LINDBERG GEOLOGIC CONSULTING
David N. Lindberg, Certified Engineering Geologist

Preliminary Engineering-Geologic
R-1 Soils Exploration Report

Proposed Five-Lot Subdivision
APN 304-071-018

Elk River Road, Eureka
Humboldt County, California

Prepared for:
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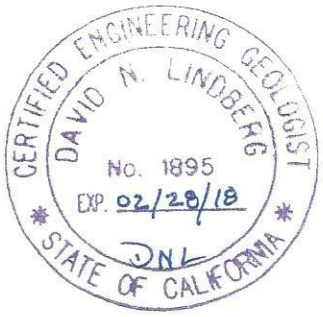

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TABLE OF CONTENTS

PRELIMINARY ENGINEERING GEOLOGIC R-1 SOILS EXPLORATION REPORT

Proposed Five-Parcel Subdivision, Elk River Road, Eureka, California
Assessor's Parcel 304-071-018

1.0 INTRODUCTION

1.1 Site and Project Description

This report presents the results of our engineering-geologic soils exploration conducted on a parcel located in Elk River, adjacent to Eureka, California (Figure 1). The parcel number assigned by the Assessor is 304-071-018 (Figure 2). Pertinent project site location information is listed in Table 1 below.

TABLE 1 – PROJECT LOCATION INFORMATION	
Assessor's Parcel 304-071-018	
Latitude and Longitude*	40.7264° N and 124.1711° W
Legal Description	SW ¼ Section 15, Township 4 N, Range 1 W; HB&M.
Parcel Size	44.08 acres*
USGS Quadrangle	Fields Landing 7.5-minute topographic quadrangle map, 1958 (photo-revised 1972).

*Centroid of parcel per Humboldt County Web GIS

Lindberg Geologic Consulting (LGC) was retained by the property owners who are proposing to subdivide this parcel into five new residential lots. Our limited-scope investigation was focused on assessing the suitability of the soils on each proposed new lot to support typical residential structures of standard materials and construction. We further assessed the potential suitability of each proposed new lot to support an on-site wastewater treatment (septic) system. To assess soil types, distribution and suitability, hand augered soil borings and exploratory backhoe test pits were installed on each proposed new lot (Figure 3). Hand auger borings were drilled in August 2014; backhoe excavations were dug, and percolation testing was performed during March 2015.

Included in this report are recommendations for design professionals (architects and engineers), to utilize for planning and design of the subdivision developments. Submitted as a separate report for the Humboldt County Division of Environmental Health are assessments of the leachfield suitability of the site soils at each proposed new lot, and recommendations to further assist planners in determining the suitability of the new lots to support the proposed developments. No site-specific designs for residential structure foundations or septic systems are provided in this report; these will be dependent on the future decisions of the individual lot owners and developers.

1.2 Scope of Work

The Scope of Services for this investigation included conducting field exploration of the proposed subdivision lots and exploration of subsurface conditions by hand augered borings and backhoe test pits to assess the suitability of the soils to support foundations and leachfields in apparently-suitable areas. Site-specific exploration of proposed future building sites and leachfield areas is advisable when considering the design for the development of the more-steeply sloping areas in this subdivision.

Our hand auger borings extended to a minimum of ten feet below existing grade, and were logged in the field and samples were collected. Boring locations were flagged in the field, and GPS coordinates were noted. Backhoe test pits were excavated to approximately five feet and were used concurrently for percolation tests. Preparation of this report, providing our opinion regarding the suitability of the site for the proposed subdivision development, completed our scope of work on this phase of this project.

The following information, recommendations, and design criteria are presented in this report:

- Description of site terrain and local geology.
- Interpretation of subsurface soil and groundwater conditions based on our explorations.
- Logs of soil profile characteristics observed within test excavations.
- Presumptive soil load bearing capacities and sliding resistance.
- Assessment of potentially-appropriate foundation system design options.
- Discussion of potential geologic hazard mitigation measures as necessary.
- Recommendations for grading, drainage and landscaping based on our explorations.

An environmental site assessment for the presence or absence of any hazardous materials was specifically excluded from our scope of work. Although we have explored subsurface conditions, we have not conducted any analytical laboratory testing for the presence of hazardous material in samples obtained.

1.3 Limitations

This report has been prepared for the exclusive use of Slack-Winzler Properties LLC, their consultants and subcontractors, and appropriate public authorities for specific application to the proposed subdivision. LGC has endeavored to comply with generally accepted engineering-geologic practice common to the local area at the time this report was prepared. LGC makes no other warranty, express or implied.

Any analyses, opinions, and recommendations contained in this report are based on data obtained from observation and subsurface exploration. Our methods indicate subsurface conditions only at those specific locations where hand auger borings were drilled and backhoe test pits were excavated, only at the time they were conducted, and only to the actual depths penetrated. Hand augered soil borings and observation of soil excavations and samples cannot always be relied on to accurately reflect stratigraphic variations which may commonly exist between boring and excavation locations, nor do they necessarily represent conditions at any other time. Samples were obtained from the hand auger borings during this project and were submitted to a certified, local materials testing laboratory for textural analysis.

The opinions presented in this report are based, in part, on assumptions about subsurface conditions that may only be tested during earthwork. Without prior review of any site-specific proposed developments on each lot, LGC cannot assume responsibility or liability for the adequacy of our opinions when they applied in the field.

Do not apply this report's conclusions or recommendations until the nature, design, and location of any proposed new developments are known. When development of any of these new lots is contemplated, LGC should be consulted for review. Note that LGC is not responsible for any claims, damages, or liability associated with any third party's interpretation of the subsurface data, or reuse of this report for other projects or locations without express written authorization.

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 Field Exploration Program

A Certified Engineering Geologist from our office visited the property several times in August, 2014, and March, 2016. The field investigation was performed to assess the *in-situ* soil and groundwater conditions, and to estimate the development suitability of each of the five proposed new lots. Our exploration included eight hand augered borings, located within areas that appeared to be suitable, based on our observation of slope steepness and location, for development with residential structures utilizing private disposal systems (Figure 3).

Soils observed in the exploratory test borings were field logged and classified in accordance with ASTM D-2488 visual-manual procedures. Boring locations are depicted on site Figure 3, and detailed soil profile logs with test results are attached as Figure 4 through Figure 11.

2.2 Laboratory Testing

Laboratory analyses of selected soil samples retained was conducted to provide insight into the soil classifications for leach field suitability of those soils. Results from the textural analyses are noted on the logs, and reported in the septic system design report, a separate document.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Topography and Site Conditions

This subject property is approximately 44, gently-to-steeply-sloping acres, situated in a rural area on the north side of the Elk River valley. Elevations range from approximately 50 to 330 feet above mean sea level, according to Humboldt County Public Works mapping as presented in Kelly-O'Hern Associates' "Tentative Subdivision Map" of January 2016 (copy attached). A portion of the tentative map is the base map for Figure 3. Most of the property has a generally westerly aspect; Lot 2 has a more southerly aspect. The eastern and highest part of the property consists of a gently sloping "flat" area shared by portions of proposed lots two through five. Slopes on proposed Lot 1 are steeper, however, several areas with slopes of less than 30 percent appear suitable for development on proposed Lot 1.

3.2 Geologic Setting

This parcel is located within California's northern Coast Ranges Geomorphic Province, a seismically active region in which large earthquakes are expected to occur during the economic life span (50 years) of any developments on the subject property. The upper, flatter part of the property is underlain by Late-Pleistocene Hookton formation, which consists of sands, silts, gravels and clay. The Hookton Formation is underlain by Wildcat Group materials which consist of fine grained marine sedimentary materials of Tertiary age.

Surface soils are composed of sand, silt and clay. Rock and gravel were notably absent. Based on our exploratory borings, soils are interpreted to be generally flat-lying to gently-dipping, and varied significantly between the upper flat area and the steeper hillsides on the subject parcel. Within the areas explored, the soil profile consists of more than ten feet of medium dense to dense sand and silty sand; stiff silt with fine sand; and interbeds of silty sandy clay. Our deepest exploratory hand auger borings extended to 11 feet below the ground surface (bgs).

Groundwater was not encountered in any of our exploratory soil borings in August of 2014. Groundwater was greater than six feet below the ground surface in our March 2016 backhoe test pits on the upper portions of all five lots. On the lowermost slopes of lots one and two, wet-season groundwater rose to within five feet of the ground surface.

