,335 square feet (SF) and 15,060 SF, respectively, and a total building area of 38,360 SF and 24,610 SF, respectively. Each cottage will contain an area of 1,085 SF. The studios will vary from 530 SF to 850 SF. Phase 2 will consist of 4, 2-story buildings, 4 cottages, and an additional 53

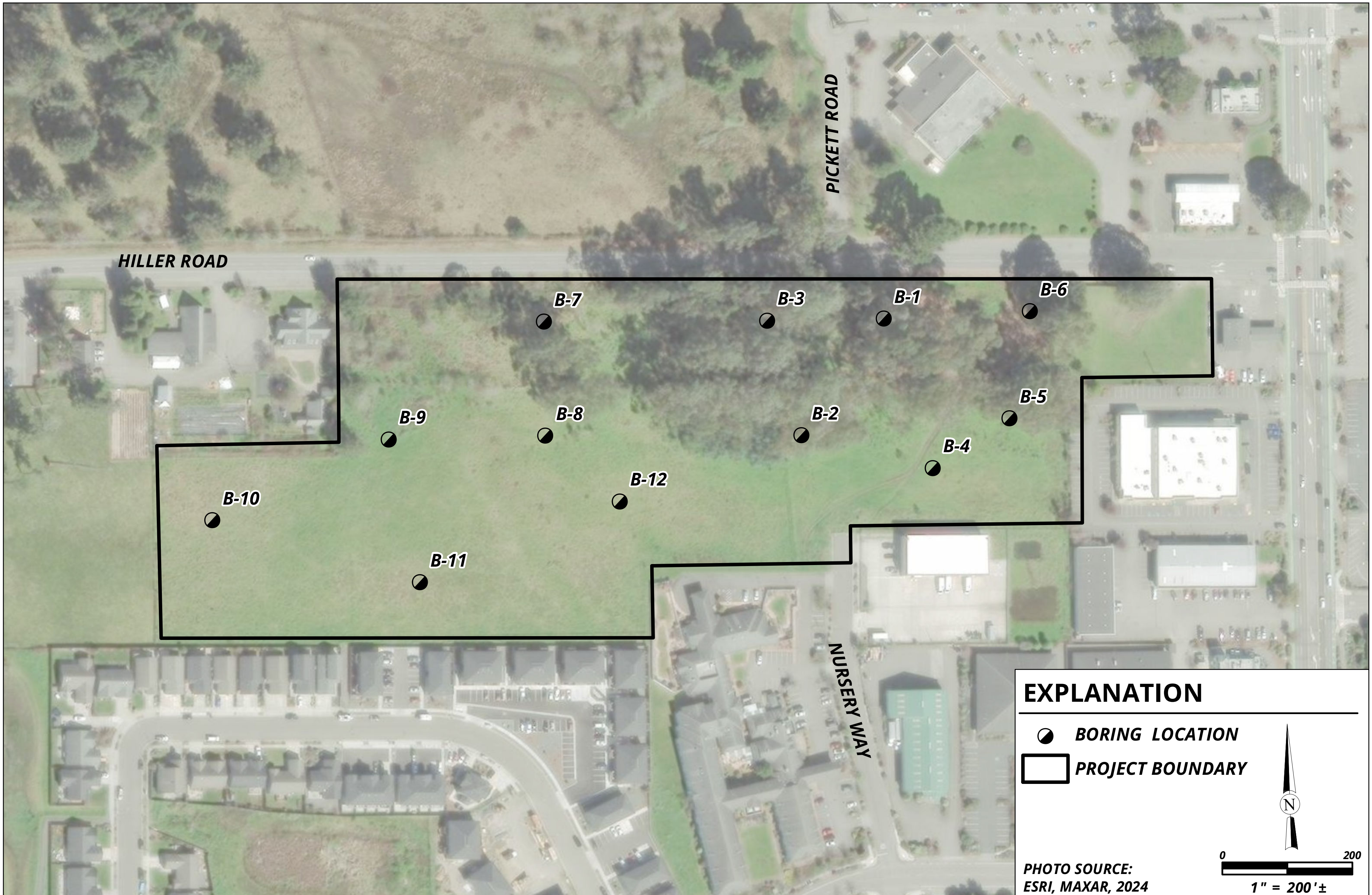



Life Plan Humboldt
Groundwater Study
Hiller Road, McKinleyville, California

**Project Location Map**

April 2025 - 024007.100

**Figure 1**

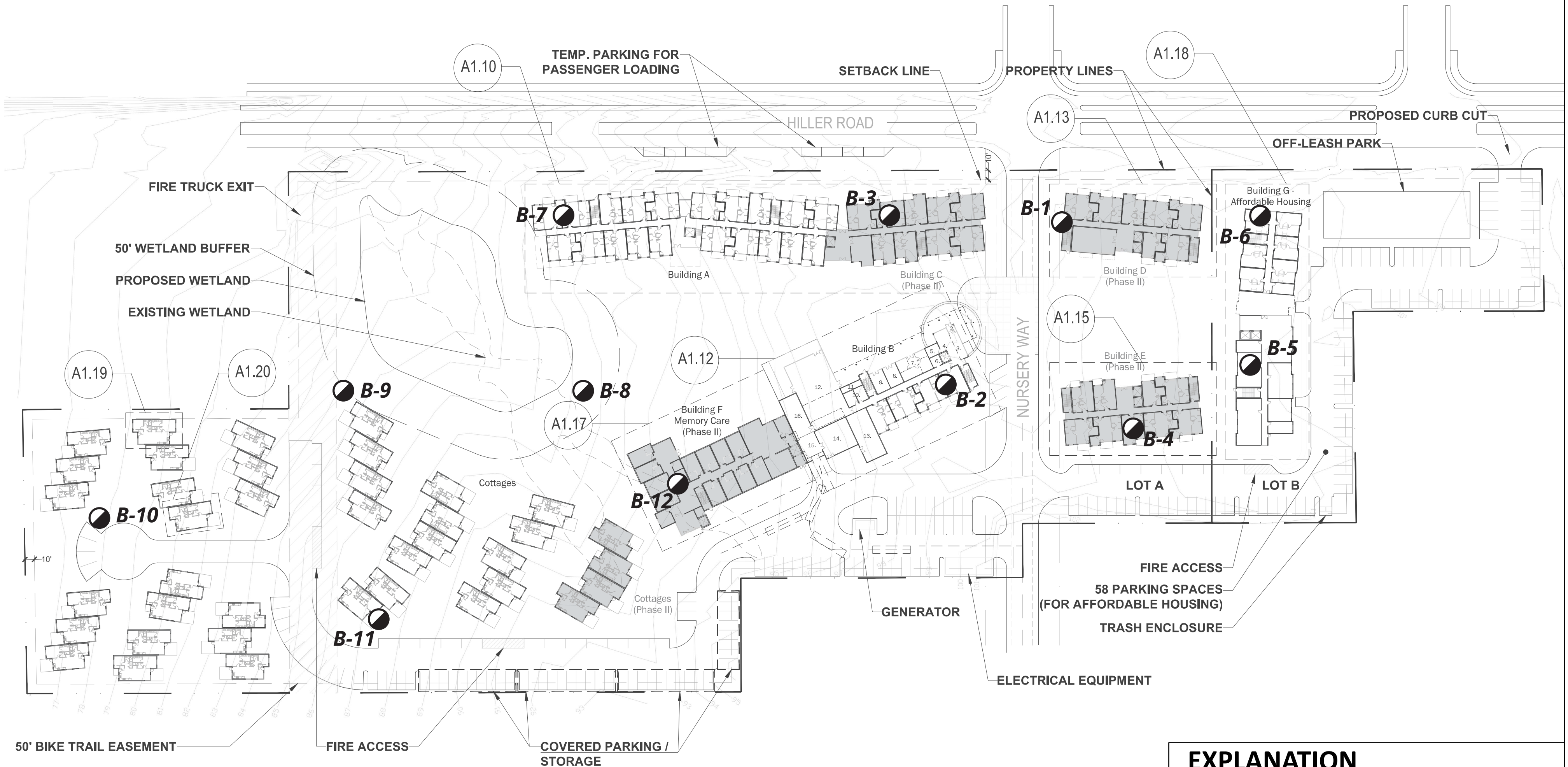



Life Plan Humboldt
Life Plan Humboldt - Geotechnical Investigation
Hiller Road, McKinleyville, CA

**Existing Conditions with Boring Locations**
April 2025 - 024007.200

**Figure 2**

P:\Eureka\2024\024007-LifePlanHumboldt\GIS\GEOTECH_Fig3_SitePlanwBoringLocations.ai -- mrose, 3/24/25




## EXPLANATION

*BORING LOCATIONS (APPROX.)*

100 *CONTOUR INTERVAL = 1 FOOT*

N *1"=150'±*

***BASEMAP MODIFIED FROM SHEET A0.10, PERKINS EASTMAN, JANUARY 1, 2024; PROJECT DATUM***

Life Plan Humboldt
Life Plan Humboldt - Geotechnical Investigation
Hiller Road, McKinleyville, CA

**Site Plan with Boring Locations**

March 2025 - 024007.200

**Figure 3**

studios. The four buildings, denoted as Buildings C through F in Figure 3, have first floor building footprints ranging from 8,870 SF to 11,920 SF and total building areas ranging from 17,875 SF to 23,840 SF. The cottages and studios in Phase 2 will be of similar size to those constructed in Phase 1.

All of the buildings' structural systems are expected to consist of conventional wood and/or metal framing. Additional site improvements include new paved roadways and parking areas, covered parking and storage areas, underground utilities, a new storm drain system and constructed wetland surrounding the existing wetland, and a dog park.

# 3.0 Site Conditions

The following sections describe the current surface conditions, local geology, and soil and groundwater conditions encountered during our geotechnical field exploration.

## 3.1 Geology

Based on review of published geologic mapping (Kelley, 1984; Carver and others, 1985) and our general knowledge of the local geology, the project site is situated on an uplifted late Pleistocene age marine terrace composed of beach and shallow marine deposits. Published mapping describes these terrace deposits as being composed of poorly to moderately consolidated marine silts, sands, and gravels, which is consistent with the earth materials logged during our field exploration.

The age of the marine terrace surface in the local area has been estimated based on correlation with global sea level high stands. Comparison of the altitudinal spacing relative to older and higher terraces in the local area indicates the terrace surface at the project site to have formed during a sea level high stand, which occurred approximately 80,000 years ago. Underlying the terrace deposits is Pliocene to Pleistocene age Falor Formation that is composed of well-indurated fluvial, coastal plain and shallow marine deposits, and is estimated to be approximately 300,000 to 500,000 years old.

## 3.2 Topography

The project datum elevation of the ground surface at the site measured over a distance of about 1,700 feet varies from a maximum of 101 feet at the northeast property corner to a minimum of 76 feet at the southwest property corner. The elevation of the site above sea level varies from about 149 feet to 124 feet (GoogleEarth, 1985). Surface gradients vary from less than about 1 percent in the eastern third of the site to more than 2 percent in the western two-thirds of the site. The change in the surface gradient generally coincides with the location of the proposed southern extension of Nursery Way through the site. Due to the sloping site grades and the proposed east-west orientation of the large building footprints, it is anticipated that engineered fill slopes up to about 9 feet high will be constructed in order to create level building pads.

Surface drainage at the site primarily occurs by sheet flow and is directed to the existing wetland located in the northwest portion of the property. Ponded surface water and saturated soil conditions are common at this location during the winter and spring wet seasons and possibly into early summer.

## 3.3 Subsurface

Soil samples collected from the geotechnical borings indicated the depths of the varying strata and relative densities of the subsurface materials to be relatively uniform across the site. The entire project site is veneered with a thin layer of soft to loose, low density, organic-rich silty topsoil that extends to a depth of about 2 feet to 3 feet BGS. Below the soft and loose surficial soils is medium dense to very dense clayey sand, silty sand, poorly graded sand, and well-graded sand with fine gravel. Descriptions of each of the geologic units are presented below.

### 3.3.1 Native Topsoil

Native topsoil and transitional soils are present to about 3 feet BGS across the entire site. Native topsoil is composed of low density, soft silt with sand (ML) to very loose silty sand (SM). The topsoil is generally about 2 feet thick across the site and is identifiable by its characteristic dark brown to black color and upper root zone that is rich in organic content. The topsoil layer transitions to loose silty sand over the depth interval of about 2 feet to 3 feet BGS. Both the topsoil and transitional soils appear highly compressible based on the minimal penetration resistance observed during sampling. Laboratory testing indicates an in-place dry density of 89 pounds per cubic foot (pcf) or less with moisture contents of 30 percent or more. These surficial earth materials should be considered unsuitable for support of foundations or engineered fills due to the potential for adverse amounts of consolidation settlement occurring under newly applied loads.

### 3.3.2 Marine Terrace and Falor Formation Deposits

The top of the granular terrace deposits is generally encountered beginning at about 3 feet BGS. The upper 1-foot of these materials are typically composed of silty sand (SM) to clayey sand (SC) with relative densities that range from loose to medium dense. Laboratory testing indicates in-place dry densities of ranging from 90 pcf to 105 pcf with moisture contents ranging from 19 percent to 29 percent. The relative density is generally observed to increase beginning at a depth of 5 feet becoming medium dense to dense with in-place dry densities that range from 98 pcf to 111 pcf and moisture contents of 8 percent to 25 percent.

Dense to very dense Falor Formation deposits predominantly composed of poorly graded sand (SP) are interpreted to be present beginning at approximately 15 feet to 20 feet BGS. The top of the Falor Formation is identified based on the presence of wood fibers and a significant increase in the sampler penetration resistance. Standard penetration test (SPT) blow counts in the Falor Formation typically range from 34 blows per foot (bpf) to greater than 78 bpf. Practical refusal occurred at several sample intervals where 50 blows for less than 6 inches was recorded.

## 3.4 Groundwater

The use of drilling fluids was delayed at each of the boring locations in order to measure the depth to the static groundwater surface. The depth to initial groundwater at the time of our field investigation during the winter wet season was typically measured to be 4 feet to more than 11.5 feet BGS. Perched groundwater was observed at several of the boring locations where the depth to free water was measured to be as shallow as 1-foot BGS. Perched groundwater conditions typically are present at the lower elevations of the site and in close proximity to the existing wetland. Ponded surface water is also noted to be present along the property boundary in the northwest corner of the site at the time of our field investigation and at the time of this report being prepared in early April.

We anticipate that the groundwater levels will fluctuate throughout the year based on seasonal precipitation, generally being lowest in the late summer and early fall (August through November) and highest in the winter and spring (December through May). Perched groundwater can occur at shallow depths above the local groundwater level where less permeable materials, such as clay-rich sediments and/or strongly cemented sediments, are present near the ground surface. It should be anticipated that shallow perched groundwater and wet soil conditions will be encountered within any excavation deeper than a few feet BGS near the lower elevations of the site and in proximity to the wetland. Measures to control the flow of groundwater during excavation and construction should be implemented on an as-needed basis.

# 4.0 Evaluation of Seismic Hazards

Potential geologic/geotechnical hazards assessed for the site include seismic ground shaking, surface fault rupture, and liquefaction and related phenomena. These potential hazards are assessed below. Ground motion parameters to be used for the seismic design of the proposed buildings are provided in the Section 5.0.

## 4.1 Seismic Ground Shaking

The site is located within a seismically active area of coastal Northern California. Seismicity in this region is attributed to the interaction between the Gorda and North American plates. Subduction of the Gorda plate beneath the North American plate occurs at the Cascadia Subduction Zone (CSZ) plate boundary located approximately 35 miles offshore of the Humboldt Bay region area.

The CSZ is a regional scale thrust fault (megathrust) that extends a length of 750 miles from Cape Mendocino in southern Humboldt County to southern British Columbia. Fault rupture along the entire length of the CSZ is capable of producing earthquakes with a maximum moment magnitude ($M_W$) 9.0 (CDMG/USGS, 1996).

Geologic evidence from the Pacific Northwest and Northern California coasts including tsunami wave deposits, drowned coastal forests, and buried tidal marshes indicate that great subduction zone earthquakes have repeatedly occurred in the recent geologic past (Personius and Nelson, 2005). Paleoseismic studies suggest that great earthquakes occur on the CSZ every 300 to 500 years with 13 known events having occurred in the previous 6,000 years. The last large subduction earthquake reportedly occurred in 1700 and presumably ruptured the entire length of the CSZ. A great subduction earthquake along the CSZ will subject the project site to very long duration and very strong ground shaking.

## 4.2 Surface Fault Rupture

No known active or recently inactive faults cross the project site, and is the site is not located within an Alquist-Priolo Fault Hazard Zone associated with any nearby active faults (CDMG, 1983; CGS, 2002). Based on our field review, we found no field evidence to suggest that a previously unrecognized active fault may be present at the site. Therefore, the potential for surface fault rupture to occur at the project site is considered to be very low.

### 4.3 Soil Liquefaction Potential

Liquefaction occurs when strong earthquake ground motion generates excess pore pressures in loose, saturated sediments resulting in the loss of soil strength. Recently deposited sediments composed of non-cemented and non-cohesive granular materials are most susceptible. Older geologic materials and clay-rich soils of all ages are generally not susceptible to liquefaction.