3.3 Seismicity

This site is located within a seismically active region in which large earthquakes from a variety of sources have the potential to occur during the economic life span (50 years) of a typical structure. North of Cape Mendocino and the Mendocino triple junction, the regional tectonic framework is controlled by the Cascadia subduction zone (CSZ), wherein the Gorda and Juan de Fuca oceanic plates are actively subducting beneath the North American continental plate.

The Cascadia subduction zone (CSZ) marks the boundary between the North American plate and the subducting Gorda and Juan De Fuca plates. Recent and ongoing research into the seismicity of the Pacific Northwest has shown that the CSZ is capable of generating great earthquakes which would affect this parcel. The CSZ, which extends from offshore of Cape Mendocino to Victoria Island (British Columbia), is considered capable of generating an upper-bound earthquake with a M_w of 8.3 on its southern Gorda segment. Based on Japanese tsunami records, and geophysical modelling, the CSZ has been interpreted to have ruptured over its entire length in the year 1700 A.D. in a 9.0 M_w earthquake event (Satake, *et al.*, 2003).

The surface trace of the Little Salmon fault is located west of the subject parcel, and is the closest recognized active fault (CDMG, 2000). The Little Salmon fault is part of the fold and thrust belt of the subduction zone, and is mapped as a northwest-striking, northeast-dipping, low-angle thrust fault that outcrops at the surface approximately 1.5 miles west of the subject parcel. The upper-bound earthquakes considered likely to occur on the Little Salmon fault have an estimated maximum moment magnitude (M_w) of 7.0 on its onshore segment, and 7.2 on its offshore segment (CDMG, 1996).

Based on the record of historical earthquakes (~150 years), faults within the plate boundary zone and internally-deforming Gorda Plate have produced numerous small-magnitude and several moderate to large (i.e. M>6) earthquakes affecting the project area. Several active regional seismic sources, in addition to the Little Salmon Fault and the Cascadia Subduction zone, are proximal to the project and have the potential to produce relatively strong ground motions. These seismic sources include the following:

- The Mad River fault zone and other similar low-angle reverse or thrust faults (Blue Lake fault, Trinidad fault, and others) associated with the subduction of the oceanic plates and the accretion of marine sediments onto the leading edge of the North American plate.
- The Mendocino fault, an offshore, high-angle (near vertical), east-west trending, right-lateral strike-slip fault that forms the boundary between the Gorda plate to the north and the Pacific plate to the south.
- Faults within the internally-deforming Gorda plate consisting of high-angle, northeast-trending, left-lateral, strike-slip faults.
- The San Andreas fault, whose northernmost extent outcrops approximately 25 miles southwest.

3.4 Subsurface Conditions

As described briefly above, during our August 2014 field explorations, eight exploratory hand augered borings were extended to a maximum depth of 11 feet to characterize soil and groundwater conditions. In the field, the soil profiles were described in general accordance with ASTM D 2488 standards. A detailed description of the subsurface stratigraphy encountered within our test borings is provided in the attached boring logs (Figures 4 through 11).

Stratigraphy within the upper several feet of the soil profile varied systematically throughout the property. Soils observed in hand auger borings HB-1 through HB-4 in the flatter higher area in the east were composed of fine sand with silt (Lots 2, 3, 4, and 5). In the south and west part of the property, in the middle and lower slopes, the soil profile exposed in borings HB-5 through HB-7 was observed to be composed of silt and fine sand (Lots 1 and 2). Also on Lot 1, the soil profile exposed in hand boring HB-8 was composed of medium and coarse sand with silt.

Apart from areas used as logging roads or skid trails, existing native topsoil appeared relatively undisturbed, and consists of forest duff and loose, low plasticity, granular soil composed primarily of loose, silt with fine sand (ML). At sites where the recent logging activity has not disturbed the ground surface, the topsoil is approximately one foot thick.

3.6 Groundwater Conditions

Groundwater was not encountered to a depth of 11 feet bgs during our August field explorations. Secondary porosity was observable in some of the hand auger cuttings from the borings, most notably fractured porosity in the soils consisting of silt with fine sand. Soil mottling, potentially indicative of transient high groundwater conditions, was observed in most borings.

Groundwater was encountered in March 2015 at depths between three and four feet below grade at locations on lots one and two, near hand auger borings HB-5, HB-7 and HB-8. At that same time, depth to groundwater was greater than six feet below the ground surface in the test pits excavated on lots two through five, near HB-1 through HB-4. Groundwater levels will fluctuate seasonally on these proposed lots. Groundwater elevations may also fluctuate due to long-term climatic variations and changes in land use. However, because the upper part of this property is

underlain by soil materials with well-developed primary and secondary porosity, groundwater was not observed above six feet below the ground surface in March 2015; except on Lots 1 and 2 where noted above.

Groundwater rose to shallow depths on Lot 1 and Lot 2 near HB-5, HB-7, and HB-8, during the 2015 winter wet season. During the wet season (October through May) groundwater will rise for brief periods during larger storms. It was not apparent that shallow groundwater is present within typical foundation depths. On proposed roads and building sites on the property, cuts taller than four feet may require drainage, depending on the developments and the grading proposed.

4.0 GEOLOGIC HAZARDS

The focus of our geologic hazard assessment for this project site primarily included seismic ground shaking due to local and distal seismic sources, the potential for liquefaction of shallow, saturated soils, tsunami, and differential settlement due to undocumented fill soils or seismic ground shaking. Our assessment of these and other potential hazards is presented below.

4.1 Seismic Ground Shaking and Surface Fault Rupture

As noted in Section 3.3, the project site is situated within a seismically active area proximal to multiple seismic sources capable of generating moderate to strong ground motions. Given the proximity of the Little Salmon fault and other significant active faults (the Fickle Hill fault and the Mad River fault zone to the north, and the Cascadia subduction zone offshore to the west), as well as other active faults within and offshore of northern California, the project site will experience strong ground shaking during the economic life span of any proposed developments.

The Little Salmon fault is located approximately 1.5 miles west of the subject parcel, and is the nearest recognized active fault (CDMG, 1998 and 2000). The subject parcel, however, is not located within an Alquist-Priolo earthquake fault zone, in which the State requires special studies for structures for human occupancy. Due to the distance from the project site to the nearest recognized active fault, and based on the information available, the potential for ground surface fault rupture to occur at the project site is considered low.

In accordance with the 2016 California Building Code (CBC, 2016), site-specific seismic Spectral Response Accelerations are presented in Table 2; these accelerations were obtained from the United States Geological Survey's (USGS) on-line ground motion parameter calculator. The USGS provides spectral acceleration values (S_s and S_1) based on the site specific geographic coordinates, the latest available seismic database maintained by the USGS, the site classification, site coefficients, and adjusted maximum considered earthquake values (F_a, F_v, SM_s and SM_1).

Based on the site conditions and an assumption of the soils within 100 feet of the ground surface, we conservatively classify the site as Site Class D consisting of a "Stiff soil" profile (Section 1613.3.2, 2016 CBC). The parameters in Table 2 below are based on this classification and were determined using the 2010 ASCE Standard 7 (w/March 2013 errata), minimum design loads for buildings and other structures (USGS, 2017).

TABLE 2 - SPECTRAL RESPONSE ACCELERATIONS		
Site Information APN 304-071-018	**Latitude / Longitude***	40.7264° / -124.1711°
	Occupancy Risk Category (CBC, Sect. 1604.5)	II
	Seismic Design Category (CBC, Sect. 1613.3.5)	D
	Site Class (CBC, Sect. 1613.3.2)	D
Spectral Acceleration	S_s (Site Class C)	3.317
	S_1 (Site Class C)	1.309
Site Coefficients	F_a / F_v	1.0/1.5
Response Accelerations	S_{MS}	3.317
	S_{M1}	1.964
	S_{DS}	2.211
	S_{D1}	1.309

* Coordinates for the Parcel Centroid per Humboldt County Web GIS.

4.2 Liquefaction

Liquefaction is a seismic phenomenon involving loss of soil strength, and resulting in fluid mobility through the soil. Liquefaction typically occurs when uniformly-sized, loose, saturated sands or silts are subjected to strong shaking in areas where the groundwater is less than 50 feet bgs. In addition to the necessary soil and groundwater conditions, the ground acceleration must be high enough, and the duration of the shaking must be sufficiently long, for liquefaction to occur. Given that strong ground shaking and shallow groundwater conditions appear to have been met at this site, liquefaction is considered unlikely because the parcel is not underlain by loose, poorly-grade (well-sorted), saturated sand materials to the depths explored.

Based on the planning scenario for a great earthquake on the Cascadia subduction zone (CDMG, 1995), the site is located outside of any areas of recognized liquefaction potential. Within our exploratory test borings and excavations, we generally encountered medium dense to dense sandy, or stiff silty fine sand soils at and below typical foundation load bearing depths. As discussed previously, groundwater was encountered in some of our backhoe test pits excavations at depths between three and five feet.

Geologically-youthful, poorly graded, saturated sands in the shallow subsurface below the groundwater table are not present, thus based on the grain-size distributions, age and density of the native soils at the site, the potential for liquefaction-related settlement is estimated to be minimal at the subject property. Earthquake-related liquefaction resulting in sand boils and minor differential settlement are not expected on this site. Lateral spreading due to liquefaction is not anticipated to affect the site given that the potential for liquefaction is low.

4.3 Settlement

Undocumented, non-engineered fill soils do not appear to be present on-site, except perhaps some thin prism fills along legacy logging roads, railroad grades, skid trails and log landings. If

encountered, undocumented fill soils should always be considered suspect, and treated as non-engineered fills. Undocumented non-engineered fills are considered unsuitable as foundation load bearing soils due to their potential for excessive total and differential settlement. Such fills should also be considered unsuitable to support driveways and roadways without being designed by an engineer experienced in earthworks design. Fills and foundations should be designed for uniform settlement, and to resist differential settlement in areas of variable soil conditions such as may be encountered on certain areas of several of these proposed lots.

For foundation systems designed in accordance with the current CBC, our recommendations, and the standard of care for civil engineering (and constructed accordingly), we estimate that total and differential settlement to be low. Settlement may be limited through the life of the structures by prudent conservative design and construction.

4.4 Landsliding

The subject property is a parcel that is, in places, both flat-lying and moderately to steeply sloping. On this parcel, the range of elevation is approximately 240 feet; from approximately 110 feet above mean sea level in the west to 350 feet in the east. The Humboldt County Web GIS site shows an historic landslide located on Lot 2, in the southeastern corner of this parcel. There are other significant steep slopes in this proposed subdivision which show little or no indication of past failure. Slope instability and landsliding is anticipated to be a potential concern during grading design and execution, and could impact grading of the steeper lots on the proposed project, especially if cut slopes or foundation excavations encounter springs or groundwater.

4.5 Flooding

The subject parcel is located adjacent to wetland areas of the lower Elk River. The flood map on the Humboldt County Web GIS site shows the property is outside of any 100-year flood zones. Development of the proposed lots in the areas shown on Figure 3 appears subject to no hazard of flood inundation.

4.6 Tsunami

As mapped by the State and County, this site is outside of the Tsunami Hazard zones. Therefore, based on the published mapping, the hazard of tsunami inundation is less than significant, and need not be addressed in the project design.

4.7 Soil Swelling or Shrinkage Potential

Subsurface soils at foundation load bearing depths consist predominantly of low-plasticity silty clay. Even late in the dry season, soils were moist at typical foundation embedment depths. Soils are permeable and generally well-drained. Despite the presence of clay, these soils do not appear to be subject to significant or detrimental shrink-swell associated with cyclic, seasonal, wetting and desiccation; soils do not appear to desiccate to a depth sufficient to affect a typical foundation system designed and built according to current building codes (CBC, 2016). The hazard to future developments associated with soil swelling or shrinkage beneath a typical spread footing foundation is therefore low.

5.0 CONCLUSIONS AND DISCUSSION

Based on the results of our exploration, it is our opinion that each of the proposed lots in this proposed subdivision contains areas suitable for location of typical wood (or metal) framed residential structures, each with access, parking, and an on-site waste treatment system, and a 100 percent reserve area. Based on our field observations, we concluded that the soils at typical foundation load bearing depths consist of stiff and medium dense soils, at minimum.

This property is currently undeveloped, has been selectively-logged in recent years, and, in places is relatively steep. Given the condition of the property at the time of our work, locations available for our explorations and testing were limited to a significant degree by accessibility. Based on our "on foot" explorations, research, and site reconnaissance, it is our opinion that there are multiple potentially-viable building sites, and suitable on-site wastewater disposal field locations, on each of the property's five proposed new lots. A preliminary, conceptual on-site wastewater treatment system plan for each lot was prepared as a separate document for submittal to the Humboldt County Health Department, Division of Environmental Health.

Lot 1: On proposed Lot 1, soils were sandy to silty and groundwater was not encountered to a total depth of 10 feet below existing grade in August 2014. Groundwater was relatively shallow in March 2015 on the lower slopes of Lot 1. Soils observed in borings HB-5, HB-6 and HB-8 on Lot 1 consists of silty fine sand with clay interbeds at depth. Based on our field reconnaissance, USGS slope mapping, and topographic map analysis, it is our opinion that there exists sufficient ground near HB-6 with slopes of 30 percent or less within which to locate a single-family residence and an on-site wastewater treatment (septic) system. When development is proposed, the actual areas selected on Lot 1 should be reviewed to confirm that the specific building site and disposal system areas conform to our observations and recommendations. This is especially important if the anticipated on-site wastewater treatment systems are proposed for locations we did not sample or test.

Lot 2: On Lot 2, the southeast corner area consists of an historic landslide and should be avoided with a setback. Our test boring HB-4 was located in the northeastern part of Lot 2 and revealed a soil profile composed of medium dense to dense fine-grained sand with silt, and some stiff silty layers and clayey interbeds. No groundwater was encountered to a total depth of 10.2 feet below existing grade in August 2014. Based on our field reconnaissance and topographic map analysis, it is our opinion, that there is sufficient ground with slopes of 30 percent or less within which to locate a single-family residence and a standard leachfield system. Our conclusions should be confirmed when specific areas have been selected for development, especially if the on-site wastewater treatment systems are proposed for locations we did not sample or test.

Lot 3: Boring HB-3 was installed in the flattest part of Lot 3, south and east of the existing access road. The soil profile in HB-3 consists of primarily dense to dense sand and silty sand with stiff silt layers and clayey interbeds. A sandy clay layer, approximately six inches thick was observed at nine feet below grade. In August 2014, no groundwater perched on the sand clay layer, and no groundwater was encountered to the total depth of 10.6 feet below existing grade.

In March 2015, groundwater was greater than six feet below the ground surface. In our opinion, based on our field reconnaissance and topographic map analysis, there is sufficient ground with slopes of 30 percent or less within which to locate a single-family residence and leachfield system. Our opinions should be confirmed at such time as Lot 3 is created and specific areas have been proposed for development, especially if the new on-site developments are proposed for locations where we did not specifically sample or test.

Lot 4: On proposed Lot 4, boring HB-2 was installed near the western edge of the flat area where the slopes become steeper to the west. The soil profile in HB-4 consisted primarily of medium dense silty sand, stiff silt with fine sand, and clayey interbeds. At the bottom of the boring, at approximately 9.5 feet, we encountered a silty clay layer, with no groundwater perched on the clay in August 2014. Silty clay continued to the total depth of 10.5 feet below grade. No groundwater was encountered to the total depth. In our opinion, based on our field reconnaissance and topographic map analysis, sufficient area exists on proposed Lot 4 with slopes of 30 percent or less within which to locate the anticipated developments. Our opinions should be confirmed when Lot 4 is created and specific areas have been proposed for development, especially if those developments are proposed for locations where we did not specifically sample and test.

Lot 5: We installed boring one (HB-1) in the flat area on Lot 5. The soil profile consisted primarily of medium dense to dense, fine sand with silt, with a clay layer approximately 8 feet below the ground surface. No perched groundwater was encountered on the clay, or to the total depth of 11 feet below grade. Based on our field reconnaissance and explorations, it is our opinion that sufficient area exists on proposed Lot 5 with slopes of 30 percent or less within which to located the anticipated developments. Our opinions should be confirmed when Lot 5 is created and specific areas have been proposed for development, especially if those developments are proposed for locations where we did not specifically sample or test.