The subsurface materials encountered below the water table surface at the site predominantly consist of medium dense to very dense Pleistocene age marine terrace deposits. Accordingly, based on the relative densities and age of the materials, and our experience analyzing similar materials in similar geologic settings, we judge the liquefaction potential at this site to be very low.

## 5.0 Code Based Seismic Design Criteria

The geotechnical-related parameters to be used for seismic design of the proposed structures were determined in accordance with American Society of Civil Engineers and Structural Engineering Institute (ASCE/SEI) 7-16 Minimum Design Loads for Building and Other Structures (ASCE/SEI, 2017). Tables 1 and 2 summarize the code-based design criteria obtained in accordance with Chapter 16 Structural Design, Section 1613 Earthquake Loads contained in the most recent edition of the California Building Code, (CBSC, 2022).

**Table 1. California Building Code Seismic Design Parameters**

| Parameter | Value | 2022 CBC [a] Reference |
|---|---|---|
| Site Class | C | Table 1613.2.2 |
| Maximum Considered Earthquake ($MCE_R$) Ground Motion Spectral Response Acceleration-Class B (short, 0.2 sec; $S_S$) | 2.614 | Figure 1613.3.1(1) |
| $MCE_R$ Ground Motion Spectral Response Acceleration-Class B (1 sec; $S_1$) | 1.081 | Figure 1613.3.1(2) |
| Site Coefficient ($F_a$) | 1.2 | Table 1613.2.3(1) |
| Site Coefficient ($F_v$) | 1.4 | Table 1613.2.3(2) |
| $MCE_R$ Spectral Response Acceleration Adjusted for Site Class Effects (short, 0.2 sec; $S_{MS}$) | 3.137 | Section 1613.2.3 (Eqn. 16-20) |
| $MCE_R$ Spectral Response Acceleration Adjusted for Site Class Effects (1 sec; $S_{M1}$) | 1.513 | Section 1613.2.3 (Eqn. 16-21) |
| 5% Damped Design Spectral Response Acceleration (short, 0.2 sec; $S_{DS}$) | 2.091 | Section 1613.2.4 (Eqn. 16-22) |
| 5% Damped Design Spectral Response Acceleration (1 sec; $S_{D1}$) | 1.009 | Section 1613.2.4 (Eqn. 16-23) |

a. CBC: California Building Code

Based on the results of our subsurface exploration and the reported shear wave velocities for the upper 100 feet of the site profile (USGS, 2025), we interpret the subgrade to be Site Class C (Very Dense Soil and Soft Rock). The recommended design criteria presented below are for the risk-targeted maximum considered earthquake (MCER) and were obtained from the ASCE Hazard Tool website for the project site coordinates of 40.941424° N latitude and -124.104149° W longitude in conjunction with the Site Class and Risk Category (III).

Table 2 below presents the mapped maximum considered geometric mean ($MCE_G$) seismic design parameters for projects located in Seismic Design Categories D through F in accordance with ASCE 7-16.

**Table 2. American Society of Civil Engineers 7-16 Peak Ground Accelerations**

| Parameter | Value | ASCE [a] 7-10 Reference |
|---|---|---|
| Seismic Design Category | E | Tables 11.6-1 and 11.6-2 |
| Mapped Maximum Considered Earthquake ($MCE_G$) Peak Ground Acceleration, (PGA) | 1.075 | Figure 22-7 |
| Site Coefficient ($F_{PGA}$) | 1.2 | Table 11.8-1 |
| $MCE_G$ Peak Ground Acceleration Adjusted for Site Class Effects, ($PGA_M$) | 1.29 | Section 11.8.3 (Eqn. 11.8-1) |

a. ASCE: American Society of Civil Engineers

Conformance to the seismic design criteria presented in the above tables does not constitute a guarantee or assurance that structural damage to the new buildings will not occur as a result of the design earthquake. The primary goal of the seismic design criteria is to make the structure life safe but not to avoid all potential damage since such a high design standard would be economically prohibitive.

# 6.0 Conclusions and Geotechnical Considerations

Based on the results of our investigation, SHN concludes the site can be developed as is currently proposed provided the recommendations presented in this report are followed. The primary geotechnical considerations related to the design and construction of the project are:

- the presence of soft to loose, organic-rich silty topsoil within the upper 2 feet of the ground surface;
- highly disturbed soils on the northern portion of the site following removal of the numerous mature, large diameter eucalyptus trees and their root systems;
- the presence of perched groundwater and saturated conditions in the near-surface soils; and
- the need to provide uniform foundation support under the new structures.

The presence of the soft and wet surficial soil will likely result in undesirable amounts of total and/or differential settlement with the potential to have an adverse effect on new engineered fills and building foundations. Development of criteria for engineered fill placement in the locations of the building pads, foundation design, and support of concrete flatwork will require consideration of these near-surface soils. The supporting capacity of the soils can be improved by over-excavation and replacement with properly compacted engineered fill.

In areas where excavations are created from the removal of the existing large diameter trees, the resulting excavations may be backfilled with properly compacted engineered fill up to the planned subgrade elevation.

The site is located in a seismically active area and is likely to experience strong seismic ground shaking during the design life of the proposed developments. The intensity of ground shaking from earthquakes will depend on several factors, including the distance and direction from the site to the earthquake epicenter, the magnitude and duration of the earthquake, and the response of the underlying soils. At a minimum, it will be necessary to design and construct the proposed structures in accordance with the earthquake-resistant provisions of the most recent building codes.

All geotechnical-related work should be performed in accordance with the recommendations of the Geotechnical Engineer-of-Record (GEOR) during construction. Where the recommendations of this report and the cited sections of Title 24 are in conflict, the Owner and Architect should request clarification from the GEOR. The recommendations provided in this report should not be waived without the consent of the GEOR for the project. Recommendations for additional work and construction monitoring, testing, and inspection are contained in the later sections of this report. The following subsections present recommendations for geotechnical-related work.

# 7.0 Geotechnical Recommendations

## 7.1 Site Preparation and Grading

All grading and site work should be performed in accordance with the 2022 California Building Code (CBC), Title 24, Chapter 33 (Safeguards During Construction), Appendix J (Grading), and Chapter 18 (Soils and Foundations), and with the recommendations of the GEOR during construction. Where the recommendations of this report and the cited sections of Title 24 are in conflict, the owner should request clarification from the GEOR.

Site preparation includes demolition/removal of existing surface and subsurface improvements, and removal of debris, organics, organic topsoil, loose soil, and any other unsuitable material. Site preparation operations should extend at least 5 feet beyond the limits of improvements. We anticipate that stripping to a depth of up to about 24 inches will be required to remove the organics and topsoil. Deeper stripping may be locally required to remove concentrations of vegetation, such as brush and tree roots.

Where the removal of large tress is required, it will be necessary to remove all major root systems, then backfill the excavations with properly placed engineered fill compacted to at least 90 percent relative compaction[1]. The cleared vegetation and debris should be removed from the site. Any soil with more than 2 percent organic material by dry weight should also be removed from the site. Alternatively, soil strippings with more than 2 percent organic material can be stockpiled onsite for reuse in landscape areas.

The GEOR should observe and approve the prepared site prior to any excavation, subgrade preparation, and placement of fill or improvements.

All areas to receive engineered fill should be stripped of loose and/or soft surface soil and vegetation and benched into firm soil. Any zones of weak or saturated soil are encountered during site preparation should be removed by further excavation to expose firm natural soil and replaced with engineered fill compacted to at least 90 percent relative compaction.

Any non-engineered fill encountered within the limits of grading should be identified and excavated to expose firm natural ground. In areas intended to support the new structures, retaining walls, paved

[1] Relative compaction refers to the in-place dry density of a soil expressed as a percentage of the maximum dry density of the same soil, as determined by the ASTM D1557 compaction test procedure. Optimum moisture is the water content (percentage by dry weight) corresponding to the maximum dry density.

roadways and parking areas, and engineered fill, and for a distance of at least 5 feet beyond the limits of these improvements, topsoil and loose soil should be excavated to expose firm, undisturbed native soil. The resulting surface created by removal of non-engineered fill and/or loose soil should be checked by the GEOR or qualified representative to determine whether further excavation is required to remove any additional loose or unsuitable materials. The approved surface may then be brought to pad grade with placement of properly compacted engineered fill.

Fill placed in swales and drainage channels should be benched into firm soils along the bottom and sides to provide a firm level surface on which to place new engineered fill. In areas where proposed structures will be supported on spread footings and are located partially on cut and partially on fill, the cut portion should be over-excavated and replaced with engineered fill in order to provide at least 12 inches of engineered fill below all of the footings to provide uniform support for the entire foundation.

Cut and fill slopes up to 5 feet in height should be placed no steeper than 1.5H:1V (horizontal to vertical) and 2H:1V, respectively. Higher or steeper slopes should be reviewed by this office for stability.

Site grading during and shortly after the rainy season will be difficult and/or uneconomical. On-site soils will have moisture contents well above optimum and will require greater than normal spreading, mixing and/or aeration to achieve near-optimum moisture content suitable for required compaction.

Excavations will be made in soils that consist of slightly cohesive and relatively soft to firm fine-grained native soils. These fine-grained soils will become disturbed when exposed to construction traffic and will be subject to sloughing and caving. As previously discussed, groundwater may be encountered as shallow as 4 feet to 6 feet BGS and locally as shallow as 1 foot to 2 feet BGS during and immediately following the winter and spring wet seasons.

Trenches and other excavations deeper than 4 feet may require bracing, shoring, or sloping of sidewalls to adequately protect workers. Project specifications should place full responsibility on the contractor for planning, design, construction, maintenance, and removal of excavation/trench support systems.

Where bracing is needed to maintain the stability of underground utilities, adjacent pavements, and other improvements, the ground support system should be installed without leaving nearby improvements unsupported. To mitigate ground failure, stockpiling earth and construction materials near open trenches and excavations shall be avoided.

The Contractor shall be responsible for the stability of all temporary excavations and should comply with applicable California Occupational Safety and Health Administration regulations (California Construction Safety Orders, Title 8). The Contractor should periodically monitor all open cuts for evidence of incipient stability failures.

## 7.2 Select Engineered Fills

Fill placed in areas to support the proposed developments including building foundations, retaining walls, access drives, roadways, and parking areas should meet the requirements for select engineered fill specified in the following sections. The GEOR shall approve of all fill material in writing prior to it being imported to the site. Samples of the proposed fill material shall be submitted by the Contractor to SHN for approval, a minimum of five business days prior to them importing it to the site. The Contractor shall be made responsible for testing and/or providing documentation indicating that the material proposed for use as select engineered fill meets all of the criteria specified in the following sections.

Select engineered fill shall have less than 2 percent by dry weight of vegetation and deleterious material and shall meet the gradation requirements specified in Table 3.

**Table 3. Fill Gradation Criteria**

| Sieve Designation | Percent Passing by Dry Weight |
|---|---|
| 3-inch (50 mm)[a] | 100 |
| 2½-inch (37.5 mm) | 85 minimum |
| ¾-inch (19 mm) | 70 minimum |
| No. 4 (4.75 mm) | 35 minimum, 60 maximum |
| No. 200 (75 µm)[b] | 5 minimum, 30 maximum |

a. mm: millimeters
b. µm: micrometers

Fine-grained soil with a liquid limit greater than 35 and a plasticity index greater than 12 should not be used as select engineered fill. If clayey soils do not meet the plasticity requirements, mixing of the clayey soils with sandier soils may be required. Crushing and/or removal of rock particles greater than 3 inches in size will be required.

Select engineered fill should have a low corrosion potential, which is defined as a minimum resistivity of 2,000 ohms-centimeters (ohms-cm) and maximum sulfate and chloride concentrations of 250 parts per million (ppm).

River-run material shall not be used as select engineered fill; crushed, angular material is recommended with at least 75 percent of the material (as determined by the material's dry weight) containing a minimum of one fractured face.

Engineered fill should be placed in loose lifts not exceeding 8 inches in thickness and compacted to a minimum of 90 percent relative compaction. A qualified field technician should be present to observe fill placement and perform field density tests in accordance with ASTM International (ASTM) D 6938 at random locations throughout each lift to verify that the specified compaction is being achieved.

## 7.3 Subgrade Protection

The native topsoil that currently surfaces the site is noted to be relatively firm when dry but soft when wet. We expect that both light and heavy rubber-tired construction equipment will be able to operate on this surface during the dry season but may have difficulty operating during and immediately following the winter and spring wet season. Soils that have been disturbed during site preparation activities, or unsuitable areas identified during proof-rolling or probing, should be removed to firm ground and replaced with stabilization material and compacted engineered fill on an as needed basis.

Protection of the subgrade is the responsibility of the contractor. The contractor will be responsible for constructing all-weather access roads and staging areas should they be necessary. The thickness of the haul roads to access the site for construction and staging areas will depend on the amount and type of construction traffic. The materials used for haul roads or site access drives should be stabilization material consisting of pit or quarry run rock that is well-graded, angular, crushed rock consisting of 4- to 6-inch minus material with less than 5 percent passing the US Standard No. 4 Sieve. The material should be free of organic matter and other deleterious material. A minimum 6-inch-thick mat of stabilization material should be used for light staging areas. The stabilization material section used for haul roads and areas with repeated heavy construction traffic will likely need to be increased to about 12 inches. The actual thickness of haul roads and staging areas should be based on the contractor's approach to site work and the amount and type of construction traffic and is the contractor's responsibility.

## 7.4 Construction Excavations and Temporary Shoring

Excavations should be made in accordance with U.S. Occupational Health and Safety Administration (OSHA) specifications and conditions. Excavations deeper than 4 feet (or shallower if excavations appear unsafe) should be laid back to a safe slope inclination or supported by an appropriate shoring system. It should be noted that the contractor is solely responsible for site safety and safe working conditions during construction. Temporary shoring may support the planned excavations. The choice of shoring method should be left to the contractor's judgement based on experience, economic considerations, and adjacent improvements such as utilities, pavements, and foundation loads.

Excavated soil should be placed a minimum of 10 feet away from the edge of any below-grade excavation to reduce surcharge loads on temporary cut slopes. If shoring or bracing systems are used, the effects of the soil stockpile on the shoring or bracing system should be considered if the soil is placed in the area between the top of the excavation and a 1H:1V projection from the toe of the excavation.

Heavy equipment should be operated in a safe manner and should be kept an adequate distance from unshored or unbraced excavation sidewalls to prevent a cut slope stability hazard. If shoring or bracing is used, surcharge loads from heavy equipment should be considered in the design calculations to prevent a surcharge failure during construction. For an unshored or unbraced excavation, a heavy equipment exclusionary zone should be established based on soil type, depth of excavation, presence of groundwater, and configuration of the open cut. As a general guideline, heavy equipment should be excluded from a zone located between the top of the excavation and a 2H:1V projection from the bottom toe of the adjacent excavation sidewall.

## 7.5 Finished Grading and Surface Drainage Control

Surface drainage should be planned to prevent ponding and enable water to drain away from foundations, slabs-on-grade, edges of pavements and tops of slopes and retaining walls, and toward suitable collection or discharge facilities. Surface drainage should be designed to capture runoff from upslope of proposed structures. A positive surface drainage of at least 4 percent is recommended within 10 feet of all building foundations and retaining walls in unpaved areas. In paved areas, a positive surface drainage of at least 2 percent is recommended to allow for rapid removal of surface water. Roof drainage systems should be planned to direct rainwater away from building foundations and retaining walls.

Concentrated water should not be discharged onto bare ground or slopes but should be carried in pipes or lined channels to suitable disposal points. Because on-site soils generally have a moderate potential for erosion, we recommend that approved temporary and permanent erosion control measures be implemented to limit erosion and comply with applicable County of Humboldt regulations. Soils on graded slopes should be fertilized, mulched, and planted as soon as possible after grading with erosion-resistant vegetation. These plants should be watered lightly at appropriate intervals until growth is established; drip irrigation systems are recommended.

The use of water-intensive landscaping around the perimeter of structures should be avoided to reduce the amount of water introduced to the subgrade. Irrigation of landscaping around structures should be limited to drip or bubbler-type systems. Trees with large roots should also be avoided since they can dry out the soil beneath foundations and cause settlement. The purpose of these recommendations is to avoid significant differential moisture changes adjacent to foundations, which have been known to cause large differential movement over short horizontal distances in clay-rich and/or expansive soils, resulting in cracking of slabs and architectural damage.

## 7.6 Foundations

Shallow spread footing may be used to support the proposed structures and may be founded in the competent native soils at the site or engineered select fill.

If footings are to be supported by engineered fill, the backfill should meet the material and placement recommendations in Section 7.1: "Site Preparation and Grading." All footings should be founded at least 18 inches below the lowest adjacent finished grade. Footings meeting the foregoing requirements may be designed for the following bearing pressures:

| | |
|---|---|
| Dead plus long-term live load | 2,500 pounds per square foot (psf) |
| All loads, including wind and seismic | 3,750 psf |

Any new footing excavations or slab-on-ground subgrade should be maintained in a wetted condition prior to pouring concrete to avoid soil shrinkage.

Provided any new foundations are constructed in accordance with these recommendations, we estimate that total post-construction settlement will be 1 inch or less under static conditions; the differential settlement will be about half of the total settlement.

The resistance to lateral loadings may be calculated using a friction factor of 0.30 between the bottom of the footings and the native soil or engineered fill. Where the footings were poured neat and the adjacent ground surface paved or covered with concrete slabs, a passive resistance of 300 pcf equivalent fluid weight may be developed between the footings and the adjacent soil. Where the adjacent ground surface is not paved, the upper 1-foot should be neglected in determining the available passive resistance.

## 7.7 Slabs-on-Grade

Concrete slabs-on-grade should be supported by properly compacted engineered fill prepared in accordance with our recommendations for earthwork. Floor slabs can then be designed using a subgrade modulus (k) of 125 pounds per cubic inch (pci).

To reduce water vapor transmission upward through floor slabs, concrete slabs-on-grade should be constructed on a minimum 4-inch-thick layer of capillary break material covered with a vapor retarder. The capillary break material should be free-draining, clean gravel or rock, such as, No. 4 by ¾-inch pea gravel or permeable aggregate complying with Caltrans Standard Specification, Section 68, Class 1, Type

B Permeable Material. The vapor retarder should be at least 10 mils in thickness and meet the material requirements for Class C vapor retarders presented in ASTM E1745 and should be installed according to ASTM E1643. These installation requirements include overlapping seams by 6 inches, taping seams, and sealing penetrations in the vapor retarder.

The field of moisture vapor transmission is a specialty field, and we suggest that qualified experts be contacted to assist in the design and construction of measures related to moisture transmission through slabs-on-grade.

The American Concrete Institute (ACI) Committee document "Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials" (ACI 302.2R-06) provides guidelines for reducing moisture migration through slabs-on-grade. This document advises that concrete slabs be cast directly on the vapor retarder (ACI 302.2R-06, Section 9.3) and provides guidelines for selecting vapor permeance, tensile strength, and puncture resistance. When casting the slab directly on the vapor retarder, a reduced joint spacing, low shrinkage mix design, or other appropriate measures should be used to control slab curl. The ACI guide also notes that a maximum water-cement ratio of 0.5 has yielded satisfactory performance on many slab-on-grade projects. Water-reducing admixtures may be useful in achieving workability at low water-cement ratios. Control joints should be provided at appropriate intervals to control the location of shrinkage cracks. After curing properly, the slab should be allowed to dry and then should be tested to check that the moisture transmission rate is appropriate for the intended floor covering.

For exterior flatwork and other slabs-on-grade where water vapor transmission through slabs is not a concern, the vapor barrier and capillary break material described in this section may be omitted. However, a minimum of 4 inches of Class 2 Aggregate Base rock, compacted to a minimum 90 percent relative compaction, should be provided beneath exterior flatwork and other slabs-on-grade where vapor transmission is not a concern.

It is important that the subgrade be moist and free of desiccation cracks at the time the slab is cast. Recommendations for slab reinforcement, strength, thickness, control and construction joints, etc., should be provided by others. Although cracks in concrete slabs are common and should be expected, the following measures may help to reduce cracking of slabs.

- Slabs should be cast using concrete with a maximum slump of 4 inches or less.
- Add a water reducing agent or plasticizer to the concrete to increase slump while maintaining a low water-cement ratio to reduce concrete shrinkage. (Concrete having a high water-cement ratio is a major cause of concrete cracking.)
- Provide control joints at appropriate intervals to control the location of shrinkage cracks.

## 7.8 Utility Trench Backfill

New utility trenches excavated parallel to spread footing foundations should be set back from the footings such that the trench bottoms lie outside a projected hypothetical 1.5:1 H:V line extending downward from the footing bottom.

Unless concrete bedding is required around utilities, bedding should consist of sand having a sand equivalent (SE) of at least 30. The bedding should extend from 6 inches below to 1 foot above the conduit or pipe. Sand bedding should not be jetted or ponded into place and should be mechanically compacted to a minimum 90 percent relative compaction.

In areas to support improvements such as slabs and pavements and adjacent to structure foundations, backfill placed above the bedding in utility trenches (including culvert and sprinkler lines) should be properly placed and adequately compacted to minimize settlement and provide a stable subgrade. If possible, the trench backfill should be compacted following rough grading but prior to final grading and compaction.

On-site inorganic soils meeting the requirements for engineered fill may be used as trench backfill. Backfill consisting of on-site soils should be placed in layers not exceeding 8 inches in loose thickness, water-conditioned, and compacted to a minimum 90 percent relative compaction as described for engineered fill. Trench backfill need only be compacted to 85 percent relative compaction in landscape areas or in areas more than 5 feet beyond the limits of buildings, pavements, concrete slabs-on-grade, sidewalks, or other flatwork. The upper 12 inches of trench backfill under pavements should be compacted to a minimum 95 percent relative compaction.

Where utility trenches cross underneath buildings, we recommend that a plug be placed within the trench backfill to minimize the normally granular backfill from acting as a conduit for water to enter beneath the building. The plug should be constructed using a sand cement slurry (minimum 28-day compressive strength of 500 pounds per square inch [psi]) or relatively impermeable native soil for pipe bedding or backfill. We recommend that the plug extend a distance of at least 3 feet in each direction from the point where the utility enters the building perimeter.

## 7.9 Retaining Walls

Retaining walls should be designed to resist static earth pressures, seismic earth pressures, and surcharge pressures. Retaining wall backfill should be placed and compacted according to the recommendations above in Section "7.1: Site Preparation and Grading," and drainage should be provided behind walls according to the recommendations that follow. Retaining wall foundations should be designed according to the recommendations above in Section "7.6: Foundations."

Active earth pressures may be used for design of unrestrained retaining walls where the top of the wall is free to translate or rotate. To develop active earth pressures, the walls should be capable of deflecting by at least 0.004H (where H is the height of the wall). At-rest earth pressures should be used for design of retaining walls where the wall top is restrained such that the deflections required to develop active soil pressures cannot occur or are undesirable. Cantilever walls retaining firm native soil or engineered fill may be designed for active or at-rest lateral earth pressures for various backfill slopes using the equivalent fluid unit weights presented in Table 4.

**Table 4. Equivalent Fluid Unit Weight (pcf)[a]**

| Backfill Slope | At-Rest Conditions | Active Conditions |
|---|---|---|
| Level | 60 | 40 |
| 3H:1V[b] | 72 | 48 |
| 2H:1V | 97 | 65 |

a. pcf: pounds per square foot

b. H:V: horizontal to vertical

Lateral earth pressures for backfill slopes other than those given above can be estimated by interpolation; backfill slopes should be inclined no steeper than 2H:1V. The lateral earth pressures should be applied to a plane extending vertically upward from the base of the heel of the retaining wall to the ground surface.

The lateral earth pressures given above apply where the wall backfill is fully drained, is not subject to traffic or other surcharge loads, and the backfill is not subject to heavy compaction equipment within a distance of one-third the height of the backfill. Lateral surcharge pressures are discussed later in this section.

If retaining wall backfill will be subject to passenger vehicle or light truck traffic loading within a distance of H/2 from the top of the wall (where H is the wall height), the wall should be designed to resist an additional uniform lateral pressure of 72 psf (equivalent to an additional 2 feet of backfill) applied to the back of yielding walls (active conditions), or 124 psf applied to the back of non-yielding walls (at-rest conditions).

Surcharge loads on retaining walls resulting from proposed adjacent building foundations parallel to the proposed retaining wall can be approximated by the following expression:

$$\Delta p_h = (4p/\pi)(x^2z/R^4)$$

Where:
$\Delta p_h$ = the lateral stress on the wall at depth z
p = magnitude of the footing load (pounds per foot [lbs/ft])
x = centerline distance from the footing load to the wall
z = depth below surface
$R^4 = x^4 + z^4$ = the radius from the location on the wall where Δp is, measured to the footing load on the surface

Surcharge loads imposed by greater loads or unusual loads within a distance of H of the back of the wall should be considered on a case-by-case basis.

In addition to active or at-rest lateral soil pressures, retaining walls supporting more than 6 feet of backfill should be designed to resist additional dynamic earth pressures during earthquake loading. The additional dynamic pressure increment may be calculated using an additional equivalent fluid pressure of 19 pcf for level backfill, 27 pcf for back slopes of 3H:1V, and 55 pcf for back slopes of 2H:1V. The dynamic pressure increment should be applied to the wall as a triangular distribution so the resultant force acts at a distance of 0.33H above the base of the wall (where H is the height of the wall). Under the combined effects of static and dynamic loading, a safety factor of 1.1 against sliding or overturning is acceptable. The dynamic component of the lateral earth pressure was calculated using the Mononabe-Okabe equation and, therefore, assumes that sufficient deformation of the wall will occur during seismic loading to develop active soil conditions.

A drainage system should be constructed on the backside of all retaining walls. The drainage system for backfilled walls should consist of a 4-inch diameter perforated pipe surrounded by Class 2 Permeable Material complying with Section 68 of the Caltrans Standard Specifications, latest edition. Alternatively, the perforated pipe may be surrounded by clean coarse gravel or drain rock, provided the gravel or rock is completely separated from the surrounding soil by an engineering filter fabric such as Mirafi 140N or similar fabric. The section of permeable material should be at least 12 inches wide and should extend up the back of the wall to within about 18 inches of finished grade. The drainage material should be capped with compacted fine-grained soil, soil-cement, or other relatively impermeable material or barrier. The pipe should be polyvinyl chloride (PVC) Schedule 40 or acrylonitrile butadiene styrene (ABS) with a standard dimension ratio (SDR) of 35 or better. Perforations in the drainpipe should be ¼ inch in diameter. The perforated pipe should be placed holes-down near the bottom of the section of permeable material and should discharge by gravity to a suitable outlet. Accessible subdrain cleanouts should be provided and maintained on a regular basis.

Backfill within 5 feet, measured horizontally behind new retaining wall structures should be compacted with relatively light, hand-operated compaction equipment to reduce the potential for the creation of relatively large compaction-induced stresses on the wall. If large or heavy compaction equipment is used, compaction-induced stresses could result in increased lateral earth pressures on retaining walls in addition to those presented in this report. In this case, the walls may need to be temporarily braced.

Backfill material should be brought up uniformly around below-grade structures (that is, backfill should be at the same elevation all around the structure as the backfill is placed and compacted). The elevation difference of the backfill surface around the structure should not be greater than 2 feet.

## 7.10 Asphalt Pavement Areas

Where new paving is to be placed, it is recommended that all soft or unsuitable materials be excavated and properly recompacted for paving support. At a minimum, the upper 12 inches of paving subgrade should be scarified, moisture conditioned to optimum moisture content and compacted to 95 percent relative compaction.

A final site grading plan has not been provided to SHN as of the time of this report being prepared. Therefore, the recommended pavement sections are based on an assumed R-Value[2] of 25 for the silt- and clay-rich soils that currently surface the site. Recommendations for both flexible pavements (asphalt concrete) and rigid pavements (Portland cement concrete) are provided below.

The Traffic Indices listed in Table 5 are based on typical vehicular traffic for residential developments.

**Table 5. Preliminary Flexible Asphalt Concrete Pavement Sections**

| Locations | Estimated Traffic Index | Asphalt Concrete (inches) | Class 2 Aggregate Base (inches) |
|---|---|---|---|
| Automobile Parking and Driveways | 4.5 | 2.5 | 6 |
| Delivery, Trash Truck, and Fire Lanes | 7.0 | 3.5 | 12 |

The actual Traffic Index for each area should be determined by the project Civil Engineer. If pavement sections for Traffic Indices other than those listed below are required, SHN should be contacted to

[2] The R-value is a measure of the ability of a soil or aggregate to resist lateral flow due to vertically applied load. It is used in pavement design and is calculated from the ratio of applied vertical pressure to developed lateral pressure.

provide additional recommendations. It is anticipated that the majority of traffic will consist of automobile and large delivery truck traffic. Pavement sections for other traffic loading should be designed on a case-by-case basis.

Pavement construction should conform to the requirements of the Caltrans Standard Specifications, latest edition. Aggregate used for asphalt concrete surfacing should conform to the grading specified in Caltrans Standard Specifications Section 39 for 9.5 millimeters (mm) or 12.5 mm (⅜ inch or ½ inch, respectively) maximum, medium grading. Asphalt concrete surfacing should be placed in a single lift. Concrete aprons should be considered adjacent to debris boxes. The additional strength would significantly reduce future maintenance.

Prior to subgrade preparation, all utility trench backfills should be properly placed and compacted. After all utility trench backfills are compacted, the upper 6 inches of subgrade should be scarified, moisture conditioned, and rolled to provide a smooth, unyielding surface, uniformly compacted to a minimum 95 percent relative compaction. Subgrade soils should be maintained in a moist condition until covered with the complete pavement section.

Aggregate used for all asphalt concrete should comply with the minimum requirements specified in Caltrans Standard Specifications, current edition. Asphalt concrete surfacing should be placed in a single lift. Aggregate base should comply with the minimum requirements for Class 2 Aggregate Base specified in Caltrans Standard Specifications Section 26., Aggregate base should be placed in thin lifts in a manner to prevent segregation, uniformly moisture conditioned and compacted to a minimum 95 percent relative compaction to provide a smooth, unyielding surface.

We recommend that rigid concrete pavements consist of at least 6 inches of Class 2 Aggregate Base beneath at least 6 inches of concrete. For durability and wear resistance, all Portland cement concrete pavements should have a minimum compressive strength of 4,000 psi. A modulus of subgrade reaction, $k_v$ (30-inch circular plate) of 150 psi may be used for design of Portland cement concrete pavements.

Paved areas should be sloped and adequately drained to prevent surface water or subsurface seepage from saturating the pavement subgrade soil. All curbs surrounding landscape areas should be embedded at least 6 inches into the soil subgrade to minimize the migration of water beneath pavements. Reinforced concrete aprons should be constructed around all drainage inlet structures and manhole covers to minimize the migration of water beneath pavements.

Heavy construction traffic on new pavements or partial pavement sections (such as, the base course over the prepared subgrade) will likely exceed the design loads and could potentially damage or shorten the pavement life. Therefore, we recommend that construction traffic not be allowed on new pavements, or that the contractor take appropriate precautions to protect the subgrade and pavement during construction.

If construction traffic is to be allowed on newly constructed road sections, an allowance for this additional traffic will need to be made in the design pavement section.

# 8.0 Additional Services

We suggest that communications be maintained during the design and construction phase between the client's engineers and contractors and SHN to optimize compatibility between the design and site conditions. We also recommend that SHN be retained during the construction phase to verify the implementation of our recommendations related to earthwork.

## 8.1 Plan Review

Grading and foundation plans should be reviewed by SHN prior to finalization to verify that the plans have been prepared in substantial conformance with the recommendations of this report and to provide additional analyses or recommendations, as necessary.

## 8.2 Construction-Phase Monitoring

SHN shall be retained during the construction phase to perform the following tasks in order to verify conformance with our recommendations:

1. Verify the removal and/or recompaction of unsuitable material prior to the placement of properly compacted engineered fill.
2. Monitor temporary excavations and installation of temporary shoring (as required).
3. Monitor subgrade preparation.
4. Provide full-time construction observation and test the placement of properly compacted engineered fill and backfill (2022 CBC Section 1705.6.1).
5. Provide full-time construction observation during the excavation and construction of foundations and quality assurance/quality control documentation under the supervision of the GEOR or their qualified representative to ensure conformance with our recommendations.

This construction-phase monitoring is important because it provides the stakeholders and SHN the opportunity to verify anticipated site conditions and recommend appropriate changes in design or construction procedures if site conditions encountered during construction vary from those described in this report. It also allows SHN to recommend appropriate changes in design or construction procedures if construction methods adversely affect the competence of onsite soils to support the structural improvements.

As required by Section 1705.6.1 of the 2022 CBC,

> *A verified report shall be submitted by the geotechnical engineer as required by the California Administrative Code. The report shall indicate that all tests and inspections required by the approved construction documents were completed and whether the tested materials and/or inspected work meet the requirements of the approved construction documents* (CBSC, 2022).

# 9.0 Limitations

The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, SHN should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous materials was not part of the scope of services provided by SHN.

This report is issued with the understanding that it is the responsibility of the owner, or their representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

The findings of this report are valid as of the date of this report. However, changes in the conditions of a property that occur due to natural processes, or the works of man may invalidate wholly or partially the findings of this report. Therefore, this report should be reviewed and should not be relied upon after a period of three years.

SHN should be retained to perform testing and observation services during construction to provide continuity of geotechnical interpretation and to verify that our recommendations pertaining to site development are incorporated during site grading, construction of improvements, and installation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, SHN will at that time cease to be the Engineer-of-Record, and that firm should prepare a letter indicating their intent to assume the responsibilities of the project GEOR. A copy of the letter shall be provided to Life Plan Humboldt for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development or provide written acknowledgement of their concurrence with the recommendations presented in SHN's report. They should also perform additional analyses that they deem necessary to assume the role of the GEOR.

# 10.0 References Cited


American Concrete Institute. (NR). "ACI 302.2R-06: Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials." NR:ACI.

American Society of Civil Engineers. (NR). "ASCE Hazard Tool." Accessed April 2025 at: https://ascehazardtool.org/

American Society of Civil Engineers and Structural Engineering Institute. (2017). "ASCE/SEI 7-16: Minimum Design Loads for Buildings and Other Structures." Reston, VA:ASCE.