5.1 Soil Bearing Capacity

Suitably dense, load bearing soils are present beginning at approximately 12 to 18 inches below the undisturbed native ground surface, where we presume future structures are likely to be sited on this property. Based on our field observations, we classified the native soils within the areas shown on Figure 3 as "Site Class D" per ASCE 7-05 consisting of a stiff soil profile (Section 1613.3.2, CBC, 2016). Presumptive load bearing values for the native soil materials are 1,500 pounds per square foot (psf) for vertical foundation pressure, 100 psf per foot below natural grade for lateral bearing pressure, and a lateral sliding resistance (cohesion) of 130 psf, multiplied by the contact area (as limited by Section 1806.3.2), per 2016 CBC Section 1806.2.

6.0 RECOMMENDATIONS

6.1 Slope Setback Recommendations

Due to the presence of some moderate to steeply-descending slopes on the subject property, slope setback per Chapter 18, Figure 1808.71 (CBC, 2016), should be followed when locating and planning grading for new residential structures near slopes greater than 30 percent.

Encroachments into the CBC slope setback areas should only be permitted with site-specific analysis by a Registered Geotechnical Engineer, Certified Engineering Geologist, or other qualified professional. At minimum, we recommend that space be allowed to permit the passage of a typical "bobcat" tractor between anticipated developments and any steeper (≥30%) slopes, to allow for repairs should any minor sloughing occur, and for access to septic tanks or leachfield areas for maintenance or future repairs.

6.2 Site Preparation

Logging slash and brush should be cleared from the parts of the property to be graded for roadways and structures. Stumps and tree roots should be grubbed from building sites and roadways. Sod, topsoil, and any other debris (e.g. old fills) encountered within the upper 12 inches of the existing ground surface should be removed from areas proposed for construction, and from an area five feet beyond their perimeters. Similarly: slash, rubble, sod, topsoil, and any other debris encountered within the upper 12 to 18 inches of the existing ground surface should be removed from the areas of the proposed new roadway footprint.

Earthwork should only be conducted during dry weather conditions; generally, May through September. Failure to comply with this recommendation may result in excessive or detrimental erosion or sedimentation. Recommendations for erosion and sediment control should be included by the project engineer in the grading plan.

6.3 Temporary Excavations

Temporary construction slopes are not anticipated for this project. Temporary construction slopes should be designed and excavated in strict compliance with applicable local, State, and Federal safety regulations including the current OSHA Excavation and Trench Safety Standards.

Construction equipment, building materials, excavated soil, vehicular traffic, and other similar loads should not be allowed near the top of any unshored or unbraced excavation. Where the stability of adjoining buildings, walls, pavements, or other similar improvements are, or may be endangered by excavation operations, support systems such as shoring, bracing, or underpinning, may be required to provide structural stability and to protect any personnel working in the excavation(s).

Since excavation operations are dependent on construction methods and scheduling, the owner and contractor shall be solely responsible for the design installation, maintenance, and performance of all shoring, bracing, underpinning, and other similar systems. Under no circumstances should any comments provided herein be inferred to mean that LGC is assuming any responsibility for temporary excavations or the safety thereof. LGC does not assume any responsibility for the design, installation, maintenance, and performance of any shoring, bracing underpinning, or other similar systems unless they are designed specifically for the work at this site by a license professional from this office.

6.4 Cut and Fill Slopes

Unrestrained cut and fill slopes may be anticipated as part of the proposed development of the new roadway and perhaps some of the new building sites within this subdivision. Without site-specific geotechnical or engineering-geologic review, unrestrained cut and/or fill slopes with heights in excess of three feet should be no steeper than two to one, horizontal to vertical (2:1, H:V), and they should be constructed in strict accordance with the Humboldt County Grading Ordinance and all current CBC requirements.

6.5 Structural Fills

Structural fills should be constructed as controlled and compacted engineered fills. Structural fill should be free of organics and composed of low plasticity mixtures of clay, sand, and gravel.

Imported fill material is likely to be needed to achieve finished grades requiring engineered fill for this subdivision. Most native site soils appear unlikely to be suitable for use as engineered fill. Imported fills should consist of select, non-expansive engineered fill. Materials for engineered fill should be free of organic material and particles larger than approximately 3-inches in diameter. Engineered fill materials should meet the following minimum criteria:

- Plasticity Index (PI): 15 or less
- Liquid Limit (LL): 35 or less
- Percent Passing No. 200 sieve: 10 to 40%
- Maximum Particle Size: 3 inches

Structural fills should be placed on relatively-level, benched, suitably prepared subgrade surfaces and should be compacted mechanically to minimize potential settlement.

Approved fill material should be placed in loose lifts no more than 8 inches thick, at a uniform moisture content, at or near optimum, and should be compacted mechanically. If structural fill is used beneath a roadway or foundation, testing and inspection is deemed prudent to monitor the suitability of such fill materials as placed, and to document compliance with the recommended compaction standards. Structural fills should be compacted as specified in the "Compaction Standard" (Section 6.6) following below.

6.6 Compaction Standard

For granular fill material such as sand and gravel, smooth-drum vibratory compactors should be used. Within small shallow excavations, it is recommended that vibratory plate compactors (e.g., "wacker packers") be used to achieve the specified compaction standards. A loaded ten-yard dump truck is also acceptable for compacting structural fill in lifts of eight-inches or less. Flooding of granular material should never be employed to consolidate fill in trenches or on flats.

Where (or if) trenches closely parallel a footing, and the trench bottom is within a two horizontal to one vertical plane, projected outward and downward from any structural element, grout slurry

should be utilized to backfill that portion of the trench below this plane. The use of slurry backfill is not required where a narrow trench crosses a footing at or near a right angle.

It is recommended that structural fill and backfill material be compacted in accordance with the specifications listed in Table 3 below. A qualified person should be present to observe fill placement and assess the field density throughout each lift to verify that the specified compaction is being achieved by the contractor.

TABLE 3 – STRUCTURAL FILL PLACEMENT SPECIFICATIONS

Fill Placement Location	Compaction Recommendations	Moisture Content (Percent Optimum)
Structural fill below the base of foundations	90%	-1 to +3 percent
Structural fill within two feet below the base of the roadway section	95%	-1 to +3 percent
Utility trenches in building or driveway/parking areas	90 %	-1 to +3 percent
Landscape and Grass Areas	So no settlement shall occur	-1 to +3 percent

6.7 Foundation Design Criteria

Foundations for any proposed residential structures may consist of thickened-edge monolithic slab on grade foundation systems, or a reinforced concrete perimeter footing with interior spread footings; combinations of these foundation types are also appropriate, provided that the recommendations presented here are adhered to during design and construction. We understand that new lot buyers preferred foundation preferences may vary and depend upon location, and on architectural and engineering considerations that we cannot at present anticipate. Upon the concurrence of the project engineer, in consultation with LGC, alternate foundation systems may be acceptable.

If concrete floor slabs are used, they should be reinforced, have a minimum thickness suitable for the anticipated loading. We recommend that floor slabs be continuous (monolithic) with a thickened-edge perimeter footing, and any isolated (interior) spread footings. Other slab and footing designs are acceptable with the approval of the project engineer and this office. Floor slabs should be underlain by at least eight inches of Class-2 aggregate base, or other approved free-draining granular material, to act as a capillary moisture break.

To reduce the potential for moisture migration through the slab on grade, a plastic membrane should be placed on the prepared subgrade. Care should be taken during construction to protect the membrane against punctures. Protect the membrane during steel and concrete placement by covering it with one inch of clean sand. Joints between plastic sheets and openings for utility pipes (if any) should be lapped and taped.

The combined thickness of the Class 2 gravel and sand can be considered part of the recommended structural fill under the floor slab. Continuous perimeter and isolated spread footings should be founded at least 12 to 18 inches below finished grade in native medium dense soils encountered, or a suitably compacted and tested engineered structural fill.

6.8 Drainage

Appropriate drainage and erosion control during construction, and throughout the life of the developments, will be a critical consideration for development in some of the more steeply sloping areas in this subdivision. Site grading should be designed with a gradient sufficient to provide for positive drainage by sheet flow. Concentration of runoff should be avoided. Finished ground surfaces near the anticipated new residences should be sloped away from the foundations.

Per the California Building Code (CBC 1804.3), slope ground (i.e., soil or gravel) surfaces around buildings at five percent (minimum) for a minimum of 10 feet from the drip line. Minimum slope for impervious (i.e., asphalt or concrete-paved) surface areas should be two percent for at least 10 feet from the drip line.

Site grading, landscaping design, and construction should be such that no water is allowed to pond anywhere onsite, nor to migrate beneath any structure foundations. Runoff from the new developments should be controlled, and discharged such that no erosion, sedimentation or discharge of turbid water occurs. Roof storm water runoff should be controlled with the installation of gutters and downspouts, and discharged at suitable outlet points where no runoff erosion or ponding will occur.

6.9 Erosion and Sediment Control Recommendations

Adhere to the recommendations of the project engineer's grading, drainage and erosion control plan(s). Do not perform grading or excavation work during the wet season, or during periods of wet weather at other times of the year. Wet weather conditions can occur any time but may be expected predominantly from October through April. Storm water erosion and pollution prevention measures for this project should be undertaken as soon as possible prior to the onset of the wet season rains. To the extent feasible for the current project, Humboldt County Erosion Control Standards should be incorporated by the design engineers into the project grading plans and should be strictly adhered to during grading and construction. We recommend the following minimum erosion and sedimentation control measures:

- Replace topsoil and revegetate disturbed areas immediately following earthwork.
- Mulch exposed flat soil areas with straw and native grass seed mix to prevent erosion.
- Fill slopes should be protected with erosion-control mats and straw wattles.
- Place silt fencing at the toe of new fill slopes.
- Cover soil stockpiles with 6 mil plastic sheeting to prevent erosion and turbid runoff.
- Anchor soil stockpile coverings securely to prevent wind disturbance.
- Allow no vehicles on the site soils when wet; use gravel to pave traffic areas

- Owner or his designated agent should monitor construction site conditions to verify properly-functioning erosion control measures, and repair them whenever necessary.

6.10 Additional Services

6.10.1 Review of Grading and Drainage Plans

The conclusions and recommendations provided in this report are based on the assumption that soil conditions encountered during grading will be essentially as exposed during our explorations, and that the general nature of the grading and use of the property will be as described above. We recommend that final drafts of grading plans be reviewed by the author of this report prior to their approval or implementation.

6.10.2 Observation and Testing

To assure conformance with the recommendations of this report, and to assure that the assumptions made in the preparation of our report are valid, LGC should be retained to review foundation design plans, and to observe site grading. We should also review and provide written approval of the exposed subgrade prior to placement of structural fill, foundation forms, reinforcing steel, or concrete.

7.0 REFERENCES

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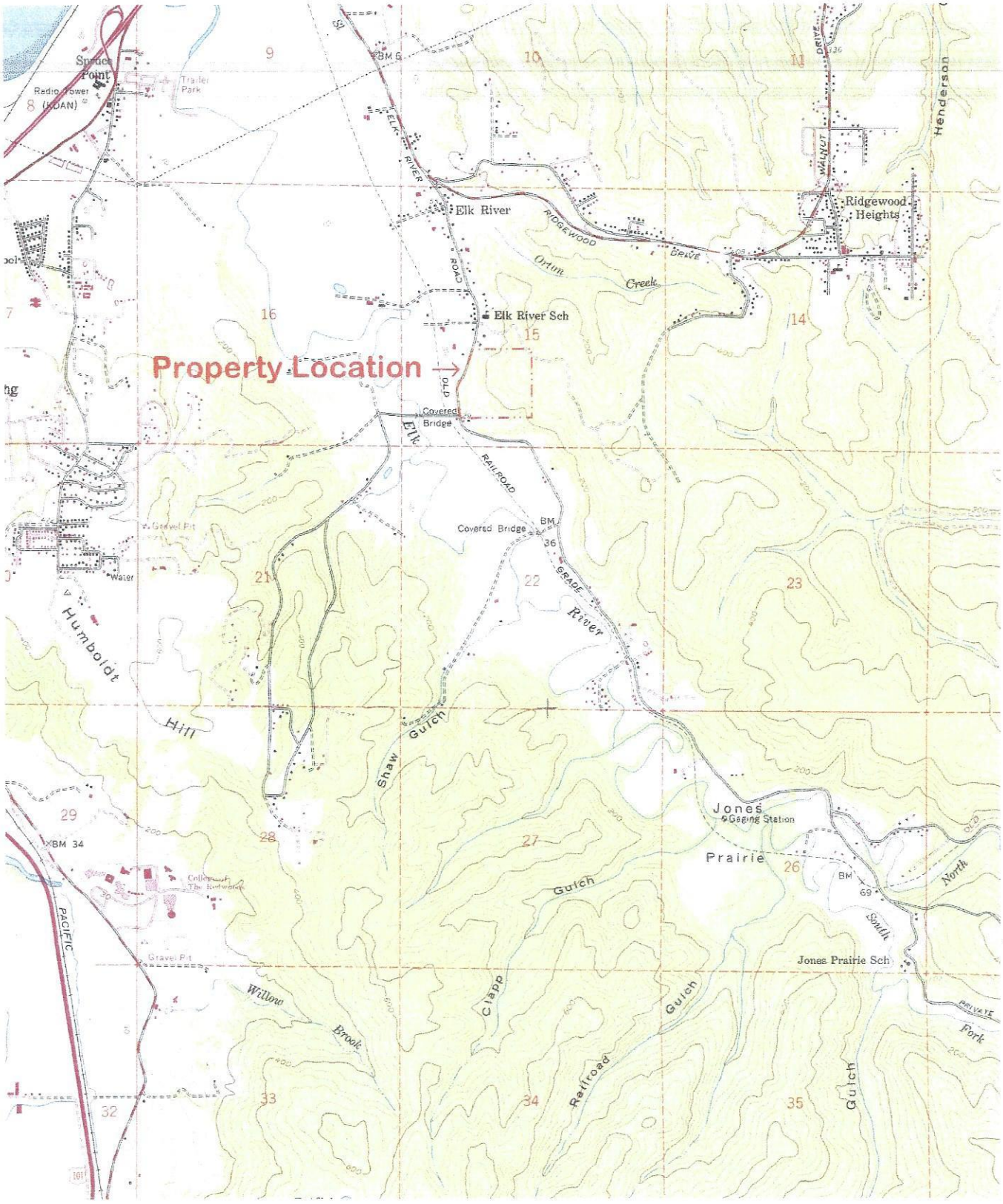
8.0 LIST OF FIGURES

Figure 1: Location Map
Figure 2: Assessor's Parcel Map
Figure 3: Site Plan Map
Figure 4: Exploratory Boring Log HB-1
Figure 5: Exploratory Boring Log HB-2
Figure 6: Exploratory Boring Log HB-3
Figure 7: Exploratory Boring Log HB-4
Figure 8: Exploratory Boring Log HB-5
Figure 9: Exploratory Boring Log HB-6
Figure 10: Exploratory Boring Log HB-7
Figure 11: Exploratory Boring Log HB-8