California Building Standards Commission. (2022). "2022 California Building Code: California Code of Regulations, Title 24, Part 2, Volume 2 of 2, based on the 2021 International Building Code." Sacramento, CA: CBSC.

California Department of Conservation, Division of Mines and Geology/United States Geological Survey. (1996). "Probabilistic Seismic Hazard Assessment for the State of California." DMG Open-File Report 96-08, USGS Open-File Report 96-706. Sacramento, CA:CDMG/USGS.

California Division of Mines and Geology. (1983). "State of California Special Studies Zones, Arcata North Quadrangle." Official Map of Earthquake Fault Zones. Scale 1:24,000. Department of Conservation, Sacramento, CA.

California State Transportation Agency, Department of Transportation. (2023). "Standard Specifications." Sacramento, CA:Caltrans.

California Geological Survey. (2002). GIS files of Official Maps of Alquist-Priolo Earthquake Fault Zones, Northern and Eastern Region. Sacramento, CA:CGS.

Carver, G.A., T. A. Stephens, and J. C. Young. (1985). "Quaternary Geologic Map of the Mad River Fault Zone, Arcata North 7.5′ quadrangle." Unpublished preliminary map for the California Division of Mines and Geology State Map Project, scale 1:24,000. Sacramento: CDMG.

Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, Aerogrid, IGN, and the GIS User Community (2024).

Google Earth. (1985). Hiller Road and Central Avenue Aerial Photograph.

Kelley, F. R. (1984). "Geology and Geomorphic Features Related to Landsliding, Arcata North 7.5-Minute Quadrangle, Humboldt County, California." (OFR 84-38). CDMG.

National Geographic Society. (2013). Topographic Map of McKinleyville, CA. Accessed at: http://maps.nationalgeographic.com/maps

Perkins Eastman. (January 1, 2024). Project Datum Sheet A0.10. New York, NY:Oerkins Eastman.

Personius, S.F. and A.R. Nelson, compilers. (2005). "Fault Number 781, Cascadia Subduction Zone" in "Quaternary Fault and Fold Database" of the United States: U.S. Geological Survey website. NR:USGS. Accessed May 2019 at: http://earthquakes.usgs.gov/hazards/qfaults

United States Geological Survey. (2025). "Vs30 Map Viewer." USGS Earthquake Hazard Program. Accessed April 2025 at: https://usgs.maps.arcgis.com/apps/webappviewer/index.html

United States Occupational Health and Safety Administration. (NR). "OSHA Excavation and Trench Safety Standards 29 CFR part. 1926, Title 29—Labor, Subtitle B--Regulations Relating to Labor, Chapter XVII--Occupational Safety and Health Administration, Department of Labor, Part 1926--Safety and Health Regulations for Construction." Washington, D.C.:OSHA.

# Boundary and Topographic Survey

# 1

NOTES:
1. BASIS OF BEARINGS: THE NORTH LINE OF SECTION 6, T6N, R1E, H.M. AS SHOWN ON THE RECORD OF SURVEY FOR THE MILLER FARMS, TAKEN AS N89°51'20"E

2. BASIS OF ELEVATIONS: ELEVATIONS FOR THIS MAP ARE ASSUMED. THE TEMPORARY BENCHMARK FOR THIS MAP IS THE TOP OF THE FIRE HYDRANT AT THE SOUTHEAST CORNER OF HILLER ROAD AND DAIRY AVENUE. ELEVATION = 99.85 FEET.

3. TOPOGRAPHIC DATA IS BASED ON A FIELD SURVEY CONDUCTED BY SPENCER ENGINEERING AND CONSTRUCTION MANAGEMENT, INC. BETWEEN JULY 17 AND JULY 20, 2001.

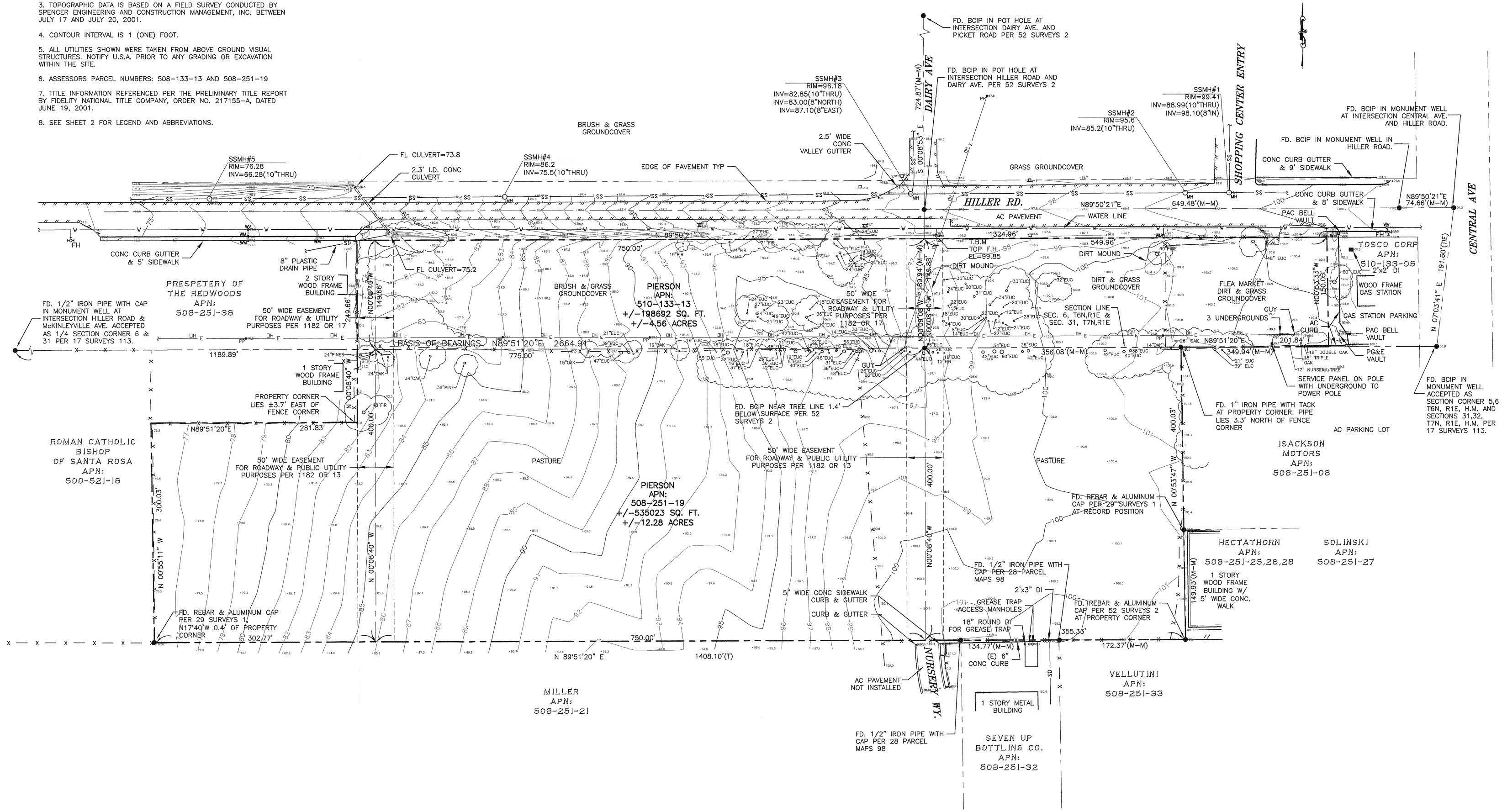
4. CONTOUR INTERVAL IS 1 (ONE) FOOT.

5. ALL UTILITIES SHOWN WERE TAKEN FROM ABOVE GROUND VISUAL STRUCTURES. NOTIFY U.S.A. PRIOR TO ANY GRADING OR EXCAVATION WITHIN THE SITE.

6. ASSESSORS PARCEL NUMBERS: 508-133-13 AND 508-251-19

7. TITLE INFORMATION REFERENCED PER THE PRELIMINARY TITLE REPORT BY FIDELITY NATIONAL TITLE COMPANY, ORDER NO. 217155-A, DATED JUNE 19, 2001.

8. SEE SHEET 2 FOR LEGEND AND ABBREVIATIONS.




## BOUNDARY AND TOPOGRAHIC SURVEY

SCALE: 1"=60'

| | | | | | |
|---|---|---|---|---|---|
| SPENCER ENGINEERING & CONSTRUCTION MANAGEMENT, INC. 1933 CENTRAL AVENUE, SUITE C McKINLEYVILLE, CA 95519 TELEPHONE (707) 839-4336 FAX (707) 839-4012 | Designed: P.GUITIERREZ<br>Drawn: J.BAKER<br>Checked: P.GUITIERREZ | PREPARED FOR: PIERSON COMPANY | A.P.N.: 508-251-19 & 510-133-13<br>BOUNDARY AND TOPOGRAPHIC SURVEY | File Name: 01426-TOPO<br>Date: 7/24/01 | BAR IS ONE INCH ON ORIGINAL DRAWING 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY | Job No. 01426<br>Sheet No. SHEET 3 |

# Preliminary Conceptual Design Set

# 2

# LIFE PLAN HUMBOLDT NEW COMMUNITY
# CONCEPT DESIGN SET

## McKinleyville, CA

**CONCEPT DESIGN DOCUMENTS - JANUARY 21, 2025**

Life Plan HUMBOLDT

PERKINS EASTMAN

Received by Alyssa Goforth
01/21/2025 8:03:48 AM

# LIFE PLAN HUMBOLDT NEW COMMUNITY CONCEPT DESIGN SET

## McKinleyville, CA

**DRAWING LIST:**



### PHASE I

| Building Name | Area Per Floor | Phase I Total Area* |
|---|---|---|
| IL Building A | 19,335 SF (1st floor) | |
| | 19,025 SF (2nd floor) | 38,360 SF |
| IL Building B | 15,060 SF (1st floor) | |
| | 9,550 SF (2nd floor) | 24,610 SF |
| IL Cottages | 1,085 SF (35 cottages) | 37,975 SF |
| | | **100,945 SF** |

| Unit Type | Unit Area | Phase I Total Units* |
|---|---|---|
| Studio | 530 SF | 1 unit |
| 1 BR | 705 SF | 25 units |
| 1 BR + Den | 850 SF | 27 units |
| Cottages | 1,085 SF | 35 units |
| | | **88 units** |

*Considers IL buildings only

### PHASE II

| Building Name | Area Per Floor | Phase II Total Area* |
|---|---|---|
| IL Building C | 9,945 SF | 19,890 SF |
| IL Building D | 8,870 SF (1st floor) | |
| | 9,005 SF (2nd floor) | 17,875 SF |
| IL Building E | 9,005 SF | 18,010 SF |
| IL Cottages | 1,085 SF | 4,340 SF |
| | | **60,115 SF** |

| Unit Type | Unit Area | Phase II Total Units* |
|---|---|---|
| Studio | 540 SF | 4 units |
| 1 BR | 705 SF | 17 units |
| 1 BR + Den | 850 SF | 32 units |
| Cottages | 1,085 SF | 4 units |
| | | **57 units** |

### PROJECT DESCRIPTION

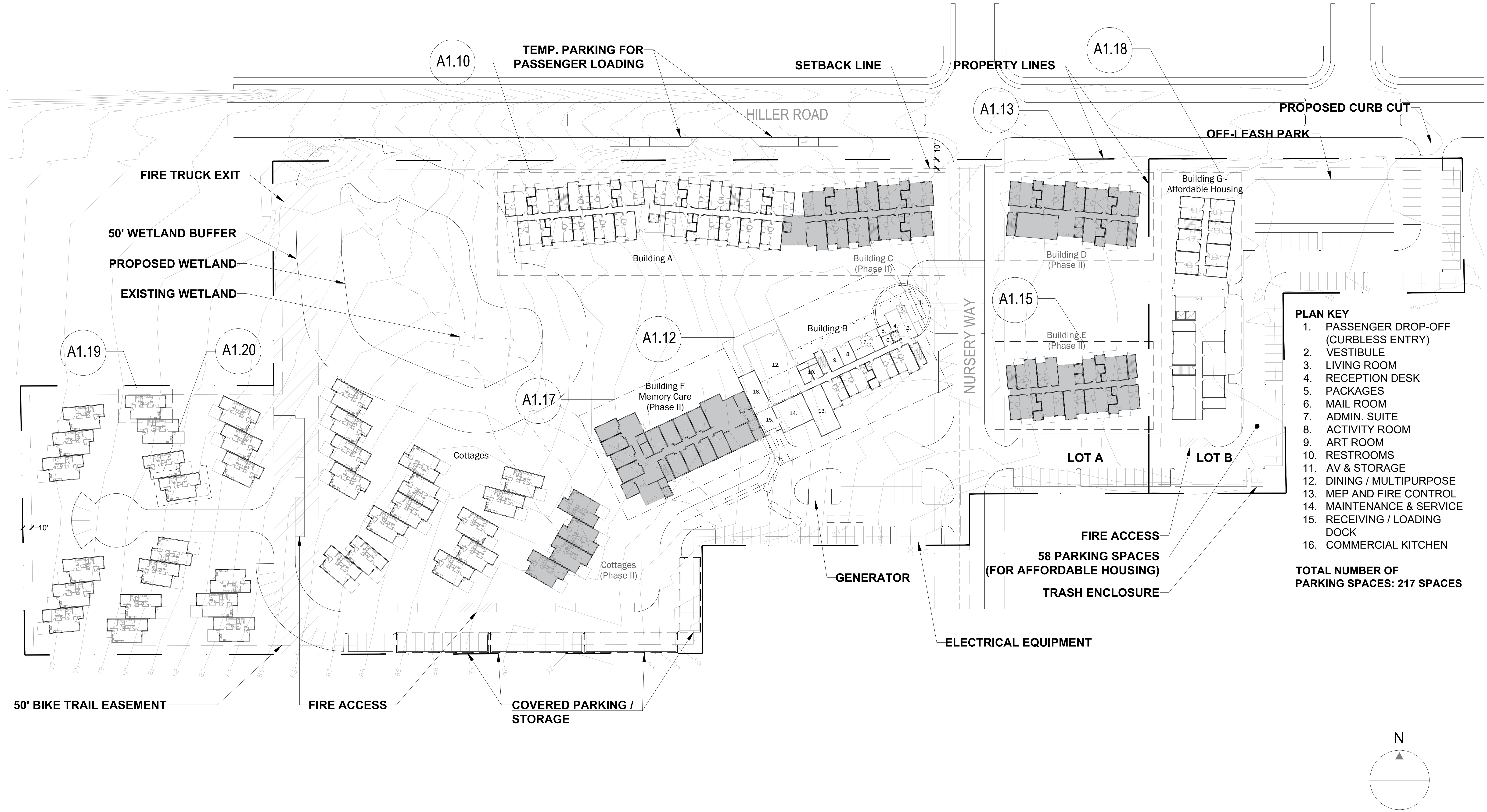
NEW LIFE PLAN COMMUNITY CONSISTING OF INDEPENDENT LIVING APARTMENTS AND COTTAGES WITH ASSOCIATED AMENITY SPACES, ASSISTED LIVING AND MEMORY CARE, AND AFFORDABLE INDEPENDENT LIVING APARTMENTS. THIS INCLUSIVE COMMUNITY AIMS FOR HIGHLY SUSTAINABLE INFRASTRUCTURE TO BUILD A NEW MODEL FOR LIVING AND AGING WELL.