9.0 ATTACHMENTS

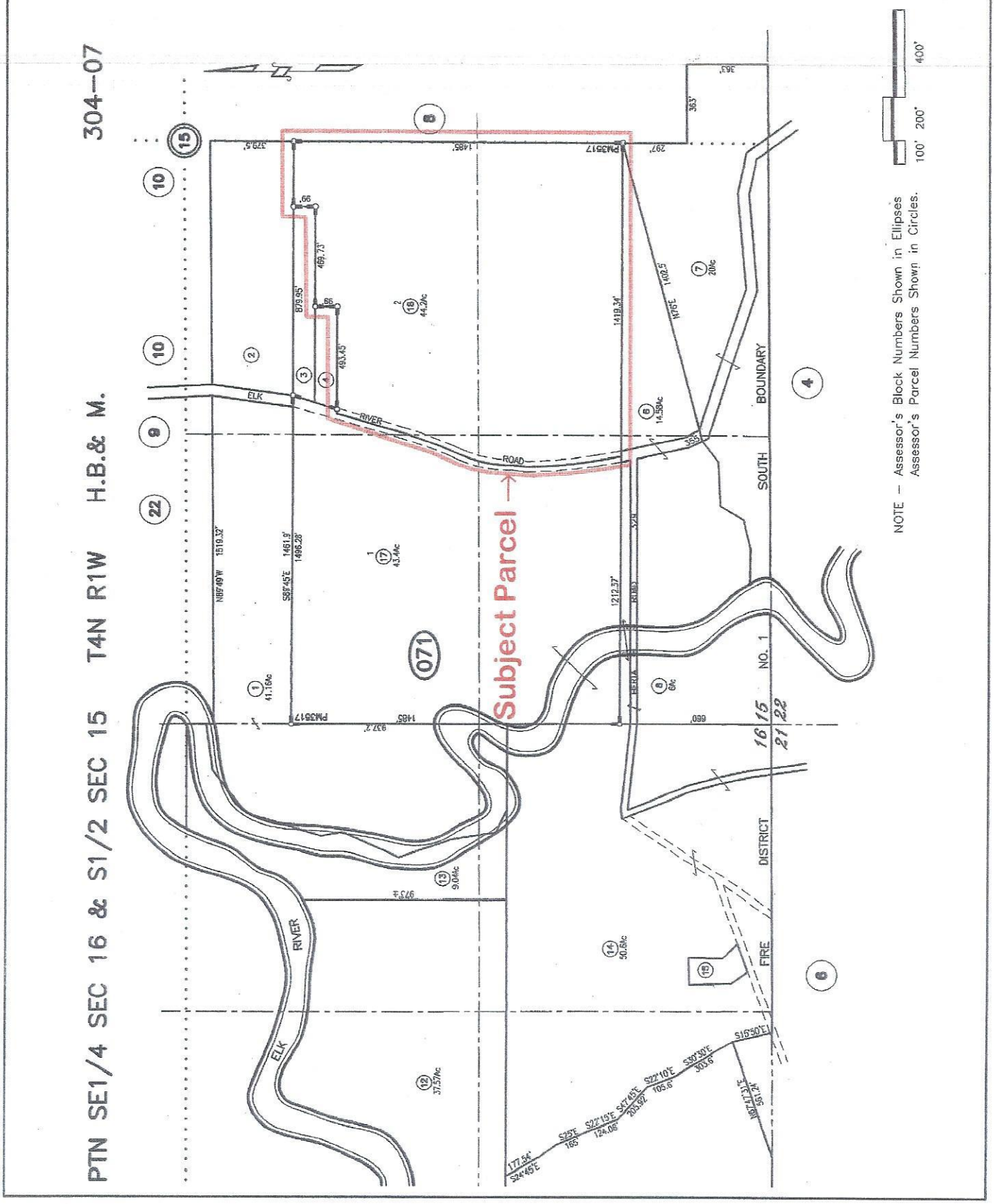
Tentative Subdivision Map, Kelly-O'Hern Associates, April 2017

Lindberg Geologic Consulting	Preliminary Engineering-Geologic R-1 Soils Exploration Report	Figure 1
Post Office Box 306	"Berta Parcel" – Elk River Road, Eureka, APN: 304-071-018	July 19, 2017
Cutten, CA 95534	Slack – Winzler Properties. LLC, Client	Project 0091.03
(707) 442-6000	Topographic Map, Subject Property Location	1 inch ≅ 0.5 mile

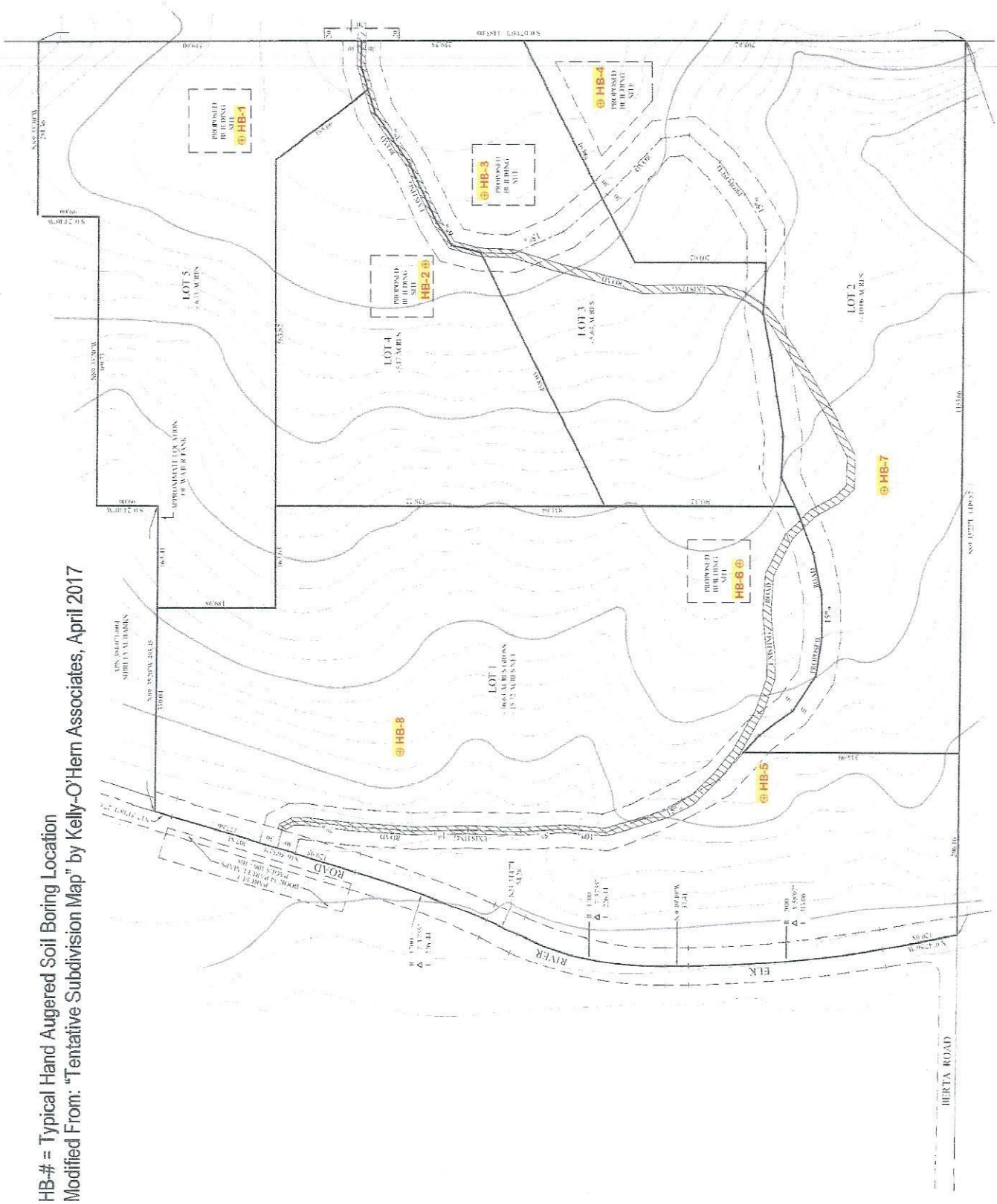


Modified From: USGS Fields Landing 7.5' Topographic Quadrangle Map, 1959, (photorevised 1972). N ≅

Lindberg Geologic Consulting	Preliminary Engineering-Geologic R-1 Soils Exploration Report	Figure 2
Post Office Box 306	"Berta Parcel" – Elk River Road, Eureka, APN: 304-071-018	July 19, 2017
Cutten, CA 95534	Slack – Winzler Properties. LLC, Client	Project 0091.03
(707) 442-6000	Humboldt County Assessor's Parcel Map 304-07, Subject Parcel Location	Scale as Shown



Lindberg Geologic Consulting	Preliminary Engineering-Geologic R-1 Soils Exploration Report	Figure 3
Post Office Box 306	"Berta Parcel" – Elk River Road, Eureka, APN: 304-071-018	July 19, 2017
Cutten, CA 95534	Slack – Winzler Properties. LLC, Client	Project 0091.03
(707) 442-6000	Tentative Subdivision Map with Approximate Soil Boring Locations	1 inch ≅ 230 Feet



HB-# = Typical Hand Augered Soil Boring Location
Modified From: "Tentative Subdivision Map" by Kelly-O'Hern Associates, April 2017

LABORATORY				FIELD						SOIL DESCRIPTION
Dry Density (pcf)	Moisture Content (%)	Cohesion; Friction Angle (psf; degrees)	Other Tests	Blows/foot*	Sample	Depth (feet)	Graphic Lithology	U.S.C.S. Designation	
								ML	Topsoil, Silt with fine sand, stiff, dark brown, dry, common fine roots.
						1			
						2		SM	Silty fine sand, medium dense, strong brown, dry to slightly moist, friable, weak blocky prismatic structure. Sampled from 2.0 - 3.0 feet.
			51% Sand, 19% Silt, 30% Clay			3			
						4		SM	Fine sand with silt, dense, yellowish brown, slightly moist, occasional MnO stains, friable. Sampled from 5 to 6 feet.
			78% Sand, 11% Silt, 11% Clay			5			
						6			
						7		SM	Fine sand with silt, dense, light olive brown, moist, interbedded with strong brown fine sand, occasional MnO staining, friable.
						8		CL	Clay with fine sand and silt, stiff, light gray, slightly moist, slightly plastic.
						9		SM	Silty fine sand, medium dense, brown and strong brown, moist, friable, fine granular crumb structure. Grades to dense sand, and moisture content increases to 11 feet below grade,
						10			
						11			No free water to 11 feet below grade.