OCCUPANCY TYPE:
- LPH COMMUNITY - R2.1 + A2 & B AS ACCESORY USE
- AFFORDABLE HOUSING - R2

CONTRUCTION TYPE: TYPE VA, NFPA 13 SPRINKLERED

APPLICABLE CODES:
- 2022 CALIFORNIA BUILDING CODE
- HUMBOLDT COUNTY MUNICIPAL CODE
- CA DSS RCFE LICENSING REQUIREMENTS

### VICINITY MAP




Life Plan HUMBOLDT

**LIFE PLAN HUMBOLDT NEW COMMUNITY**

**CONCEPT DESIGN**

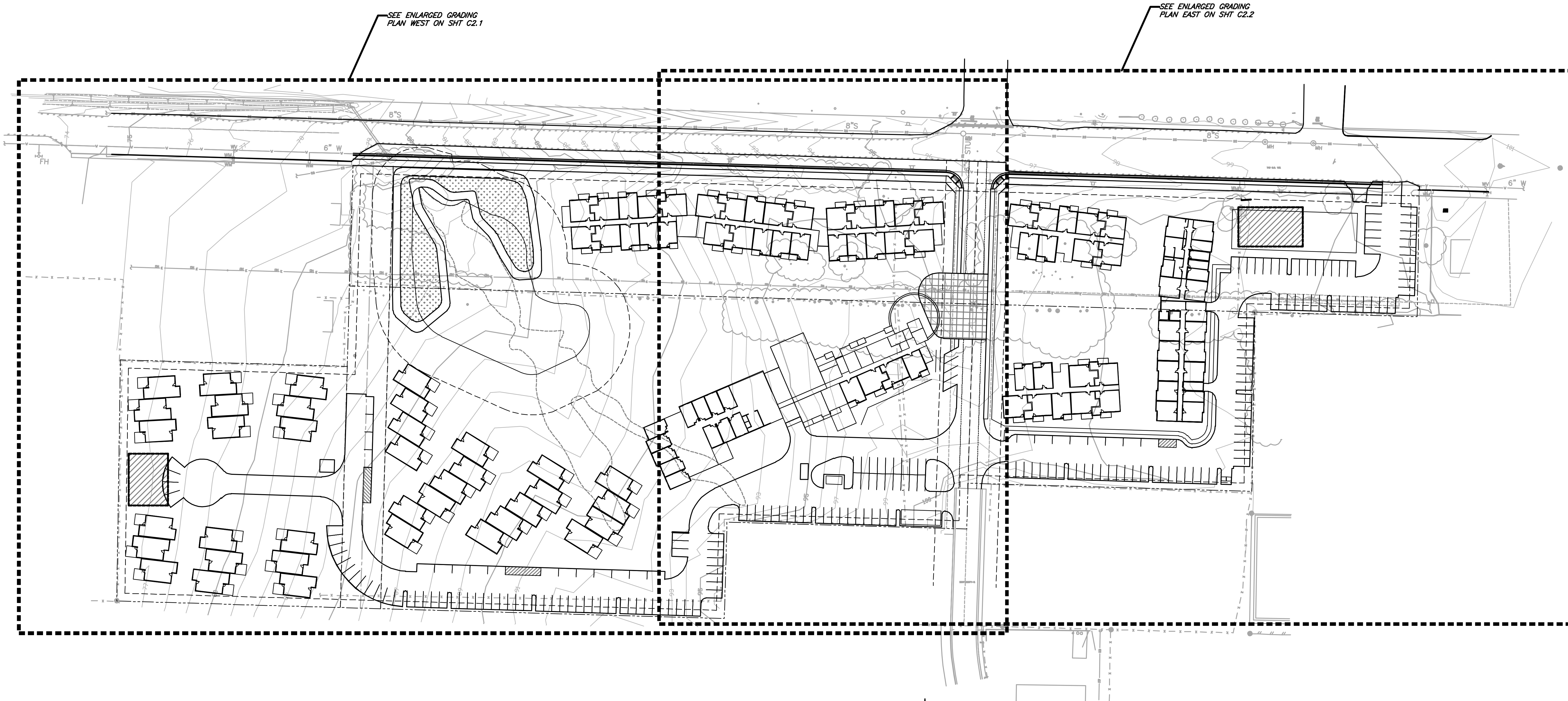
**SITE PLAN - FIRST FLOOR**

SCALE: 1" = 100'

**A0.10**

January 21, 2024

PERKINS EASTMAN




## GRADING PLAN OVERVIEW
NTS

LIFE PLAN HUMBOLDT NEW COMMUNITY

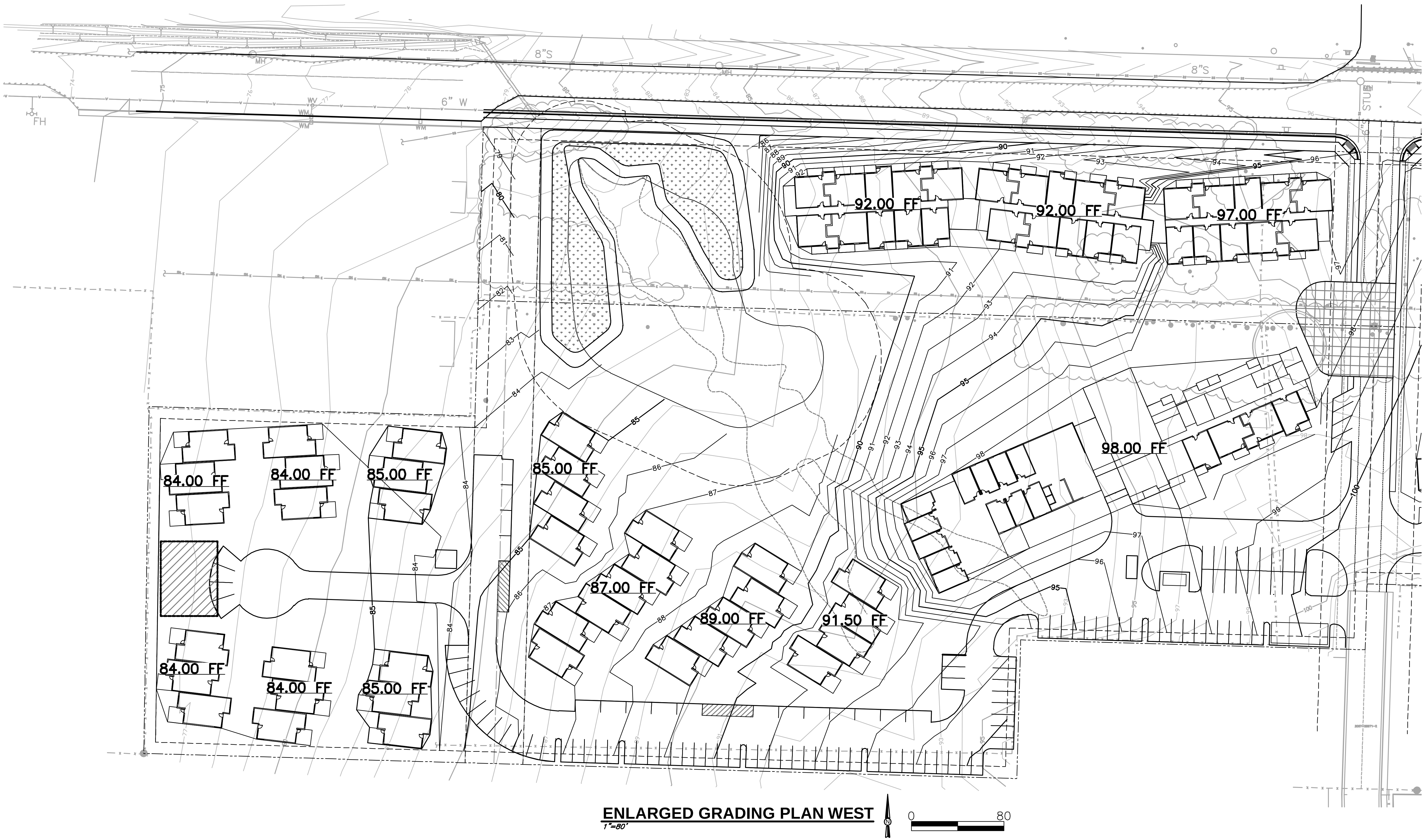
CONCEPT DESIGN

GRADING PLAN OVERVIEW

C2.0

January 21, 2024

PERKINS EASTMAN




**ENLARGED GRADING PLAN WEST**
1"=80'

0 80

LIFE PLAN HUMBOLDT NEW COMMUNITY

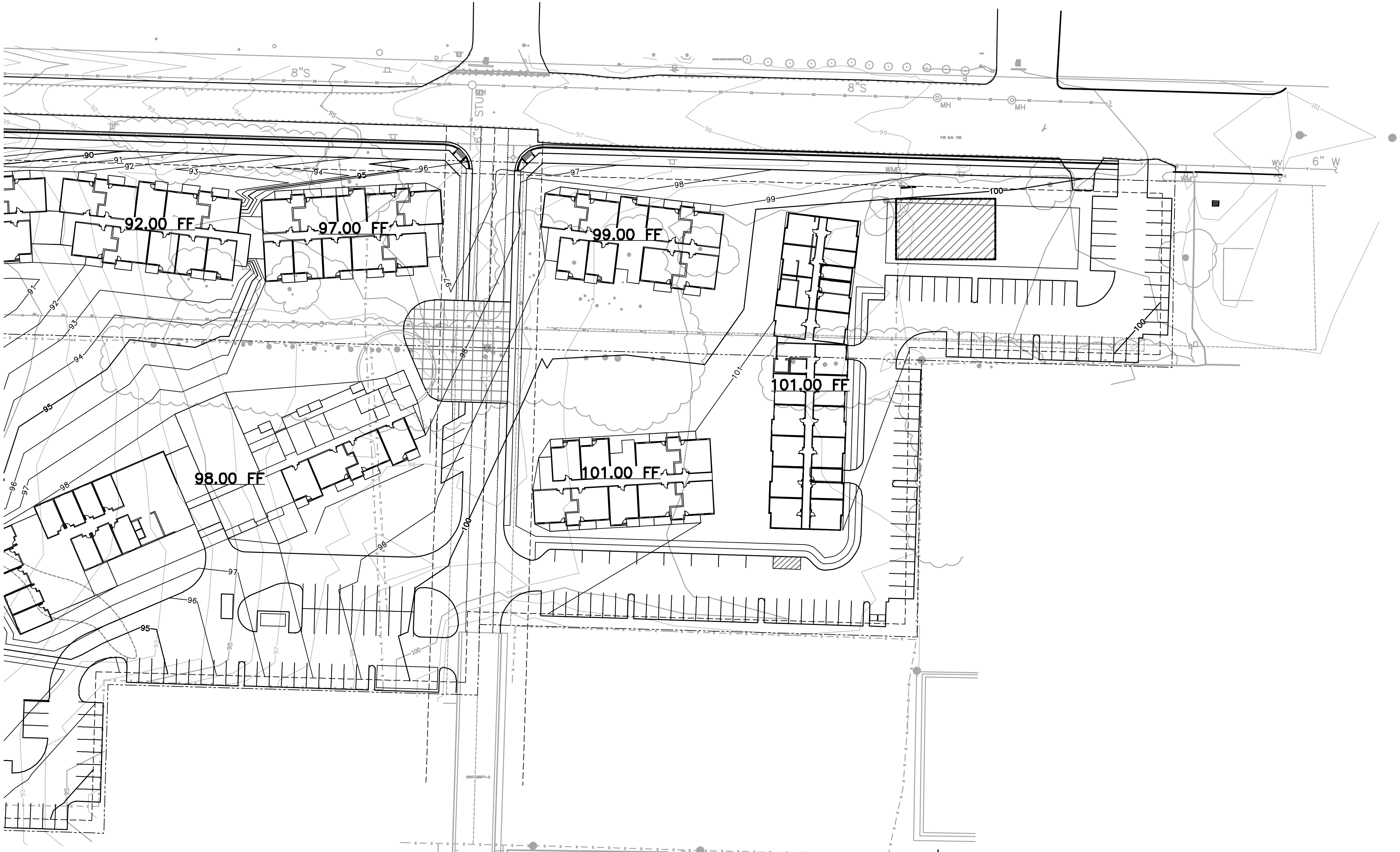
CONCEPT DESIGN

ENLARGED GRADING PLAN WEST

C2.1

January 21, 2024

PERKINS EASTMAN




ENLARGED GRADING PLAN EAST
1"=80'

0 80

LIFE PLAN HUMBOLDT NEW COMMUNITY
CONCEPT DESIGN

ENLARGED GRADING PLAN EAST

C2.2

January 21, 2024

PERKINS EASTMAN


Life Plan HUMBOLDT

**LIFE PLAN HUMBOLDT NEW COMMUNITY**

**CONCEPT DESIGN**

**LANDSCAPE PLAN**

SCALE: 1" = 100'

**L1.10**

January 21, 2024

PERKINS EASTMAN

LAND CONCERN LANDSCAPE ARCHITECTURE

# Geotechnical Subsurface Exploration

# 3

# Geotechnical Subsurface Exploration

Twelve rotary wash geotechnical borings were drilled on January 14-15, 2025, with a track-mounted CME-55 drilling rig operated by Taber Drilling of West Sacramento. The borings were located at the approximate locations as shown in Figures 2 and 3.

Water level observations were made during drilling by delaying the introduction of drilling fluid until wet conditions were encountered. The borings were initially drilled with 4-inch diameter solid flight augers until saturated soil conditions were encountered. Mud rotary drilling methods were used to complete the borings, and to control the potential disturbance and heave of the saturated sands underlying the project site. All of the borings were completed and sampled to their final depths.

Relatively undisturbed soil samples were obtained by driving a 2.5-inch internal diameter (ID), 3.0-inch outside diameter (OD), Modified California Sampler (MCS) containing steel liners and a 1.4-inch ID, 2.0-inch OD SPT sampler without liners in accordance ASTM-International (ASTM) D1586 standards. Both sampler types were advanced using a 140-pound CME auto-hammer falling 30 inches per blow. The number of blows required to drive the samplers the last 12 inches of an 18-inch drive is provided on the boring logs as penetration resistance (blows per foot [bpf]). The penetration resistance values (bpf) recorded for SPT sampler drives and provided on the boring logs are actual penetration resistance (N-values) that are uncorrected for depth and the energy transfer ratio of the automatic hammer used. The penetration resistance values provided on boring logs for the MCS sampler drives are field blow counts and should not be construed as SPT N-values. Equivalent SPT N-values for the MCS sampler should be considered lower by a factor of approximately 0.64.

The earth materials encountered were logged and field classified in general accordance with the Manual-Visual Classification Method (ASTM D 2488). The final boring logs, presented on the following pages, were prepared based on the field logging, examination of samples in the laboratory, and the results of laboratory testing.

Phone: (707) 441-8855 Email: info@shn-engr.com Web: shn-engr.com
812 W. Wabash Avenue, Eureka, CA 95501-2138

# METHOD OF SOIL CLASSIFICATION

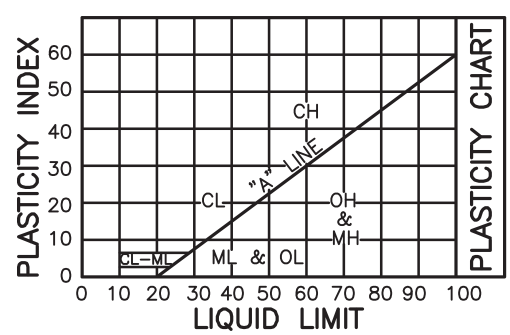
## CLASSIFICATION CHART

| MAJOR DIVISIONS | | SYMBOLS | TYPICAL NAMES |
|---|---|---|---|
| COARSE GRAINED SOILS (MORE THAN 1/2 OF SOIL >NO. 200 SIEVE SIZE) | GRAVELS (MORE THAN 1/2 OF COARSE FRACTION > NO.4 SIEVE SIZE) | GW | WELL GRADED GRAVELS OR GRAVEL–SAND MIXTURES, LITTLE OR NO FINES |
| | | GP | POORLY GRADED GRAVELS OR GRAVEL–SAND MIXTURES, LITTLE OR NO FINES |
| | | GM | SILTY GRAVELS, GRAVEL–SAND–SILT MIXTURES |
| | | GC | CLAYEY GRAVELS, GRAVEL–SAND–CLAY MIXTURES |
| | SANDS (MORE THAN 1/2 OF COARSE FRACTION < NO.4 SIEVE SIZE) | SW | WELL GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES |
| | | SP | POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES |
| | | SM | SILTY SANDS, SAND–SILT MIXTURES |
| | | SC | CLAYEY SANDS, SAND–CLAY MIXTURES |
| FINE GRAINED SOILS (MORE THAN 1/2 OF SOIL <NO. 200 SIEVE SIZE) | SILTS & 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 & CLAYS LIQUID LIMIT GREATER THAN 50 | MH | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS |
| | | CH | INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS |
| | | OH | ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTY CLAYS, ORGANIC SILTS |
| HIGHLY ORGANIC SOILS | | PT | PEAT AND OTHER HIGHLY ORGANIC SOILS |

## GRAIN SIZE CHART

| CLASSIFICATION | U.S. STANDARD SIEVE SIZE |
|---|---|
| BOULDERS | ABOVE 12” |
| COBBLES | 12” TO 3” |
| GRAVEL | 3” TO NO. 4 |
| COARSE | 3” TO 3/4” |
| FINE | 3/4” TO NO. 4 |
| SAND | NO. 4 TO NO. 200 |
| COARSE | NO. 4 TO NO. 10 |
| MEDIUM | NO. 10 TO NO. 40 |
| FINE | NO. 40 TO NO. 200 |
| SILT & CLAY | BELOW NO. 200 |