* The blow counts have been converted to standard N-value blow counts

SURFACE ELEVATION: 315 Feet

TOTAL DEPTH: 11 Feet

GROUNDWATER DEPTH: >11 Feet

LOGGED BY: David N. Lindberg, CEG

BOREHOLE DIAMETER: 3.5 Inches

EQUIPMENT: Hand Auger

HAMMER TYPE: None

LINDBERG GEOLOGIC CONSULTING

PROJECT NUMBER: 0091.01 DATE: August 4, 2014

LOG OF TEST EXCAVATION / BORING

HB-1, Lot 5 Slack & Winzler - Berta

Figure No. 4

LABORATORY				FIELD						SOIL DESCRIPTION
Dry Density (pcf)	Moisture Content (%)	Cohesion; Friction Angle (psf; degrees)	Other Tests	Blows/foot*	Sample	Depth (feet)	Graphic Lithology	U.S.C.S. Designation	
								ML	Topsoil. Sandy silt, loose, dry, brown, common fine roots.
						1		ML	Silt with fine sand, stiff, dry, brown, few roots, friable, fine granular crumb structure.
						2			
			67% Sand, 14% Silt, 19% Clay			3		SM	Silty sand, medium dense, strong brown, moist, friable, granular crumb to weak blocky prismatic structure. Sample 2.5 to 3.5 feet: Zone 2 Sandy Loam.
						4		SM	Fine sand with silt, medium dense, light olive brown, moist, trace strong brown mottling, friable, fine granular crumb to weak blocky prismatic structure.
						5		CL	Sandy clay, stiff, variegated light olive brown and strong brown, moist, slightly plastic.
			42% Sand, 35% Silt, 23% Clay			6		SM	Clayey sand, grades to silty fine sand, medium dense, moist, light olive brown and strong brown, granular crumb structure, visible secondary porosity. Sample 5.0 to 6.0 feet: Zone 2 Loam.
						7		SM	Silty Sand, medium dense, light olive brown and strong brown variegated, moist, friable, granular crumb weak blocky prizmatic structure, visible secondary porosity.
						8		ML	Silt with fine sand, stiff, light olive brown mottled with strong brown, moist, blocky prismatic structure, visible secondary porosity.
						9		ML	Silt with fine sand, stiff, olive brown with strong brown mottles, moist, granular crumb structure.
								CL	Silty clay, stiff, olive/strg. brn., moist, sl. plastic.
						10		CL	Clay with silt, stiff, blueish gray to gray, moist, plastic, common plant material.
						11			No free water to 10.5 feet below grade. Boring backfilled with cuttings on completion. Lat./Long.: 40.72671, -124.17008, +/-9.8'

* The blow counts have been converted to standard N-value blow counts

SURFACE ELEVATION: 310 Feet

TOTAL DEPTH: 10.5 Feet

GROUNDWATER DEPTH: >10.5 Feet

LOGGED BY: David N. Lindberg, CEG

BOREHOLE DIAMETER: 3.5 Inches

EQUIPMENT: Hand Auger

HAMMER TYPE: None

LINDBERG GEOLOGIC CONSULTING

PROJECT NUMBER: 0091.01 DATE: August 4, 2014

LOG OF TEST EXCAVATION / BORING

HB-2, Lot 4 Slack & Winzler - Berta

Figure No. 5

LABORATORY				FIELD						SOIL DESCRIPTION
Dry Density (pcf)	Moisture Content (%)	Cohesion; Friction Angle (psf; degrees)	Other Tests	Blows/foot*	Sample	Depth (feet)	Graphic Lithology	U.S.C.S. Designation	
						1		ML	Silt with fine sand, stiff, brown, dry, friable, common roots to 3/4" diameter. Forest duff, sod and topsoil.
			66% Sand, 17% Silt, 17% Clay			2		SM	Sand with silt, medium dense, olive brown and light olive brown, moist, friable, fine granular crumb structure. Sample 2.5 to 3.0 feet: Zone 2 Sandy Loam.
						3			
						4		SM	Sand with silt, medium dense, olive brown grading to strong brown, moist, friable, fine granular crumb structure, silt content decreasing with depth.
			56% Sand, 29% Silt, 15% Clay			5			
						6		SM	Sand, medium dense, olive brown, moist, slightly silty, friable, weak fine granular crumb structure. Sample 5.0 to 6.0 feet: Zone 2 Sandy Loam.
						7		ML	Sandy silt, stiff, light gray, moist, friable, porous weak subangular blocky structure.
						8		SM	Fine sand with silt, dense, olive gray, moist, friable, granular crumb structure.
						9		CL	Clay with fine sand and silt, stiff, light gray, moist, slightly plastic, slightly sticky, visible secondary porosity.
						10		SM	Fine sand with silt, dense, light olive gray, moist, friable, fine granular crumb structure, grades to strong brown at 10 feet and olive brown at 10.3 feet.
						11			No free water to 10.6 feet below grade. Boring backfilled with cuttings on completion. Lat./Long.: 40.72667, -124.16959, +/-9.8'

* The blow counts have been converted to standard N-value blow counts

SURFACE ELEVATION: 321 Feet

TOTAL DEPTH: 10.6 Feet

GROUNDWATER DEPTH: >10.6 Feet

LOGGED BY: David N. Lindberg, CEG

BOREHOLE DIAMETER: 3.5 Inches

EQUIPMENT: Hand Auger

HAMMER TYPE: None

LINDBERG GEOLOGIC CONSULTING

PROJECT NUMBER: 0091.01 DATE: August 4, 2014

LOG OF TEST EXCAVATION / BORING

HB-3, Lot 3 Slack & Winzler - Berta

Figure No. 6

LABORATORY				FIELD					
Dry Density (pcf)	Moisture Content (%)	Cohesion; Friction Angle (psf; degrees)	Other Tests	Blows/foot*	Sample	Depth (feet)	Graphic Lithology	U.S.C.S. Designation	SOIL DESCRIPTION
								ML	Silt with fine sand, loose, brown, dry, common fine roots; Topsoil.
						1		SM	Fine sand witth silt, medium dense, yellowish brown grading to strong brown, dry, occasional fine roots.
			33% Sand, 38% Silt, 29% Clay			2		ML	Silt with fine sand and clay, stiff, light olive brown with strong brown mottling, dry, friable, occasional roots to 3/4" diameter, fine granular crumb to weak angular blocky structure, secondary porosity evident. Sample 2 to 3 feet.
						3		SM	Fine sand with silt, medium dense, light olive brown with strong brown mottling. moist, friable, granular crumb to weak subangular blocky structure, apparent secondary porosity.
						4			
						5		CL	Clay, stiff, olive brown, moist.
			49% Sand, 31% Silt, 20% Clay					SM	Fine sand with silt and clay, dense, olive brown with strong brown mottling, moist, firable, angular blocky structure. Sample 5 to 6 feet.
						6			
						7			
						8		ML	Silt with fine sand interbedded with silty fine sand and thin clay layers, stiff/medium dense to dense, olive brown to strong brown, often with strong brown mottling, moist, friable to slightly plastic, granular crumb to subangular blocky structure, secondary porosity evident.
						9			
						10		CL	Clay, silty, stiff, gray, moist, slightly plastic. No free water to 10.2 feet below grade. Boring backfilled with cuttings on completion. Lat./Long.: 40.72629, -124.16916, +/-9.8'
						11			

* The blow counts have been converted to standard N-value blow counts

SURFACE ELEVATION: 333 Feet

TOTAL DEPTH: 10.2 Feet

GROUNDWATER DEPTH: >10.2 Feet

LOGGED BY: David N. Lindberg, CEG

BOREHOLE DIAMETER: 3.5 Inches

EQUIPMENT: Hand Auger

HAMMER TYPE: None

LINDBERG GEOLOGIC CONSULTING

PROJECT NUMBER: 0091.01 DATE: August 5, 2014

LOG OF TEST EXCAVATION / BORING

HB-4, Lot 2 Slack & Winzler - Berta

Figure No. 7

LABORATORY				FIELD						SOIL DESCRIPTION
Dry Density (pcf)	Moisture Content (%)	Cohesion; Friction Angle (psf; degrees)	Other Tests	Blows/foot*	Sample	Depth (feet)	Graphic Lithology	U.S.C.S. Designation	
								ML	Silt with fine sand, loose, dark brown, dry, abundant fine roots. Topsoil.
						1			
						2		ML	Silt with fine sand, stiff (very stiff by 2.5'), yellowish brown to olive brown, trace gray-brown mottling, dry to moist, granular crumb to fine subangular blocky sturcture. Sample 2.5 to 3.5 feet is USDA Clay Loam.
			30% Sand, 38% Silt, 32% Clay			3			
						4		ML	Silt with fine sand, v.stiff, strong brown with gray mottling, moist, friable, granular crumb to fine subangular blocky structure, common fine roots, secondary porosity as fine tubes with clay linings, slightly clayey in-part. Sample 5 to 6 feet is USDA Silty Clay Loam.
			17% Sand, 52% Silt, 31% Clay			5			
						6		ML	Silt with fine sand, v.stiff, strong brown, trace gray mottling, moist, friable, granular crumb to subangular blocky structure, few roots, good apparent secondary fracture porosity.
						7			
						8		ML	Silt with fine sand and clay. v.stiff, strong brown (no mottling), moist, friable, granular crumb to subangular blocky structure, appears well-drained by secondary fracture porosity.
						9			
						10			
						11			No free water to 11 feet below grade.

* The blow counts have been converted to standard N-value blow counts

SURFACE ELEVATION: 110 Feet

TOTAL DEPTH: 11 Feet

GROUNDWATER DEPTH: >11 Feet

LOGGED BY: David N. Lindberg, CEG

BOREHOLE DIAMETER: 3.5 Inches

EQUIPMENT: Hand Auger

HAMMER TYPE: None

LINDBERG GEOLOGIC CONSULTING

PROJECT NUMBER: 0091.01 DATE: August 7, 2014

LOG OF TEST EXCAVATION / BORING

HB-5, Lot 1 Slack & Winzler - Berta

Figure No. 8

LABORATORY				FIELD						SOIL DESCRIPTION
Dry Density (pcf)	Moisture Content (%)	Cohesion; Friction Angle (psf; degrees)	Other Tests	Blows/foot*	Sample	Depth (feet)	Graphic Lithology	U.S.C.S. Designation	
								ML	Legacy skid road; most topsoil stripped.
						1		ML	Silty clay with fine sand, stiff, light yellowish brown to olive brown, dry to moist, friable, granular crumb to fine subangular blocky structure, common fine roots. Sample 2.5 to 3.5 feet.
						2			
			13% Sand, 45% Silt, 42% Clay			3		ML	Silty clay with fine sand, stiff, yellowish brown to strong brown, light gray mottling, moist, friable, visible porosity, granular crumb to fine subangular blocky structure. Sample 5 to 6 feet.
						4			
						5			
			16% Sand, 48% Silt, 36% Clay			6		ML	Silty clay with fine sand, stiff, light yellowish brown and olive brown, strong brown mottles, moist, friable, granular crumb to fine subangular blocky structure, fine tube and fracture porosity.
						7			
						8			
						9		ML	Silty clay with fine sand, stiff to v.stiff, strong brown, gray mottling, moist, friable, subangular blocky structure, fine tube and fracture porosity as in overlying unit.
						10			No free water to 10 feet below grade. Boring backfilled with cuttings upon completion. Lat./Long.: 40.72556, -124.17182, +/-9.8'
						11			

* The blow counts have been converted to standard N-value blow counts

SURFACE ELEVATION: 190 Feet

TOTAL DEPTH: 10 Feet

GROUNDWATER DEPTH: >10 Feet

LOGGED BY: David N. Lindberg, CEG

BOREHOLE DIAMETER: 3.5 Inches

EQUIPMENT: Hand Auger

HAMMER TYPE: None

LINDBERG GEOLOGIC CONSULTING

PROJECT NUMBER: 0091.01 DATE: August 12, 2014

LOG OF TEST EXCAVATION / BORING

HB-6, Lot 1 Slack & Winzler - Berta

Figure No. 9

LABORATORY				FIELD						
Dry Density (pcf)	Moisture Content (%)	Cohesion; Friction Angle (psf; degrees)	Other Tests	Blows/foot*	Sample	Depth (feet)	Graphic Lithology	U.S.C.S. Designation	SOIL DESCRIPTION	
								ML	Silt with fine sand, soft/loose, brown, dry, common fine roots. Topsoil	
								ML	Silt with fine sand, stiff, light yellowish brown, dry, friable.	
						1				
						2				
			20% Sand, 42% Silt, 38% Clay			3		ML	Silt with fine sand, stiff, light yellowish brown with strong brown mottling, moist, friable, subangular blocky structure. Sample 2.5 to 3.5 feet.	
						4				
						5				
			13% Sand, 44% Silt, 43% Clay			6		ML	Silt with fine sand, v.stiff, light gray with strong brown mottling, moist, friable, fine granular crumb structure, occasional fine roots, fine tube and fracture porosity. Sample 5 to 6 feet.	
						7				
						8		ML	Silt with fine sand, v.stiff, strong brown with gray mottling, moist, friable, granular crumb structure.	
						9				
						10			No free water to 10 feet below grade. Boring backfilled with cuttings on completion. Lat./Long.: 40.72459, -124.17145, +/-9.8'	
						11				

* The blow counts have been converted to standard N-value blow counts

SURFACE ELEVATION: 170 Feet

TOTAL DEPTH: 10 Feet

GROUNDWATER DEPTH: >10 Feet

LOGGED BY: David N. Lindberg, CEG

BOREHOLE DIAMETER: Inches

EQUIPMENT: Hand Auger

HAMMER TYPE: None

LINDBERG GEOLOGIC CONSULTING

PROJECT NUMBER: 0091.01 DATE: August 14, 2014

LOG OF TEST EXCAVATION / BORING

HB-7, Lot 2 Slack & Winzler - Berta

Figure No. **10**

LABORATORY				FIELD						SOIL DESCRIPTION
Dry Density (pcf)	Moisture Content (%)	Cohesion; Friction Angle (psf; degrees)	Other Tests	Blows/foot*	Sample	Depth (feet)	Graphic Lithology	U.S.C.S. Designation	
								ML	Silt with fine sand, soft/loose, dark brown, dry, common roots. Forest duff and topsoil.
						1		ML	Silt with fine sand, stiff, yellowish brown, dry, friable, granular crumb structure.
			39% Sand, 34% Silt, 27% Clay			2		SM	Fine sand with silt, dense, light yellowish brown, dry to moist, friable, fine granular crumb structure. Sample 2 to 3 feet.
						3		SM	Sand with silt and clay, dense, strong brown with gray mottles, moist, occasional fine roots, friable, fine granular crumb to weak subangular blocky structure.
			34% Sand, 36%Silt, 30% Clay			4			Sample 5 to 6 feet.
						5			
						6		SM	Sand with silt and clay, dense, strong brown, moist, trace fine well-rounded gravel and coarse sand, friable, fine granular crumb structure.
						7			
						8			
						9			
						10			No free water to 10 feet below grade. Boring backfilled with cuttings on completion. Lat./Long.: 40.72703/-124.17304, +/-9.8 feet.
						11			

* The blow counts have been converted to standard N-value blow counts

SURFACE ELEVATION: 115 Feet

TOTAL DEPTH: 10 Feet

GROUNDWATER DEPTH: >10 Feet

LOGGED BY: David N. Lindberg, CEG

BOREHOLE DIAMETER: 3.5 Inches

EQUIPMENT: Hand Auger

HAMMER TYPE: None

LINDBERG GEOLOGIC CONSULTING

PROJECT NUMBER: 0091.01 DATE: August 14, 2014

LOG OF TEST EXCAVATION / BORING

HB-8, Lot 1 Slack & Winzler - Berta

Figure No. 11