## PLASTICITY CHART




| CONSISTENCY OF FINE GRAINED SOILS | | DENSITY OF COARSE GRAINED SOILS | |
|---|---|---|---|
| CLASSIFICATION | COHESION (PSF) | CLASSIFICATION | STANDARD PENETRATION (BLOW COUNT) |
| VERY SOFT | 0–250 | VERY LOOSE | 0–4 |
| SOFT | 250–500 | LOOSE | 4–10 |
| MEDIUM STIFF | 500–1000 | MEDIUM | 10–30 |
| STIFF | 1000–2000 | DENSE | 30–50 |
| VERY STIFF | 2000–4000 | VERY DENSE | 50+ |
| HARD | 4000+ | | |

| MOISTURE CLASSIFICATIONS |
|---|
| DRY |
| DAMP |
| MOIST |
| WET |

BASED ON UNIFIED SOILS CLASSIFICATION SYSTEM

# BORING NUMBER B-1



**CLIENT** Life Plan Humboldt
**PROJECT NAME** LPH Community Geotechnical Investigation
**PROJECT NUMBER** 024007.200
**PROJECT LOCATION** Hiller Road, McKinleyville, CA
**DATE STARTED** 1/14/24 **COMPLETED** 1/14/24
**GROUND ELEVATION** 140 ft (+/-) **HOLE SIZE** 4"
**DRILLING CONTRACTOR** Taber Drilling
**GROUNDWATER DEPTH**
**DRILLING METHOD** Solid Flight Augers/ Mud Rotary
▽ **AT TIME OF DRILLING** 7.00 ft / Elev 133.00 ft
**LOGGED BY** A. Troia **CHECKED BY** G. Vadurro
**NOTES** Tremie grout backfill

| DEPTH (ft) | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | (ML) SANDY SILT, soft, very dark brown, dry, very fine sand, organic-rich, low plasticity fines, cohesive (NATIVE TOPSOIL). Becomes moist at ~1' | MCS | | 2-3-5 (8) | .75 | | | | | | |
| | (SM) SILTY SAND, loose, yellowish brown, moist, fine to medium sand, low plasticity fines, slightly clayey, moderate cementation, weak mottling (MARINE TERRACE DEPOSITS). | MCS | | 4-4-8 (12) | 1 | 88 | 30 | | | | |
| 5 | Increased cementation. | MCS | | 7-6-6 (12) | 4 | 111 | 19 | | | | 26 |
| | ▽ Becomes light olive gray with strong brown mottling, strong cementation, few very fine roots and plant fibers. Becomes wet, medium dense. | SPT | | 7-10-14 (24) | | | | | | | |
| 10 | (SC) Grades to CLAYEY SAND, medium dense, greenish gray, fine sand, cohesive, low toughness, no dilatency. | SPT | | 6-7-7 (14) | | | | | | | 41 |
| 15 | (SP) Poorly graded SAND, dense, dark gray, wet, fine sand, many wood fibers and fine roots, strong cementation, trace fines, slow dilatency (FALOR FORMATION). | MCS | | 12-34-31 (65) | | | | | | | |
| 20 | Increasing fines content, no organics. | SPT | | 14-18-16 (34) | | | | | | | 15 |
| 25 | Becomes olive brown with trace fines. | SPT | | 14-20-21 (41) | | | | | | | |
| 30 | | | | | | | | | | | |

*(Continued Next Page)*

# BORING NUMBER B-1



**CLIENT** Life Plan Humboldt **PROJECT NAME** LPH Community Geotechnical Investigation

**PROJECT NUMBER** 024007.200 **PROJECT LOCATION** Hiller Road, McKinleyville, CA

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | | (SP) Poorly graded SAND, dense, dark gray, wet, fine sand, many wood fibers and fine roots, strong cementation, trace fines, slow dilatency (FALOR FORMATION). *(continued)* Becomes very dense. | SPT | | 21-38-26 (64) | | | | | | | |
| 35 | | | | | | | | | | | | |
| 40 | | | SPT | | 38-40-50/5" | | | | | | | |
| 45 | | | | | | | | | | | | |
| 50 | | (SW) Well-graded SAND overlain by 1" thick peat layer, very dense, dark brownish gray, mostly fine sand, increasing medium to coarse sand with depth, quartz-rich, subangular to subrounded; subangular coarse gravel at 50.5'. | SPT | | 19-28-50 (78) | | | | | | | |

Bottom of borehole at 51.5 feet.

# BORING NUMBER B-2



**CLIENT** Life Plan Humboldt
**PROJECT NAME** LPH Community Geotechnical Investigation
**PROJECT NUMBER** 024007.200
**PROJECT LOCATION** Hiller Road, McKinleyville, CA
**DATE STARTED** 1/14/24 **COMPLETED** 1/14/24
**GROUND ELEVATION** 146 ft (+/-) **HOLE SIZE** 4"
**DRILLING CONTRACTOR** Taber Drilling
**GROUNDWATER DEPTH**
**DRILLING METHOD** Rotary Hollow Stem Auger
**AT TIME OF DRILLING** 1.50 ft / Elev 144.50 ft (Perched GW)
**LOGGED BY** A. Troia **CHECKED BY** G. Vadurro
**NOTES** Tremie grout backfill

| DEPTH (ft) | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | (SM) SILTY SAND, very loose, very dark brown, wet (perched groundwater), fine sand, abundant woody debris, fine roots (NATIVE TOPSOIL). | MCS | | 1-2-1 (3) | | | | | | | |
| | (SC-SM) SILTY SAND to CLAYEY SAND, medium dense, light olive brown, wet, fine sand, few very fine roots/plant fibers, moderate cementation (MARINE TERRACE DEPOSITS). **Unconfined Compression Test** Undrained Shear Strength = 319 psf | MCS | | 1-11-20 (31) | | 97 | 24 | | | | |
| 5 | (SP) Poorly graded SAND, medium dense, moist, light olive brown, trace fines, moderate cementation, mottling. | MCS | | 11-12-17 (29) | | | | | | | |
| | Becomes loose. | MCS | | 2-1-6 (7) | | | | | | | |
| 10 | (SM) SILTY SAND, loose, wet, dark greenish gray, fine sand, trace coarse sand, slightly cohesive. | SPT | | 3-2-4 (6) | | | | | | | 30 |
| 15 | (SP) Poorly graded SAND, medium dense, moist, dark gray, fine sand, trace silt, fine wood deposits and plant fibers (FALOR FORMATION). | SPT | | 8-7-4 (11) | | | | | | | |
| 20 | (SM) Grades to medium dense SILTY SAND with wood fragments. | SPT | | 4-7-5 (12) | | | | | | | 22 |
| 25 | Becomes dense, no wood/organics. | SPT | | 12-18-15 (33) | | | | | | | |
| 30 | Encountered heaving sands; no sample collected. | | | | | | | | | | |

Bottom of borehole at 30.0 feet.

GEOTECH BH COLUMNS - DATA TEMPLATE FOR TESTING.GDT - 4/11/25 13:45 - \\EUREKA\GEOGROUP\GINT\LIBRARYBENTLEY\GINTCL\PROJECTS\PROJECT_FILES\2024\024007.200-LIFEPLAN-GEOTECH.GPJ

# BORING NUMBER B-3



**CLIENT** Life Plan Humboldt
**PROJECT NAME** LPH Community Geotechnical Investigation
**PROJECT NUMBER** 024007.200
**PROJECT LOCATION** Hiller Road, McKinleyville, CA
**DATE STARTED** 1/14/24 **COMPLETED** 1/14/24
**GROUND ELEVATION** 145 ft (+/-) **HOLE SIZE** 4"
**DRILLING CONTRACTOR** Taber Drilling
**GROUNDWATER DEPTH**
**DRILLING METHOD** Solid Flight Augers/ Mud Rotary
∇ **AT TIME OF DRILLING** 6.00 ft / Elev 139.00 ft
**LOGGED BY** A. Troia **CHECKED BY** G. Vadurro
**NOTES** Tremie grout backfill

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | (ML) SANDY SILT, medium stiff, wet, very dark brown, organic-rich, low plasticity, slightly cohesive, fine sand, many fine roots (NATIVE TOPSOIL). Grades to SILTY SAND, olive brown to yellowish brown with few fine roots. | MCS | | 2-4-9 (13) | | | | | | | |
| | | Slight increase in cementation. (SP) Poorly graded SAND, medium dense, moist, yellowish brown to olive brown, moderate to strong cementation, fine sand, <10% fines (MARINE TERRACE DEPOSITS). | MCS | | 12-15-18 (33) | | 98 | 22 | | | | |
| 5 | | ∇ (CL) SANDY LEAN CLAY, soft, moist to wet, olive gray with strong mottling, low plasticity/cohesive fines. | MCS | | 5-2-4 (6) | | | | | | | 53 |
| | | Becomes medium stiff, few fine plant fibers, soft clay interbeds. | SPT | | 4-3-3 (6) | | | | | | | |
| 10 | | (SM) SILTY SAND, dense, bluish gray, wet, fine sand. | MCS | | 14-24-29 (53) | | 109 | 19 | | | | 18 |
| 15 | | (SP) Poorly graded SAND, medium dense with many fine roots and plant fibers, moderate to strong cementation, medium dry strength (FALOR FORMATION). | SPT | | 2-4-10 (14) | | | | | | | |
| 20 | | (SP) Poorly graded SAND, medium dense, wet, dark gray, fine sand, trace fines. | SPT | | 14-17-17 (34) | | | | | | | |
| 25 | | Becomes very dense. | SPT | | 38-50/5" | | | | | | | |
| 30 | | Becomes dense. | SPT | | 21-23-19 (42) | | | | | | | |

Bottom of borehole at 31.5 feet.

# BORING NUMBER B-4



**CLIENT** Life Plan Humboldt
**PROJECT NAME** LPH Community Geotechnical Investigation
**PROJECT NUMBER** 024007.200
**PROJECT LOCATION** Hiller Road, McKinleyville, CA
**DATE STARTED** 1/14/24 **COMPLETED** 1/14/24
**GROUND ELEVATION** 149 ft (+/-) **HOLE SIZE** 4"
**DRILLING CONTRACTOR** Taber Drilling
**GROUNDWATER DEPTH**
**DRILLING METHOD** Solid Flight Augers
▽ **AT TIME OF DRILLING** --- (No GW encountered)
**LOGGED BY** A. Troia **CHECKED BY** G. Vadurro
**NOTES** Tremie grout backfill

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | (SM) SILTY SAND, loose, very dark brown, moist, fine sand, organic-rich (NATIVE TOPSOIL). | | | | | | | | | | |
| | | Becomes olive brown, increase in cementation. | MCS | | 3-4-9 (13) | | 89 | 31 | | | | |
| | | (SP-SM) Poorly graded SAND with SILT, medium dense, moist, yellowish brown, few fine roots, moderate to strong cementation (MARINE TERRACE DEPOSITS). | MCS | | 9-18-23 (41) | | 97 | 22 | | | | |
| 5 | | (SC) CLAYEY SAND, loose, light gray with strong brown mottling, moist, fine sand, cohesive, medium toughness, moderate to strong cementation. | MCS | | 3-4-4 (8) | 1.0 | | | | | | 44 |
| | | | MCS | | 5-6-6 (12) | | 109 | 20 | | | | |
| 10 | | (SP-SC) Poorly Graded SAND with SILT, loose, olive brown, moist, fine sand, strong cementation; grades downward to CLAYEY SAND. | MCS | | 3-5-5 (10) | | | | | | | |

Bottom of borehole at 11.5 feet.

# BORING NUMBER B-5



**CLIENT** Life Plan Humboldt

**PROJECT NAME** LPH Community Geotechnical Investigation

**PROJECT NUMBER** 024007.200

**PROJECT LOCATION** Hiller Road, McKinleyville, CA

**DATE STARTED** 1/14/24 **COMPLETED** 1/14/24

**GROUND ELEVATION** 149 ft (+/-) **HOLE SIZE** 4"

**DRILLING CONTRACTOR** Taber Drilling

**GROUNDWATER DEPTH**

**DRILLING METHOD** Solid Flight Augers

▽ **AT TIME OF DRILLING** 6.00 ft / Elev 143.00 ft

**LOGGED BY** A. Troia **CHECKED BY** G. Vadurro

**NOTES** Tremie grout backfill

| DEPTH (ft) | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | (ML) SANDY SILT, medium stiff, very dark brown to black, fine sand, low plasticity, organic-rich (NATIVE TOPSOIL). | | | | | | | | | | |
| | (SC) CLAYEY SAND, medium dense, olive brown, moist, fine sand, moderate cementation (MARINE TERRACE DEPOSITS). | MCS | | 2-4-4 (8) | | | | | | | |
| | | MCS | | 5-9-17 (26) | | 90 | 29 | | | | |
| 5 | (SM) SILTY SAND, loose, yellowish brown, moist, fine sand, moderate cementation, few fine roots. ▽ Becomes wet, olive brown; manganese oxide nodules and fine plant fibers. | MCS | | 3-4-5 (9) | | 103 | 23 | | | | 29 |
| | Decreased fines content. | MCS | | 5-4-8 (12) | | 98 | 25 | | | | |
| 10 | (SC) CLAYEY SAND, medium dense, light gray to yellowish brown, moist, strong cementation, low plasticity, cohesive. | MCS | | 9-8-10 (18) | | | | | | | 41 |

Bottom of borehole at 11.5 feet.

# BORING NUMBER B-6



**CLIENT** Life Plan Humboldt
**PROJECT NAME** LPH Community Geotechnical Investigation
**PROJECT NUMBER** 024007.200
**PROJECT LOCATION** Hiller Road, McKinleyville, CA
**DATE STARTED** 1/15/24 **COMPLETED** 1/15/24
**GROUND ELEVATION** 149 ft (+/-) **HOLE SIZE** 4"
**DRILLING CONTRACTOR** Taber Drilling
**GROUNDWATER DEPTH**
**DRILLING METHOD** Solid Flight Augers/ Mud Rotary
▽ **AT TIME OF DRILLING** 9.00 ft / Elev 140.00 ft
**LOGGED BY** A. Troia **CHECKED BY** G. Vadurro
**NOTES** Tremie grout backfill

| DEPTH (ft) | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | (SM) SILTY SAND, loose, moist, very dark brown, organic-rich, fine sand, many fine roots (NATIVE TOPSOIL). | | | | | | | | | | |
| | Becomes dense, olive brown, weak to moderate cementation, few very fine roots. | MCS | | 4-3-6 (9) | | | | | | | |
| | (SP) Poorly graded SAND, dense, moist, very fine to fine sand, moderate to strong cementation, trace silt, weak mottling (MARINE TERRACE DEPOSITS). | MCS | | 16-35-46 (81) | | 91 | 23 | | | | |
| 5 | (SC) CLAYEY SAND, loose, moist, light olive gray, cohesive with low plasticity, low toughness, moderate cementation; decreasing fines with depth. | MCS | | 6-3-5 (8) | | 98 | 25 | | | | |
| | (SM) SILTY SAND, loose, wet, olive brown, fine sand. ▽ | MCS | | 5-4-5 (9) | | | | | | | 40 |
| 10 | Becomes medium dense, dark yellowish brown. | SPT | | 9-5-8 (13) | | | | | | | 26 |
| 15 | (SP) Poorly graded SAND, medium dense, wet, olive, fine sand, cohesive with medium plasticity fines (FALOR FORMATION). | SPT | | 11-14-14 (28) | | | | | | | |
| 20 | Becomes dark greenish gray; approx. 1" thick peat layer at 21'. | SPT | | 12-10-16 (26) | | | | | | | |
| 25 | Thin silty interbeds. | SPT | | 19-28-42 (70) | | | | | | | |
| 30 | Becomes very dense, gray, fine sand. | SPT | | 28-50 | | | | | | | |

Refusal at 31.0 feet.
Bottom of borehole at 31.0 feet.

# BORING NUMBER B-7



**CLIENT** Life Plan Humboldt
**PROJECT NAME** LPH Community Geotechnical Investigation
**PROJECT NUMBER** 024007.200
**PROJECT LOCATION** Hiller Road, McKinleyville, CA
**DATE STARTED** 1/15/24 **COMPLETED** 1/15/24
**GROUND ELEVATION** 133 ft (+/-) **HOLE SIZE** 4"
**DRILLING CONTRACTOR** Taber Drilling
**GROUNDWATER DEPTH**
**DRILLING METHOD** Solid Flight Augers/ Mud Rotary
▽ **AT TIME OF DRILLING** 1.00 ft / Elev 132.00 ft (Perched GW)
**LOGGED BY** A. Troia **CHECKED BY** G. Vadurro
**NOTES** Tremie grout backfill

| DEPTH (ft) | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | ▽ (ML) SANDY SILT, soft, very dark brown to black, moist, very fine sand, low plasticity to non-plastic (NATIVE TOPSOIL). | | | | | | | | | | |
| | (SC-SM) SILTY SAND to CLAYEY SAND, dense, light olive gray, moist, weak cementation, fine sand (MARINE TERRACE DEPOSITS). Grades coarser with depth, few very fine roots. | MCS | | 12-18-24 (42) | 1.25 | 105 | 1 | | | | |
| 5 | (SC-SM) SILTY SAND to CLAYEY SAND, loose, dark yellowish brown to strong brown, moist, weak cementation, fine sand, cohesive, low plasticity fines, low toughness. ▼ Becomes greenish gray. | MCS | | 8-5-7 (12) | 0.5 | 108 | 8 | | | | 27 |
| 10 | (SC) CLAYEY SAND, medium dense, greenish gray, fine sand, moderate cementation, few fine roots. | MCS | | 6-11-9 (20) | 2.25 | | | | | | 38 |
| 15 | (SP) Poorly graded SAND, dense, dark gray, wet, fine sand, few fine plant/woody fragments, strong cementation, rapid dilatency (FALOR FORMATION) | MCS | | 8-21-27 (48) | | | | | | | |
| 20 | Becomes very dense; trace silt. | SPT | | 21-31-26 (57) | | | | | | | |
| 25 | | SPT | | 12-19-36 (55) | | | | | | | |
| 30 | | SPT | | 29-35-42 (77) | | | | | | | |

Bottom of borehole at 31.5 feet.

**CLIENT** Life Plan Humboldt
**PROJECT NAME** LPH Community Geotechnical Investigation
**PROJECT NUMBER** 024007.200
**PROJECT LOCATION** Hiller Road, McKinleyville, CA
**DATE STARTED** 1/15/24 **COMPLETED** 1/15/24
**GROUND ELEVATION** 135 ft (+/-) **HOLE SIZE** 4"
**DRILLING CONTRACTOR** Taber Drilling
**GROUNDWATER DEPTH**
**DRILLING METHOD** Solid Flight Augers/ Mud Rotary
▽ **AT TIME OF DRILLING** 1.50 ft / Elev 133.50 ft
**LOGGED BY** A. Troia **CHECKED BY** G. Vadurro
**NOTES** Tremie grout backfill

| DEPTH (ft) | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | (ML) SANDY SILT, soft, very dark brown to black, moist, very fine sand, low plasticity to nonplastic (NATIVE TOPSOIL). ▽ | | | | | | | | | | |
| | (SP-SC) Poorly graded SAND to CLAYEY SAND, medium dense, pale olive to light yellowish brown, wet, fine sand, weak cementation, low plasticity, low toughness, few fine roots (MARINE TERRACE DEPOSITS). | MCS | | 10-8-9 (17) | | 105 | 19 | | | | |
| 5 | (SP) Poorly graded SAND with SILT, dense, gray, wet, fine sand. | MCS | | 10-17-35 (52) | | 110 | 18 | | | | |
| 10 | (SM) Grades to medium dense SILTY SAND. | SPT | | 10-10-7 (17) | | | | | | | 17 |
| 15 | (SP) Poorly graded SAND, very dense, wet, fine subrounded gravel at 16' (FALOR FORMATION). | SPT | | 20-24-28 (52) | | | | | | | |
| 20 | Becomes dense. | SPT | | 16-22-24 (46) | | | | | | | |
| 25 | | SPT | | 14-15-24 (39) | | | | | | | |
| 30 | | | | | | | | | | | |

(Continued Next Page)

# BORING NUMBER B-8



**CLIENT** Life Plan Humboldt
**PROJECT NAME** LPH Community Geotechnical Investigation
**PROJECT NUMBER** 024007.200
**PROJECT LOCATION** Hiller Road, McKinleyville, CA

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | | (SP) Poorly graded SAND, very dense, wet, fine subrounded gravel at 16' (FALOR FORMATION). *(continued)* | | | | | | | | | | |
| 35 | | Becomes very dense; no recovery. | MCS | | 50/3" | | | | | | | |
| | | | SPT | | 50/6" | | | | | | | |
| 40 | | | SPT | | 50/5" | | | | | | | |
| 45 | | Rig chatter from 45'-50'; color change in drill cuttings to brown with fine gravel and wood fragments. | | | | | | | | | | |
| 50 | | Increasing medium to coarse sand with approx. 5% fine gravel; quartz-rich. | SPT | | 50/4" | | | | | | | |

Refusal at 50.3 feet.
Bottom of borehole at 50.3 feet.

# BORING NUMBER B-9



**CLIENT** Life Plan Humboldt

**PROJECT NAME** LPH Community Geotechnical Investigation

**PROJECT NUMBER** 024007.200

**PROJECT LOCATION** Hiller Road, McKinleyville, CA

**DATE STARTED** 1/15/24 **COMPLETED** 1/15/24

**GROUND ELEVATION** 132 ft (+/-) **HOLE SIZE** 4"

**DRILLING CONTRACTOR** Taber Drilling

**GROUNDWATER DEPTH**

**DRILLING METHOD** Solid Flight Augers

∇ **AT TIME OF DRILLING** 4.00 ft / Elev 128.00 ft

**LOGGED BY** A. Troia **CHECKED BY** G. Vadurro

**NOTES** Tremie grout backfill

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | (ML) SANDY SILT, soft, very dark brown to black, moist, very fine sand, low plasticity to nonplastic (NATIVE TOPSOIL). | | | | | | | | | | |
| | | (SC-SM) SILTY SAND to CLAYEY SAND, very loose, pale olive, moist, fine sand, weak cementation (MARINE TERRACE DEPOSITS). | SPT | | 3-1-2 (3) | | | | | | | |
| | ∇ | | | | | | | | | | | |
| 5 | | | SPT | | 7-6-8 (14) | | | | | | | |
| | | Black, friable, thin hardpan layer at approx. 6', coarse sand-sized grains; becomes yellowish brown with manganese oxide nodules, strong cementation, decrease in moisture content. | | | | | | | | | | |
| | | Becomes loose; no recovery. | MCS | | 7-6-4 (10) | | | | | | | |
| 10 | | (SM) SILTY SAND, medium dense, greenish gray, moist, fine sand, few fine wood fragments. | SPT | | 6-8-7 (15) | | | | | | | 26 |

Bottom of borehole at 11.5 feet.

# BORING NUMBER B-10



**CLIENT** Life Plan Humboldt

**PROJECT NAME** LPH Community Geotechnical Investigation

**PROJECT NUMBER** 024007.200

**PROJECT LOCATION** Hiller Road, McKinleyville, CA

**DATE STARTED** 1/15/24 **COMPLETED** 1/15/24

**GROUND ELEVATION** 126 ft (+/-) **HOLE SIZE** 4"

**DRILLING CONTRACTOR** Taber Drilling

**GROUNDWATER DEPTH**

**DRILLING METHOD** Solid Flight Augers

▽ **AT TIME OF DRILLING** 2.00 ft / Elev 124.00 ft

**LOGGED BY** A. Troia **CHECKED BY** G. Vadurro

**NOTES** Tremie grout backfill

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | (ML) SANDY SILT, soft, very dark brown to black, moist, very fine sand, low plasticity to nonplastic (NATIVE TOPSOIL). | | | | | | | | | | |
| | ▽ | (SM) SILTY SAND, loose, pale olive with yellowish brown mottling, moist to wet, fine sand, weak cementation, decreasing fines content with depth (MARINE TERRACE DEPOSITS). | SPT | | 3-3-4 (7) | | | | | | | 47 |
| 5 | | (SP) Poorly graded SAND, medium dense, olive, wet, fine sand, weak mottling and iron oxide nodules. | MCS | | 3-5-11 (16) | | 98 | 25 | | | | |
| | | | SPT | | 9-11-9 (20) | | | | | | | |
| 10 | | Becomes dense. | SPT | | 12-14-16 (30) | | | | | | | |

Bottom of borehole at 11.5 feet.

# BORING NUMBER B-11



**CLIENT** Life Plan Humboldt
**PROJECT NAME** LPH Community Geotechnical Investigation
**PROJECT NUMBER** 024007.200
**PROJECT LOCATION** Hiller Road, McKinleyville, CA
**DATE STARTED** 1/15/24 **COMPLETED** 1/15/24
**GROUND ELEVATION** 136 ft (+/-) **HOLE SIZE** 4"
**DRILLING CONTRACTOR** Taber Drilling
**GROUNDWATER DEPTH**
**DRILLING METHOD** Solid Flight Augers
▽ **AT TIME OF DRILLING** --- (Not measured)
**LOGGED BY** A. Troia **CHECKED BY** G. Vadurro
**NOTES** Tremie grout backfill

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | (ML) SANDY SILT, soft, very dark brown to black, moist, very fine sand, low plasticity to non-plastic (NATIVE TOPSOIL). | | | | | | | | | | |
| | | (SM) SILTY SAND, loose, pale olive, moist, fine sand, weak to moderate cementation, approx. 30% fines (MARINE TERRACE DEPOSITS). | MCS | | 2-2-4 (6) | | 89 | 30 | | | | |
| 5 | | Grades sandy, becomes medium dense, moist to wet, mottled with iron oxide nodules. | MCS | | 12-14-16 (30) | | 105 | 15 | | | | |
| | | (SM) SILTY SAND, medium dense, color change to gray with fine wood fragments and thin interbedded silt layers. | SPT | | 0-5-8 (13) | | | | | | | 32 |
| 10 | | (SC-SM) SILTY SAND to CLAYEY SAND, medium dense, greenish gray, moist, moderate cementation, fine sand, low plasticity, cohesive. | SPT | | 2-4-9 (13) | | | | | | | 37 |

Bottom of borehole at 11.5 feet.

# BORING NUMBER B-12



**CLIENT** Life Plan Humboldt

**PROJECT NAME** LPH Community Geotechnical Investigation

**PROJECT NUMBER** 024007.200

**PROJECT LOCATION** Hiller Road, McKinleyville, CA

**DATE STARTED** 1/15/24 **COMPLETED** 1/15/24

**GROUND ELEVATION** 140 ft (+/-) **HOLE SIZE** 4"

**DRILLING CONTRACTOR** Taber Drilling

**GROUNDWATER DEPTH**

**DRILLING METHOD** Solid Flight Augers

▽ **AT TIME OF DRILLING** 5.00 ft / Elev 135.00 ft

**LOGGED BY** A. Troia **CHECKED BY** G. Vadurro

**NOTES** Tremie grout backfill

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | (ML) SANDY SILT, soft, very dark brown to black, moist, fine sand, low plasticity to non-plastic (NATIVE TOPSOIL). | | | | | | | | | | |
| | | (SM) SILTY SAND, medium dense, dark yellowish brown, moist, fine sand, moderate cementation (MARINE TERRACE DEPOSITS). | SPT | | 8-9-8 (17) | | | | | | | 26 |
| 5 | ▽ | (SP) Poorly graded SAND, dense, pale olive, wet, fine sand with trace fines. | MCS | | 11-18-32 (50) | | 107 | 19 | | | | |
| | | Becomes medium dense. | SPT | | 9-8-10 (18) | | | | | | | |
| 10 | | (SM) SILTY SAND, medium dense, bluish gray, moist, fine sand, moderate cementation. | SPT | | 4-6-13 (19) | | | | | | | |

Bottom of borehole at 11.5 feet.

# Laboratory Test Data

# 4

Phone: (707) 441-8855 Email: info@shn-engr.com Web: shn-engr.com
812 W. Wabash Avenue, Eureka, CA 95501-2138

# DENSITY BY DRIVE- CYLINDER METHOD (ASTM D2937)

| | | | |
|---|---|---|---|
| Project Name: | Life Plan Humboldt | Project Number: | 024007 |
| Performed By: | SC | Date: | 2/25/25 |
| Checked By: | KEW | Date: | 3/6/25 |
| Project Manager: | GAV | | |

| Lab Sample Number | 25-068 | 25-070 | 25-077 | 25-080 | 25-081 |
|---|---|---|---|---|---|
| Boring Label | B-1 | B-1 | B-3 | B-3 | B-4 |
| Sample Depth (ft) | 4-4.5' | 6-6.5' | 4-4.5' | 11-11.5' | 2-2.5' |
| Diameter of Cylinder, in | 2.42 | 2.42 | 2.42 | 2.42 | 2.42 |
| Total Length of Cylinder, in. | 6.00 | 6.00 | 6.00 | 6.00 | 6.02 |
| Length of Empty Cylinder A, in. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Length of Empty Cylinder B, in. | 0.56 | 0.38 | 0.39 | 0.42 | 0.49 |
| Length of Cylinder Filled, in | 5.44 | 5.62 | 5.61 | 5.58 | 5.53 |
| Volume of Sample, $in^3$ | 25.02 | 25.85 | 25.80 | 25.67 | 25.44 |
| Volume of Sample, cc. | 410.03 | 423.60 | 422.85 | 420.59 | 416.82 |

| Pan # | ss2 | ss10 | ss24 | ss23 | ss14 |
|---|---|---|---|---|---|
| Weight of Wet Soil and Pan | 944.1 | 1084.3 | 1116.2 | 1186.6 | 970.1 |
| Weight of Dry Soil and Pan | 770.9 | 945.8 | 968.9 | 1047.5 | 786.8 |
| Weight of Water | 173.2 | 138.5 | 147.3 | 139.1 | 183.3 |
| Weight of Pan | 193.4 | 195.4 | 308.3 | 311.9 | 192.6 |
| Weight of Dry Soil | 577.5 | 750.4 | 660.6 | 735.6 | 594.2 |
| **Percent Moisture** | **30.0** | **18.5** | **22.3** | **18.9** | **30.8** |
| Dry Density, g/cc | 1.41 | 1.77 | 1.56 | 1.75 | 1.43 |
| **Dry Density, $lb/ft^3$** | **87.9** | **110.6** | **97.5** | **109.2** | **89.0** |

Phone: (707) 441-8855 Email: info@shn-engr.com Web: shn-engr.com
812 W. Wabash Avenue, Eureka, CA 95501-2138

# DENSITY BY DRIVE- CYLINDER METHOD (ASTM D2937)

| | | | |
|---|---|---|---|
| Project Name: | Life Plan Humboldt | Project Number: | 024007 |
| Performed By: | SC | Date: | 2/26/25 |
| Checked By: | KEW | Date: | 3/6/25 |
| Project Manager: | GAV | | |

| Lab Sample Number | 25-082 | 25-084 | 25-086 | 25-088 | 25-089 |
|---|---|---|---|---|---|
| Boring Label | B-4 | B-4 | B-5 | B-5 | B-5 |
| Sample Depth (ft) | 4-4.5' | 8.5-9' | 4-4.5' | 6' | 8.5' |
| Diameter of Cylinder, in | 2.42 | 2.42 | 2.42 | 2.42 | 2.42 |
| Total Length of Cylinder, in. | 6.00 | 6.00 | 6.00 | 6.00 | 6.00 |
| Length of Empty Cylinder A, in. | 0.00 | 0.00 | 0.00 | 0.50 | 0.58 |
| Length of Empty Cylinder B, in. | 0.31 | 0.32 | 0.58 | 0.00 | 0.00 |
| Length of Cylinder Filled, in | 5.69 | 5.68 | 5.42 | 5.50 | 5.42 |
| Volume of Sample, $in^3$ | 26.17 | 26.13 | 24.93 | 25.30 | 24.93 |
| Volume of Sample, cc. | 428.88 | 428.12 | 408.53 | 414.56 | 408.53 |

| Pan # | ss15 | ss10 | ss1 | ss3 | ss8 |
|---|---|---|---|---|---|
| Weight of Wet Soil and Pan | 1003.4 | 1087.9 | 955.4 | 1038.2 | 992.3 |
| Weight of Dry Soil and Pan | 857.8 | 941.3 | 785.3 | 881.7 | 831.8 |
| Weight of Water | 145.6 | 146.6 | 170.1 | 156.5 | 160.5 |
| Weight of Pan | 194.2 | 195.3 | 194.7 | 197.2 | 192.9 |
| Weight of Dry Soil | 663.6 | 746.0 | 590.6 | 684.5 | 638.9 |
| **Percent Moisture** | **21.9** | **19.7** | **28.8** | **22.9** | **25.1** |
| Dry Density, g/cc | 1.55 | 1.74 | 1.45 | 1.65 | 1.56 |
| **Dry Density, $lb/ft^3$** | **96.6** | **108.8** | **90.3** | **103.1** | **97.6** |

Phone: (707) 441-8855 Email: info@shn-engr.com Web: shn-engr.com
812 W. Wabash Avenue, Eureka, CA 95501-2138

# DENSITY BY DRIVE- CYLINDER METHOD (ASTM D2937)

| | | | |
|---|---|---|---|
| Project Name: | Life Plan Humboldt | Project Number: | 024007 |
| Performed By: | JMA | Date: | 2/28/25 |
| Checked By: | KEW | Date: | 3/6/25 |
| Project Manager: | GAV | | |

| Lab Sample Number | 25-091 | 25-092 | 25-095 | 25-097 | 25-099 |
|---|---|---|---|---|---|
| Boring Label | B-6 | B-6 | B-7 | B-7 | B-8 |
| Sample Depth (ft) | 3.5' | 6' | 3' | 6' | 3' |
| Diameter of Cylinder, in | 2.42 | 2.42 | 2.42 | 2.42 | 2.42 |
| Total Length of Cylinder, in. | 6.00 | 6.00 | 6.00 | 6.00 | 6.00 |
| Length of Empty Cylinder A, in. | 1.85 | 0.46 | 0.78 | 0.43 | 2.01 |
| Length of Empty Cylinder B, in. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Length of Cylinder Filled, in | 4.15 | 5.54 | 5.22 | 5.57 | 3.99 |
| Volume of Sample, $in^3$ | 19.09 | 25.48 | 24.01 | 25.62 | 18.35 |
| Volume of Sample, cc. | 312.80 | 417.57 | 393.45 | 419.83 | 300.74 |

| Pan # | ss1 | ss14 | ss11 | ss6 | s27 |
|---|---|---|---|---|---|
| Weight of Wet Soil and Pan | 756.0 | 1013.8 | 978.7 | 976.1 | 754.1 |
| Weight of Dry Soil and Pan | 651.4 | 850.5 | 855.0 | 921.0 | 657.0 |
| Weight of Water | 104.6 | 163.3 | 5.0 | 55.1 | 97.1 |
| Weight of Pan | 194.2 | 192.6 | 192.6 | 196.0 | 150.4 |
| Weight of Dry Soil | 457.2 | 657.9 | 662.4 | 725.0 | 506.6 |
| Percent Moisture | **22.9** | **24.8** | **0.8** | **7.6** | **19.2** |
| Dry Density, g/cc | 1.46 | 1.58 | 1.68 | 1.73 | 1.68 |
| Dry Density, $lb/ft^3$ | **91.2** | **98.4** | **105.1** | **107.8** | **105.2** |

Phone: (707) 441-8855 Email: info@shn-engr.com Web: shn-engr.com
812 W. Wabash Avenue, Eureka, CA 95501-2138

# DENSITY BY DRIVE- CYLINDER METHOD (ASTM D2937)

| | | | |
|---|---|---|---|
| Project Name: | Life Plan Humboldt | Project Number: | 024007 |
| Performed By: | JMA | Date: | 2/28/25 |
| Checked By: | KEW | Date: | 3/6/25 |
| Project Manager: | GAV | | |

| Lab Sample Number | 25-100 | 25-104 | 25-105 | 25-106 | 25-110 |
|---|---|---|---|---|---|
| Boring Label | B-8 | B-10 | B-11 | B-11 | B-12 |
| Sample Depth (ft) | 6' | 6' | 2.5' | 5' | 6' |
| Diameter of Cylinder, in | 2.42 | 2.42 | 2.42 | 2.42 | 2.42 |
| Total Length of Cylinder, in. | 6.00 | 6.00 | 6.00 | 6.00 | 6.00 |
| Length of Empty Cylinder A, in. | 0.88 | 0.38 | 0.95 | 0.00 | 0.00 |
| Length of Empty Cylinder B, in. | 0.00 | 0.00 | 0.00 | 0.31 | 0.72 |
| Length of Cylinder Filled, in | 5.12 | 5.62 | 5.05 | 5.69 | 5.28 |
| Volume of Sample, $in^3$ | 23.55 | 25.85 | 23.23 | 26.17 | 24.29 |
| Volume of Sample, cc. | 385.91 | 423.60 | 380.64 | 428.88 | 397.97 |

| Pan # | s26 | s8 | s25 | s22 | ss10 |
|---|---|---|---|---|---|
| Weight of Wet Soil and Pan | 968.0 | 984.2 | 848.4 | 972.2 | 1006.1 |
| Weight of Dry Soil and Pan | 844.2 | 822.0 | 685.3 | 866.8 | 877.2 |
| Weight of Water | 123.8 | 162.2 | 163.1 | 105.4 | 128.9 |
| Weight of Pan | 163.3 | 158.7 | 143.3 | 148.0 | 195.6 |
| Weight of Dry Soil | 680.9 | 663.3 | 542.0 | 718.8 | 681.6 |
| Percent Moisture | **18.2** | **24.5** | **30.1** | **14.7** | **18.9** |
| Dry Density, g/cc | 1.76 | 1.57 | 1.42 | 1.68 | 1.71 |
| Dry Density, $lb/ft^3$ | **110.1** | **97.8** | **88.9** | **104.6** | **106.9** |

Phone: (707) 441-8855 Email: info@shn-engr.com Web: shn-engr.com
812 W. Wabash Avenue, Eureka, CA 95501-2138

# PERCENT PASSING # 200 SIEVE (ASTM - D1140)

| | | | |
|---|---|---|---|
| Project Name: | Life Plan Humboldt | Project Number: | 024007 |
| Performed By: | SC | Date: | 2/26/25 |
| Checked By: | KEW | Date: | 3/6/25 |
| Project Manager: | GAV | | |

| Lab Sample Number | 25-069 | 25-071 | 25-072 | 25-075 | 25-076 |
|---|---|---|---|---|---|
| Boring Label | B-1 | B-1 | B-1 | B-2 | B-2 |
| Sample Depth (ft) | 5.5-6' | 10-11.5' | 20-21.5' | 10-11.5' | 20-21.5' |
| Pan Number | SS1 | SS14 | SS15 | SS7 | SS8 |
| Dry Weight of Soil & Pan | 616.7 | 757.2 | 585.7 | 875.9 | 746.3 |
| Pan Weight | 194.7 | 192.6 | 194.2 | 193.0 | 192.9 |
| Weight of Dry Soil | 422.0 | 564.6 | 391.5 | 682.9 | 553.4 |
| Soil Weight Retained on #200&Pan | 508.2 | 528.6 | 525.5 | 673.2 | 624.1 |
| Soil Weight Passing #200 | 108.5 | 228.6 | 60.2 | 202.7 | 122.2 |
| Percent Passing #200 | **25.7** | **40.5** | **15.4** | **29.7** | **22.1** |

| Lab Sample Number | 25-078 | 25-079 | 25-083 | 25-087 | 25-090 |
|---|---|---|---|---|---|
| Boring Label | B-3 | B-3 | B-4 | B-5 | B-5 |
| Sample Depth | 5.5-6' | 10.5-11' | 6-6.5' | 5.5-6' | 11-11.5' |
| Pan Number | SS11 | SS24 | SS15 | SS14 | SS1 |
| Dry Weight of Soil & Pan | 575.0 | 1005.6 | 877.9 | 879.7 | 869.4 |
| Pan Weight | 192.6 | 308.5 | 194.1 | 192.6 | 194.7 |
| Weight of Dry Soil | 382.4 | 697.1 | 683.8 | 687.1 | 674.7 |
| Soil Weight Retained on #200&Pan | 371.5 | 879.0 | 578.0 | 680.7 | 590.3 |
| Soil Weight Passing #200 | 203.5 | 126.6 | 299.9 | 199.0 | 279.1 |
| Percent Passing #200 | **53.2** | **18.2** | **43.9** | **29.0** | **41.4** |

Phone: (707) 441-8855 Email: info@shn-engr.com Web: shn-engr.com
812 W. Wabash Avenue, Eureka, CA 95501-2138

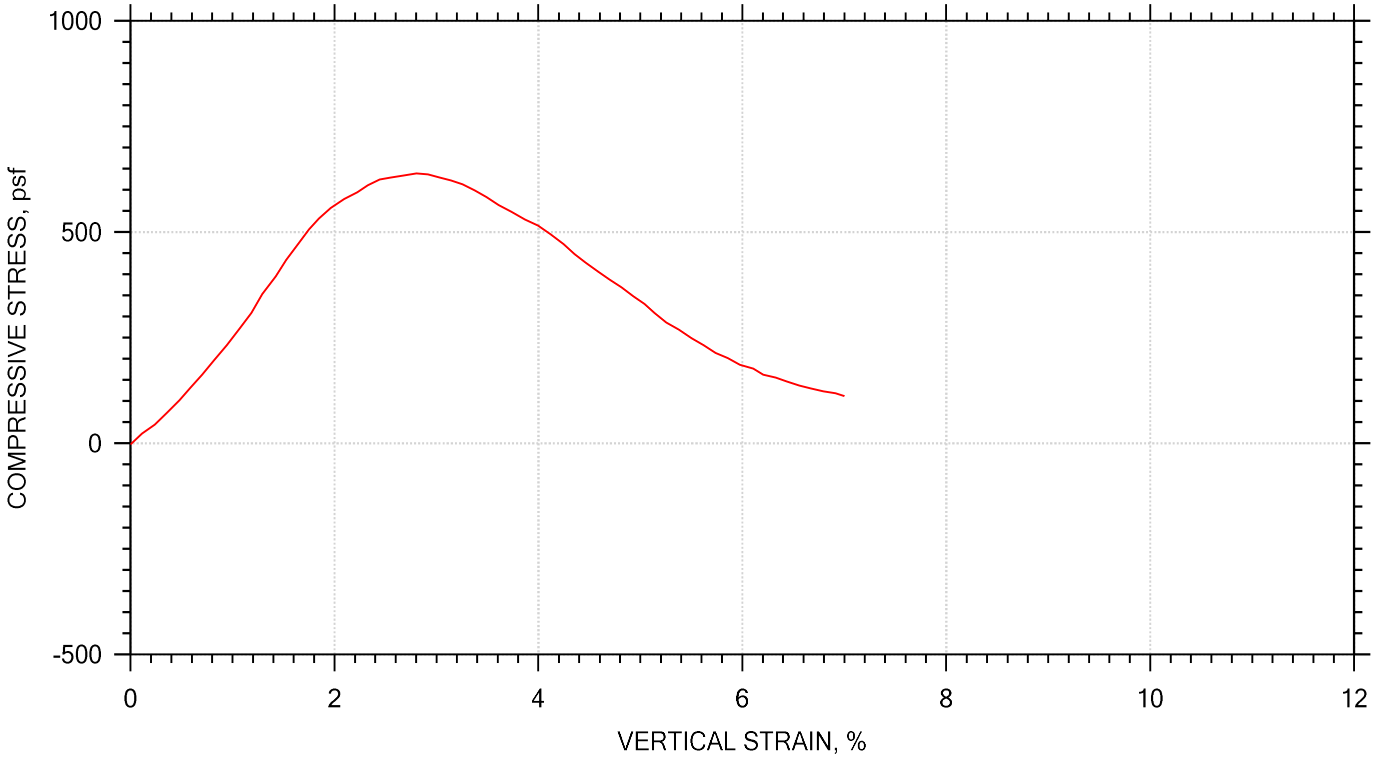
# PERCENT PASSING # 200 SIEVE (ASTM - D1140)

| | | | |
|---|---|---|---|
| Project Name: | Life Plan Humboldt | Project Number: | 024007 |
| Performed By: | SC | Date: | 2/26/25 |
| Checked By: | KEW | Date: | 3/6/25 |
| Project Manager: | GAV | | |

| Lab Sample Number | 25-093 | 25-094 | 25-096 | 25-098 | 25-101 |
|---|---|---|---|---|---|
| Boring Label | B-6 | B-6 | B-7 | B-7 | B-8 |
| Sample Depth (ft) | 7.5-8' | 10-11.5' | 5.5-6' | 10.5-11' | 10- 11.5 |
| Pan Number | SS9 | SS2 | SS5 | SS24 | SS22 |
| Dry Weight of Soil & Pan | 604.2 | 547.0 | 689.4 | 797.5 | 789.3 |
| Pan Weight | 196.5 | 193.4 | 195.3 | 308.3 | 314.2 |
| Weight of Dry Soil | 407.7 | 353.6 | 494.1 | 489.2 | 475.1 |
| Soil Weight Retained on #200&Pan | 440.1 | 455.6 | 555.5 | 612.3 | 710.7 |
| Soil Weight Passing #200 | 164.1 | 91.4 | 133.9 | 185.2 | 78.6 |
| Percent Passing #200 | **40.3** | **25.8** | **27.1** | **37.9** | **16.5** |

| Lab Sample Number | 25-102 | 25-103 | 25-107 | 25-108 | 25-109 |
|---|---|---|---|---|---|
| Boring Label | B-9 | B-10 | B-11 | B-11 | B-12 |
| Sample Depth | 10- 11.5 | 2- 3.5 | 6- 7.5 | 10 - 11.5 | 2- 3.5 |
| Pan Number | SS23 | SS10 | SS2 | SS5 | SS9 |
| Dry Weight of Soil & Pan | 926.7 | 805.8 | 825.6 | 710.1 | 675.3 |
| Pan Weight | 311.9 | 195.3 | 193.4 | 195.3 | 196.5 |
| Weight of Dry Soil | 614.8 | 610.5 | 632.2 | 514.8 | 478.8 |
| Soil Weight Retained on #200&Pan | 769.8 | 522.1 | 626.1 | 521.4 | 548.9 |
| Soil Weight Passing #200 | 156.9 | 283.7 | 199.5 | 188.7 | 126.4 |
| Percent Passing #200 | **25.5** | **46.5** | **31.6** | **36.7** | **26.4** |

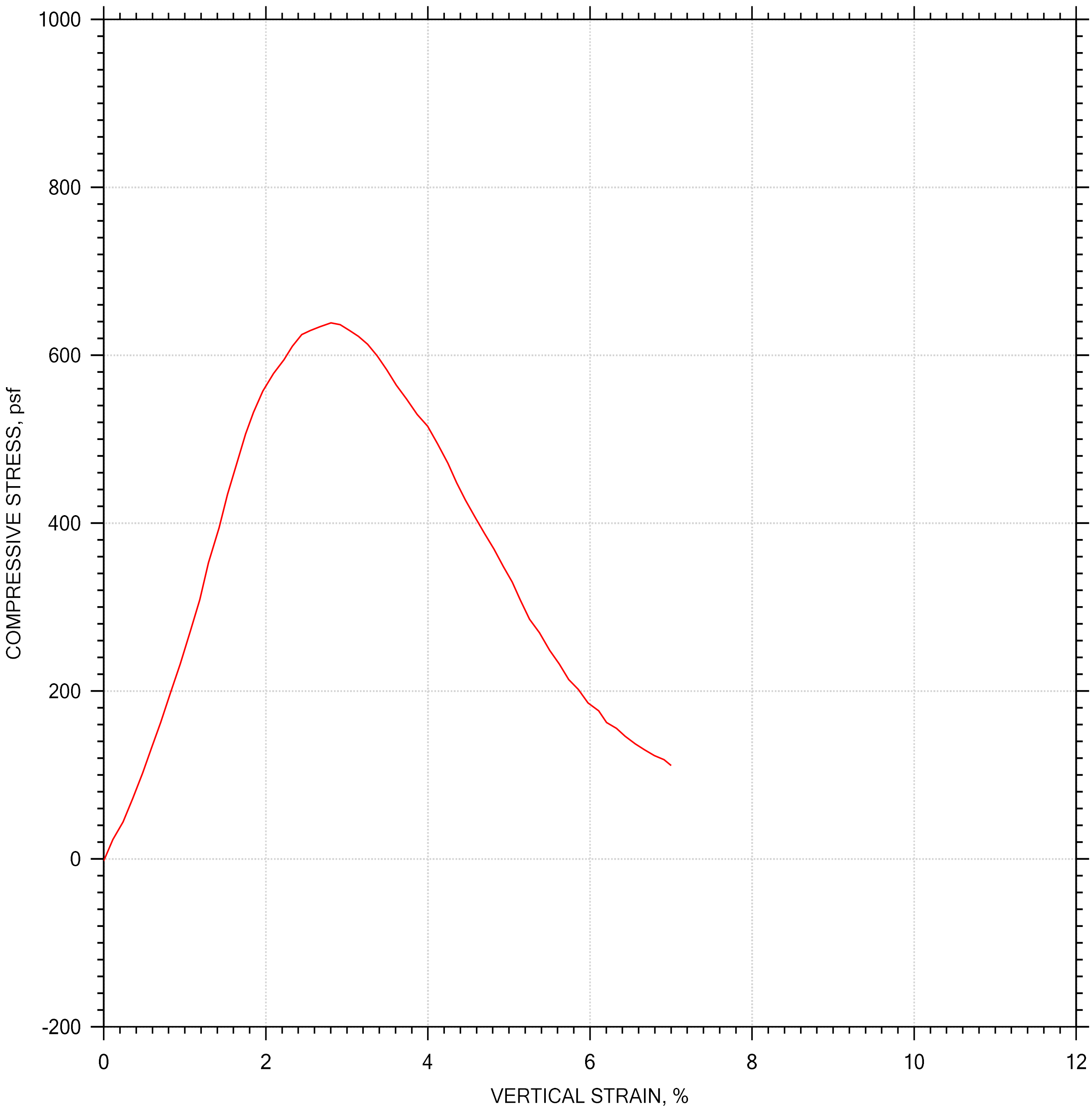
# UNCONFINED COMPRESSION TEST REPORT




| | | | | | |
|---|---|---|---|---|---|
| Symbol | | | | | |
| Test No. | | 25-073 | | | |
| Initial | Diameter, in | 2.42 | | | |
| | Height, in | 5.4 | | | |
| | Water Content, % | 23.93 | | | |
| | Dry Density, pcf | 96.77 | | | |
| | Saturation, % | 89.38 | | | |
| | Void Ratio | 0.71 | | | |
| Unconfined Compressive Strength, psf | | 638.7 | | | |
| Undrained Shear Strength, psf | | 319.3 | | | |
| Time to Failure, min | | 2.4019 | | | |
| Strain Rate, %/min | | 0.01 | | | |
| Estimated Specific Gravity | | 2.65 | | | |
| Liquid Limit | | 0 | | | |
| Plastic Limit | | 0 | | | |
| Plasticity Index | | 0 | | | |
| Failure Sketch | | | | | |

| | | | |
|---|---|---|---|
| SHN | Project: LPH | Location: | Project No.: 024007 |
| | Boring No.: B-2 | Tested By: JMA | Checked By: KEW |
| | Sample No.: 4 | Test Date: 2/28/25 | Elevation: |
| | Test No.: 25-073 | Preparation: Undisturbed | Depth: 4' |
| | Description: Reddih BrownSily SAND | | |
| | Remarks: | | |

# UNCONFINED COMPRESSION TEST REPORT




| | | | |
|---|---|---|---|
| | Project: LPH | Location: | Project No.: 024007 |
| | Boring No.: B-2 | Tested By: JMA | Checked By: KEW |
| | Sample No.: 4 | Test Date: 2/28/25 | Elevation: |
| | Test No.: 25-073 | Preparation: Undisturbed | Depth: 4' |
| | Description: Reddih BrownSily SAND | | |
| | Remarks: | | |

Eureka, CA | Redding, CA | Willits, CA | Fort Bragg, CA | Coos Bay, OR | Klamath Falls, OR